

A New Facility

Thaden Competition Gymnasium

Bentonville, Arkansas

Project No. # 2333.3



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SPECIFICATIONS

FOR FURNISHING LABOR AND

MATERIALS FOR:

CONSTRUCTION OF

A NEW FACILITY THADEN COMPETITION GYMNASIUM BENTONVILLE, ARKANSAS

HIGHT JACKSON ASSOCIATES PA

ARCHITECT, A.I.A.

ROGERS, ARKANSAS

PROJECT #2335.3

JANUARY 24, 2025

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PROJECT MANUAL FOR CONSTRUCTION OF

A NEW FACILITY THADEN COMPETITION GYMNASIUM BENTONVILLE, ARKANSAS

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SECTION 00 72 00

GENERAL CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work included under these Specifications consists of furnishing all items, materials, operations, or methods listed, mentioned, indicated, or scheduled on the drawings and/or in these Specifications, including all labor, materials, equipment, transportation, temporary facilities, services and incidental necessary and required for the construction and completion of the project named in the title page in accordance with contract documents.

1.2 FORM OF SPECIFICATIONS

- A. General Conditions and Division 1 (General Requirements) apply to every Division (1 through 33 of these Specifications.
- B. These Specifications are of abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the Contractor shall" "shall be", "as noted on the drawings", "according to the drawings", "a", "an", "the", and "all" are intentional. Omitted words and phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.
- C. All specification instructions are directed to the Contractor and the inclusion of any work by mention, note, or itemization, however brief, implies the Contractor shall provide same, unless specifically directed otherwise. Where a specific Contractor is named, he shall be responsible for and provide work so designated.
- D. In specifying an item by manufacturer's name and/or catalog number, such item is to be provided complete with all the standard devices and accessories as indicated in the latest edition of the manufacturer's catalog or brochure published at date of invitation to submit proposal, unless specifically stated otherwise.

1.3 AIA GENERAL CONDITIONS

A. AIA Document A201-2017: "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION", 2017 EDITION, 15 Articles, hereinafter referred to as the "AIA General Conditions', is hereby made a part of this specification, a copy of which is herein attached. Contractor shall consult this document and become intimately familiar with its contents before submitting his proposal.

END OF SECTION

00 72 00-1

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

AIA Document A201° – 2017

General Conditions of the Contract for Construction

for the following PROJECT: (Name and location or address)

A New Facility Thaden Competition Gym Bentonville, AR

THE OWNER: (Name, legal status and address)

Thaden Schools Bentonville, Arkansas

THE ARCHITECT: (Name, legal status and address)

Hight Jackson Associates PA Rogers, Arkansas

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For guidance in modifying this document to include supplementary conditions, see AIA Document A503[™], Guide for Supplementary Conditions.

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ARTICLE 1 **GENERAL PROVISIONS**

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials. equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

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§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

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§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These

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obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

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§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

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§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

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§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and .2 other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 3.12 Shop Drawings, Product Data and Samples

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§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional,

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whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3,12,10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

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§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work,

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provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

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Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

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§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS ARTICLE 6

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

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§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

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§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- The change in the Work; .1
- The amount of the adjustment, if any, in the Contract Sum; and .2
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to .1 permit evaluation;
- Unit prices stated in the Contract Documents or subsequently agreed upon; .2
- Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or .3 percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, .1 workers' compensation insurance, and other employee costs approved by the Architect;
- Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or .2 consumed;

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- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others:
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- Costs of supervision and field office personnel directly attributable to the change. .5

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith. including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

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§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- third party claims filed or reasonable evidence indicating probable filing of such claims, unless security .2 acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
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- .5 damage to the Owner or a Separate Contractor;
- reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid .6 balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

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§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

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§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled; .1
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- audits performed by the Owner, if permitted by the Contract Documents, after final payment. .4

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

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§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

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§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities

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proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

INSURANCE AND BONDS **ARTICLE 11**

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

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procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

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§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

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The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

UNCOVERING AND CORRECTION OF WORK ARTICLE 12

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

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§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

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timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

TERMINATION OR SUSPENSION OF THE CONTRACT ARTICLE 14

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be .1 stopped;
- An act of government, such as a declaration of national emergency, that requires all Work to be .2 stopped;
- Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the .3 reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2. .4

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions

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of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

- § 14.2.1 The Owner may terminate the Contract if the Contractor
 - .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
 - .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
 - .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
 - .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- Exclude the Contractor from the site and take possession of all materials, equipment, tools, and .1 construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- cease operations as directed by the Owner in the notice; .1
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.
- § 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work

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properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

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§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

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- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue dispute resolution proceedings with respect to the initial decision.

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§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of dispute resolution proceedings but, in such event, mediation shall proceed in advance of dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for dispute resolution. If such a demand is made and the party receiving the demand fails to file for g dispute resolution within 60 days after receipt thereof, then both parties waive their rights to dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

(Paragraphs deleted)

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Additions and Deletions Report for

AIA[®] Document A201[®] – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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A New Facility Thaden Competition Gym Bentonville, AR

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Thaden Schools Bentonville, Arkansas

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Arbitration 8.3.1, 15.3.2, 15.4

...

Bidding Requirements

...

Binding-Dispute Resolution PAGE 3

Claims Subject to Arbitration 15.4.1 PAGE 7

Rules and Notices for Arbitration 15.4.1 PAGE 24

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding-dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents. PAGE 33

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act-shall-govern Section 15.4.

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The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2. **PAGE 37**

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding-dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

...

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

...

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding-dispute resolution proceedings with respect to the initial decision. **PAGE 38**

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry

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Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding-dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding-dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding-dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding g dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

...

§ 15.4 Arbitration

§ 15.4.1-If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim-subject-to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration-Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration-is-permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable-law-in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural-rules and methods for selecting-arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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Certification of Document's Authenticity

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I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 09:53:07 ET on 01/27/2025 under Order No. 2114451452 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA[®] Document A201[™] - 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

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AIA[°] Document A133[°] – 2019 Exhibit B

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Construction Manager, dated to be determined (In words, indicate day, month and year.)

for the following **PROJECT**: (Name and location or address)

A New Facility Thaden Competition Gym Bentonville, AR

THE OWNER: (Name, legal status, and address)

Thaden School Bentonville, AR

THE CONSTRUCTION MANAGER: (Name, legal status, and address)

Kinco, Inc Springdale, AR

TABLE OF ARTICLES

- **B.1** GENERAL
- **B.2 OWNER'S INSURANCE**

CONSTRUCTION MANAGER'S INSURANCE AND BONDS **B.3**

B.4 SPECIAL TERMS AND CONDITIONS

ARTICLE B.1 GENERAL

The Owner and Construction Manager shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201[™]-2017, General Conditions of the Contract for Construction.

ARTICLE B.2 **OWNER'S INSURANCE**

§ B.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article B.2 and, upon the Construction Manager's request, provide a copy of the property insurance policy or policies required by Section B.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ B.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201™-2017, General Conditions of the Contract for Construction. Article 11 of A201™-2017 contains additional insurance provisions.

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§ B.2.3 Required Property Insurance

§ B.2.3.1 Unless this obligation is placed on the Construction Manager pursuant to Section B.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section B.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Construction Manager, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ B.2.3.1.1 Causes of Loss. The insurance required by this Section B.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials.

§ B.2.3.1.2 Specific Required Coverages. The insurance required by this Section B.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Construction Manager's services and expenses required as a result of such insured loss, including claim preparation expenses.

§ B.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section B.2.3.1 or, if necessary, replace the insurance policy required under Section B.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ B.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section B.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ B.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section B.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Construction Manager shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

THE CONTRACTOR SHALL MAINTAIN BUILDERS' RISK INSURANCE AND SHALL FILE CERTIFICATES OF INSURANCE WITH THE OWNER AS REQUIRED. The limits of such insurance shall be not less that the following:

1. Property Insurance (Builders' Risk) shall be purchased and maintained by the Contractor. Furnish Owner with a copy of the policy. Contractor shall notify Owner at least Fifteen (15) days before policy is terminated. Insurance shall not exclude Owners current and continued occupancy.

§ B.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of

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the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section B.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

(Paragraphs deleted) ARTICLE B.3 CONSTRUCTION MANAGER'S INSURANCE AND BONDS § B.3.1 General

§ B.3.1.1 Certificates of Insurance. The Construction Manager shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article B.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section B.3.2.1 and Section B.3.3.1. The certificates will show the Owner as an additional insured on the Construction Manager's Commercial General Liability and excess or umbrella liability policy or policies.

§ B.3.1.2 Deductibles and Self-Insured Retentions. The Construction Manager shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Construction Manager.

§ B.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Construction Manager shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Construction Manager's negligent acts or omissions during the Construction Manager's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Construction Manager's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ B 3.1.4 Waiver of Subrogation the Commercial General Liability and Automobile Liability policies shall each contain a waiver of subrogation in favor of the Owner, Architect, and their officers, directors, Board Members, employees and agents.

§ B 3.1.5 Subcontractors, Contractor shall cause each subcontractor to purchase and maintain insurance of the types and amounts specified as a minimum. Limits of such coverage may be reduced only upon written agreement of Owner. Contractor shall provide to the Owner copies of certificates evidencing coverage for each subcontractor. Subcontractor's commercial general liability and business automobile liability insurance shall name Owner and Architect as additional insured and have the Waiver of subrogation endorsement added in accord with Article A.3.
§ B .3.1.6 These certificates and the insurance policies required by this Article A.3 shall contain a provision afforded under the policies will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Owner. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

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§ B 3.1.7 Failure to file certificates or acceptance by the Owner or Architect of certificates of insurance which do not indicate the specified coverage shall in no way relieve the contractor of his responsibility for maintaining insurance as specified above.

8 B.3.2 Construction Manager's Required Insurance Coverage

§ B.3.2.1 The Construction Manager shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Construction Manager shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

§ B.3.2.2 Commercial General Liability

§ B.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Million Dollars 1,000,000) each occurrence, Two Million Dollars (\$ 2,000,000) general aggregate, and Two Million Dollars (\$ 2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

- damages because of bodily injury, sickness or disease, including occupational sickness or disease, and .1 death of any person;
- personal injury and advertising injury; .2
- damages because of physical damage to or destruction of tangible property, including the loss of use of .3 such property;
- bodily injury or property damage arising out of completed operations; and .4
- the Construction Manager's indemnity obligations under Section 3.18 of the General Conditions. .5

§ B.3.2.2.2 The Construction Manager's Commercial General Liability policy under this Section B.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact .1 that the claimant is an insured, and there would otherwise be coverage for the claim.
- Claims for property damage to the Construction Manager's Work arising out of the products-completed .2 operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- Claims for bodily injury other than to employees of the insured. .3
- Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees .4 of the insured.
- Claims or loss excluded under a prior work endorsement or other similar exclusionary language. .5
- Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary .6 language.
- Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed .7 on such a project.
- Claims related to roofing, if the Work involves roofing. .8
- Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings .9 or surfaces, if the Work involves such coatings or surfaces.
- Claims related to earth subsidence or movement, where the Work involves such hazards. .10
- Claims related to explosion, collapse and underground hazards, where the Work involves such hazards. .11

§ B.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Construction Manager, with policy limits of not less than One Million Dollars (\$ 1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ B.3.2.4 The Construction Manager may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section B.3.2.2 and B.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower

coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ B.3.2.5 Workers' Compensation at statutory limits.

§ B.3.2.6 Employers' Liability with policy limits not less than One Million Dollars (\$ 1,000,000) each accident, One Million Dollars (\$ 1,000,000) each employee, and One Million Dollars (\$ 1,000,000) policy limit.

§ B.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ B.3.2.8 If the Construction Manager is required to furnish professional services as part of the Work, the Construction Manager shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than One Million Dollars (\$ 1,000,000) per claim and One Million Dollars (\$ 1,000,000) in the aggregate.

§ B.3.2.9 Construction Manager shall procure Pollution Liability insurance, with policy limits of not less than One Million Dollars (\$ 1,000,000) per claim and One Million Dollars (\$ 1,000,000) in the aggregate.

(Paragraphs deleted)

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§ B.3.3 Construction Manager's Other Insurance Coverage

§ B.3.3.1 Insurance selected and described in this Section B.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Construction Manager shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

§ B.3.3.2 The Construction Manager shall purchase and maintain the following types and limits of insurance in accordance with Section B.3.3.1.

(Select the types of insurance the Construction Manager is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[X] § B.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section B.2.3, which, if selected in this Section B.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section B.2.3.1.3 and Section B.2.3.3. The Construction Manager shall comply with all obligations of the Owner under Section B.2.3 except to the extent provided below. The Construction Manager shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Construction Manager shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

(Where the Construction Manager's obligation to provide property insurance differs from the Owner's obligations as described under Section B.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[X] § B.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

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- [X] § B.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Construction Manager and used on the Project, including scaffolding and other equipment.
- [] § B.3.3.2.6 Other Insurance (List below any other insurance coverage to be provided by the Construction Manager and any applicable limits.)

Coverage

Limits

§ B.3.4 Performance Bond and Payment Bond

The Construction Manager shall provide surety bonds, from a company or companies lawfully authorized to issue (Paragraphs deleted)

(Table deleted)

Payment and Performance Bonds shall be AIA Document A312TM, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312TM, current as of the date of this Agreement.

§ B.3.4 Revised Language:

Construction Manager shall pay premium for and furnish Two (2) copies of a Performance Bond, and a Labor and Material Payment Bond in full amount of the contract sum to cover faithful performance of the contract and payment of all obligations arising thereunder, within seven (7) calendar days after signing contract. Furnish bonds in accordance with application laws of the State of Arkansas. Labor and Material Payment Bond coverage for project shall be maintained for a period of not less than one (1) year after substantial completion. A Warranty Bond shall be furnished in full amount of the contract sum to cover faithful performance of the contract and payment of all obligations for an additional year beyond Labor and Material Payment Bond coverage.

§ B 3.4.1 Furnish Owner, through the Architect, with two (2) copies each of required bonds.

§ B .3.4.2 Furnish Owner, through the Architect, with two (2) copies of the signed "Contractor's and Resident Local Agents Affidavit of Qualification, attached.

§ B .3.4.3 The Construction Manager shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy.

ARTICLE B.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

None

User Notes:

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GENERAL REQUIREMENTS AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General intention.
- B. General Method of Procedure.
- C. Applicable state and local laws
- D. Fire Protection verification
- E. Erosion Control.

1.2 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition of existing items where noted, furnish labor and materials and perform work for a New facility, Thaden Competition Gym, Bentonville, AR, as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Construction Manager
- C. In some instances it may have been impracticable to detail all items in specifications or on drawings because of variances in manufacturer's methods or of multiple methods of achieving specified results. In such instances Contractor will be required to furnish all labor, materials, drawings, services and connections necessary to produce systems or equipment which are completely installed, functional, and ready for operation by personnel in accordance with their use. Contractor and each subcontractor is to perform work to comply with standard practices of his or her trade or profession.
- D. Offices of HIGHT/JACKSON/ASSOCIATES/P.A., as Architects, will render certain technical services during construction. Such services shall be considered as advisory to the Owner and shall not be construed as expressing or implying a contractual act of the Owner without affirmations by the Owner or his duly authorized representative.

1.3 GENERAL METHOD OF PROCEDURE

- A. Working space and space available for storing materials shall be coordinated prior to construction.
- B. Workmen are subject to rules of the Owner applicable to their conduct.

01 00 00-1

- C. Contractor shall furnish Architect with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof.
- D. If work is scheduled to be performed on Saturdays, Sundays or holidays the Contractor shall provide written notification to the Architect indicating dates on which work will be performed. Notification shall be a minimum of 48 hours before the work date commences.
- E. Existing Utilities: Before construction can begin, contractor shall have all existing underground utility line locations in affected construction area verified and located by one-call service, if this service exists. In addition consult Owner and/or utility companies. In Arkansas the one-call phone number is 1 800-482-8998.. Contractor to provide written proof that contact with utility companies and any private utilities such as telephone companies that the Owner may have contracted with. Provide a statement that contact has been made with Owner's personnel, all utility companies, and that all utility lines have been located to the best of their knowledge and ability. It shall be the responsibility of the contractor to relocate all existing utilities which conflict with the proposed improvements shown on the drawings.
- F. Utilities Services: Maintain existing utility services for adjacent building at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer, air pipes, or conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Architect/Engineer.
 - 1. All such work required in connection with telephone systems shall be done by Owner's Telephone Company at Contractor's expense.
 - 2. No utilities service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Owner.
 - 3. Contractor shall submit a request to interrupt any such services to Owner 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
- G. To minimize interference of construction activities with flow of traffic comply with the following:
 - 1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.
- H. Staging and construction traffic
 - 1. Refer to civil drawings for staging area and routing of construction traffic.
- 1.5 APPLICABLE STATE AND LOCAL LAWS

01 00 00-2

A. Contractor and all subcontactors of all trades present on site shall comply with applicable state and local laws and ordinances while present on public property.

B. <u>Absolutely no tobacco or e-cigarette use is permitted in building or on the project</u> <u>site.</u>

1.6 FIRE PROTECTION VERIFICATION

A. If any changes to the contract during construction occurs that involves work to any addition, remodel, or work to this project or in an adjacent building. Contractor to be responsible for verifying and adding onto, altering or updating existing fire alarm or fire sprinkler system to meet state and local current code requirements and verified by representative of the local fire department having jurisdiction.

1.7 EROSION CONTROL

- A. The site work contractor is to comply with the provisions of the Arkansas Water and Air Pollution Control Act (Act 274 of 1949, as amended, AR Ann. 8-4-101 et seq.), and the Federal Clean Water Act 33 U.S.C. 1251 et seq. which safeguards the storm water runoff to all receiving waters, i.e., streams, lakes and oceans by limiting effluent, erosion and other conditions. Application for permitting and monitoring requirements will be required through the state where the work is being performed. State of Arkansas, Storm Water Section NPDES, PO Box 8913, Little Rock, AR 72214 Phone 501/-682-0628.
- PART 2 PRODUCTS Not Used.
- PART 3 EXECUTION Not Used.

END OF SECTION

01 00 00-3

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

STANDARD SPECIFICATIONS REFERENCE

PART 1 - GENERAL

1.1 SUMMARY

- A. All materials and construction shall comply with the latest edition of the following standard Specifications and Codes. The following specifications and codes are hereby incorporated by reference to these Project Specifications.
 - 1. City of Bentonville, Municipal Code: APPENDIX C STREET SPECIFICATIONS; available for download at the following website; <u>https://bentonville.municipalcodeonline.com/book?type=ordinances#name=APPEND</u> <u>IX_C_STREET_SPECIFICATIONS</u>
 - 2. City of Bentonville, CITY OF BENTONVILLE: STANDARD WATER AND SEWER SPECIFICATIONS, 2024: available for download at the following website; http://www.bentonvillear.com/208/2024-Water-Sewer-Specifications
 - 3. City of Bentonville, CITY OF BENTONVILLE: BEUD ELETRIC SPECIFICATIONS, 2019: available for download at the following website; http://ar-bentonville.civicplus.com/DocumentCenter/View/100/BEUD-Electric-Specifications-PDF
- B. If conflicts exist between the referenced Standard Specifications and other specifications incorporated in these contract documents, the more stringent requirement shall govern.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01 10 00-1

ENDANGERED SPECIES REFERENCE

PART 1 - GENERAL

1.1 SUMMARY

- A. Contractor shall comply with all requirements and recommendations of the United States Endangered Species Act and Gold and Bald Eagle Protection Act. All construction activity shall comply with the recommendations and requirements of the US Fish and Wildlife Service for the protection of endangered species. The following documents and codes are hereby incorporated by reference to these Project Specifications.
 - 1. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.)
 - 2. Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)
- B. There are NOT known endangered species, or Bald or Golden Eagles present at or near the proposed work areas.
- C. If endangered species or Bald or Golden Eagles are encountered during construction the Contractor shall stop work immediately and notify the Owner and Engineer. Contractor shall await direction prior to commencing work activities.
- D. Contractor shall conduct a tree removal pre-construction conference to review the trees to be removed.
- E. Contractor shall obtain written approval from the City, Owner and Engineer prior to any burning of trees or brush onsite.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01 10 02-1

STORMWATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.1 SUMMARY

- A. Contractor shall comply with all requirements and recommendations of the Arkansas Department of Environmental Quality (ADEQ) Construction Stormwater Discharge Permit. The following documents and codes are hereby incorporated by reference to these Project Specifications.
 - 1. Stormwater Pollution Prevention Plan (SWPPP) for Construction Activities for Small Construction Sites.
 - 2. ADEQ SWPPP General Permit No. ARR150000

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01 10 03-1

ARKANSAS HISTORICAL PRESERVATION PROGRAM AND REFERENCE

PART 1 - GENERAL

1.1 SUMMARY

- A. Contractor shall comply with all requirements and recommendations of the Arkansas Department of Heritage, Arkansas Historic Preservation Program and National Historic Preservation Act. The following documents and codes are hereby incorporated by reference to these Project Specifications.
 - 1. National Historic Preservation Act of 1966 (NHPA, Public Law 89-665; 54 U.S.C. 300101 et seq.)
- B. There are NOT known historic properties or cultural resources at or near the proposed work areas.
- C. If cultural resources or historic properties are encountered during construction the Contractor shall stop work immediately and notify the Owner and Engineer. Contractor shall await direction prior to commencing work activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01 10 04-1

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Contract Description.
- B. Description of the work.
- C. Owner supplied Products.
- D. Contractor use of site and premises.
- E. Future work.
- F. Work sequence.
- G. Site security and encumbrances.
- H. Owner occupancy.
- I. Permits and fees
- 1.2 CONTRACT DESCRIPTION
 - A. Contract Type: Construction Manager as Constructor.
- 1.3 DESCRIPTION OF THE WORK
 - A. The work under this contract will include all work as shown on drawings and specifications and shall include all work required to complete the project <u>with exception</u> <u>of the following:</u>
 - 1. Telephone and computer system (Other than conduit and junction boxes).
 - 4. Lockers & locker room furniture
 - 5. Concessions equipment supplied by Owner except for items noted otherwise on equipment schedule. Plumbing, mechanical, and electrical rough-in and final connections to be provided in contract.
 - B. Items noted NIC (Not in Contract), will be supplied and installed by Owner.
 - C. Contractor will remove existing monument sign and store for re-install at the Thaden Lower School

01 11 00-1

- D. Contractor is responsible for familiarizing himself with the entire project; for expediting and completing all phases of the project in accordance with the Contract Documents; and is solely responsible for work completed by other trades under his contract.
- E. Contractor is responsible for coordinating items furnished and installed by owner.

1.4 OWNER SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples, to Contractor.
 - 2. Arrange and pay for Product delivery to site.
 - 3. On delivery, inspect Products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed Shop Drawings, Product Data, and Samples. Verify owner supplied products fit where product is to be installed or placed.
 - 2. Receive and unload Products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish Products.
 - 4. Repair or replace items damaged after receipt.
- C. Products supplied to site and installed by Owner's direct hire installer/contractor:
 - 1. Structured network cabling.
 - 2. Concession Appliances
 - 3. Furniture (reference specialty plans for further information)
 - 4. Multipurpose A/V system
 - 5. Ice Machine in Janitor Room
 - 6 Commercial Washer & Dryer
- D. Items supplied by Owner for installation by Contractor:
 - 1. Paper Towel & Soap Dispensers
 - 2. Tissue Dispensers
 - 3. TV & TV brackets
 - 4. Therapy Tub in Training Room
 - 5. Scoreboards

1.5 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow construction in accordance with contract and construction documents.
- 1.6 FUTURE WORK

01 11 00-2

- A. Project is designed for future weight room building addition.
- B. Provide framed opening for future installation of door access. Reference drawings.

1.7 WORK SEQUENCE

- A. Properly prepare all work to receive subsequent work or finish. Notify Architect if any work is unsatisfactory to receive such subsequent work or finish and receive his instructions before proceeding. Failure to make such notification by trade applying work over unsatisfactory materials will constitute his acceptance or responsibility for making the necessary corrections.
- B. Contractor to take photographs of Critical areas of work and other items as deemed necessary when asked to do so by Architect/Engineer. Refer to Section 01 32 33.

1.8 SITE SECURITY

- A. Contractor is responsible for securing the site at all times to prevent loss of property or injury to persons present at site. Such responsibility shall remain with the Contractor until all work is completed.
- B. Refer to Section 01 50 00 for temporary construction fencing requirements.

1.9 SITE ENCUMBRANCES

- A. Contractor will remove and/or relocate all interfering sheds, concrete slabs, driveways, curbs, walks, trees, footings, etc., prior to construction.
- B. Contractor shall maintain utilities in operation on temporary basis till near the end of construction when finished utilities shall be completed.
- C. Contractor will cut grass and weeds before starting of project and dispose of same.
- D. Provide barriers at drip line of trees to keep traffic off of root system. Trim branches to clear equipment.

1.10 ACCESS TO PROPERTY

- A. Provide and maintain access to property for all trades.
- B. Provide unobstructed access to building areas required to remain in operation. Use hoist or lift wherever practical to move equipment and materials to levels above the ground floor. Hoist or lift is to be removed from premises at completion of construction.
- C. Access by Contractor and his personnel through occupied portions of buildings is not permitted within the occupied building area except along designated routes verified by the Owner.

01 11 00-3

1.11 OWNER OCCUPANCY

A. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in Owner operations will not be hindered. Contractor shall permit access to Owner personnel through construction areas. Contractor to provide temporary means of protected access to all occupied areas of alteration during the construction period.

1.12 PERMITS AND FEES

- A. Contractor to be responsible for verifying and obtaining written list of all permits, fees, etc. from local, county, state, and federal (if applicable) governing bodies that will apply to this project. Contractor is responsible for paying for these permits and fees.
- B. Building Permit Contractor secure and pay for city building permit if required by City.
- C. Special Permits/Fees Contractor and/or subcontractors shall be responsible for securing and paying for all special permits, licenses and fees that may be required by local, state, or federal laws as may be applicable to the review, installation or certification of their systems and materials or required for installation of such materials.
- D. Connection Fees Contractor and/or subcontractors shall be responsible for securing and paying for all fees and associated costs for review of, and connection to public utility services.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01 11 00-4

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Measurement and payment criteria applicable to portions of the Work performed under a unit price payment method.
- B. Defect assessment and nonpayment for rejected work.

1.2 AUTHORITY

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. The Architect/Engineer will verify measurements and quantities.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.3 UNIT QUANTITIES SPECIFIED

- A. All labor and material shall be provided as shown in construction documents, unless otherwise noted. Pricing for unit quantities referenced in the individual specification sections are for bidding and in cases of unusual conditions of change in scope of work.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted. Quantities and measurements supplied or placed into the work shall be verified by a third party and approved by the Architect/Engineer prior to proceeding with work. The cost for work performed by the third party to verify quantities shall be paid for by Contractor, unless noted otherwise.
- C. Each Unit Price shall include all costs incurred to the contractor for the particular item the Unit Price provides for.

1.4 MEASUREMENT OF QUANTITIES

- A. Measurement Devices:
 - 1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.

01 22 13-1

- 3. Metering Devices: Inspected, tested and certified by the applicable State department within the past year.
- B. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- D. Measurement by Area: Measured by square dimension using mean length and width or radius.
- E. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- F. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.5 PAYMENT

- A. Payment Includes: Full compensation for all required labor, Products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.
- B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Architect/Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

1.6 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct one of the following remedies:
 - 1. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the Architect/Engineer.
 - 2. The defective Work will be partially repaired to the instructions of the Architect/Engineer, and the unit sum/price will be adjusted to a new sum/price at the discretion of the Architect/Engineer.
- C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.
- D. The authority of the Architect/Engineer to assess the defect and identify payment adjustment is final.

01 22 13-2

1.7 NONPAYMENT FOR REJECTED PRODUCTS

- A. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected Products.
- 1.8 SCHEDULE OF UNIT PRICES
 - A. Item: Rock Removal, Section 31 20 00
 - B. Item: Trench Rock Removal, Section 31 21 16
 - C. Item: Engineered Fill, Section 31 21 16
 - D. Item: Engineered Fill Where Trench Rock is Removed, Section 31 23 33
 - E. Item: Earth Removal, Section 31 21 16
 - F. Item: Credit to Owner for use of on-site fill, Section 31 21 16
 - H. Item: Controlled Low Strength Material (CLSM) / Flowable Fill, Section 31 21 16

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01 22 13-3
SECTION 01 26 00

MODIFICATION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals.
- B. Documentation of change in Contract Sum/Price and Contract Time.
- C. Change procedures.
- D. Construction Change Directive.
- E. Stipulated Sum change order.
- F. Unit price change order.
- G. Time and material change order.
- H. Execution of change orders.
- I. Correlation of Contractor submittals.
- 1.2 RELATED SECTIONS
 - A. Document 00 72 00 General Conditions AIA: Governing requirements for changes in the Work, in Contract Sum/Price, and Contract Time.
 - B. Section 01 33 00 Submittals: Schedule of values.
 - C. Section 01 60 00 Material and Equipment: Product options and substitutions.
 - D. Section 01 77 00 Contract Closeout: Project record documents.

1.3 SUBMITTALS

- A. Submit the name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Change Order Forms: AIA G701. Change Order.
- 1.4 DOCUMENTATION OF CHANGE IN CONTRACT SUM/PRICE AND CONTRACT TIME

01 26 00-1

- A. Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. Provide additional data to support computations:
 - 1. Quantities of products, labor, and equipment.
 - 2. Taxes, insurance, and bonds.
 - 3. Overhead and profit.
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.
- D. Support each claim for additional costs, and for work done on a time and material basis, with additional information:
 - 1. Origin and date of claim.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time records and wage rates paid.
 - 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.5 CHANGE PROCEDURES

- A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by AIA A201, 2017 Edition, Paragraph 7.4 by issuing a Field Order, AIA Form G708, Supplemental Instructions, AIA Form G710 or Hight Jackson Associates Architect's Supplemental Instructions.
- B. The Architect/Engineer may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications and change in Contract Time for executing the change with a stipulation of any overtime work required. Contractor will prepare and submit an estimate within 10 calendar days unless instructed otherwise.
- C. The Contractor may propose a change by submitting a request for change to the Architect/Engineer, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.

1.6 CONSTRUCTION CHANGE DIRECTIVE

01 26 00-2

- A. Architect/Engineer may issue a document, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
- B. The document will describe changes in the Work and will designate method of determining any change in Contract Sum/Price or Contract Time.
- C. Promptly execute the change in Work.
- 1.7 STIPULATED SUM CHANGE ORDER
 - A. Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.
- 1.8 UNIT PRICE CHANGE ORDER
 - A. For predetermined unit prices and quantities, the Change Order will be executed on a fixed unit price basis.
 - B. For unit costs or quantities of units of work which are not predetermined, execute Work under a Construction Change Directive.
 - C. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.
- 1.9 TIME AND MATERIAL CHANGE ORDER
 - A. Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
 - B. Architect/Engineer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.
 - C. Maintain detailed records of work done on a Time and Material basis.
 - D. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- 1.10 EXECUTION OF CHANGE ORDERS
 - A. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.11 CORRELATION OF CONTRACTOR SUBMITTALS

01 26 00-3

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum/Price.
- B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub schedules to adjust times for other items of work affected by the change and resubmit.
- C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

01 26 00-4

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 29 76

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for payment.
- 1.2 RELATED SECTIONS
 - A. Document 00 72 00 General Conditions AIA: Progress payments and final payments.
 - B. Section 01 31 00 Coordination and meetings:
 - C. Section 01 32 36 Construction Progress Schedules: Submittal procedures.
 - D. Section 01 77 00 Contract Closeout: Final payment.

1.3 FORMAT

- A. AIA G702 Application and Certificate for Payment and AIA G703 Continuation Sheet.
- B. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders Listed separately.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.

1.4 PREPARATION OF APPLICATIONS

- A. Present required information in typewritten form or on electronic media printout.
- B. Execute certification by signature of authorized officer.
- C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- D. List each authorized Change Order as an extension on AIA G703 Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work.

01 29 76-1

E. Prepare Application for Final Payment as specified in Section 01 77 00.

1.5 SUBMITTAL PROCEDURES

- A. Submit three copies of each Application for Payment.
- B. Submit three copies of **updated** construction schedules with each Application for Payment.
- C. Submit three copies of Certificate of Insurance for items stored off-site with each Application for Payment.
- D. Submit delays caused as a result of adverse weather, strikes, etc. Include backup with each pay application. Provide project superintendent's weather log for project with each pay application. If no delay days occurred during the last pay period provide statement on transmittal or letter stating that no delay days occurred. Delay days for Saturday and Sunday and Holidays will not be approved unless prior notice has been given and accepted by Architect. Approved delay days will not result in an increase in completion time unless days exceed anticipated delay days as set forth under General Conditions.
 - 1. Submit as part of the pay application a monthly updated CPM work schedule as required in Section 01 32 36.
 - 2. Monthly Progress Report
 - a. Refer to Section 01 31 00, paragraph 1.7 for details.
 - 3. Updated and currently in force proof of insurance. (The proof of insurance needs to only be filed during the month of renewal, however, a lapsed Insurance Certificate will result in Pay Application being held as incomplete)
 - 4. Failure to submit any of the above required items will result in pay application being held until submissions are complete.
- F. Payment Period: Submit at intervals stipulated in the Agreement.
- G. Submit with transmittal letter as specified for Submittals in Section 01 33 00.

1.6 SUBSTANTIATING DATA

- A. When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one copy of data with a cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- C. Include the following with the application when substantiating data is asked for:
 - 1. Current available construction photographs of item in question.
 - 2. Record documents for review by the Owner which will be returned to the contractor.
 - 3. Affidavits attesting to off-site stored products.
 - 4. Construction progress schedules revised and current.

01 29 76-2

- 5. Other data and information as required or asked for by Architect.
- D. Partial Lien Waivers: If directed by Owner or Architect, the Contractor may be required to submit partial lien waivers of subcontractors and suppliers accompanying payment request applications to show proof that he has made percentage of progress payment as shown on previous payment request application. If partial lien waivers are asked for, Contractor must submit them for review and approval. If he has not submitted them, or if a subcontractor or supplier has not been paid for the previous pay periods, the current pay application will not be processed until partial lien waivers are received and approved, or until justification is accepted by Owner and Architect as to the reason payment was withheld for the subcontractor or supplier on previous payment applications.

1.7 PROOF OF INSURANCE FOR MATERIALS STORED OFF SITE.

A. Payments will only be processed for materials stored off site that are stored in a bonded or insured warehouse. If materials are stored off site on a secure open-air site, material must be insured. Payment claims for materials stored off site must be accompanied with an itemized list of materials establishing value, proof that the materials are insured, and a receipt of storage from a bonded warehouse. Upon payment of materials stored, title to the material shall be to the Owner. All expenses incurred in storage of materials will be paid by the contractor.

1.8 RETAINAGE

- A. In making partial payments for the work, there shall be retained **Five (5%)** of the estimated amount for labor and materials until final completion and acceptance of all work covered in the contract. Retainage shall be paid to the Contractor in the final payment if all conditions of the contract documents have been met including completed close-out documents and as-built drawings.
- PART 2 PRODUCTS Not Used.
- PART 3 EXECUTION Not Used.

END OF SECTION

01 29 76-3

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 31 00

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Pre-construction meeting.
- C. Field engineering
- D. Progress meetings.
- E. Pre-installation meetings.
- F. Equipment electrical characteristics and components.
- G. Examination.
- H. Preparation.
- I. Schedule and Reports

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

- E. Coordinate completion and cleanup of Work of separate sections in preparation for Substantial Completion and for portions of Work if designated for Owner's partial occupancy.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

- A. Contractor shall locate and protect survey control and reference points.
- B. Control datum for survey is shown on Drawings.
- C. Verify setbacks and easements; confirm drawing dimensions and elevations.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.4 PRECONSTRUCTION MEETING

- A. Owner, through Architect/Engineer will schedule a meeting after Notice of Award.
- B. Construction Manager shall conduct meeting.
- C. Attendance Required: Owner, Architect/Engineer, Prime Contractor, Major Subcontractors, Representatives of Governmental or other regulating Agencies.

D. Agenda:

- 1. Execution of Owner-Contractor Agreement.
- 2. Submission of executed bonds and insurance certificates.
- 3. Submission of list of Subcontractors, schedule of values, and progress schedule.
- 4. Designation of personnel representing the parties in Contract, and the Architect/Engineer.
- 5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, and Change Order procedures.
- 6. Scheduling and coordination of prime contractors.
- 7. Inspection procedures.
- 8. Shop drawings and Submittals, Grouping of Submittals
- 9. Critical areas of the work
- 10. Reports, testing and scheduling activities of a Geotechnical Engineer.
- 11. Use of premises by Owner and Contractor.
- 12. Owner's requirements and occupancy.
- 13. Construction facilities and controls.
- 14. Temporary utilities.
- 15. Procedures for maintaining record documents (As-Builts).
- 16. Requirements for start-up of equipment.

- 17. Inspection and acceptance of equipment put into service during construction period.
- 18. Contract closeout procedures, Substantial Completion, Final inspection, warranties, and manuals.
- 19. Other items as deemed necessary by the Architect or owner.
- E. Contractor to record minutes and distribute copies within two days after meeting to participants, with copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.5 PROGRESS MEETINGS

- A. Contractor will schedule and administer meetings with assistance of Architect throughout progress of the Work at weekly intervals unless different interval is approved by Architect and Owner.
- B. Contractor will schedule and make arrangements for meetings, prepare agenda with copies for participants, preside at meetings. Schedule comments from Architect on agenda. Architect to approve schedule.
- C. Contractor shall provide written copies of previous items of discussion, resolution of same, and any new outstanding issues to be addressed.
- D. Attendance is required by the following people:
 - 1. General Contractor's Project Manager and Job Superintendent
 - 2. Project Manager and Field Foreman for each trade currently working on the site.
 - 3. Project Manager of any trade who will be mobilizing on site during the next thirty (30) days.
 - 4. Representative of Major Suppliers
 - 5. Owner/Architect/Engineer as appropriate to address agenda items.
- E. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems which impede planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Contractor to present outline work schedule for the next month.
 - 14. Other business relating to Work.

F. Contractor to record minutes and distribute copies within two days after meeting to participants, with copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.6 PRE-INSTALLATION MEETING

- A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect/Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of installation, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Attendance Required: Contractor's Project Manager, Job superintendent, major Subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

1.7 PROGRESS REPORTS

- A. The Contractor shall submit monthly progress reports to the Architect, attached to his request for payment, showing each major item of the work, the current percentage of completion, and whether ahead or behind schedule. Any delays beyond the contractor's control, such as adverse weather conditions, strikes, etc., that delay the project completion are to be documented and submitted each month along with the progress report. Orders for all materials, except those requiring a decision by the Owner, must be placed within thirty (30) days after award of the contract and evidence of such orders furnished to the Architect. For order of materials requiring Owner decision, such as color, texture, etc; these orders will be placed as soon as possible after selection. Contractor is responsible for notifying the Architect when delaying selection will cause delays in completion. These requirements will be considered mandatory prior to any approval of monthly pay request by the Architect.
- B. Include the following items as additional requirements of the monthly report.
 - 1. Updated schedule
 - 2. All meeting minutes for month
 - 3. Updated submittal schedule
 - 4. RFI log (all logs should contain date submitted to Architect, Date returned and Status)

1.8 OWNER'S ACCESS TO CONSTRUCTION

- A. In addition to the Architect, the Owner shall be allowed to provide on-site representation as he/she deems necessary. Contractor and all subcontractors are to allow access to this (these) Individual(s) identified during the pre-construction conference, or by later correspondence from the Architect.
 - Note: The Architect shall be notified of any Owner on site selections, determining colors and/or textures, and any owner directed modifications to the work before final modifications are made to ensure information given does not conflict with other scope in the construction documents.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

01 31 00-5

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SECTION 01 32 33

CONSTRUCTION PHOTOGRAPHS & DOCUMENTATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Photography.
- B. Electronic Photographic Digital Images
- C. Technique.
- D. Submittals.

1.2 RELATED SECTIONS

- A. Section 01 11 00 Summary of Work: Stages of the Work.
- B. Section 01 77 00 Contract Closeout: Project record documents.

1.3 PHOTOGRAPHY

- A. Have available a digital camera of sufficient quality to produce photographs of site and construction throughout progress of work when required or asked for by Architect or Owner. Contractor must have means of electronically transferring images from job site and office via e-mail to Architect/Engineer.
- B. If an Architect elects to view an observation such as footing or slab preparation via photos taken by Contractor, placement will not take place until Architect/Engineer reviews and issues observation and comment of photos.
- C. Take photographs of critical areas asked of the Architect/Engineer. Such areas might be:
 - 1. Excavations.
 - 2. Foundations.
 - 3. Structural framing.
 - 4. Enclosure of building.
 - 5. Other items as asked for.

1.4 IMAGES

- A. Full color.
- B. Size: Appropriate to show detail required.

01 32 33-1

- C. Identify each image in electronic file name. Identify name of Project, and date of view.
- D. Deliver electronic images to Architect immediately for his/her review and retention in job files.

1.5 VIEWS

A. Consult with Architect/Engineer for instructions on views required.

1.6 SUBMITTALS

A. Deliver e-mail images for each requested installation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01 32 33-2

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 32 36

CONSTRUCTION PROGRESS SCHEDULES

PART 1 GENERAL

- 1.1 SECTION INCLUDES
 - A. Format.
 - B. Content.
 - C. Revisions to schedules.
 - D. Submittals.

1.2 RELATED SECTIONS

- A. Section 01 11 00 Summary of Work: Work sequence.
- B. Section 01 29 76 Applications for Payment: Application for payment.
- C. Section 01 33 00 Submittals: Shop drawings, product data,

1.3 FORMAT

- A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first workday of each week.
- B. Scale and Spacing: To provide space for notations and revisions.
- C. Sheet Size: Multiples of 11 x 17 inches.

1.4 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages, and other logically grouped activities.
- D. Show critical path for sequencing of trades and materials.
- E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

01 32 36-1

F. Coordinate content with schedule of values specified in Section 01 29 76.

1.5 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes. Show on schedule by either variation of shading or patterns so the difference is apparent.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule and report corrective action taken or proposed and its effect.
- D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including dates when submittals will be required from Architect. Show decision dates for selection of finishes.

1.6 SUBMITTALS

- A. Submit initial schedules on or before pre-construction conference. After review, resubmit required revised data within ten (10) days.
- B. Submit revised Progress Schedules with each Application for Payment. Pay request will not be processed without revised schedule submittal. Submit one copy for each copy of the Application for payment.
- C. Submit a computer generated horizontal bar chart with separate lines for each section of Work, identifying first work day of each week.
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- E. Indicate estimated percentage of completion for each item of Work at each submission.
- F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.
- G. Show critical path if sequence of work is dependant on certain items or trades completing their work in order for the project to be completed on time.

1.7 DISTRIBUTION

A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.

01 32 36-2

- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- PART 2 PRODUCTS Not Used.
- PART 3 EXECUTION Not Used.

END OF SECTION

01 32 36-3

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 33 00

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Proposed Products list.
- C. Product Data.
- D. Shop Drawings.
- E. Samples.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Warranties
- L. Erection drawings.
- 1.2 RELATED SECTIONS
 - A. Section 01 40 00 Quality Control: Manufacturers' field services and reports.
 - B. Section 01 77 00 Contract Closeout: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.
- 1.3 REFERENCES
 - A. AGC (Associated General Contractors of America) publication "The Use of CPM in Construction A Manual for General Contractors and the Construction Industry".
- 1.4 GENERAL SUBMITTAL PROCEDURES
 - A. Transmit each submittal with AIA Form G810. Or Architect/Engineer accepted form.

- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
 Contractor shall review submittal before submitting to Architect. Architect will not review submittal until Contractor has shown proof of review.
- E. Group submittals of like type together such as Plumbing submittals, HVAC submittals, Masonry submittals, Structural submittals, etc. Review of single submittals of like types will be subject to delay until remaining submittals related to that being submitted are received by Architect.
- F. Architect will review submittals and if applicable, forward to consultant(s) for review. Upon review, Architect or consultant shall stamp each set of submittals indicated review status or required action, if any. This stamp in no way relieves the Contractor of meeting the requirements and/or intent of the specifications. Architect's review of shop drawings and submittals is for intent and general compliance with contract documents. All other criteria are the sole responsibility of the General Contractor and his supplier.
- G. Schedule submittals to expedite the Project and deliver to Architect/Engineer at business address. Coordinate submission of related items.
- H. Where colors and/or patterns are to be selected, or specifications include cash allowances by Architect, request such selections and materials in ample time for procurement.
- I. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor. However, Architect will make every effort to return submittals in a timely manner.
- J. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- K. Provide space for Contractor and Architect/Engineer review stamps on front of submittal, minimum space of 4" x 8" on right hand border.
- L. When revised for resubmission, identify all changes made since previous submission. Similar procedure is to be followed when resubmitting.
- M. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

N. Submittals not requested will not be recognized or processed.

1.5 ELECTRONIC SUBMITTAL PROCEDURE

- A. All product data sheets, shop drawings, and miscellaneous submittal information are to be submitted electronically via email, FTP site, or other acceptable electronic submittal means. Please note that at Architect's discretion for large shop drawing submittals, a hard copy would need to be submitted along with electronic submittal. Architect will advise contractor of such submittals.
 - Contractor shall perform initial review and have comments and review stamp included on electronic submittal or shop drawings. <u>Please note that this is</u> <u>mandatory. Submittals and shop drawings will not be reviewed by Architect</u> <u>until Contractor reviews them and notes any comments or corrections required.</u>
 - 2. Submit for Architect's review.
 - 3. After review, electronic copy will be sent back to Contractor with any comments and markups, including review stamp status. If comments require re-submittal of all or partial original submittals or shop drawings, correct and resend for final approval or for Architect's record copy.
 - 4. Contractor to list specification section related to each item submitted. This shall include product data and shop drawings.
- B. Items to be included in electronic submittals (As required by each product or item specification section):
 - 1. Product data
 - 2. Shop drawings
 - 3. Design data
 - 4. Test reports
 - 5. Certificates
 - 6. Manufacturer's instructions
 - 7. Warranties
 - 8. Erection drawings
 - 9. Any other information pertinent to a product or item.

1.6 PRODUCT DATA

- A. Product Data for Review:
 - 1. Submitted to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 77 00 CONTRACT CLOSEOUT.
- B. Product Data for Information:
 - 1. Submitted electronically for the Architect/Engineer's knowledge as contract administrator or for the Owner.

- C. Product Data for Project Closeout:
 - 1. Submitted for the Owner's benefit during and after project completion.
- D. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- E. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. After review distribute in accordance with the Submittal Procedures article above and provide copies of record documents described in Section 01 77 00 CONTRACT CLOSEOUT.

1.7 SHOP DRAWINGS

- A. Shop Drawings for Review:
 - 1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 77 00 CONTRACT CLOSEOUT.
- B. Shop Drawings for Information:
 - 1. Submitted electronically for the Architect/Engineer's knowledge as contract administrator or for the Owner.
- C. Shop Drawings for Project Closeout:
 - 1. Submitted for the Owner's benefit during and after project completion.
- D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.8 SAMPLES

- A. Samples for Review:
 - 1. Submit actual samples to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- B. Samples for Information:
 - 1. Submit actual samples for the Architect/Engineer's knowledge as contract administrator or for the Owner.
- C. Samples for Selection:
 - 1. Submitted to Architect/Engineer for aesthetic, color, or finish selection.

- 2. Submit samples of finishes from the full range of manufacturers' current standard colors, textures, and patterns for Architect/Engineer selection.
- 3. After review, produce duplicates and distribute them in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 77 00 CONTRACT CLOSEOUT.
- D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- E. Include identification on each sample, with full Project information.
- F. Submit the number of samples specified in individual specification sections; one of which will be retained by Architect/Engineer.
- G. For each job-finished material (i.e. Masonry, Stucco, concrete, paint and other finishes), prepare a sample panel as called for in individual sections. Obtain Architect's approval before installing balance of such work. Architect may require additional panels or samples. Contractor shall follow same procedure for Architect's approval. Subsequent work shall be in accordance with the approved sample panels.
- H. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- I. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.9 DESIGN DATA

- A. Submit electronically for the Architect/Engineer's knowledge as contract administrator or for the Owner.
- B. Submit information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 TEST REPORTS

- A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner. All test reports are to immediately be sent to Architect for his/her review.
- B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application Subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.

- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product but must be acceptable to Architect/Engineer.

1.12 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data. A copy of such information will be included in the appropriate section of Close-Out Documents.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for the Architect/Engineer's benefit as contract administrator or for the Owner.
- B. Submit report within 15 days of observation to Architect/Engineer for information.
- C. Submit information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.14 WARRANTIES

A. Submit product or system warranty for each product submitted on. Warranties shall accompany shop drawings and submittals. The warranty must be at least to a minimum specified in individual sections, but not less than one year from date of substantial completion. Warranties will also be required as part of record documents. Refer to Section 01 77 00.

1.15 ERECTION DRAWINGS

- A. Submit electronic drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.
- B. Submit information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

- PART 2 PRODUCTS Not Used.
- PART 3 EXECUTION Not Used.

END OF SECTION

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SECTION 01 40 00

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance control of installation.
- B. Cleaning during construction
- C. Tolerances
- D. Protection
- E. References and standards.
- F. Mockup.
- G. Inspecting and testing laboratory services.
- H. Architect/Engineer Construction Observation Notices
- I. Required Special Inspections
- J. Required Pre-Installation Meetings
- K. Manufacturers' field services.
- L. Tobacco Use
- M. Grading Certification
- 1.2 RELATED SECTIONS
 - A. Section 01 33 00 Submittals: Submission of manufacturers' instructions and certificates.
 - B. Section 01 60 00 Material and Equipment: Requirements for material and product quality.
 - C. Section 01 75 00 Starting of Systems.

1.3 CRAFTMANSHIP

A. Each trade is to perform work and install products, following best standards of their industry. Work not in conformance with industry standards and quality will not be tolerated and will be subject to rejection.

1.4 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Furnish, apply, install, connect, erect, clean, and condition manufactured articles, materials, and equipment per manufacturer's printed directions, unless otherwise indicated or specified. Comply with manufacturers' instructions, including each step-in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement. All attachment devices and materials shall be required to secure materials together or to other materials and to secure work of other trades.
- H. Manufacturer's printed directions must be on the job prior to and during installation of materials and equipment.
- I. Make allowance for ample expansion and contraction for all building components subject to same.
- J. Each trade shall provide sleeves, recesses and openings in their work as required to receive work from other trades.
- K. Make field check of actual building dimensions before fabricating products.
- L. Where proper fit of work depends upon close tolerances of manufactured products, furnish manufacturer with necessary templates to insure proper fit of all components.

- M. Install materials only when conditions of temperature, moisture, humidity, and condition of adjacent building components are conducive to achieving the best installation on results.
- N. Erect, install and secure building components in a structurally sound and appropriate manner. Where necessary, temporarily brace, shore, or otherwise support members until final connection or installation. Brace walls and other structural elements to prevent damage by wind and construction operations. Leave temporary bracing, shoring or other structural supports in place as long as necessary for safety and until the structure is strong enough to withstand all loads involved.
- O. Where construction consists of a series of courses of units, assemble units in best acceptable manner to provide structurally sound installation, waterproof where exposed to exterior. Accurately plumb and level all courses and verify levels of frequent courses with instruments.
- P. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking or other disfigurement.
- Q. Unless indicated, fabricate, and install materials true to line, plumb and level. Leave finished surfaces smooth and flat or of smooth contour where indicated, free from wrinkles, warps, scratches, dents, and other imperfections.
- R. Provide a quality of workmanship not less than the commercially accepted standards of that trade.
- S. Where obviously of best practice, furnish materials in longest practical lengths and largest practical sizes to avoid unnecessary jointing. Make all joints secure.
- T. Where fabrics, plastics and other such items join, make seams tight, secure and inconspicuous.
- U. Scribe and/or otherwise neatly fit materials to adjoining materials.
- V. Consult Architect for mounting height or position of any unit not specifically located.
- W. Mix no more materials than can be used before materials begin to "set". Mix no partially "set" batch with another. Clean tools and appliances prior to mixing materials to avoid contamination.
- X. Conduct work in a manner to avoid injury to previously placed work.
- Y. Do not disturb materials requiring curing time until appropriate curing time has transpired.

- Z. Vertical & Horizontal Penetrations and Sleeves:
 - 1. Contractor is responsible for the layout, placement and identification of all necessary sleeves or penetrations needed to complete his work.
 - 2. All penetrations are to be fire stopped (where penetrating smoke and fire rated barriers) and sealed watertight prior to completion of contractor's work.
 - 3. All vertical sleeves or penetrations are to extend one and one half (1 ¹/₂") above the floor, slab, or housekeeping pad and be sealed watertight.
- AA. Coordinate plumbing fixtures and valves with all toilet accessories to obtain proper clearances and meet ADA Guidelines at accessible locations.
- BB. Contractor to be responsible for coordinating items or equipment provided by owner so that proper space and clearances are provided in newly installed work. Notify the owner if conflicts are found.
- CC. During construction, if any material or product is damaged, it shall be repaired to the Architect's satisfaction. If the repair is not satisfactory, the material or product will be replaced at no additional cost to owner.
- DD. Where masonry is installed, all vertical and horizontal joints align according to bond types. Where differing masonry types are installed in same wall, joints are to align between each masonry unit type unless noted otherwise.
- EE. Where electrical conduit & wire, plumbing piping, fire sprinkler piping and mechanical ductwork are exposed, each trade is to install items neatly and coordinated with work of other trades. Where multiple electrical conduits or pipes protrude through walls or space, they are to be evenly spaced apart and routed in the same plane. Do not install below finished ceiling elevation unless shown otherwise. At exposed structure locations conduit to exit wall at top of wall at coursing directly below roof supporting bond beam. Ductwork shall be routed logically and will be installed to provide neat, clean, and aligned appearance, both vertically and horizontally.
- FF. Any exposed exterior or interior plywood sheathing to be covered with temporary or permanent weather barrier within 24 hours following sheathing installation to prevent exposure to moisture or sunlight. Gypsum sheathing is to be covered with temporary or permanent weather barrier within minimum time allowed by sheathing manufacturer.
- GG. No plywood roof decking will be left exposed to moisture and sunlight. Weather barriers are to be installed immediately following installation of roof deck.
- HH. Schedule work so that installed weather barriers at roofs and walls are not exposed to moisture, wind, or sunlight any longer than what the weather barrier manufacturer allows. Replace any weather barrier damaged by these elements.

II. No items including millwork and ceiling grid are to be installed against or on walls prior to the final coat of paint being applied.

1.5 CLEANING DURING CONSTRUCTION

- A. Contractor to keep building and site reasonably free of debris during construction, including mud and dirt inside building. Provide means for keeping mud and clay off floors that are to remain unfinished or clear sealed only.
- B. If a floor sweep product is used, use only a wax base product. **Oil base products are not to be used.** Verify with floor covering and adhesive suppliers and obtain approval of floor sweep product so that warranty is not jeopardized.

1.6 DUST CONTROL DURING CONSTRUCTION

- A. Contractor to keep dust on site to a minimum the entire duration of construction by means of regular watering. This will include dust created by grading operations, vehicular traffic, and wind. Also comply with SWPPP requirements.
- B. Contractor to sprinkle work with water during demolition operations to minimize dust. Provide hoses and water connections for this purpose.

1.7 MATERIALS STORAGE

A. Limit site storage for construction materials in a central, secured area, within the boundaries of construction area. Assume full responsibility for protection of same.

1.8 APPROPRIATE MATERIALS

A. No materials containing asbestos fibers shall be allowed in any construction materials used in this project. General Contractor shall provide written certification to this effect at the end of the project. Certification shall be included in the project close-out documents.

1.9 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerance to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.10 PROTECTION

- A. Protect installed materials to prevent damage until substantial completion and comply with individual specification sections pertaining to protection of finished products.
- B. No gypsum board, batt insulation, or materials prone to damage by moisture, mold and/or mildew will be installed prior to enclosing and drying in of building.
- C. During construction, if any material is damaged after installation because of moisture, mold and/or mildew, it shall be replaced immediately.
- D. Prior to installation and/or application of interior finishes, the building will be completely enclosed, dried in and conditioned continually to meet minimum temperature and humidity requirements for finished product installation/application.

1.11 REFERENCES AND STANDARDS

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes. The contractor is to be familiar with all standards pertaining to project.
- B. Conform to reference standards at date of invitation to bidders.
- C. Obtain copies of standards when required by the Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.
- F. Neither the contractual relationship, duties, nor responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

1.12 REFERENCES

- A. Reference to technical society, organization or body is made in these specifications in accordance with but not limited to the following:
 - AIA AMERICAN INSTITUTE OF ARCHITECTS
 - ACI AMERICAN CONCRETE INSTITUTE
 - ADA THE AMERICANS WITH DISABILITIES ACT
 - AEC ARKANSAS ENERGY CODE
 - AFGG ARKANSAS FUEL GAS CODE
 - AFPC ARKANSAS FIRE PREVENTION CODE

AIEE	AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AMC	ARKANSAS MECHANICAL CODE
APC	ARKANSAS PLUMBING CODE
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-
	CONDITIONING ENGINEERS, INC.
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AWSC	AMERICAN WELDING SOCIETY CODE
AWI	ARCHITECTURAL WOODWORK INSTITUTE
IBC	INTERNATIONAL BUILDING CODE
IMC	INTERNATIONAL MECHANICAL CODE
IPC	INTERNATIONAL PLUMBING CODE
NBFU	NATIONAL BOARD OF FIRE UNDERWRITERS
NBS	NATIONAL BUREAU OF STANDARDS
NEC	NATIONAL ELECTRIC CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OSHA	OCCUPATIONAL SAFETY & HEALTH ACT OF 1970
UL	UNDERWRITERS' LAB

1.13 MOCK-UP

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Accepted mock-ups shall be a comparison standard for the remaining Work.
- C. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.
- D. Wall Mock-Ups: Construct mock-ups of wall assemblies in "cut-away view, showing each step and material or the assembly (i.e., Stud wall, sheathing, weather barrier, thruwall membrane flashing, cavity insulation system, and wall finish material). Also show typical weather barrier installation(s) at wall openings.

1.14 TESTING SERVICES

A. Furnish materials and equipment that have been properly inspected and tested in accordance with accepted industry standards. Make field or laboratory tests where specified herein, the costs of such being paid for by the contractor, unless specifically stated otherwise. FOR TESTING PAID FOR BY CONTRACTOR, THE PROPOSED TESTING LABORATORY/ENGINEER MUST BE APPROVED BY THE ARCHITECT NO LATER THAN 10 DAYS PRIOR TO BID OPENING. If certain tests are to be paid for by others, the General Contractor will remain responsible for scheduling and coordinating their tests at appropriate times.

- B. Should such test or visual observation indicate failure of the materials or construction to meet requirements of the drawings and or specification, Contractor is to make additional tests as directed by the Architect, until compliance has been achieved. If such work should fail to comply, Contractor shall replace it at his expense. Charges for this additional testing will be paid for by the Contractor.
- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.
- D. Reports will be submitted by the independent firm to the Architect/Engineer and Contractor at the same time, indicating observations and results of tests and indicating compliance or noncompliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing does not relieve Contractor to perform Work to contract requirements.

1.15 NOTICE FOR ARCHITECT/ENGINEER OBSERVATION

- A. Whenever specifications require the contractor to have any part of the work observed and approved by the Architect, THE CONTRACTOR SHALL GIVE THE ARCHITECT A MINIMUM 24 HOUR NOTICE as to when that part of the work will be ready for observation. No part of weekends or holidays shall be counted as part of the required hours of notice. If the schedule of work has changed after notification, immediately notify Architect to inform him of change. The following is a partial list of items requiring Construction Observation. This is a general listing; your specific project may not contain some of the items listed. Refer to each individual specification section for additional observation requirements:
 - 1. **Sanitary Sewer Line**: 24 hr 10' standpipe, proper bedding, proper clearances from water lines
 - 2. **Domestic Water Line**: 24 hr city wall pressure or 75 psi air pressure test, proper bedding, proper clearance from sanitary sewer lines.
 - 3. **Footing Inspections**: Count rebar and sizes, clearances, clean trenches, proper supports, proper clearances for drain lines & conduit.
 - 4. **Cast In Place Concrete**: (retaining walls, stem walls, pedestals) water stops are in place, count rebar and size.
 - 5. Below Grade Water Proofing Membranes: Inspection of surfaces, laps, lapping over top of footing prior to any backfill, or protection board being applied.
 - 6. **Slab on Grade**: vapor barrier, taping, extension to adjacent pours, wire mesh placement, proper supports, concrete slab depth, termite spray application (dyed)
 - 7. Floor or Roof Deck: structural engineer / architect is to inspect welds and side-lap fasteners.
 - 8. Slab on Deck: wire mesh placement, proper supports, block-outs

- 9. **Wall and Above Ceiling**: correct insulation, mechanical and electrical engineers are to inspect conduits, ducts etc. prior to closing in walls.
- 10. **Masonry**: Mason to prepare mock sample for review prior to starting masonry on job site
- 11. EIFS: check substrate prior to EIFS coating
- 12. Gas Line: 15psi, 24hr or as required by governing jurisdiction if more stringent.
- 13. **Through Wall Flashing**: Inspection of surfaces, laps, termination bar installed and sealed, alignment with masonry face.

1.16 REQUIRED SPECIAL INSPECTIONS

A. When required by local or governing jurisdiction, the contractor will arrange with testing company, special inspections in accordance with Chapter 17 of the International Building Code. Owner is to pay for special inspections. Contractor to coordinate.

1.17 REQUIRED PRE-INSTALLATION MEETINGS

A. When noted in individual Specification Sections, on-site pre-installation meetings will be scheduled and held by the Contractor prior to installation of system, product or material. Installation of items is not to begin until meeting is held. Each specification Section should state the people that are required to attend each meeting.

1.18 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01 33 00 SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

1.19 TOBACCO USE

A. <u>Absolutely no tobacco or e-cigarette use is permitted inside new or existing building</u> <u>areas throughout construction of project.</u> No tobacco or e-cigarette use is permitted on entire site at anytime while present on public school property.

1.20 FINISH GRADING AND SITE STRUCTURE PLACEMENT CERTIFICATION

- A. Contractor to provide and pay for the services a surveyor licensed in the state which the work is to be performed, approved by the Architect, to certify that finish grade elevations and building and site structure locations are as per drawings and specifications. The Civil Engineer of record would be the preferred Surveyor, but not mandatory. Criteria for verification shall be, but not limited to the following:
 - 1. Finish (Subgrade) elevation of grading about perimeter of building, Detention basins, finish (subgrade) spot elevations shown on grading plan, and general site grading.
 - 2. Finish (Subgrade) elevations of paving areas, sidewalks, handicapped ramp slopes, finished floor elevation of new building(s), catch basins, and top of retaining walls and other site structures.
 - 3. Location of new building(s), retaining walls and other site structures.
 - 4. Finish elevations shall be checked by string line at not more than 50 feet on center. Tolerance of not more than 0.10 feet will be permitted.
- B. Any items found out of compliance with the drawings and specifications are to be identified, stated, and shown as to how it differs from intended elevation and/or location. All spot elevations are to be shown on a grading plan submitted by a surveyor.
- C. Items found out of compliance with the drawings and specifications will be subject to rework or adjustment as determined by the Architect and certified by Surveyor as corrected. Provide a letter and drawing from surveyor stating and showing that grades and locations are within tolerances per specifications.
- D. Final certification, showing all items within tolerances shall be submitted to and approved by Architect before Final payment will be released. Certification shall also be included for project closeout, Section 01 77 00.
- E. Grade and site structure elevations found to not be in compliance with intended grades after certification shall be corrected by grading contractor under this contract and recertified as correct.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying the next material or substance.
- B. Seal cracks or openings of substrate prior to applying the next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

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SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.
- D. Temporary Equipment

1.2 RELATED SECTIONS

- A. Section 01 77 00 Contract Closeout: Final cleaning.
- 1.3 TEMPORARY ELECTRICITY
 - A. Cost: By Contractor; provide and pay for power service required from utility source. Provide enough power and voltage/phase sufficient for construction needs of any and all trades during course of construction. Contractor shall continue to pay for this temporary service until project is substantially complete as determined by Architect and/or Owner.
 - B. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
 - C. Provide main service disconnect and over current protection and meter at convenient location.
 - D. Permanent convenience receptacles may be utilized during construction. Damage done to receptacles and cover plates during construction period shall be repaired and or replaced.
 - E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.

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- B. Provide and maintain 1 foot candle of lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide and maintain 5 foot candles of lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be utilized during construction.

1.5 TEMPORARY HEATING

- A. Contractor is to provide and pay for heating devices and heat from electric utility or gas utility as needed to maintain specified conditions for construction operations until project is substantially complete as determined by Architect and/or Owner. Contractor to make ready permanent heating system to supply heat to building as soon as system is tested and operational and pay for operation of permanent heating system until project is substantially complete as determined by Architect and/or Owner. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Contractor is to double filter at return air during construction. Refer to Specification Division 23 for additional requirements during construction. Contractor shall continue to pay for this temporary service until project is accepted by owner. Warranty period shall not begin until Certificate of Substantial Completion is issued.
- B. Maintain minimum ambient temperature between 50 and 70 degrees F during working hours and 35 degrees F at other times in areas where construction is in progress, unless indicated otherwise in product sections.

1.6 TEMPORARY COOLING

- A. Existing facilities shall not be used.
- B. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
- C. Just prior to turning building or portions of building over to owner, contractor will replace all filters on equipment that was used for temporary ventilation, heat, or cooling during construction. Double-filter at return air during construction.

D. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.7 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Utilize existing ventilation equipment as they become available. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.8 TELEPHONE SERVICE

A. Contractor to have cellular telephone service at time of project mobilization.

1.9 COMPUTER E-MAIL SERVICE

- A. Provide, maintain and pay for computer to contractor's office at time of project mobilization.
- A. Equipment to remain in operation until project substantial completion is issued.

1.10 TEMPORARY WATER SERVICE

A. At earliest possible date provide, maintain and pay for suitable quality water service required for construction operations at time of project mobilization. Contractor shall continue to pay for this temporary service until project is substantially complete as determined by Architect and/or Owner.

1.11 TEMPORARY SANITARY FACILITIES

A. Provide and maintain the required facilities and enclosures. Existing facility use is not permitted. Provide at time of project mobilization. Maintain disposal service on a weekly basis and more often as required.

1.12 BARRIERS

- A. Provide protection for plants designated to remain. Replace damaged plants.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.13 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide a minimum 8-foot-high fence around construction site per requirements of International Building Code Section 3306; equip with vehicular and pedestrian gates with locks. The contractor shall be responsible for compliance with this requirement.
- C. Coordinate with owner construction fencing and student access to existing sidewalks.

1.14 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. Remove ice and snow as necessary for safety and proper execution of work.
- B. Protect site from puddling or running water.
- C. The contractor is to comply with the provisions of Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, AR Ann. 8-4-101 et seq.), and the Federal Clean Water Act [33 U.S.C. 1251 et seq.]

1.15 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
- B. Temporary Construction: Framing with contractor's option of reinforced polyethylene, plywood, or gypsum board sheet materials unless more specifically called for on drawings, with closed joints and sealed edges at intersections with existing surfaces.

1.16 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, top of cavity walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.
- G. In cold weather, protect work from damage from frost and freezing. In hot weather, protect work from rapid drying out.
- H. Protect previously placed work by suitable coverings or other protection during installation of subsequent work. Immediately clean off any foreign materials accidentally deposited on finished surfaces and where such would stain, corrode, or otherwise disfigure work.
- I. Support no runways, ramps, or construction equipment on, nor transport over any items or assemblies subject to displacement, disfigurement, or other damage to finished surfaces.
- J. Brace all construction to prevent damage or failure from wind.

1.17 SECURITY

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.18 ACCESS ROADS

- A. Construct and maintain temporary roads accessing public thoroughfares to serve the construction area.
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets. Streets shall be cleaned on a regular basis of mud and gravel soiled as a result of construction activities. Local requirements shall also be followed in maintaining cleanliness of streets.
- E. Designated existing parking lot shall not be used for construction traffic. Contractor will be responsible for repairing any damage to existing parking areas as a result of construction traffic. Road/parking lot inspection shall be conducted prior to beginning of construction by Owner, Architect, and Contractor.

1.19 PARKING

- A. Arrange for or Provide temporary gravel surface parking areas to accommodate construction personnel.
- B. When site space is not adequate, arrange for additional off-site parking.
- C. Do not allow vehicle parking on existing pavement.
- D. Coordinate parking for workers with owner.

1.20 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from site weekly, or more often if needed, and dispose off-site.
- E. Open free fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.21 PROJECT IDENTIFICATION

- A. Construction Manager to provide 8 feet wide x 8 feet high [8 feet wide x 4] feet high project sign. Provide four (4) colors as noted on the job sign diagram shown in Appendix "A" at end of specification book. Provide full color image provided by the Architect with location shown on project sign diagram shown in Appendix "A" at end of specification book. Colors must not deviate in any way from those called for. Architect will provide digital image, information and verbiage layout. Place where directed by Architect. Provide wood structural support as required to resist light to moderate winds in the area.
- B. No other signs are allowed without Owner permission except those required by law.

1.22 FIELD OFFICES AND SHEDS

A. Office: For use by Contractor and Architect/Engineer, Weather tight, with lighting, electrical outlets, phone facsimile machine, heating, cooling, and Janitor service, and equipped with minimum 2 chairs, marker board/chalkboard, drawing rack, and drawing display table. Adequate size trailer will also be acceptable. The Field Office is to remain the property and/or responsibility of the Contractor.

- A. Provide space for Project meetings, with table and chairs to accommodate all anticipated persons attending.
- B. It shall be the Contractor's responsibility to secure placement for field office staging and material storage areas either on or off site for the accomplishment of the construction and to pay any associated fees.

1.23 TEMPORARY EQUIPMENT

- A. Contractor is to provide temporary elevators, hoists, walks, ramps, ladders, runways, scaffolding, shoring, bracing, and other equipment required for proper progress of project work.
- B. Each subcontractor is to provide proper equipment necessary to perform and complete work associated with his trade.

1.24 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, and all other temporary items prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing and permanent facilities used during construction to original or specified condition as indicated on drawings and specifications.

PART 2	PRODUCTS	Not Used.
PART 3	EXECUTION	Not Used.

END OF SECTION

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SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.2 RELATED REQUIREMENTS

- A. Section 31 1000 Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 31 2000 Earthwork: Temporary and permanent grade changes for erosion control.
- C. Section 32 1123 Aggregate Base Courses: Temporary and permanent roadways.

1.3 DEFINITIONS

- A. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated defined by a circle concentric with each tree with a radius 12 times the tree's caliper size and with a minimum radius of 96 inches unless otherwise indicated. Reference Demo and Tree Preservation Plan for tree protection fence locations.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- 1.5 ACTION SUBMITTALS
 - A. Product Data: For each type of product.
 - B. Shop Drawings:
 - 1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.

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- C. Samples: For each type of the following:
 - 1. Organic Mulch: Sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 - 2. Protection-Zone Fencing: Assembled Samples.
 - 3. Protection-Zone Signage: Full-size Samples.
- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.6 INFORMATIONAL SUBMITTALS

- A. Certification: From ISA Certified Arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- B. Maintenance Recommendations: From ISA Certified Arborist, for care and protection of trees affected by construction during and after completing the Work.
- C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.7 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.

1.8 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
 - 1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil.
 - 2. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation".
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Engineer.
 - 1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1-5/8-inch- OD top rails and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 48 inches
 - 2. Plywood Protection-Zone Fencing: Plywood framed with four 2-by-4-inch rails, with 4-by-4-inch preservative-treated wood posts spaced not more than 96 inches apart. a. Height: 48 inches.
 - 3. Wood Protection-Zone Fencing: Constructed of two 2-by-4-inch (50-by-100-mm) horizontal rails, with 4-by-4-inch (100-by-100-mm) preservative-treated wood posts spaced not more than 96 inches (2400 mm) apart, and lower rail set halfway between top rail and ground.
 - a. Height: 48 inches.
 - 4. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of highdensity extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches (2400 mm) apart. High-visibility orange color. Height: 48 inches. a.
 - 5. Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering, stating

"Notice: Tree Preservation Area DO NOT ENTER" or other verbiage as required by Urban Forester for the jurisdiction in which work will take place.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosionand sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Tree-Protection Area: An Arborist shall examine all trees to remain and assess the health and maintenance needed for each individual tree. A report shall be generated from the Arborist and submitted to the Contractor, Owner and Landscape Architect.

3.2 PREPARATION

- A. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- B. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates.
 - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Landscape Architect.
 - 3. Access Gates: Install where indicated.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Landscape Architect.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete, and equipment has been removed from the site.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Do not allow exposed roots to dry out before placing permanent backfill.

3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 3. Cover exposed roots with burlap or mulch and water regularly.
 - 4. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Expose roots by hand or using an air spade. Prune tree roots by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning Standards: Prune trees according to ANSI A300 and/or as indicated on Drawings.

- B. Cut branches with sharp pruning instruments; do not break or chop.
- C. Do not paint or apply sealants to wounds.
- D. Chip removed branches and spread over areas identified by Engineer.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil approved by Landscape Architect. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.
- B. Reports: All trees disturbed or damaged within a tree protection area or easement are to be assessed and a report produced by an arborist. All trees to remain are to be evaluated individually in a report by an arborist. Report is to be reviewed and approved by the Landscape Architect. All associated cost of arborist and associated work recommended in reports are to be at the contractor's expense. Including but not limited to pruning, dead wooding, tree removal and legal disposal of material offsite.

3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by the Landscape Architect.
 - 1. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch uniform thickness to remain.

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3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

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SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to noncompliance by Contractor.

1.2 RELATED REQUIREMENTS

- A. Section 00 1003 Stormwater Pollution Prevention Plan Accessibility Standard: Minimum surfacing performance according to ASTM F1951.
- B. Section 31 1000 Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- C. Section 31 2000 Earthwork: Temporary and permanent grade changes for erosion control.
- D. Section 32 1123 Aggregate Base Courses: Temporary and permanent roadways.

1.3 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of U.S. Environmental Protection Agency (EPA)and Arkansas Department of Environmental Quality (ADEQ) for erosion and sedimentation control.
 - 1. Comply with requirements and recommendations of the EPA National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP)
 - 2. Comply with requirements and recommendations of the ADEQ Construction Stormwater Discharge Permit ARR150000.

- 3. Comply with requirements and recommendation of the ADEQ Short Term Activity Authorization Permit, Specification Section 001001.
- B. Comply with requirements of State of Arkansas, Erosion and Sedimentation Control Manual.
- C. Comply with requirements of the City of Bentonville.
- D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit weekly inspection reports.
- E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
- F. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- G. Timing: Put preventive measures in place prior to disturbance of surface cover and before precipitation occurs.
- H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

- K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- M. Open Water: Prevent standing water that could become stagnant.
- N. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- O. All area left disturbed longer than 14 days shall be vegetated and/or stabilized.

1.4 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 - 1. Submit within 2 weeks after Notice to Proceed.
 - 2. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 - 3. Obtain the approval of the Plan by authorities having jurisdiction.
 - 4. Obtain the approval of the Plan by Owner.

- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Straw or hay, certified weed seed free 'clean'.
 - 2. Erosion control matting or netting, bio- or photo-degradable straw, coconut, coir or jute.
 - 3. 100% Wood Fiber Hydroseeding Mulch
- B. Grass Seed for Temporary Cover: If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
 - 1. Summer Temporary Cover: May -September shall be Browntop Millet seeded at 100 lbs per acre and Plains Coreopsis seeded at 2 lbs per acre.
 - 2. Winter Temporary Cover: September-May shall be Cereal Rye -Secale cereale grain 200 lbs/acre.
- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
 - 2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
 - 4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
 - 6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

- D. Silt Fence Posts: One of the following, minimum 5 feet long:1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
- E. Gravel: See Section 32 1123 for aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the toe of cut slopes and fill slopes.
 - c. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
 - d. Across the entrances to culverts that receive runoff from disturbed areas.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet..
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.

- e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches.
 - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.
- B. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D 4873.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 - 5. Install with top of fabric at nominal height and embedment as specified.

3.5 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Ecological Design Group, Inc.

- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

3.6 MAINTENANCE

A. Contractor shall maintain, repair, replace or add best management practices and structural erosion and sediment controls as necessary or required to maintain project compliance with all applicable local, state and federal requirements, including Project specific Permits.

3.7 WARRANTY

- A. Contractor shall warrant the project for Permit compliance for the duration of all project work or project area surface disturbance and for one year after project completion, whichever is longer.
- B. Contractor shall pay for any and all fines, fees or costs incurred by the Project or Owner for non-compliance with Permit requirements.

END OF SECTION

SECTION 01 60 00

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

1.2 RELATED SECTIONS

A. Section 01 40 00 - Quality Control: Product quality monitoring.

1.3 **PRODUCTS**

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Provide interchangeable components of the same manufacturers for components being replaced.

1.4 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.

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- C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.
- D. For exterior storage of fabricated Products, place on sloped supports above ground.
- E. Provide bonded or insured off-site storage and protection when site does not permit onsite storage or protection.
- F. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.
- G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.7 ALTERNATE SUBSTITUTIONS

- A. In general, these Specifications identify the required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification; the first-named manufacturer's product used as the basis for design; other named brands considered acceptable for the application by Architect. Alternate brand manufacturers named must furnish products consistent with the specifications for the first-named product, as determined by Architect. Base Proposal shall include only those brands named, except as hereinafter provided.
 - 1. Submit product data and specifications.
 - 2. Submit color samples if color selection is required or specified.
 - 3. Provide a list of locations and contacts with telephone numbers of local installations.
 - 4. Provide qualifying comparison, comparing specifications of specified product to proposed substitution.

If any of these items are not provided, proposed substitution will be rejected.

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- B. Where materials or equipment are described but not named, provide required first-quality items, adequate in every respect for the intended use, such items subject to Architect's approval prior to procurement.
- C. Prior to receipt of proposals, should Contractor wish to incorporate in Base Proposal brands of products other than those named in Specifications, <u>he shall submit written request for substitution with required information to Architect not later than ten (10) days prior to date proposals are due.</u> Architect will consider requests and items. If proposed substitution is approved, it will be listed in an addendum issued to principal Proposers.
- D. After execution of Owner-Contractor Agreement, alternate substitution of product brands for those named in Specifications will be considered, only if (1) request is received within thirty (30) calendar days after Contract date and request includes statement showing credit due Owner, if any; if substitution product is used, (2) Owner requests consideration be given to substitute brands, (3) Proposer provides qualifying comparison, comparing specifications of specified product to proposed alternate substitution. If this is not provided, the proposed substitution will be rejected. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.
- E. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents. Materials and equipment proposed for substitution shall be acceptable by Architect to that specified in regard to construction, efficiency, utility, aesthetic design, and color. The Architect's decision shall be final and without further recourse. The physical size of substitute brand shall not be larger than the space provided for it. Requests must be accompanied by full description and technical data, in two copies, including manufacturer's name, model, catalog number, photographs or cuts, physical dimensions, operating characteristics, and any other information necessary for comparison.
- F. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- G. A request constitutes a representation that the Bidder: / Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities if required.

01 60 00-3

H. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, specifications section states that no substitutions are allowed for a specific material or item, or when acceptance will require revision to the Contract Documents.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

01 60 00-4

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of Work.

1.2 RELATED SECTIONS

- A. Section 01 33 00 Submittals.
- B. Section 01 11 00 Summary of Work: Work by Owner or by separate Contractors.
- C. Section 01 35 16 Alteration Project Procedures: Cutting and patching for alterations work.
- D. Section 01 60 00 Material and Equipment: Product options and substitutions.
- E. Section 07 84 13 Fire stopping.
- F. Individual Product Specification Sections:
 - 1. Cutting and patching incidental to work of the section.
 - 2. Advance notification to other sections of openings required in work of those sections.
 - 3. Limitations on cutting structural members.

1.3 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected Work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed Work and Products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate Contractor.
 - 7. Written permission of affected separate Contractor.
 - 8. Date and time work will be executed.

01 73 29-1

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTIONS

3.1 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide temporary support to ensure structural integrity of the Work. Provide devices and methods to protect other portions of the Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.3 CUTTING

- A. Execute cutting and fitting including excavation and fill if required, to complete the Work.
- B. Remove and replace defective or nonconforming work.
- C. Remove samples of installed work for testing when requested.
- D. Provide openings in the Work for penetration of mechanical and electrical work.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

01 73 29-2

3.4 PATCHING

- A. Execute patching to complement adjacent Work. Match with existing finish where exposed to view unless noted otherwise.
- B. Fit Products together to integrate with other Work.
- C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Employ skilled and experienced installer to perform patching for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire resistant material in accordance with Section 07 84 00 to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish the entire unit.

END OF SECTION

01 73 29-3

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 75 00

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Starting systems.
- B. Demonstration and instructions.
- C. Testing, adjusting, and balancing.

1.2 RELATED SECTIONS

- A. Section 01 40 00 Quality Control: Manufacturers field reports.
- B. Section 01 77 00 Contract Closeout: System operation and maintenance data and extra materials.
- C. Division 23 Heating, Ventilation, and Air Conditioning

1.3 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect/Engineer seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions and requirements.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

01 75 00-1

H. Submit a written report in accordance with Section 01 33 00 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of final inspection.
- B. Demonstrate Project equipment and instruct the owner's representative by a qualified manufacturers' representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstrations for other season within six months.
- D. Utilize operation and maintenance manuals as the basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- F. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instruction.
- G. The amount of time required for instruction on each item of equipment and system is specified in individual sections.
- H. Contractor to provide <u>DVD</u> recording of all training sessions with Owner personnel. A copy of the recorded training sessions is to be given to the Owner included in the closeout documents.
- 1.5 TESTING, ADJUSTING, AND BALANCING
 - A. The Contractor will employ services of an independent firm to perform testing, adjusting, and balancing. Contractor shall pay for services.
 - B. The independent firm will perform the services specified in Division 23.
 - C. Reports will be submitted by the independent firm to the Architect/Engineer indicating observations and results of tests and indicating compliance or noncompliance with the requirements of the Contract Documents.

PART 2	PRODUCTS	Not Used.
PART 3	EXECUTIONS	Not Used.

END OF SECTION

01 75 00-2

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Spare parts and maintenance Products.
- G. Warranties and Guarantees.
- H. Maintenance service.

1.2 RELATED SECTIONS

- A. Section 01 50 00 Construction Facilities and Temporary Controls: Progress cleaning.
- B. Section 01 75 00 Starting of Systems: System start-up, testing, adjusting, and balancing.

1.3 CLOSEOUT PROCEDURES

- A. Contractor shall notify Architect ten (10) days prior to the date on which the building will be ready for final inspection and prepare his own punch list of items to complete to meet contract documents. Such notice shall not be made until completion of all items is assured, and has submitted completed punch list items to Architect. Architect will not schedule inspection for punch list until Contractor's completed punch list is received and each item is initialed by contractor as complete.
- B. Incomplete work found during the inspection shall be grounds for ceasing the inspection. Final inspection shall be resumed again only upon completion of work.
- C. Minor adjustments and corrections to work shall not be considered cause for discontinuing final inspection.

- D. Upon receipt of punch list prepared by Architect, the Contractor will immediately make necessary corrections to work as required for final completion of the project.
- E. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.
- F. Provide submittals to Architect / Engineer that are required by any governing or other authorities.
- G. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The final application for payment will not be approved for payment by the Architect until the "COMPLETE CLOSEOUT" documents are provided to and reviewed by the Architect by the Contractor.
- H. Owner will occupy all portions of the building as specified in Section 01 11 00.

1.4 FINISHING

- A. Adjust windows, doors, drawers, hardware, appliances, motors, valves, controls, and other equipment for proper operation.
- B. Seal exterior joints between materials to form a waterproofed and airtight enclosure.
- C. Clean surface using appropriate materials and methods that will thoroughly clean but not damage materials and their finishes.

1.5 REPAIRS

A. Unless Architect grants permission to repair any defective work, remove from project any work not in accordance with Contract Documents. Permission to repair any such work shall not constitute a waiver of Architect's right to require complete removal of defective work if repair operation does not restore quality and appearance of member of surface to Architect's satisfaction. If permission is granted, repair according to Architect's directions.

1.6 COMPLETED WORK

- A. Completed work shall find materials structurally sound, free from scratches, abrasions, distortions, chips, breaks, blisters, holes, splits, or other disfigurement considered as imperfections for the specific material.
- B. Completed surfaces shall be thoroughly clean and free from foreign materials and stains.
- C. Contractor is to install, connect, service and operate permanent systems at earliest practical dates, unless otherwise directed by Architect.

D. Contractor is to provide Certification that finish grades and site structures placement is as per drawings and specifications. Refer to Section 01 40 00.

1.7 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Clean permanent filters or replace disposable filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.8 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Adjust windows, doors, drawers, hardware, appliances, motors, valves, controls, and other equipment for proper operation.

1.9 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications. (Actual sections of addendum items may be pasted into specification in appropriate locations.)
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent marker (i.e. new building, property line, etc.).
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
 - 6. Changes made by Addenda and modifications. (Actual sections of addendum items may be pasted onto drawings in appropriate locations.)
- G. Submit to Architect in electronic media, <u>two (2) Flash Drives</u>, containing <u>Record</u> <u>Documents as described in this section</u> and scanned <u>As-Built drawings in PDF</u> <u>format</u>, properly marked to show field modifications. <u>These shall include both</u> <u>Drawings and Specifications</u>. For videos asked for, provide videos on separate DVDs or Flash Drives
- H. Submit to Architect as part of closeout documents in printed media, <u>one set of Record</u> <u>Documents, one hard copy set of Record Drawings (As-Built Drawings),</u>
- I. Submit <u>one set</u> of three-ring binders containing <u>only</u> manufacturer <u>warranties and</u> <u>guarantees</u> for each product and system provided under this contract. Provide installer and manufacturer warranty department phone numbers and contact person if available for each product and system.
- J. All paper copies of closeout items to be scanned and copied to the electronic media.

1.10 CLOSEOUT DOCUMENTS

- A. Prepare DVD or Flash Drive titled "CLOSEOUT DOCUMENTS", title of project, and subject matter.
- B. Submit two (2) complete Sets of closeouts and As-Built drawings in electronic format, within 60 days after final inspection.

C. Organize closeout contents, logically organized into sections as described below. GENERAL (section tab)

Contents:

1. A Directory, listing names, addresses, and telephone numbers of Architect

/ Engineer, Contractor, Subcontractors, and major equipment suppliers.

- 2. Executed original of occupancy permit
- 3. Punch Lists showing items signed off as completed by Contractor.
- 4. Contractor's "Asbestos Free" certification letter stating that no materials have been placed in the building containing asbestos material.
- 5. Contractors "storm water pollution" certification letter stating that the work has been performed in compliance with the requirements of the Arkansas Water and Air Pollution Control Act and the Federal Clean Water Act.

LIEN WAIVERS (section tab)

Lien Waivers must demonstrate that the project is free of any debt or claim from any subcontractor, supplier or vendor and that the project is free and clear with the exception of monies owed the General Contractor. All subcontractors and suppliers must have been completely paid with the exception of the percentage of monies owed by the General Contractor, or payment a bond posted for each sub-contractor and supplier for whom a balance is owed. For this project, the amount is not to exceed 5% of their contract. Lien waiver submitted from each subcontractor and supplier is to show amount they are still owed. These requirements are mandatory conditions to qualify for final payment.

Contents:

- 1. AIA G706A CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS
- 2. AIA G706 CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS
- 3. AIA G707 CONSENT OF SURETY TO FINAL PAYMENT
- 4. Final Lien Release from each subcontractor and supplier.

WARRANTIES / GUARANTEES / BONDS (section tab)

- A. Provide notarized copies, one original and one photocopy. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers. Submit warranties prior to final Application for Payment. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.
- B. Provider manufacturer <u>warranties and guarantees</u> for each product and system provided under this contract. Provide installer and manufacturer warranty department phone numbers and contact person if available for each product and system. This is a general listing; your specific project may not contain some of the items listed.

Contents:

- 1. General Contractor's Statement of Warranty
- 2. All manufacturer's warranties and guaranties stipulated or implied on equipment and products (i.e., carpet wear. prefinished metal finish, etc.)
- 3. One-year warranty from each subcontractor
- 4. Termite Protection Warranty (Five-Year)
- 5. Polished concrete warranty: Ten-Year
- 6. Below-Grade Waterproofing Membrane Warranty (Five-Year)

- 7. Executed membrane Roofing Guarantee (Twenty-Year NDL), two-year installer's warranty.
- 8. FM 1-90 roof uplift compliance letter from roofer.
- 9. Fluid-applied weather barrier (Five-Year)
- 10. Executed Metal Roofing Guarantee (Five-Year Installer's Warranty, 20-year Finish Warranty)
- 11. Wood interior door: Lifetime warranty
- 12. Aluminum door construction: Lifetime warranty
- 13. Overhead Coiling Door: Limited Warranty (Refer to specific Specification Section)
- 14. Coiling shutter door warranty: (Refer to specific Specification Section)
- 15. Glazing warranty
- 16. Continuous hinges warranty: (manufacturer's lifetime warranty)
- 17. Lockset warranty: Cylindrical: 10-year
- 18. Exit device: Three-years.
- 19. Door closers: 30-years
- 20. Suspended ceilings: 30-year limited system performance Warranty
- 21. Luxury Vinyl Tile: 10-year warranty
- 22. Millwork: 1-year warranty)
- 23. Modular carpet warranty: (Refer to specific Specification Section)
- 24. Wood gymnasium floor system: 2-year installer warranty; 1-year manufacturer's warranty
- 25. Tackable wall surface: 5-year manufacturer's limited warranty
- 26. Fiber Reinforced Plastic (FRP): One-year warranty
- 27. Special coatings: 5-year warranty
- 28. Dry-Erase Coatings: 10-year warranty
- 29. Toilet Partitions: Twenty-Five (25) year warranty
- 30. Executed pre-engineered metal building 20-year weathertightness warranty. (Five-Year Installer's Warranty, 20-year Finish Warranty)
- 31. Hot Water Tank Warranty: (Refer to specific Specification Section and/or water heater schedule on drawings)
- 32. HVAC Manufacturers Warranties-(Contractor to fill out equipment warranty and registration cards and mail into manufacturer. Provide a copy of each warranty in the closeout manual.
- 33. Warranty Bond for second year following date of Substantial Completion

1.11 OPERATION / MAINTENANCE DOCUMENTS

- A. Submit data on DVD or Flash Drive.
- B. Organize each individual section with printed title "OPERATION / MAINTENANCE DOCUMENTS", title of project, and subject matter.
- C. Submit one set of volumes, within 10 days after final inspection.

D. Subdivide contents, logically organized into sections as described below, with tab titling each section. Prepare a Table of Contents for each system or material description identified as follows:

MECHANICAL (section tab)

Contents:

- 1. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment suppliers.
- 2. Operation and maintenance instructions, arranged by system. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- g. Video on flash drive or DVD of each equipment and system training session.
- 3. Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air balance and test reports see specifications.
 - c. Certificates.
 - d. Start up report on all major equipment items (See Division 23 of Specifications)
 - e. Copies of registration and warranty cards on major equipment initiating warranty time dated the date of substantial completion and mailed by contractor as required.

ELECTRICAL (section tab)

Contents:

- 1. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment suppliers.
- 2. Operation and maintenance instructions, arranged by system. Identify the following:
 - a. Significant design criteria.
 - b. List of fixtures, equipment and switch gear.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - g. Video on flash drive or DVD of each equipment and system training session.
- 3. Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Electrical System Test Report see specifications
 - c. Certificates / Warranties.
 - d. Start up report
 - e. Copies of registration cards on major equipment initiating warranty time dated the date of substantial completion and mailed by contractor as required.
MISCELLANEOUS EQUIPMENT & MATERIALS (section tab)

Contents:

- 1. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment or materials suppliers.
- 2. Operation and maintenance instructions for equipment arranged by system and subdivided by specification section. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- 3. Finish material schedule including the following:
 - a. Listing of all materials
 - b. Manufacturers of each material.
 - c. Color or finish supplied on each material.
- 4. Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Material Maintenance instructions and recommendations.
 - c. Wear, finish, or misc. guarantees

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.13 CLOSEOUT SUBMITTAL LIST

The following is a list of submittals required by this section. It includes but is not necessarily limited to the following:

- All warranties guarantees and bonds as listed above.
- Record Drawings and Shop Drawings Provide one set of All Shop Drawings, and two sets of Record Drawings per section 1.9.
- A Directory, listing names, addresses, and telephone numbers of Architect / Engineer, Contractor, Subcontractors, and major equipment suppliers.
- Executed original of occupancy permit
- Copy of Architect's and consultant's punch list(s) with the project manager's initials beside each item signifying that each item has been corrected.
- Contractor's "Asbestos Free" certification letter.
- Contractor's "storm water pollution" certification letter
- Contractor's "concrete placement" drawings identifying the area placed, the time and date of the placement and weather conditions.
- Finish grading and site structure placement certification

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- Letter or proof stating SWPPP has been terminated for this contract from state environmental office and responsibility transferred to Building Contractor.
- AIA G706A CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS
- AIA G706 CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS
- AIA G707 CONSENT OF SURETY TO FINAL PAYMENT
- Final Lien Release from each subcontractor and supplier.
- General Contractor's Statement of Warrantee
- Warranty Bond for second year following date of Substantial Completion.
- Inspection Report from Roofing Manufacturer's Representative.
- Third Party Special Inspection Reports
- Copy of HVAC Manufacturers Warranties and registration (Originals filled out and sent to manufacturer.)
- MECHANICAL, ELECTRICAL & MISCELLANEOUS EQUIPMENT
- a. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment suppliers.
- b. Design criteria.
- c. List of equipment.
- d. Parts lists
- e. Operating instructions.
- f. Maintenance instructions
- g. Shop drawings and product data.
- h. test reports.
- i. Certificates.
- j. Startup report.
- Finish material schedule including the following:
 - a. Listing of all materials
 - b. Manufacturers of each material.
 - c. Color or finish supplied on each material.
- Owner receipt of spare parts and maintenance products. Contractor will provide list, naming all spare material, items and parts as specified in individual sections or on drawings. The contractor will deliver spare material, items and parts to the owner and ask him to sign list as proof that all items have been provided as listed.
- PART 2 PRODUCTS Not Used.
- PART 3 EXECUTION Not Used.

END OF SECTION

01 77 00-9

SECTION 02 32 00

GEOTECHNICAL SOILS REPORT

PART 1 GENERAL

1.1 SUMMARY

- A. A soils investigation report has been prepared for the site of this work by McClelland Consulting Engineers, Inc., Fayetteville, AR, hereinafter referred to as the Soil Engineer.
- B. Availability: The soils investigation report is bound in this specification for reference only.
- C. Use of data:
 - 1. This report was obtained only for the Architect's use in design and is not a part of the Contract Documents. The report is available for bidders' information but is not a warranty of subsurface conditions.
 - 2. Bidders should visit the site and acquaint themselves with all existing conditions. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but all such investigations, shall be performed only under time schedules and arrangements approved in advance by the Architect.
 - 3. If a conflict should occur between the soil report and Section 31 23 00, the information in Section 31 23 00 shall govern.
- PART 2 PRODUCTS Not Used
- PART 3 EXECUTIONS
- 3.1 SUMMARY
 - A. Contractor shall follow the design for this work indicated by the drawings. Include all labor, equipment, and materials including borrow and disposal of waste, to accomplish final grades shown on drawings and specified herein.
 - B. Adjustment of work: Re-adjust all work performed that does not meet technical or design requirements but make no deviations from the Contract Documents without specific and written approval from the Architect.

END OF SECTION

02 32 00-1



September 20, 2023



Dear Ms. Humann:

We are submitting herewith the report for the Geotechnical Report on the above-referenced project. We appreciate the opportunity to provide this service to you. If there are any questions regarding the Geotechnical Investigation, please contact us.

Sincerely yours,



Steven J. Head, PE Principal | Geotechnical Department Head

Marshall Roberson, E.I. Project Designer

Enclosure: Geotechnical Report

ARKANSAS
PROFESSIONAL 2
ENCINEER No. 16434
09/20/2023



1580 East Stearns Street Fayetteville, Arkansas 72703 <u>mce.us.com</u>

GEOTECHNICAL INVESTIGATION

Thaden Athletic Facility Development

Project No. 23-3887 September, 2023 Prepared For: Walton Enterprises, Inc. Ms. Cheryl Humann Thaden School 800 SE C Street Bentonville, Arkansas 72712 chumann@weioffice.com

GEOTECHNICAL REPORT

Thaden Athletic Facility Development

MCE Project Number: 23-3887

Bentonville, Arkansas

FOR

Thaden School

800 SE C Street Bentonville, Arkansas 72712

Executive Summary

This is a report of the findings of the Geotechnical Investigation for the Athletic Facility expansion to the existing Thaden School campus in Bentonville, Arkansas. This report includes information on surface materials and subsurface conditions in addition to providing recommendations for site preparation, grading, structure foundations, estimated lateral earth pressures, and recommended minimum pavement sections. The significant findings listed below should not be used separately from the further discussion provided in the body of this report.

• This Geotechnical Investigation consisted of a total of four (4) borings; the project borings were located based on discussions with the Client and placed to capture an adequate amount of subsurface data across the development area. The table below provides details on the locations of the borings, their planned target depths, and how the borings relate to the planned development features.

	Boring ID	Target Depth (ft)	Location in the Development Area	
B-01 15.0 Northwest Corner of Buildin		Northwest Corner of Building Footprint		
	B-02	15.0	Northeast Corner of Building Footprint	
B-03 15.0		15.0	Southwest Corner of Building Footprint	
	B-04	15.0	Southeast Corner of Building Footprint	

- The surface materials (Stratum I) consisted of grass with topsoil materials. The thickness of the encountered topsoil was found to be three (3) inches at each investigated location.
- The materials that make up Stratum II consist of Lean Clay (CL), Sandy Lean Clay (CL), Lean Clay with Gravel (CL), and Lean Clay with Sand (CL). These fine-grained materials contained varying amounts and gradations of sand and gravel.
- Stable Stratum II Materials were encountered at varying depths across the development area. Moisture conditions of these soils increased with depth and groundwater was encountered in three (3) of the four (4) project borings.
- Following stripping and initial grading, the subgrade should be initially evaluated by the Geotechnical Engineer or his/her representative. All subgrade materials should be proof-rolled with a tandem-axle fully-loaded dump truck weighing approximately 60,000 pounds, or equivalent construction equipment.
- Based on the provided information, current project scope, and encountered subgrade materials, we recommend that a shallow foundation system composed of continuous and/or individual (spread) footings will be suitable for the support of the proposed building footprint. It is recommended that a minimum of three (3) feet of select fill material is budgeted below footings. This should be field-verified by MCE during construction operations.
- Slab-on-grade construction may be utilized for the planned structure provided a minimum of four (4) inch cushion of sand, crushed stone, or gravel is placed below the slab areas with a vapor barrier directly below the concrete.
- The following pavement recommendations provided in this section are based on stable subgrade material and/or select fill material existing beneath the recommended pavement sections.



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Appendices

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1.0 Introduction

McClelland Consulting Engineers, Inc. (MCE) conducted a subsurface investigation for the planned Athletic Facility expansion to the existing Thaden School campus in Bentonville, Arkansas. The investigation was requested and authorized by Ms. Cheryl Humann, with Walton Enterprises, Inc. This investigation was intended to explore the subsurface soil conditions within the planned development area in an effort to provide recommendations for site preparation, grading, structure foundations, lateral earth pressures, and recommended minimum pavement sections. Thank you for providing the preliminary development drawings used as an aid in the preparation of the recommendations and considerations contained herein.

2.0 Existing Site Description

The planned site is located on the northeast quadrant of the intersection of South Main Street and Southeast 10th Street in Bentonville, Arkansas. Specifically, the site is located in the southwest corner of the existing Thaden School campus. The development area is understood to encompass approximately 1.18 acres of previously undeveloped greenspace within the existing campus. The existing topography may be described as relatively flat-lying, with maximum grade differentials on the order of three (3) feet. Existing vegetation consists of unkept grass and shrubbery.

3.0 Project Scope

It is understood that the scope of the Thaden Athletic Facility includes the new construction of one (1) indoor gym/athletic facility structure. The structure is expected to primarily be a single-story structure with a second-floor mezzanine and an approximate structural footprint of 19,928 square feet (SF) and a total area of 21,584 SF. MCE also understands the gym structure is planned to be a pre-engineered, steel-framed structure, that will utilize a concrete slab-on-grade and will be supported by a shallow foundation system.

MCE understands that a previous investigation was conducted by Geotechnical & Testing Services, Inc. (GTS). This investigation took place in March of 2017 and was primarily aimed at investigating the areas for the Home Building and other now-existing structures that are part of the Thaden School campus. MCE was provided the data and information for this development by the Client, with the intent to utilize them during this investigation.

Finalized Design Drawings were not available at the time of this report. However, based on the existing developments and associated parking features of the Thaden School, it is anticipated that finished floor elevations (FFE) are to be at or very near the existing ground elevations.

Additionally, the provided Architectural Site Plan did not include any pavement improvement areas associated with the new facility. MCE anticipates some pavement improvements may be required to provide access to the new facility from existing parking areas and/or the bordering streets. These pavement improvements will likely be constructed utilizing asphalt paving materials above a coarse-aggregate base section.

4.0 Field Investigation

Based on the provided information from the preliminary Geotechnical Investigation conducted by GTS, our understanding of the project scope, as well as our experience in the area with projects of similar scope, MCE conducted a geotechnical investigation consisting of four (4) project borings.

Table 1 on the following page provides details on the locations of the final borings, their planned target depths, and how the borings relate to the planned Athletic Facility Structure.



Table 1: Project Boring Locations and Target Depths

Boring ID	Planned Target Depth (ft)	Location in the Development Area
B-01	15.0	Northwest Corner of Building Footprint
B-02	15.0	Northeast Corner of Building Footprint
B-03	15.0	Southwest Corner of Building Footprint
B-04	15.0	Southeast Corner of Building Footprint

All project borings were conducted using a CME 45-B truck-mounted drill rig, utilizing 4.25-inch diameter solid stem augers. Soil samples were obtained at the depths indicated on the boring logs with the use of a two (2) inch diameter split-spoon sampler. The split-spoon sampler was driven by blows from a 140-pound automatic hammer dropped from a fixed height of 30 inches. The number of blows required to drive the split-spoon sampler the final 12 inches of an 18-inch drive, or portion thereof, is referred to as the Standard Penetration value, N, and is recorded on the boring logs in units of blows-per-foot. Final drilled depths are shown as the depths achieved by the split-spoon sampler or depths where auger refusal were encountered.

In addition to Standard Penetration Testing (SPT), the field tests performed included visual soil classifications and groundwater observations. The visual soil classifications are given on the boring logs, which can be referenced in Appendix B on Plates 2 through 5; a key to the symbols on the boring logs is provided on Plate 6. Table 2 below provides details for each of the project borings.

Boring ID	Existing Surface Elevations (ft)	Topsoil Thickness (in)	Planned Target Depth (ft)	Auger Refusal Depth (ft)	End of Boring Depth (ft)	End of Boring Elevation (ft)
B-01	1291.0	3	15.0	11.0	11.0	1280.0
B-02	1291.0	3	15.0	13.0	13.0	1278.0
B-03	1289.0	3	15.0	11.0	11.0	1278.0
B-04	1292.0	3	15.0	14.0	14.0	1278.0

Table 2: Project Boring Details

NOTES: Elevations shown in Table 2 are rounded to the nearest 1.0 foot, and are based on the current grading information provided by the CEI Alta Survey (dated 9/1/23). Reported thicknesses of the surface materials are rounded to the nearest one (1) inch.

4.1 Supplemental Boring Information

As mentioned briefly in Section 3.0, a previous investigation was conducted for this project by GTS in March of 2017 to provide recommendations relevant to the Thaden School campus buildings. This investigation consisted of 61 project borings and multiple Geotechnical Reports relevant to the now existing Thaden School site, but did not include borings within the immediate development area of the new Athletic Facility.

Given the lack of relevant information contained within these reports as it relates to the new Thaden School Athletic Facility, the data contained within the Geotechnical Reports provided by GTS was not utilized as a primary reference for the recommendations contained herein. However, recommendations given in the furnished reports regarding site grading and shallow foundations that were utilized on other structures within the Thaden School campus were taken into consideration.

4.2 Encountered Groundwater Conditions

At the time of this investigation, perched groundwater was encountered within three (3) boring locations (B-02, B-03, and B-04) at depths ranging from 11 feet to 13.5 feet below the existing surface elevations. It should be noted, that these groundwater conditions were encountered immediately before hard rock materials resulting in Auger Refusal (see Section 4.3). As a result of the low permeability created by these subsurface materials, groundwater has the potential to collect above them in a "perched" condition during and after precipitation events.



Encountering perched groundwater could cause significant issues during undercutting and utility installation operations if not properly mitigated. Any groundwater or perched water must be removed, if encountered during construction, prior to the placement of fill or paving elements. To help reduce the potential for issues related to perched groundwater, it is recommended that earthwork operations take place during historically dry portions of the calendar year (June through September). Earthwork operations conducted outside of this recommended timeframe should expect general dewatering measures to be required to maintain a desirable construction schedule.

The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below the project site. Project grading should be properly designed to discharge any surface water that may develop following precipitation events.

4.3 Encountered Auger Refusal Materials

Auger Refusal materials are generally defined as those that, when encountered, prevent the advancement of the boring through traditional auger drilling techniques. Refusal is somewhat subjective and is dependent on the type of drilling equipment used and the down pressures exerted by the drill rig. At the time of this investigation, materials resulting in auger refusal were encountered by <u>all</u> four (4) of the project borings. These auger refusal materials were encountered at depths ranging from 11 feet to 14 feet below existing surface elevations at the time of the investigation.

Based on our knowledge of the underlying materials and the associated geologic formation, MCE recommends the Contractor budget for potential rock removal efforts in excavations exceeding five (5) feet in depth. Specifically, excavation efforts required to extend to depths where auger refusal or hard consistency values were recorded.

More information on the local geology and how it may affect the project site can be found in the *Local Geology* section of this report (Section 7.0). Additional guidance regarding these materials and the potential for difficult excavation conditions are provided in the *Rock Excavation Considerations* section of this report (Section 10.8).

5.0 Laboratory Analysis

Laboratory tests were performed on soil samples recovered from the borings. The laboratory tests were conducted to determine the engineering properties of the project soil strata. The laboratory tests were conducted following the American Society for Testing and Materials (ASTM) designations. The tests performed on samples from the borings included moisture content, Atterberg Limits, and sieve analyses.

The natural soil moisture content was determined on all soil samples to provide a moisture profile for each boring. Atterberg Limits tests (liquid and plastic limits) were performed on selected samples to aid in the soil classification and to help evaluate the volume-change characteristics of each soil stratum. Sieve analyses were performed on representative soil samples to aid in the soil classification of the selected soil strata. Results of laboratory testing for the project borings are provided on the boring logs and the Laboratory Test Results Summary in Appendix C. A key to the terms and symbols used on the boring logs is also presented in Appendix B. Table 3 below shows the relevant test method specifications utilized on the project.

Test Designation	Test Method
ASTM D2488	Standard Practice for Description and Identification of Soils (Visual)
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purpose (USCS)
ASTM D2216	Standard Test Method for Lab Determination of Water Content of Soil
ASTM D6913	Standard Test Method for Particle-Size Distribution of Soils Using Sieve Analysis
ASTM D4318	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Table 3: Laboratory Test Method Specifications



6.0 On-Site Soil Conditions

The following project sections provide information regarding onsite conditions at the project location. This information includes descriptions of the existing soil types, imagery showing the approximate location of the existing soil types, and details about the local geology.

6.1 United States Department of Agriculture (USDA) Soil Types and Map

The following soil types exist in the project area according to current USDA soil maps, with descriptions from the Natural Resources Conservation Service (NRCS). The project site is located in Benton County in Northwest Arkansas. The existing soil types are briefly detailed in Table 4 below. Figure 1 below provides imagery of the approximate site location and how it relates to the existing soil types.

Table 4: USDA Local Soil Types

USDA Soil Type	USDA Symbol	USDA Descriptions
Cherokee Silt Loam	Cs	The Cherokee Series consists of very deep, somewhat poorly drained soils that formed in fine textured sediments of the Cherokee Prairies (MLRA 112). Cherokee soils are on terraces, upland benches or in head of drains. Slope ranges from 0 to 3 percent.



Figure 1: USDA Soil Survey Report Image The image was produced by the United States Department of Agriculture.

7.0 Local Geology of the Project Site

According to maps and literature published by the United States Geological Survey (USGS) and the Arkansas Geological Survey (AGS), the project site is underlain by the Mississippian Age (300 to 350 million years ago) Boone Formation. A brief description from the Stratigraphic Summary of Arkansas – Information Circular 36 (IC36) of the local geologic formation is provided below, as well as how these materials may impact the project site.



7.1 The Boone Formation

The Boone Formation is primarily comprised of fine to coarse-grained limestone with interbedded chert. The quantity and quality of the chert are known to vary considerably both vertically and horizontally within the Boone section. Residual soils formed from the Boone Formation typically consist of various gradations of clay, sand, and chert gravel. The Boone Formation is named after exposures in Boone County, Arkansas. The Boone Formation is well known for its karst features such as springs and sinkholes. The Boone Formation is thought to range from 300 to 400 feet in thickness, according to most literature.

The chert layers associated with the Boone Formation are known to provide excavation difficulties depending on the quality and consistency of the chert. The weathered cherts associated with the Boone have a "chalky" texture and tend to be easier to excavate than those with a more competent structure. Both of these chert types are anticipated to be present across the project site. Figure 2 below provides a visual of the local geologic formation in relation to the project site.



Figure 2: Image from the Geologic Map of Arkansas (1993) The red dot represents the approximate location of the project site.

8.0 IBC Site Classification

The planned development area is recommended to be assigned as a Risk Category III according to Table 1604.5 of the 2021 International Building Code (IBC). The site seismic classification determination may utilize spectral response accelerations S_{DS} and S_{D1} of **0.139** and **0.091** respectively, with reference to Section 1613 of the 2021 IBC, and current Applied Technology Council (ATC) information based on a Site Class C for the soil profile within the project area.

9.0 On-Site Soil Stratum Summary

This summary is based on a collection of field notes and field-testing values recorded during the investigation, notes recorded during the lab analysis, and results from the laboratory testing. The encountered subsurface soil conditions are summarized below.



9.1 Stratum I – Surface Materials

The surface materials across the site consisted of grass and topsoil. For this report, topsoil is defined as the horizon that contains the majority of the root mat from the existing vegetation. The encountered topsoil thickness was found to be three (3) inches at the investigated areas. MCE anticipates that the thickness of these materials across the development area may vary due to the utilization of this portion of the Thaden School property as a staging area during construction; based on historical imagery from Google Earth.

9.2 Stratum II – Fine-Grained Subgrade Materials

The materials that make up Stratum II consist of Lean Clay (CL), Sandy Lean Clay (CL), Lean Clay with Gravel (CL), and Lean Clay with Sand (CL). These fine-grained materials contained varying amounts and gradations of sand and gravel.

Consistency values for the Stratum II CL Materials ranged from soft to hard, with corresponding N-values ranging from three (3) to 44. The natural soil moisture content for these materials ranged from 4.3 to 31.7 percent. The Liquid Limit (LL) of these materials ranged from 26 to 38, with a Plasticity Index (PI) value that ranged from 13 to 26. The fine fraction of these materials exhibited moderate plasticity characteristics and moderate potential for volumetric changes due to alterations in the soil's moisture content. The fine fraction of these soils make up between 71.7 and 88.1 percent of the overall soil mass, as indicated by the results of gradation analysis from the borings.

10.0 Engineer's Analysis and Recommendations

It is understood that the scope of the Thaden Athletic Facility includes the new construction of one (1) indoor gym/athletic facility structure. The primary structure is expected to be a single story with a second-floor mezzanine and an approximate structural footprint of 19,928 square feet (SF). MCE also understands the gym structure is planned to be a preengineered, steel-framed structure, that will utilize a concrete slab-on-grade and will be supported by a shallow foundation system.

Finalized Design Drawings were not available at the time of this report. However, based on the existing developments and associated parking features of the Thaden School, it is anticipated that finished floor elevations (FFE) are to be at or very near the existing ground elevations. MCE anticipates the proposed building will be constructed with light-to-medium gauge steel framing supported on shallow foundations. We expect that the structure will experience moderate loading conditions with maximum column loads not to exceed 100 kips and wall loads on the order of 3 kips per linear foot.

The purpose of this investigation was to obtain adequate subsurface information from which to provide recommendations and considerations for the proposed structure and anticipated site developments. Those recommendations and considerations are presented in the following sub-sections of this report.

10.1 Initial Site Preparation – Stripping/Grubbing

As previously described in the Stratum I summary (Section 9.1), the project borings encountered topsoil materials at the surface at each of the four (4) final boring locations. The encountered topsoil was found to have a thickness of three (3) inches at each location.

MCE recommends that all Stratum I topsoil and organic materials be removed full-depth as part of the initial site preparation. MCE recommends that the Contractor carry a budget for the removal of a minimum of eight (8) inches of stripping and grubbing of topsoil materials across the planned development area.

10.2 Subgrade Verification Method

Following stripping and initial grading in the building and any pavement areas, the subgrade should be initially evaluated by the Geotechnical Engineer or his/her representative prior to any undercut. All subgrade materials should be proof-rolled with a tandem-axle fully-loaded dump truck weighing approximately 60,000 pounds, or equivalent construction equipment. The stability of soils beneath the foundation footprint can also be evaluated by alternate means if proof rolling is not feasible, provided that it is verified by a representative of the Geotechnical Engineer. These recommendations assume that weather conditions at the time of construction are similar to those experienced at the time of our investigation.



The proof-rolling should serve as final means to verify and document stable subgrade conditions/recommendations. Any soft and/or yielding subgrade areas encountered should be repaired by undercutting and backfilling with select fill material and then subsequently evaluated by the Geotechnical Engineer or his/her representative for approval. Recommendations for select fill material thickness and/or undercut in building and pavement areas should only occur following the subgrade evaluation process.

10.3 Site Grading Considerations – Proposed Building Footprint

Based on the data from the final borings conducted during this investigation, MCE anticipates that stable materials exist at varying depths within the planned development area. Project Boring B-01 encountered stable materials within the upper two (2) feet, Project Boring B-02 encountered stable materials within the upper 3.5 feet, relatively stable subgrade materials were first encountered by Project Boring B-03 at a depth of six (6) feet below the surface, and Project Boring B-04 encountered favorable material within the upper five (5) feet. A moderately hard-to-hard chert rock seam was encountered by B-04 at an approximate depth of 4.5 feet below the existing ground elevation. It should be noted that the majority of the stable materials encountered across the site were encountered atop soil strata with elevated moisture conditions that are not favorable for support of the anticipated loading conditions if exposed.

MCE anticipates that following initial stripping, excavation operations on the order of five (5) to six (6) feet may be required to expose stable subgrade materials in some areas of the building footprint; particularly on the west side of the structure, depending on site conditions at the time of construction. It is recommended that earthwork operations take place during relatively dry periods of the calendar year (June through October) with favorable moisture conditions. Any undercut operations should be coordinated so that the exposed subgrade may be covered with approved Select Fill materials prior to prolonged exposure to the elements, as outlined in Section 10.13 of this report.

Mass undercut and backfilling of the structure footprint may reduce the effects of long-term settlement by allowing a period of "pre-loading" directly following fill placement and prior to the placement of structural elements.

Thickened lifts or "bridging" lifts should not be utilized within the structure's footprint. Additionally, MCE highly recommends that the Geotechnical Engineer or his/her representative be on-site during the undercut operations mentioned above to help reduce total undercut where applicable.

10.4 Site Grading Considerations – Anticipated Pavement Improvement Areas

MCE recommends the project budgets for the placement of a minimum of two (2) feet of newly placed, properly compacted, and moisture-conditioned select fill materials under any additional parking and access drive areas. This recommendation is provided with the anticipation that finished pavement surface elevations will be at or very near existing surface elevations and also intends to be conservative should isolated areas require undercut. The implemented thickness of select fill material should recommended by a representative of the Geotechnical Engineer based on conditions at the time of construction. A thickened "bridging" lift on the order of 18 to 24 inches should only be implemented within the parking and access drive areas under the direction of the Geotechnical Engineer or his/her representative. The top eight (8) inches of any thickened lift should be compacted and tested per project specifications. A minimum of one (1) standard lift should be placed above any thickened lift utilized beneath pavement areas.

10.5 Site Grading Considerations – Excavated Slopes/Vertical Trenching

Excavated slopes during construction should be benched or sloped to provide a minimum two-to-one horizontal-to-vertical (2H:1V) ratio. Construction slopes steeper than recommended may be unstable, particularly when introduced to moisture increases during precipitation events. Although not anticipated, if excavation efforts require deep vertical trenching (deeper than five (5) feet), and the minimum 2H:1V ratio is not achievable, then the Contractor must establish a comprehensive Shoring Plan. That Shoring Plan should be reviewed and stamped by a licensed Professional Engineer (PE) prior to excavation.



10.6 Rock Excavation Considerations

As mentioned previously in Section 4.3, materials resulting in auger refusal were encountered by all four (4) project borings during the investigation at depths ranging from 11 feet to 14 feet below existing surface elevations. Although excavation efforts to these depths are not anticipated, MCE expects that these materials exist throughout the project site at varying elevations. This expectation is based on our current knowledge of the underlying materials and the associated geologic formation.

These materials consisted of very dense or hard chert and limestone. Hard chert and limestone materials are common in the Boone Formation. These materials are known to vary in consistency and composition and could provide excavation difficulties at depths deeper than those investigated during this investigation. MCE anticipates that all Stratum II Materials may generally be excavated using medium-to-heavy-duty equipment and techniques in the upper five (5) to 10 feet. However, the Auger Refusal Materials that exist at deeper depths may require rock excavation techniques to advance excavation efforts. Such techniques may consist of jackhammering, hammer hoe attachments, ripper teeth, or other means.

10.7 General Foundation Recommendations

The foundations relevant to the structure addition should be sized to meet three (3) conditions. First, the maximum stresses imposed on the foundation strata should not exceed the allowable bearing pressures as determined by the shear strength properties of the bearing strata. Secondly, foundations should be designed to limit the maximum anticipated total and differential settlement to magnitudes that will neither damage nor impair the use of the structures.

Finally, the foundation systems must also be designed to resist the anticipated lateral or overturning forces during the most critical loading conditions, including earthquake loadings. These factors, as well as construction considerations related to the existing soil and ground conditions, were influential in the preparation of the recommendations presented hereinafter.

10.8 Shallow Foundation Recommendations

Based on the provided information, current project scope, and encountered subgrade materials, we recommend that a shallow foundation system composed of continuous and/or individual (spread) footings will be suitable for the support of the planned structure.

The shallow foundations should bear on a minimum of one (1) foot of newly-placed, properly-compacted, and moistureconditioned select fill material meeting the criteria outlined in the *Select Fill Material* section of this report. Stable subgrade conditions should be exposed prior to placing any select fill or footing elements. It is anticipated that up to three (3) feet of select fill material may be required beneath foundations in certain areas of the structure footprint, based on the subgrade conditions encountered by the borings and also those known to exist at the project site. It is recommended that all foundations for this structure bear on select fill material to provide consistent conditions regarding bearing capacity and settlement.

In this case, "stable" subgrade conditions within the planned addition footprint should include the stiff to very stiff Stratum II CL soils that were encountered at varying depths across the investigated area. The anticipated site grading for the structure is briefly detailed in *Section 10.3 Site Grading Considerations – Proposed Building Footprint*.

Footings bearing on newly placed, properly compacted, and moisture-conditioned select fill material can utilize safe allowable bearing pressures of 2,500 pounds per square foot (psf) for continuous foundations and 3,000 psf for spread or individual foundations. The allowable bearing pressures provide a minimum factor of safety of three (3) and were calculated using a minimum footing width of two (2) feet, a minimum footing thickness of one (1) foot, and a minimum footing depth of two (2) feet below exterior ground elevations, which is adequate to protect against frost heave in the project area.

The total long-term foundation settlement for footings bearing on properly placed select fill material with the assumed dimensions and loading is anticipated to be approximately ³/₄-inch. The maximum differential settlement between footings is anticipated to be on the order of ¹/₂-inch between individual footings or along a 40-foot span for continuous footings.



10.9 Subgrade Improvements – Aggregate Piers

An additional foundation option for the new Thaden Athletic Facility that would greatly reduce undercut and backfilling operations is continuous and individual (spread) footings placed on soils improved by an aggregate pier deep foundation system.

The recommendation for the aggregate pier system would be aimed at improving the subgrade capacity and conditions within the structure footprint by their installation. The implementation of the aggregate pier system can improve the bearing capacity of otherwise unsuitable subgrade materials so that conventional shallow foundations may be utilized and also reduce the settlement potential for the subgrade soils. The piers are typically constructed by drilling 24 to 30-inch diameter holes to planned terminal depths and backfilling the holes with compacted aggregate. However, finalized shaft diameters may vary upon the finalized design. Compaction consolidates the aggregate column and increases lateral stress in the soil matrix.

The system serves to reduce settlement by replacing and reinforcing the relatively loose (compressible) soils in the shallow subgrade material below the planned structure location. The aggregate pier system would provide an advantage over drilled piers in that they would not require additional equipment, such as concrete pump trucks and cranes. The aggregate pier system would provide an additional benefit over a drilled pier foundation system in that it would not require temporary or permanent casing elements. The installation of an aggregate pier system is typically more economical and efficient than other deep foundation options, which require achieving a more competent bearing stratum at deeper elevations, with added material costs. It is anticipated that the aggregate pier installation would occur after pad construction (recommended two (2) feet of moisture-conditioned and properly compacted select fill material) within the relevant building areas.

Precise bearing capacity values should be directed by the chosen aggregate pier designer, but a minimum capacity on the order of 5,000 pounds per square foot (psf) can be obtained at the site with an expected settlement range on the order of one (1) inch total long-term and one-half (1/2) inch differential settlement after loading. It is likely that a bearing capacity on the order of 6,000 psf can be achieved, but this should be confirmed with the aggregate pier designer once more finalized structure loading information is available. For aggregate piers that may be in an uplift condition, the initial project design constraints may utilize a maximum uplift capacity of 15 kips per pier.

By providing proper installation energy, whether through vibration or compaction methods, the aggregate piers increase the shear strength of the immediately surrounding soil matrix, which in turn improves the subgrade for an area larger than the actual pier dimensions. Methods of installation that do not provide adequate compaction energy result in placing endbearing stone columns that extend a vertical load onto deeper bearing strata but do not improve the structure subgrade as intended by the recommendations for this foundation system. A vertically-loaded stone column is not the recommended foundation type and does not provide the same soil improvements as the referenced aggregate pier system.

Should the design team desire to pursue this alternative foundation option, MCE would be happy to provide further recommendations and coordination to assist in this process.

10.10 Structure Slab-on-Grade

Slab-on-grade construction may be utilized for the planned structure provided a minimum of four (4) inch cushion of sand, crushed stone, or gravel is placed below the slab areas with a vapor barrier directly below the concrete. MCE recommends that a minimum of two (2) feet of select fill materials be placed and compacted underneath the planned Slab-on-Grade.

This select fill should be properly placed beneath the slab dimensions to provide adequate subgrade support and stable under-slab conditions. These recommendations will likely be satisfied during initial earthwork operations if the recommended process is followed as described in Section 10.8. The entirety of the structure slab is recommended to be verified by proof-rolling, as previously described in the *Subgrade Verification* section of this report.



10.11 Site Retaining Structures – Lateral Earth Pressures

Should any below ground drainage structures or retaining walls be included in this scope of work, MCE recommends all earth-retaining structures should be designed to resist the minimum equivalent fluid weights provided in Table 5 below.

The recommended minimum factor of, safety against sliding and overturning is 1.5 and 2.0 respectively. The provided lateral earth pressures assume a drained condition for the backfill material. To achieve a drained condition, the retaining structures should be backfilled using a free-draining granular material and be provided with thru-drains or a gravity trench drain system graded to daylight for the release of any hydrostatic pressure that may develop. The values provided in Table 5 for No. 57 or No. 67 crushed stone gravel assume a 1H:1V maximum backfill slope from the heel of the retaining wall foundation. If a vertical "chimney drain" is provided by the No. 57 or No. 67 stone, then the values for onsite soils should be used based on proximity and relevancy to the material behind the gravel.

Table 5:	Estimated	Lateral Earth	Pressures

	Moist Unit	Friction Angle φ (⁰)	Equivalent Fluid Pressure (lbs/ft ³)		
Soil/Backfill Type	Weight (Ibs/ft ³)		Active	Passive	At-Rest
Onsite Soils Stratum II	105	15	62	178	78
Select Fill Material (GC or GM)	120	28	43	332	64
No. 57 or No. 67 Stone	95	35	25	350	41

A coefficient of friction of 0.40 may be used provided the retaining structure is supported on a minimum of four (4) inches of placed and compacted Class 7 Base Course material. A friction value of 0.35 may be used provided the retaining structures are supported directly on select fill material or onsite soils.

10.12 Minimum Pavement Section Recommendations

The following pavement recommendations provided in this section are based on stable subgrade material and/or a minimum of two (2) feet of select fill material existing beneath the recommended pavement sections. This requirement would be provided by proper placement of approved select fill material and/or stable onsite material being verified by proof-rolling within the pavement subgrade dimensions. Minimum pavement sections are recommended to be as shown in Table 6 and Table 7 below.

For the recommendations provided in Tables 6 and 7, standard-duty pavements are considered to be those pavements with low-volume traffic areas such as pedestrian sidewalks, parking, and staging areas, and areas primarily subjected to passenger vehicles. The standard-duty pavements are recommended as performing similarly to a typical city street pavement section with a local/residential classification which would primarily receive passenger vehicle traffic with intermittent truck traffic. Heavy-duty pavement recommendations are intended to apply to areas subjected to frequent heavy-truck traffic, such as dumpster pads.

Table 6: Minimum Project Pavement Sections - Asphalt Materials

Pavement Type	Pavement Materials	Light Duty	Standard Duty	Heavy Duty
	ACHM Surface Course (1/2")	2"	3"	2"
Asphalt Pavement	ACHM Binder Course (1")	N/A	N/A	3"
	Class 7 Base Course (95% MPD)	6"	8"	10"

Table 7: Minimum Project Pavement Sections – Concrete Materials

Pavement Type	Pavement Materials	Light Duty	Standard Duty	Heavy Duty
Concrete Deversant	Portland Cement Concrete	4"	N/A	6"
Concrete Pavement	Class 7 Base Course (95% MPD)	6"	8"	8"



The pavement sections provided in Tables 6 and 7 should be viewed as minimums and can be increased through the design process by the project Civil Engineer if warranted.

10.13 Select Fill Materials

Any select fill material required for the project is recommended to be an off-site borrow material of locally available silty or clayey chert gravel meeting Unified Soils Classification as a GC or GM material and having a Plasticity Index of 35 or less, a Liquid Limit of 55 or less, a minimum of 30% retained on the ³/₄-inch sieve and a maximum of 35% passing the No. 200 sieve.

All fill and backfill should be placed in horizontal lifts. When placing fill next to existing slopes, the slope face should be stripped of all vegetation and the face "benched" to allow the placement of horizontal lifts and bonding to the slope face. Table 8 below provides the recommended compaction parameters for select fill and Class 7 base course to be used on the project.

Table 8: Compaction Requirements

Material Type	Test Standard	Minimum Dry Density (%)	Optimum Moisture Range (%)
Select Fill	ASTM D698 / AASHTO T99	98	-3% to +3%
Base Course	ASTM D1557 / AASHTO T180	95	Near Optimum

Any material to be used as a select fill on the project should be reviewed and approved by the Geotechnical Engineer.

11.0 Construction Materials Testing and Special Inspections

Construction materials testing and special inspection services are recommended to be provided by MCE to provide consistency with the recommendations in this report and the documentation of those recommendations being implemented during construction. Testing of the earthwork, concrete, paving, structure, and other phases is recommended to be conducted and documented during construction to assure the Owner and Engineer that the construction complies with the specifications. In particular, field verification of earthwork operations will be required to confirm the recommendations contained herein. Additionally, all trenching and excavations should be conducted following the current Arkansas State Law and Occupational Safety and Health Administration (OSHA) guidelines and requirements.

12.0 Limitations and Reserved Rights

The recommendations and conclusions made in this report are based on the assumption that the subsoil conditions do not deviate appreciably from those disclosed in the subsurface exploration. Should significant subsoil variations or undesirable conditions be encountered during construction that are not described herein, the Geotechnical Engineer reserves the right to inspect these conditions for the purpose of reevaluating this report. A review of the final construction plans and specifications by this office is encouraged to ensure compliance with the intent of these recommendations.



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APPENDIX A: BORING LAYOUT





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GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN (tsf)	DRY UNIT WT (pcf)	2(1 2(□ FIN 2(
<u>3 4: 3</u> 19/19							
	- Light Bround Scherberger Stiff; Dry; Low to Moderate Plasticity - Possi derial from Previous Construction	SPT 1	44	7-8-14 (22)			•
	CLAY WITH SAND n-Brown to Dark Brown; Stiff; Low to Moderate Plasticity; pravels; Little Sands; Mostly Fines; Very Moist	SPT 2	61	3-5-3 (8)			
		SPT	17	2-3-4			

APPENDIX B: BORING LOGS

'Y DEVEL													
	NED TO SERVE	McClelland Consulting Engineers 1580 E Stearns St Fayetteville, AR 72703 Telephone: 4734432377				E	30F	RINO	G NUMBER B-01 PAGE 1 OF 1				
		naden School PRC	OJECT	NAME	Thad	en School	Athleti	c Faci	lity				
	OJECT	NUMBER_23-3887 PRC	OJECT	LOCA		Bentonville	e, Arka	nsas					
be da	TE STA	RTED_8/31/23 COMPLETED_8/31/23 GR0	OUND	ELEVA	TION_	1291 ft		HOLE	SIZE 4.25 inches				
	ILLING	CONTRACTOR McClelland Consulting Engineers, Inc. GRO	OUND	WATE	R LEVI	ELS:							
	ILLING	METHOD Solid Stem Auger	AT		F DRIL	LING							
	GGED B	Y_C. Chiddister CHECKED BY_M. Roberson	AT END OF DRILLING										
NO	TES _Co	onducted Utilizing a CME-45B Truck Mounted Drill Rig	AFT	ER DR	LLING	i							
ELOPMENT (GEOT)/GF DEPTH (#)	(III) GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 40 60 80 □ FINES CONTENT (%) □				
<u> </u>) (<u>., 1, 1, 1</u>)	TOPSOIL (3")							20 40 60 80				
		(CL) LEAN CLAY WITH GRAVEL					-						
		 Light Brown to Reddish-Brown; Very Stiff; Dry; Low to Moder Plasticity Possible Fill Material from Previous Construction 	rate	SPT 1	44	7-8-14 (22)			•				
ADEN SCHOOL /	5	(CL) LEAN CLAY WITH SAND - Reddish-Brown to Dark Brown; Stiff; Low to Moderate Plastic Trace Gravels; Little Sands; Mostly Fines; Very Moist		SPT 2	61	3-5-3 (8)			•				
ENTONVILLE, AR - TH 		Dark Craviah Braura Saft to Madium Stiffs Wat		SPT 3	17	2-3-4 (7)	_		•				
S/23-GEOT/23-3887 - E		- Dark Grayish-Diown, Solt to Medium-Sun, Wet		SPT 4	83	2-1-2 (3)	_		•				
RENT PROJECTS/GEOT	5	- Light Grayish-Brown; Stiff; Moist					_						
10:52 - L:\CUR	0			5 5	78	3-3-4 (7)	_		▲ ⊢ ●Ⅰ □				
113/2:	-\////												
DT - 5		Refusal at 11.0 feet.											
AB.G		Bottom of borehole at 11.0 feet.											
SUD													
IT STI													
- GIN													
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GEOT													

	NT <u>Th</u> JECT N E STAR LING C LING N GED B	McClelland Consulting Engineers 1580 E Stearns St Fayetteville, AR 72703 Telephone: 4734432377 aden School IUMBER_23-3887 RTED_8/31/23 COMPLETED_8/31/23 COMPLETED_8/31/23 CONTRACTOR McClelland Consulting Engineers, Inc. IETHOD_Solid Stem Auger Y_C. Chiddister CHECKED BY_M. Roberson nducted Utilizing a CME-45B Truck Mounted Drill Rig	PROJECT NAME Thaden School Athletic Facility PROJECT LOCATION Bentonville, Arkansas GROUND ELEVATION 1291 ft HOLE SIZE 4.25 i c. GROUND WATER LEVELS: AT TIME OF DRILLING 13.00 ft / Elev 1278.00 ft AT END OF DRILLING AFTER DRILLING AFTER DRILLING												
evelopment (GEOT)/GF O DEPTH O (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 40 60 80 □ FINES CONTENT (%) □ 20 40 60 80						
		TOPSOIL (3") (CL) SANDY LEAN CLAY - Dark Brown; Very Stiff; Low to Moderate Plasticity; Trac Gravels; Little Sands; Mostly Fines; Moist	e	SPT 1	28	9-7-6 (13)	_		•						
1400 2.5		- Hard; Some Gravels		SPT 2	17	6-25-10 (35)	-		•						
		- Stiff - Medium-Stiff; Very Moist		SPT 3	50	6-5-5 (10)	-								
KUJECI Ski2-4501 23-388/				SPT 4	44	2-2-3 (5)	-								
		- Light Brown; Stiff		SPT 5	33	16-5-6 (11)	-								
		∑ Refusal at 13.0 feet. Bottom of borehole at 13.0 feet.													

CLIEI PRO. DATE DRILI LOGO NOTE	NT The JECT N E STAR LING C LING M GED BY ES CO	McClelland Consulting Engineers 1580 E Stearns St Fayetteville, AR 72703 Telephone: 4734432377 aden School I UMBER_23-3887 TED_8/31/23 COMPLETED_8/31/31 COMPLETED_8/31/31 COMPLETED_8/31/31 COMPLETED_8/31/31 COMPLETED_8/31/31 COMPLETED_8/31/31 COMPLETED_8/31/31 COMPL	PROJECT NAME _Thaden School Athletic Facility PROJECT LOCATION Bentonville, Arkansas GROUND ELEVATION 1289 ft HOLE SIZE _4.25 inches GROUND WATER LEVELS: ✓ AT TIME OF DRILLING _11.00 ft / Elev 1278.00 ft AT END OF DRILLING AFTER DRILLING												
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N 20 40 PL 20 40 □ FINES C0 20 40	N VALUE 60 MC L 60 DNTENT 60	▲ 80 L 1 80 (%) □ 80				
		TOPSOIL (3") (CL) SANDY LEAN CLAY WITH GRAVEL - Light Brown; Medium-Stiff to Stiff; Low to Moderate Plast Dry	icity;	SPT 1	22	4-3-3 (6)			•						
2.5		- Medium-Stiff		SPT 2	6	2-2-2 (4)			•						
		(CL) LEAN CLAY - Dark Brown; Medium-Stiff; Little Sands; Mostly Fines; Ver	ry Moist	SPT 3	22	2-1-3 (4)	_		•						
		- Light Brown to Gray; Stiff		SPT 4	89	2-2-5 (7)	-								
7.5 		- Very Stiff		SPT 5	61	2-8-9 (17)	_								
10.0		∑ Refusal at 11.0 feet. Bottom of borehole at 11.0 feet.					-								

CLIEN PROJ DATE DRILI	ECT N STAF	McClelland Consulting Engineers 1580 E Stearns St Fayetteville, AR 72703 Telephone: 4734432377 aden School IUMBER_23-3887 RTED_8/31/23 COMPLETED_8/31/23 CONTRACTOR_McClelland Consulting Engineers, Inc.	PROJECT NAME _Thaden School Athletic Facility PROJECT LOCATION Bentonville, Arkansas GROUND ELEVATION 1292 ft HOLE SIZE _4.25 inche GROUND WATER LEVELS: ♀ AT TIME OF DRILLING 13.50 ft / Elev 1278.50 ft											
	LING N GED B	METHOD Solid Stem Auger Y C. Chiddister CHECKED BY M. Roberson	TA ⊻ AT	TIME OI	F DRIL	LING <u>13.</u> LING	50 ft / E	Elev 12	278.50 ft					
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	Ar	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 40 60 80 □ FINES CONTENT (%) □					
<u> </u>		TOPSOIL (3") (CL) SANDY LEAN CLAY - Dark Brown; Stiff to Very Stiff; Few Gravels; Little Sand Fines; Dry	s; Mostly	SPT 1	39	5-6-6 (12)	-		<u>20 40 60 80</u>					
 <u>2.5</u> 		- Stiff		SPT 2	50	3-5-4 (9)	-		↓ □					
 _ <u>5.0</u>		- Hard (Chert Seam Encountered 4.5' - 5') - Dark Brown; Stiff; Very Moist		SPT 3	28	2-7-37 (44)	_		•					
 <u>7.5</u>				4	39	(7)	-							
 _ <u>10.0</u> 		- Medium-Stiff to Stiff; Moist		SPT 5	67	0-2-4 (6)	-		•					
 <u>12.5</u> 		Σ												



1, 11,

(Unified Soil Classification System)

CL: USCS Low Plasticity Clay

CLG: USCS Low Plasticity Gravelly Clay

KEY TO SYMBOLS

CLIENT Thaden School

PROJECT NUMBER 23-3887

PROJECT NAME Thaden School Athletic Facility

PROJECT LOCATION Bentonville, Arkansas

SAMPLER SYMBOLS



Standard Penetration Test

TOPSOIL: Topsoil

LITHOLOGIC SYMBOLS

IN-SITU SHEAR STRENGTHS

	COARSE-0	GRAINED SOILS		FINE-GR	AINED SOILS
Pener (blows	tration s/foot)	In-Situ Strengths	Pene (blow	tration s/foot)	In-Situ Strengths
Auto	Manual		Auto	Manual	11 909-000-000-000-000-000-000-000-000-000
0 - 3	0 - 4	Very Loose	< 2	<2	Very Soft
3 - 8	4 - 10	Loose	2 - 3	2 - 4	Soft
8 - 23	10 - 30	Medium-Dense	3 - 6	4 - 8	Medium-Stiff
23 - 38	30 - 50	Dense	6 - 12	8 - 15	Stiff
> 38	> 50	Very Dense	12 - 23	15 - 30	Very Stiff
	at date		> 23	> 30	Hard

Descriptor	Meaning
Trace	Less than 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%
Mostly	50% to 100%

FINE GRAINED ANALYSIS DESCRIPTORS

LL -I

- ABBREVIATIONS
- LL LIQUID LIMIT (%)
- PI PLASTIC INDEX (%) W - MOISTURE CONTENT (
- W MOISTURE CONTENT (%) DD - DRY DENSITY (PCF)
- NP NON PLASTIC
- -200 PERCENT PASSING NO. 200 SIEVE
- PP POCKET PENETROMETER (TSF)

- TV TORVANE
- PID PHOTOIONIZATION DETECTOR
- UC UNCONFINED COMPRESSION
- ppm PARTS PER MILLION
- \forall Water Level at Time
- ▼ Water Level at End of Drilling, or as Shown
- Water Level After 24
- Hours, or as Shown



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APPENDIX C: LABORATORY RESULTS



GRAIN SIZE DISTRIBUTION

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	B-02 3.5			9.5													3.5	;		26.0		69.		69.2	9.2			
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SUMMARY OF LABORATORY RESULTS



McClelland Consulting Engineers 1580 E Stearns St Fayetteville, AR 72703 Telephone: 4734432377

PAGE 1 OF 1

CLIENT Thaden School

PROJECT NAME Thaden School Athletic Facility

ĒN	PROJECT NUMBE	ER 23-3887				PRO	JECT LOCA	TION Bento	onville, Arkaı	nsas		
-3887 - THAD	Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class- ification	Water Content (%)	Dry Density (pcf)	Satur- ation (%)	Void Ratio
RT\23	B-01	0.5							6.9			
EPOF	B-01	2.0							10.9			
CH R	B-01	3.5							26.2			
OTE	B-01	5.0							31.7			
T)/GE	B-01	8.5	26	13	13	9.5	72	CL	20.2			
GEO	B-02	0.5							18.7			
ENT (B-02	2.0							15.0			
OPM	B-02	3.5	28	15	13	9.5	69	CL	15.0			
EVEL	B-02	5.0							22.3			
TΥD	B-02	8.5							15.9			
ACILI	B-03	0.5							24.9			
FIC F.	B-03	2.0							4.3			
HLE	B-03	3.5							29.9			
DL AT	B-03	5.0	38	12	26	4.75	88	CL	28.3			
СНО	B-03	8.5							29.9			
EN S	B-04	0.5							11.0			
HAD.	B-04	2.0	30	16	14	9.5	69	CL	12.2			
4R - T	B-04	3.5							11.1			
-LE, ∕	B-04	5.0							27.7			
INNC	B-04	8.5							23.2			
-												

SECTION 02 41 19

DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

A. Section 312000 – Earthwork

1.3 REFERENCES

- A. 29 CFR 1926 U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.4 SUBMITTALS

- A. Site Plan: Showing: Areas for temporary construction and field offices.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.5 QUALITY ASSURANCE

A. Demolition Firm: Company specializing in the type of work required.

1.6 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCOPE

- A. Remove paving and curbs as required to accomplish new work.
- B. Remove other items indicated, for salvage, relocation, and recycling.
- C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 7. Do not close or obstruct roadways or sidewalks without permit.
 - 8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from the Owner.
- C. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.

- 2. Prevent movement or settlement of adjacent structures.
- 3. Stop work immediately if adjacent structures appear to be in danger.
- D. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- E. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Dismantle existing construction and separate materials.
 - 2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3 EXISITNG UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to the owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to the owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
- I. Coordinate re-location or modifications to all utilities affected by new access street tie ends to any public or private drives and or streets.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.

- 2. Report discrepancies to landscape architect before disturbing existing installation.
- 3. Beginning of demolition work constitutes acceptance of existing conditions.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 11 00

CONCRETE FORM WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All concrete and related items required to complete the building, provide off-sets, bulkheads, recesses, openings, chases, etc., and install any inserts, sleeves, etc., required by other trades.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Concrete: Section 03 30 00
- B. Concrete Reinforcement: Section 03 21 00
- 1.3 WORK INSTALLED BUT FURNISHED BY OTHER SECTIONS:
 - A. Built-in anchors, inserts and bolts for connection of other materials.
 - B. Built-in sleeves, thimbles, dovetail slots, and water-stops.

1.4 **DEFINITIONS**:

- A. Architectural Concrete Surfaces: Formed surfaces where appearance is of major importance.
- B. Non-Architectural Concrete Surfaces: Formed surfaces where appearance is not of major importance.
- 1.5 QUALITY ASSURANCE:
 - A. Design Criteria:
 - 1. General: Conform to ACI 347-Current Edition Chapter 1, Design.
 - 2. Plywood: Conform to tables for form design in APA Form V 345- Current Edition, including strength.
 - B. Requirements of Regulatory Agencies: Erect forms to meet the requirements of the Local Building Code.
 - C. Allowable Tolerances:
 - 1. Non-Architectural Concrete: Conform to ACI 347- Current Edition.
 - D. Contractor shall assume full responsibility for earthwork, or an existing structure used as a form and such form work must meet all requirements of this section.

03 11 00-1

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. On delivery to the job site, place materials in area protected from weather.
- B. Store materials above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Handle materials to prevent damage.

PART 2 PRODUCTS

- 2.1 MATERIALS:
 - A. Conform to ACI 347- Current Edition, Chapter 3, Materials and Form Work.

2.2 LUMBER:

- A. Softwood framing lumber: Kiln dried, PS 20-70.
- B. Boards less than 1 1/2" thick, used for basic forms and form liners: Kiln dried.
- C. Grade marked by grading rules agency approved by American Lumber Standards Committee.
- D. Light framing or studs for plywood forms, 2 in. to 4 inches in width and thickness, construction grade.
- 2.3 PLYWOOD:
 - A. Exterior type softwood plywood, PS 1-66.
 - B. Each panel stamped or branded indicating veneer grades, species, type and identification.
 - C. Wood faced plywood for architectural concrete surfaces. Panel veneer grades: A-C. Milloiled sides and mill-sealed edges of panels.

2.4 CORNER FORMERS:

- A. Profile type: chamfered face.
- B. Material: Wood
- 2.5 TIES:
 - A. Material: Carbon Steel

03 11 00-2

- B. Type: Snap ties
- C. Depth of break back: 1 inch
- D. Maximum diameter: 1/4 inch

2.6 FORM COATINGS:

- A. Plywood and wood forms shall be sealed against absorption of moisture from the concrete with an approved non-staining form oil or sealer.
- B. Form sealer, lacquer or any form of release agents containing wax, oil, or other materials that would interfere with adhesion shall not be used on form work for concrete which is to receive exposed aggregate coatings.
- C. Provide dissipating polymerized solution for form release agent containing no oils, waxes, paraffin, or silicones for cast-in-place concrete scheduled to receive interior or exterior finishes.

PART 3 EXECUTION:

3.1 GENERAL

- A. The design, engineering, bracing and construction of form work shall be the responsibility of the Contractor.
- B. Form work shall conform to shapes, lines and dimensions of members as shown on contract plans and shall be sufficient to prevent mortar leakage and to maintain position and shape during and after placing of concrete. Form work for exposed surfaces shall be constructed of undamaged materials that will result in an unblemished, flush surface when removed.
- C. Shoring and bracing of form work shall be adequate to resist all construction loads, wet concrete, stored and lateral loads due to earthwork. Shoring and bracing of elevated slabs shall remain in place until the concrete has reached a minimum compressive strength of 3,500 psi.
- D. Preparation of forms. Edges of exposed concrete work, exterior and interior shall be pointed up to present a good square appearance.
- E. Provide temporary openings in framework for concrete placement.
- F. Removal of forms is subject to weather conditions after concrete is poured. Remove formwork in manner to ensure complete safety of structure. Do not place building materials on slabs until they are strong enough to carry the imposed load. The contractor shall decide when to remove and accept full responsibility for their removal.

03 11 00-3
G. Do not run reinforcement, corner protection angles, or related fixed metal items, embedded in or bonded into concrete through expansion joints. Provide filler strips for expansion joints between slabs on grade and all joints between slabs on grade and vertical surfaces. Construct joints ¹/₂ inch wide and full depth of slab unless noted otherwise.

END OF SECTION

03 11 00-4

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SECTION 03 21 00

CONCRETE REINFORCEMENT

PART 1 GENERAL

- 1.1 Section Includes:
 - A. All steel reinforcement, mesh, dowels, and related items to comply with drawings and specifications including materials, labor, and equipment to complete the building and work shown.
 - B. Observation and Required Special Inspections
- 1.2 RELATED WORK SPECIFIED ELSEWHERE:
 - A. Section 01 40 00 Quality Control: Required Special Inspections
 - B. Section 03 11 00 Concrete Form Work: Section
 - C. Section 03 30 00 Cast-In-Place Concrete
 - D. Section 04 22 00 Concrete Unit Masonry
- 1.3 QUALITY ASSURANCE:
 - A. Acceptable Manufacturers: Regularly engaged in manufacture of steel bar and welded wire fabric reinforcing.
 - B. Installer Qualifications:
 - 1. Three years experience in installation of steel bar and welded wire fabric reinforcing.
 - C. Requirements of Regulatory Agencies: Conform to requirements of local Building Code.
 - D. Perform work of this section in accordance with CRSI, ACI 301, ACI SP-66, ACI 318, and ASTM A 184.
 - E. Allowable Tolerances:
 - 1. Fabrication:
 - a. Sheared length: + or 1 inch
 - b. Stirrups, ties and spirals: + or -1/2 inch
 - c. All other bends: + or 1 inch
 - 2. Placement:
 - a. Concrete cover to form surfaces: + or 1/4 inch
 - b. Minimum spacing between bars: + or 1/4 inch
 - c. Top bars in slabs and beams:

- (1) Members 8 inches deep or less: + or 1/4 inch
- (2) Members more than 8 inches, but not over 2 feet deep:+ or 1/2 inch
- (3) Members more than 2 ft. deep: + or 1 inch
- d. Crosswise of members: Spaced evenly within 2 inches of stated separation.
- e. Lengthwise of members: + or 2 inches.
- 3. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1 bar diameter.

1.4 SHOP DRAWINGS:

- A. Comply with Section 01 33 00, and requirements of ACI SP-66.
- B. Show sizes and dimensions for fabrications and placing of reinforcing steel and bar supports.
- C. Indicate bar schedule, stirrup spacing, and diagrams of bend bars.
- D. All detailing, fabrication and erection of reinforcing bars shall comply with the A.C.I. Manual of Standard Practice for Detailing Reinforced Concrete Structures. (A.C.I. 315).ACI 315R-18 is titled "Guide to Presenting Reinforcing Steel Design Details."
- E. Manufacturer's Literature: Manufacturer's specifications and installation instructions for splice devices.
- 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:
 - A. Deliver reinforcement to project site in bundles marked with durable tags indicating bar size and length.
 - B. Handle and store materials to prevent contamination.

1.6 COORDINATION

A. Coordinate with placement of formwork, formed openings, and other Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. REINFORCING STEEL. Reinforcing steel for concrete shall be deformed, clean, free from rust and new. It shall conform to ASTM Standard A 615 and shall be Grade 60 for bars No. 4 and larger and Grade 40 for No. 3 bars and smaller.
- B. WIRE FABRIC. Wire fabric shall be electrically-welded wire fabric of cold-drawn wire (70,000 psi yield point) of the diameter and spacing required and shall conform to ASTM Standard A 185. Welded wire fabric or mesh shall be of gauge and mesh shown on plans and shall conform to "Standard Specifications for Welded Steel Wire Fabric for Concrete

REINFORCEMENT: (ASTM A1064-Current Edition). Furnish mesh in flat sheets. ASTM A1064/A1064M – 17 is titled "Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete."

- D. TIE WIRE: FS-QQ-W-461, annealed steel, black, 16 gauge minimum
- E. BAR & WIRE MESH SUPPORTS: Conform to "Bar Support Specifications", CRSI Manual of Standard Practice. Metal bolsters required. No bricks or CMU allowed. Bars supports used over or against concrete surfaces which are exposed shall be plastic protected. The plastic shall have a thickness of 3/32" or greater at points of contact with the form work. The plastic shall extend upward on the wire to a point at least 1/2" above the form work. Provide following support types (CRSI Designation):
 - 1. Woven Wire Mesh: Type "SBU", linear, longest length possible.
 - 2. Steel reinforcement bars: Type "SBU", length as required to fit in trench and properly support bars.
 - 3. Note: "SBU" type supports to have two (2) bottom runners and one (1) top runner, all continuous.
- F. DIAMOND PLATE DOWEL SYSTEM: Provide Diamond Dowel System manufactured by PNA construction technologies, "Speed Plate" System by SIKA Corp. or approved alternate. Plates are manufactured from steel certified to meet ASTMA36 (1/4" and 3/8") or ASTM A108 (3/4")
 - 1. Install at all construction joints at building slabs-on-grade.
 - 2. Provide diamond plate thickness as follows, depending on slab thickness:
 - a. 1/4" (6mm) typically used in 4"- 6" slab depths
 - b. 3/8" (10 mm) typically used in 7"- 8" slab depths
 - c. 3/4" (20 mm) typically used in 9" plus slab depths

PART 3 EXECUTION

3.1 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) Manual of Standard Practice, ACI SP-66 ACI Detailing Manual, and ACI 318.
- B. Locate reinforcing splices not indicated on drawings at point of minimum stress.

3.2 INSTALLATION:

- A. Placements:
 - 1. Bar Supports: CRSI Placing Reinforcing Bars (10th Edition)
 - Reinforcing Bars: CRSI Supports for Reinforcement Used in Concrete (2016). Support footing reinforcement bars with SBU type supports. Space at no more than 4'-0" on center. Support reinforcement bars at each footing corner and intersection. <u>Rebar chairs will not be acceptable.</u> For large double layer reinforcement pad

footing mats, provide doubling of the SBU supports. Concrete bricks may be used as an option at large double-matted footings, **but only upon Architect's approval**.

- 3. Details shall be in accordance with "Building Code Requirements for Structural Concrete" (ACI 318-Current Edition)
- 4. <u>Place sufficient length supports for wire mesh concrete slab reinforcement no</u> <u>more than 3'-0" on center, or stagger at 2'-0" on center. Do not cut supports</u> <u>into small lengths.</u> Do not extend support through control joints.
- 5. Install #4 reinforcement hoops around slab penetrations 3" or larger in diameter. This would include, but not be limited to plumbing pipes, electrical conduit, floor drains, electrical floor boxes, etc.
- 6. Where groups of electrical conduits exceed 3" in diameter, install #4 reinforcement hoops around groups, or provide straight #4 bars around linear groups.
- B. Steel Adjustment:
 - 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
 - 2. Do not move bars beyond allowable tolerances without concurrence of Architect/Engineer.
 - 3. Do not heat, bend, or cut bars without concurrence of Architect/Engineer.
- C. Concrete covering over reinforcement shall be not less than the following:
 - 1. Where concrete is deposited directly against earth: 3"
 - 2. Where formed concrete surface will be exposed to weather or ground: 2"
 - 3. Where formed concrete surface will not be exposed to weather or ground: for walls and slabs: 3/4"
 - 5. All covering: Nominal bar diameter
- D. Splices:
 - 1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
 - 2. Splice devices: Install in accordance with manufacturer's written instructions.
 - 3. Welding: Do not weld reinforcement.
 - 4. Do not splice bars except at locations shown on drawings without concurrence of Architect/Engineer.
- E. Wire Fabric:
 - 1. Install in longest practicable length.
 - 2. Lap adjoining pieces one full mesh minimum, and lace splices with 16-gauge wire.
 - 3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
 - 4. Offset end laps in adjacent widths to prevent continuous laps.
 - 5. Do not continue wire fabric through control joints

3.3 CLEANING:

A. Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

3.4. PROTECTION DURING CONCRETING:

A. Keep reinforcing steel in proper position during concrete placement.

3.5 OBSERVATION AND SPECIAL INSPECTIONS

A. Reinforcement and placement shall be observed by the Architect/Engineer prior to placing concrete. Inspection of reinforcement for conformance to the construction documents shall be completed by the designated third-party Special Inspector.

3.6 INSTALLATION OF MISCELLANEOUS ITEMS:

A. Contractor shall coordinate and check that all work required to be embedded in concrete is in place prior to pouring. Placement of such work is to be done without disturbing reinforcement in place.

END OF SECTION

F. Section 04 22 00 - Concrete Unit Masonry

1.3 QUALITY ASSURANCE:

- A. Acceptable Manufacturers: Regularly engaged in manufacture of steel bar and welded wire fabric reinforcing.
- B. Installer Qualifications:
 - 1. Three years experience in installation of steel bar and welded wire fabric reinforcing.
- C. Requirements of Regulatory Agencies: Conform to requirements of local Building Code.

D. Allowable Tolerances:

- 1. Fabrication:
 - a. Sheared length: + or 1 inch
 - b. Stirrups, ties and spirals: + or -1/2 inch
 - c. All other bends: + or 1 inch
- 2. Placement:
 - a. Concrete cover to form surfaces: + or 1/4 inch
 - b. Minimum spacing between bars: + or 1/4 inch
 - c. Top bars in slabs and beams:
 - (1) Members 8 inches deep or less: + or 1/4 inch
 - (2) Members more than 8 inches, but not over 2 feet deep:+ or 1/2 inch
 - (3) Members more than 2 ft. deep: + or 1 inch
 - d. Crosswise of members: Spaced evenly within 2 inches of stated separation.

- e. Lengthwise of members: + or 2 inches.
- 3. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1 bar diameter.
- 1.4 SHOP DRAWINGS:
 - C. Comply with Section 01 33 00 <OR> 01 11 00
 - B. Show sizes and dimensions for fabrications and placing of reinforcing steel and bar supports.
 - C. Indicate bar schedule, stirrup spacing, and diagrams of bend bars.
 - D. All detailing, fabrication and erection of reinforcing bars shall comply with the A.C.I. Manual of Standard Practice for Detailing Reinforced Concrete Structures. (A.C.I. 315).ACI 315R-18 is titled "Guide to Presenting Reinforcing Steel Design Details."
 - E. Manufacturer's Literature: Manufacturer's specifications and installation instructions for splice devices.
- 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:
 - A. Deliver reinforcement to project site in bundles marked with durable tags indicating bar size and length.
 - B. Handle and store materials to prevent contamination.

PART 2 PRODUCTS

2.1 MATERIALS

- A. REINFORCING STEEL. Reinforcing steel for concrete shall be deformed, clean, free from rust and new. It shall conform to ASTM Standard A 615 and shall be Grade 60 for bars No. 4 and larger and Grade 40 for No. 3 bars and smaller.
- D. SMOOTH STEEL DOWEL BARS. Plain steel dowel bars for reinforcing concrete slab joints shall meet the requirements of ASTM A 615, Grade 60. These plain round dowel bars shall be free from burrs or other deformations restricting slippage in the concrete.
 - 1. Smooth Dowel bars shall be held in position parallel to the surface and centerline of the slab by a metal assembly of sufficient strength and anchorage to prevent displacement during the paving operations. Immediately prior to placement of concrete, each bar shall be field coated for a minimum distance of 2 inches greater than half the length of the bar with an approved lubricant. Lubricated ends of adjacent bars shall be on alternating sides of the slab joint.

- E. WIRE FABRIC. Wire fabric shall be electrically-welded wire fabric of cold-drawn wire (70,000 psi yield point) of the diameter and spacing required and shall conform to ASTM Standard A 185. Welded wire fabric or mesh shall be of gauge and mesh shown on plans and shall conform to "Standard Specifications for Welded Steel Wire Fabric for Concrete REINFORCEMENT: (ASTM A1064-Current Edition). Furnish mesh in flat sheets. ASTM A1064/A1064M – 17 is titled "Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete."
- D. TIE WIRE: FS-QQ-W-461, annealed steel, black, 16 gauge minimum
- E. BAR & WIRE MESH SUPPORTS: Conform to "Bar Support Specifications", CRSI Manual of Standard Practice. Metal bolsters required. No bricks or CMU allowed. Bars supports used over or against concrete surfaces which are exposed shall be plastic protected. The plastic shall have a thickness of 3/32" or greater at points of contact with the form work. The plastic shall extend upward on the wire to a point at least 1/2" above the form work. Provide following support types (CRSI Designation):
 - 1. Woven Wire Mesh: Type "SBU", linear, longest length possible.
 - 4. Steel reinforcement bars: Type "SBU", length as required to fit in trench and properly support bars.
 - 5. Note: "SBU" type supports to have two (2) bottom runners and one (1) top runner, all continuous.
- F. DIAMOND PLATE DOWEL SYSTEM: Provide Diamond Dowel System manufactured by PNA construction technologies, "Speed Plate" System by SIKA Corp. or approved alternate. Plates are manufactured from steel certified to meet ASTMA36 (1/4" and 3/8") or ASTM A108 (3/4")
 - 2. Install at all construction joints at building slabs-on-grade.
 - 2. Provide diamond plate thickness as follows, depending on slab thickness:
 - d. 1/4" (6mm) typically used in 4"- 6" slab depths
 - e. 3/8" (10 mm) typically used in 7"- 8" slab depths
 - f. 3/4" (20 mm) typically used in 9" plus slab depths

G. FIBER REINFORCEMENT Refer to Section 03 30 00.

PART 3 EXECUTION

3.1 FABRICATION

A. In accord with CRSI Manual of Standard Practice.

3.2 INSTALLATION:

A. Placements:

- 1. Bar Supports: CRSI Placing Reinforcing Bars (10th Edition)
- 2. Reinforcing Bars: CRSI Supports for Reinforcement Used in Concrete (2016). Support footing reinforcement bars with SBU type supports. Space at no more than 4'-0" on center. Support reinforcement bars at each footing corner and intersection.

<u>Rebar chairs will not be acceptable.</u> For large double layer reinforcement pad footing mats, provide doubling of the SBU supports. Concrete bricks may be used as an option at large double-matted footings, **but only upon Architect's approval**.

- 3. Details shall be in accordance with "Building Code Requirements for Structural Concrete" (ACI 318-Current Edition)
- 4. <u>Place sufficient length supports for wire mesh concrete slab reinforcement no</u> <u>more than 3'-0" on center, or stagger at 2'-0" on center. Do not cut supports</u> <u>into small lengths.</u> Do not extend support through control joints.
- 5. Install #4 reinforcement hoops around slab penetrations 3" or larger in diameter. This would include, but not be limited to plumbing pipes, electrical conduit, floor drains, electrical floor boxes, etc.
- 6. Where groups of electrical conduits exceed 3" in diameter, install #4 reinforcement hoops around groups, or provide straight #4 bars around linear groups.
- B. Steel Adjustment:
 - 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
 - 2. Do not move bars beyond allowable tolerances without concurrence of Architect/Engineer.
 - 3. Do not heat, bend, or cut bars without concurrence of Architect/Engineer.
- C. Concrete covering over reinforcement shall be not less than the following:
 - 1. Where concrete is deposited directly against earth: 3"
 - 2. Where formed concrete surface will be exposed to weather or ground: 2"
 - 3. Where formed concrete surface will not be exposed to weather or ground: for walls and slabs: 3/4"
 - 4. For beams, girders, and columns: 1-1/2"
 - 5. All covering: Nominal bar diameter
- D. Splices:
 - 1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
 - 2. Splice devices: Install in accordance with manufacturer's written instructions.
 - 3. Welding: Do not weld reinforcement.
 - 4. Do not splice bars except at locations shown on drawings without concurrence of Architect/Engineer.
- E. Wire Fabric:
 - 1. Install in longest practicable length.
 - 2. Lap adjoining pieces one full mesh minimum, and lace splices with 16-gauge wire.
 - 3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
 - 4. Offset end laps in adjacent widths to prevent continuous laps.
 - 5. Do not continue wire fabric through control joints
- F. Diamond Plate Dowel System:
 - 1. Install Diamond Plate Dowell System, following manufacturer's instructions.
 - 2. Provide diamond plate dowel spacing as follows, depending on slab thickness:

- a. 4" -6" slab thickness: $\frac{1}{4}$ " thick at 18" O.C.
- b. 7" -8" slab thickness: 3/8" thick at 18" O.C.
- c. 9" -11" slab thickness: $\frac{3}{4}$ " thick at 20" O.C.

3.3 CLEANING:

- A. Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.
- 3.4. PROTECTION DURING CONCRETING:
 - A. Keep reinforcing steel in proper position during concrete placement.
- 3.5 OBSERVATION AND SPECIAL INSPECTIONS
 - A. Reinforcement and placement shall be observed by the Architect/Engineer prior to placing concrete. Inspection of reinforcement for conformance to the construction documents shall be completed by the designated third-party Special Inspector.

3.6 INSTALLATION OF MISCELLANEOUS ITEMS:

A. Contractor shall coordinate and check that all work required to be embedded in concrete is in place prior to pouring. Placement of such work is to be done without disturbing reinforcement in place.

END OF SECTION

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE:

- A. This Contractor shall furnish all material and labor necessary to complete execution of all concrete portions of this project, including the following items and other items of concrete or cement work which may be essential to complete that portion of the work as shown on the contract drawings and as hereinafter specified.
 - 1. Footings, foundations and structural members as shown, including piers if required.
 - 2. Concrete finish floor slabs.
 - 3. All concrete steps, landings, walks, curbs, etc.
 - 4. Non-Shrink and Epoxy Grout
 - 5. Concrete Accessories
 - 6. Concrete Floor Densifier/Hardener
 - 8. Concrete Minimum Finish Tolerances & Standards
 - 9. Concrete Slab Moisture Mitigation
 - 10. Observation and Required Special Inspections
 - 11. Concrete Mix Design Submittal Form

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 01 40 00 Quality Control: Required Special Inspections
- B. Section 03 11 00 Concrete Form Work
- C. Section 03 21 00 Concrete Reinforcement
- D. Section 03 35 20 Polished Concrete Finish System
- E. Section 04 22 00 Concrete Unit Masonry
- F. Section 09 91 00 Painting
- G. Section 31 23 00 Structural Excavation, Backfill and Compaction
- H. Section 32 16 00 Walks and Curbs

1.3 QUALITY ASSURANCE:

A. Standards: Provisions of American Concrete Institute "Building Code Requirements for Structural Concrete" (ACI 318-Current Edition). American Concrete Institute "Specifications for Structural Concrete" (ACI 301-Current Edition), Concrete Reinforcing Steel Institute "Manual of Standard Practice" (Current Edition), American

Concrete Institute "Guide to Presenting Reinforcing Steel Design Details" (ACI 315-Current Edition) and "Guide to Formwork for Concrete" (ACI 347-Current Edition) are adopted except that where additional or more stringent requirements are required by these specifications.

- B. Tests: As listed in Standard Practice for Sampling Freshly Mixed Concrete ASTM C 172-Current Edition.
- C. Control Joints and Expansion Joints: Follow Provisions of American Concrete Institute concerning maximum area for placement of expansion and control joints unless shown or noted otherwise on drawings and specifications. If contractor requests adjustments to control joint placement or additional control joints and/or expansion joints, consult Architect prior to concrete placement.
- D. Slabs must be replaced that have a crack(s) with a width of 0.05" or greater. In high visibility areas all cracks in slabs will be subject to replacement of slab sections at the discretion of the Architect.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. This conference shall be held at least 7-14 days prior to the beginning of the installation of foundations. The Contractor shall hold a meeting to review the detailed requirements for the floor, including the concrete mix designs, placing techniques, finishing techniques, floor hardener application procedures and the equipment required for these procedures.
 - 2. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - f. Independent testing agency responsible for field quality control.
 - g. Admixture manufacturer.
 - h. Concrete pumping contractor.
 - i. Owner's Project Manager
 - 3. Notify all required attendees in writing of scheduled time and place at least two (2) weeks in advance of meeting. Include copy of agenda with invitation.
 - 4. Review special inspection and testing and inspecting agency procedures for field quality control, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, steel reinforcement installation, and concrete protection.
 - 5. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting. One copy of the minutes shall also be transmitted to the following for information purposes:

- a. Owner's representative
- b. Architect
- c. Structural Engineer
- 6. The minutes shall include a statement by the concrete contractor indicating that the proposed mix design and placing techniques can produce the concrete quality required by these specifications.
- 7. Changes to Contract Drawings from recommendations or discussions at the Preinstallation Conference shall be approved in writing by the Contractor prior to implementation.
- 8. The Structural Engineer will be present at the conference. The Contractor shall notify the Structural Engineer at least 10 days prior to the scheduled date of the conference.

1.5 SUBMITTALS:

- A. Test Reports: Reports of concrete compression, yield, and slump tests.
- B. Certificates:
 - 1. Manufacturer's certification that materials meet specification requirements.
 - 2. Material content per cubic yard of each class of concrete furnished:
 - a. Dry weights of cement.
 - b. Saturated surface-dried weights of fine and coarse aggregate.
 - c. Quantities, type and name of admixtures.
 - d. Weight of water.
 - 3. Ready-mix delivery tickets, ASTM C 94-Current Edition.
- C. Fully completed concrete mix design submittal form found at the end of this section for each type of concrete to be placed.

1.6 PRODUCT AND ENGINEERING DATA:

- A. Submit data for design mixes, proposed admixtures, etc. per Section 01 33 00.
- B. The Contractor shall be responsible for checking quantities and dimensions in accordance with contract drawings and field conditions. Where discrepancies in dimensions are noted, the Contractor shall notify the Architect of such discrepancies and corrected dimensions noted on submittal drawings.
- C. Contract drawings receive precedence over shop drawings unless authorized in writing.
- D. Shop drawings furnished for reinforcing steel shall contain fabrication details as well as placement drawings which are to be used in conjunction with contract drawings.
- E. Detailing and fabrication of reinforcing shall conform to " Guide to Presenting Reinforcing Steel Design Details", (ACI 315-Current Edition).

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Cement: Store in weather tight enclosures and protect against dampness, contamination, and warehouse set. Any cement damaged by moisture, or which fails to meet any of the specified requirements shall be rejected and removed from the work.
- B. Aggregates:
 - 1. Stockpile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
 - 2. Use only one supply source for each aggregate stockpile.
- C. Mixing: Ready-mixed concrete shall be mixed and delivered in accordance with Standard Specifications for Ready-Mixed Concrete" (ASTM C94-Current Edition).

1.8 ENVIRONMENTAL REQUIREMENTS:

- A. Allowable Concrete Temperatures
 - 1. Cold Weather: Minimum 40 degrees. With temperatures lower than 40 degrees, approval by the Architect shall be required.
 - 2. Hot Weather: Maximum 90 degrees F.
- B. Do not place concrete during rain, sleet, or snow unless protection is provided which is approved by Architect.
- 1.9 CONCRETE SLAB MOISTURE MITIGATION:
 - A. It will be the responsibility of the Contractor to obtain moisture levels at or below the required percentages as required for installation of all floor covering products by the time the products are ready to be installed. If moisture levels are not reached at the scheduled time to install floor coverings, the Contractor will pursue other means to meet floor covering moisture requirements at no additional cost to owner. This will not be a reason to delay project completion.

1.10 CERTIFICATION

- A. Ready Mix concrete batch plant to be NRMCA (National Ready Mixed Concrete Association) certified. Submit proof of certification with submittals.
- B. Concrete Flatwork Finishers to be ACI certified. Submit proof of certification to the Architect for approval.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Concrete:
 - 1. Portland Cement: Type 1 Portland, meeting "Standard Specifications for Portland Cement", (ASTM C150-Current Edition) shall be used.
 - 2. Aggregates: All aggregates shall be limestone, clean, hard strong and durable particles free of chemicals or foreign material that may affect the bonding of cement paste and shall conform to "Specifications for Concrete Aggregates" (ASTM C33-Current Edition). Coarse aggregate gradation shall be within the limits of 1 inch to No. 4 standard sieve analysis. Alternate aggregate materials must be reviewed and approved by the architect.
 - 3. Mixing Water: Water shall be fresh, clean, and potable.
 - 4. Slump: Refer to Structural Drawings for design slump.
 - 5. Mix proportioning: To produce 28-day minimum compressive strength of moist cured laboratory samples. Provide the following minimum compressive strengths at listed locations unless noted otherwise in other specification sections or on drawings:
 - a. 3000 psi for all footing and foundation stem walls.
 - b. 3000 psi for all exterior sidewalk/stoop/patio locations.
 - c. 4000 psi for all interior slabs-on-grade.
 - d. 3000 psi for all other concrete items
- B. Curing Material: Products and material as required to apply and maintain slab in moist condition during curing period per this specification. Constant water sprinkling or water curing covers kept wet are acceptable.
 - 1. Under no circumstances are chemical curing compounds to be used in slabs on grade unless prior approval is obtained from the Architect.
 - 2. Do not use polyethylene vapor barrier or similar membrane for curing membranes when water curing in areas where exposed concrete finish is scheduled.
 - 3. At Polished Concrete Slab-on-Grade a full wet cure is required. No covers allowed. Refer to Specification 03 35 20 Polished Concrete Finish System.
- C. Below-slab vapor barrier shall be as specified in Section 07 10 00, but no less than 10 mils thick.
- D. Reinforcement: See Section 03 21 00.

2.2 CONCRETE FLOOR DENSIFIER/HARDENER AND SEALER

- A. Penetrating Hardener/Densifier: (Clear liquid reactive lithium-silicate based.)
 - 1. Retroplate 99 by Advanced Floor Products.
 - 2. Consolideck LS, by Prosoco.
 - 3. 3D HS, by Ameripolish
 - 4. Approved alternate by other manufacturer specified herein.
- B. Clear Sealer: Refer to specification 09 91 00 Paint & Finishing

2.3 MIXES:

- A. Proportions: Ready-mix concrete shall meet "Specifications for Ready-Mixed Concrete" (ASTM C94-94). Proportions of concrete shall produce the required strength and be workable to the extent that it can be worked into the corners and angles of forms and around reinforcement. Collection of excess free water on the surface will not be permitted nor a segregation of the materials in the mixture.
- B. Free surface moisture on aggregates shall be included as part of the mixing water.
- C. Water-cement ratios for project concrete mix shall be such that the relationship between the required strength and water-cement ratio of ingredients used has been previously established by reliable tests and data. Copies of previous test data, along with design mix data shall be submitted to the Architect by the Contractor for approval. Where such data is not available or is insufficient, water-cement ratios shall meet the requirements of Table 4.2.2 of ACI 318-Current Edition. Cementitious content shall be the total weight of all Portland cement and fly ash in a given mix.
- D. Admixtures shall comply with the ASTM Specifications for Chemical Admixtures. (ASTM C494-Current Edition).
 - 1. Mid-Range Water Reducing Admixture: Mira 110, manufactured by Grace Concrete Products, 877-423-6491, Master Builders Polyheed 1720, manufactured by BASF or approved alternate product. Non-chloride, non-corrosive. Admixture to meet ASTM C494 Type A & F requirements. Comply with manufacturer's instructions for dosage. Admixture to be incorporated with mix at batch plant.
 - a. other admixtures may be used as a concrete mix component only with approval of the Architect.
 - b. Use all admixtures in accordance with recommendations of the manufacturer.
 - 2. In no case shall the use of the admixtures produce a compressive strength less than that specified in this section.
 - 3. Fly ash (Type C per ASTM C618) may be used as an admixture in concrete which is not exposed to view and does not require surface finish. Use of only one type of fly ash throughout the project shall be permitted. Such areas are limited to footings, below grade foundation walls, filled masonry voids, etc. The use of fly ash as an admixture **shall not be permitted** in concrete where surface finish is required. Such areas as floor slabs, exposed concrete walls, exposed concrete structure, etc., shall not be poured with concrete containing fly ash. Other admixtures may be used only with the approval of the Architect. Each delivery record shall indicate mix design. Concrete will be subject to rejection if mix design is not called out on invoice at time of delivery.
 - 4. All concrete installed at the exterior on a permanent basis shall be air entrained. Interior slabs shall not contain air entrainment. If admixture is desired, obtain approval through Architect.

- 5. Air-entraining admixture if used, shall meet "Specifications for Air-Entraining Admixtures" (ASTM C260-Current Edition) and shall produce air content by volume between 5 to 7%.
- F. Use same Portland cement manufacturer throughout project for all interior concrete. Portland cement manufacturer may be different for exterior concrete but must be the same Portland cement manufacturer for all exterior concrete.

2.4 NON-SHRINK AND EPOXY GROUT

- A. Non-Shrink Grout, Non-Metallic Grout: Factory premixed grout conforming to CRD-C-621-80, "Corps of Engineers Specification for Non-Shrink Grout".
 - 1. Acceptable Manufacturers:
 - a. EUCO NS, the Euclid Chemical Company
 - b. Sonogrout, Sonneborn-Contech
 - c. Masterflow 713, Master Builders
 - d. Duragrout, L & M Construction Chemical Co.
- B. Epoxy Grout: Structural epoxy adhesive conforming to ASTM C881.
 - 1. Acceptable Manufacturers:
 - a. Sikadur 32 Hi-Mod by Sika Corporation
 - b. Sonneborn Epogel by Chemrex, Inc.
 - c. Epcon C6 by ITW Ramset/Redhead
 - d. Hilti HY-200

2.5 ACCESSORIES

A. Furnish concrete splash block at each downspout approximately 12" wide x 24" long. Slope from back to front for proper drainage.

PART 3 EXECUTION

3.1 OBSERVATIONS AND SPECIAL INSPECTIONS

- A. All reinforced concrete construction shall be performed under the personal supervision of the Building Superintendent. This superintendent shall keep a record of all concrete poured on the job. The record shall show in detail the area placed, the time and date of the placement and weather conditions which existed at the time of the placement. Upon completion of the work, this record of Concrete Placement shall be included in the close out documents.
- B. The Contractor shall plan his work so that adequate time is allowed for the Architect to properly observe all embedded work prior to actual placement of concrete. The Contractor shall notify the Architect of his intent to placement at least 24 hours prior to the time that he estimates the work will be ready for observation. The Contractor shall not place any reinforced concrete without the approval of the Architect.

- C. Contractor shall plan work and coordinate with independent testing lab to be present onsite throughout concrete placement.
- D. Inspection of concrete and concrete preparation for conformance to the construction documents and IBC shall be completed by the designated third-party Special Inspector.

3.2 INSTALLATION:

- A. Placing Concrete:
 - 1. Convey concrete from mixer to final position by method which will prevent separation or loss of material.
 - 2. Maximum time permitted before a placement of concrete after adding mixture water shall be as follows:
 - a. Air temperature above 78 degrees F. 60 minutes.
 - b. Air temperature below 78 degrees F. 90 minutes.
 - 3. Concrete shall not be placed until an observation by the Architect has been made and reinforcement placement, vapor barrier, etc., is approved.
 - 4. Excavations for footing shall be free of debris, loose dirt, mud and water just prior to placing of concrete.
 - 5. All forms shall be clean of debris and all embedded items shall be in place and secured prior to concrete placement.
 - 6. Wood forms shall be sprinkled with water and wet when concrete is placed, but pooling of water in forms is to be prevented.
 - 7. Maximum height of concrete free fall, 3 feet.
 - 8. Regulate rate of placement so concrete remains plastic and flows into position.
 - 9. Deposit concrete in continuous operation until panel or section is completed.

10. Concrete Placement Tolerances & Standards:

- a. Submit proposed slab pouring plan for review and approval by Architect prior to forming. For purposes of planning layout, approximately 5,000 to 7,000 sq.ft.is the maximum area allowed. Pending crew size and equipment larger square foot pour areas may be allowed by Architect. Provide diamond plate dowels at construction joints between placements. Refer to Section 03 21 00.
- b. **Control joints:** Saw cuts are to be performed within 12 hours after finishing. Use 1/8" thick blade, cutting no less than 1/3 of the slab thickness, unless noted otherwise.
- c. Place control joints for concrete slabs (slab–on-grade and elevated concrete slabs) no more than 8'-0" o.c. each way.

- i. For other concrete slab thicknesses, refer to structural drawings for control joint spacing.
- d. Note: Other placement methods may be considered only with approval of Architect.
- 11. Concrete Slab Levelness and Flatness:
 - a. Levelness: FL=35 for polished slabs. FL=20 for non-polished slabs.
 - b. Flatness: FF = 50 for polished slabs. FF = 25 for non-polished slabs
 - c. In areas with floor drains, maintain finished floor level elevation at walls and slope surfaces uniformly to drains.
- 12. Place concrete in horizontal layers, 18 inches maximum thickness.
- 13. For concrete on grade or fill, sub-grades shall be properly prepared and maintained as specified previously. Where concrete is placed in direct contact with the earth, the subgrade material shall be wet but not muddy at time of placement.
- 14. Under all slabs, provide crushed stone choked off with fines per specification Section 31 23 00, meeting ASTM C33-Current Edition, which shall be leveled and compacted. A vapor barrier, as specified in Section 07 10 00 and shown on the drawings shall be placed under all interior slabs-on-grade.
- 15. Removal of forms. Do not remove forms until concrete has hardened sufficiently to support its own weight and imposed construction loads. Remove forms in such manner as to ensure the complete safety of the structure and to prevent spalling or chipping of concrete. When removing forms, conform to the following:
 - a. Non-Weight Supporting Forms: Form work for columns, walls, sides of beams and other parts not supporting the weight of the concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations, but in no case sooner than 24 hours.
 - b. Weight Supporting Forms: Do not remove form work for beam soffits, supported slabs or other parts which support the weight of concrete until concrete has reached 75% of its specified 28-day strength based on the lab cured concrete cylinder tests, but no sooner than 7 days.
- 16. Wall tie treatment. Wall ties shall be broken off after forms are removed and sealed against water penetration.
- 17. Slope all concrete floors to trench, or floor drains from corners of room, or as shown on drawings. Provide total slope of 1/2", unless noted otherwise on drawings.
- 18. Follow procedures as listed below for placement and routing of pipes, sleeves, and electrical conduit:

(If any of these items are not met, pouring of concrete will not be allowed until corrected.)

a. **Do not** route groups of conduit, pipes or sleeves above footings, unless noted to do so. If conflict occurs, consult Architect/Engineer.

- b. **Do not** route conduit, pipes, and sleeves below bearing walls when running parallel with wall.
- c. Limit width of conduit, pipes and sleeves not to exceed 3'-0" in width as it passes under wall footing. As much as possible, align the items perpendicular to the footing as it passes below footing.
- d. Provide a minimum spacing of 2'-0" between conduit or pipe groups as items pass under footings.
- e. **Do not** route conduits, pipe or sleeves under or through column footings or pad footings unless prior approval is given by Architect/Engineer.
- f. At elevated slab work, conduits will not limit slab depth to any less than one half of an inch of the total thickness. Conduits will not be within one inch of any reinforcing materials.
- g. The top of all conduits, sanitary drain pipe, water supply pipe, etc. shall be installed at or below bottom of concrete slab where slab is on grade.
- h. Where in-slab electrical floor boxes occur, the conduit shall slope down to below-slab elevation as soon as possible on exterior sides of floor box.
- B. Consolidating Concrete at Steel Reinforcement:
 - 1. Use mechanical vibrating equipment for consolidation.
 - 2. Vertically insert and remove hand-held vibrators having minimum 1" diameter at points 18 inches to 30 inches apart.
 - 3. Do not use vibrators to transport concrete in forms.
 - 4. Minimum vibrator speed, 3600 rpm.
 - 5. Vibrate concrete minimum amount required for consolidation, 3 to 5 seconds maximum.
- C. Construction Joints:
 - 1. Clean and roughen the surface of concrete and remove laitance.
 - 2. Wet concrete surface and flush with neat cement grout before placing additional concrete.
 - 3. Construction Joints for slabs on ground (floor joints) shall be plate dowel system. Plate dowel system sleeves shall be attached to 2 x wood members matching the depth of the slab for removal and reuse with steel stakes @ 2'-0" o.c. Form boards must have clean smooth top surface so finishing machines can pass over the top of the form.
 - 4. Construction Joints for elevated slabs shall be a straight edge pour stop. 2 x wood members matching the depth of the slab secured to the metal deck. Wire mesh is not to continue through the form board. Form boards must have clean smooth top surface so finishing machines can pass over the top of the form.
- D. Plate Dowel System: Provide Diamond Dowel System manufactured by PNA construction technologies, "Speed Plate" System by Sika. or approved alternate. Refer to Section 03 21 00.
 - 1. Install at all slab on grade construction joints.
- E. Expansion joints: Expansion joint filler, where indicated, shall meet "Specifications for pre-formed Expansion Joint Fillers for Concrete Paving and Structural Construction,

Non-extruding and Resilient, Non-bituminous. (ASTM D1752-Type 1). Provide "Zip Strip" type filler so that top ½" can be provided for sealant installation.

- F. Isolation Joint Material:
 - 1. Provide ¹/₂" thick closed cell foam material, separating steel or concrete columns from concrete slab at slabs-on-grade and at elevated slabs to prevent bonding and cracking of concrete from structure movement. Hold down from top of slab ¹/₂" and fill with sealant.
 - 2. At perimeter steel edge angles and other floor or wall penetrations where steel angles or framing exists, apply bituminous material on steel where concrete is to be placed to create bond breaker.
- G. Column Block-Outs:
 - 1. Unless noted otherwise on drawings, provide round blockouts created by a "Sonotube form" section or other means. **Diamond shaped blockouts will not be accepted.**
 - 2. Provide same Portland Cement manufacturer and mix design for concrete fill in column block-outs as surrounding concrete slab.
- H. Finishing:
 - 1. Floor Finish
 - a. Edge forms and intermediate screed strips shall be placed accurately to give the desired elevations and contours. Strike-off templates or straight edges shall be used to give all floor slabs an even surface. Screeds are to be of such type not to interfere with reinforcing.
 - b. Troweled finishes shall be applied to floors where concrete is the walking surface, or to have floor coverings. Troweling shall begin after all surface water has disappeared naturally and surface has wood floated to a plane smooth surface. Initial troweling shall be done after concrete has hardened sufficiently to prevent excess fines from working to surface, to produce a smooth surface free from defects and a final troweling shall be done after sufficient hardening to remove trowel marks and give a hard, dense smooth surface. Drying shall be natural. The use of "dryers" by dusting cement or sand is not permitted.
 - c. Floors to receive tile or other bonded cementitious finishes shall, after wood floating to a smooth plane surface, be roughened with stiff brushes before final set.
 - 2. Walks: See Section 32 16 00.
 - 3. Exposed Concrete Surfaces
 - a. Areas not receiving special coatings shall be wetted and rubbed with carborundum bricks or other abrasive to give a smooth finish with a uniform color and texture. All edges shall be eased to give a good appearance.
 - b. Areas receiving special coatings shall be free from imperfections such as voids and protrusions and shall be finished to a smooth and level surface.
- Curing: Provisions shall be made for maintaining all concrete surfaces in a continuously moist condition immediately following finishing operations for a period of seven days by one of the following methods when exposed or immediately following removal of forms:
 Sprinkling

- 2. Absorptive fabric kept continuously wet.
- 3. Maintain concrete within 40 degrees F. temperature range while curing for length of time shown below:
 - a. Three (3) days for footings.
 - b. Seven (7) days for flatwork.
- 4. Chemical curing will be considered only when water curing is not practical, such as threat of freezing weather conditions. Unless specified otherwise in this specification section, <u>absolutely no chemical curing</u> is to occur on slab areas that are to receive carpet, resilient and synthetic floor coverings, or any other specified floor covering that prohibits chemical curing in their requirements.
- 5. Polished Concrete at Slab-on-Grade is to be fully wet cured per specification section 03 35 20 Polished Concrete Finish System.
- J. Patching: After removal of forms, all honeycomb areas, voids, air pockets, tie holes and surface cracks shall be immediately patched.
- K. Application of Floor Densifier/Hardener:
 - 1. Apply to **polished and unpolished** interior concrete slabs and exterior porch or patio areas scheduled to be exposed to view.
 - 2. Apply per manufacturer's instruction to all exposed trowelled concrete floor areas and other areas as called out on finish schedule. Product to be applied as soon after curing period as manufacturer's instructions allow. Application must be smooth and even. No excess application or puddling of the product will be allowed.
 - a. Clean floors where densifier/hardener is applied with manufacturers cleaners.

3.3 GRIND ONLY AT SEALED CONCRETE FLOORS

- A. At sealed concrete floors
 - 1. Progressively polish slab surface with 200 grit resin-bonded, phenolic diamond heads. 1 pass.
 - 2. Seal with DNS-400 Sprayable Acrylic Sealer by Ameripolish.

3.4 ACCEPTANCE OF CONCRETE:

A. Concrete not meeting the strength requirements of these specifications shall be tested at critical locations designated by the Architect by a laboratory approved by the Architect. These tests shall be at the Contractor's expense. Such tests performed shall be in accordance with the Building Code Requirements for Structural Concrete: (ACI 318-Current Edition). If these tests still indicate below required strengths, or if inconclusive, then the Contractor shall proceed at his own expense as follows:

Remove and replace or reconstruct all under strength concrete in an approved manner or perform load tests in accordance with the "Building Code Requirements for StructuralConcrete" (ACI 318-Current Edition). If load test results are not acceptable then Contractor shall remove and replace or reconstruct all designated under strength concrete to meet requirements of these specifications.

- B. Concrete improperly placed, cured, reinforced, damaged or not meeting testing tolerances shall be considered potentially deficient and shall be tested and replaced if necessary, in accordance with Paragraph a) above.
- C. Concrete not meeting the tolerances of "Recommended Practice for Concrete Formwork: (ACI 347) and concrete not formed as shown on plans shall be considered as not acceptable and shall be removed and replaced by Contractor at his own expense unless Architect permits patching and repairing of such work. Finished repair work shall meet criteria mentioned above or shall be removed and replaced.

3.5 TESTING AND SAMPLING:

- A. Slump Tests: A minimum of two (2) slump tests shall be made each day concrete is placed with one (1) test being made at the time test cylinders are made. Slump tests are to be made in accordance with " Standard Test Method for Slump of Hydraulic-Cement Concrete" (ASTM C-143-Current Edition). Where slump exceeds design slump +1" or the average 28 day strength of the three (3) test specimens falls below the strength specified for the class of concrete tested, or below proportional minimum seven (7) day strengths, (80 percent of specified 28 day strength) the proportions, water content or temperature conditions shall be changed to secure the required properties, and, at the discretion of the Architect, portions of the structure containing such concrete shall be removed and replaced, or reinforced as necessary. No concrete below 3" slump shall be accepted. Follow guidelines of ASTM C94 for water added to mix on site. Do not exceed design specifications.
- B. Strength Tests. The compression strength test shall be performed in accordance with Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens" (ASTM C39-Current Edition). Samples for concrete cylinders shall be made in accordance with "Method of Sampling Fresh Concrete" (ASTM C172-Current Edition), and test cylinders shall be prepared, and laboratory cured in accordance with "Method of Making and Curing Concrete Compression and Flexure Test in the Field" (ASTM C31-Current Edition).
- C. Cylinders. Five (5) cylinders from the same batch shall be prepared by a certified technician for each 50 cubic yards or fraction thereof placed, but not less than four (4) cylinders for each day of concrete operations shall be made. Location of batch as to placement on the subject and supplier mix ID# shall be noted on report, and cylinders so designated. Maximum and minimum initial curing temperatures as recorded per ASTM C31 shall be included in this report. No tests shall be required for sidewalks. One (1) cylinder shall be tested at seven (7) days and three (3) at 28 days. If cylinder break is lower than required, the testing company to contact Contractor and Architect immediately for direction. The remaining cylinder shall be maintained in proper curing conditions until specified 28-day compressive strength has been affirmed.
- D. A minimum of nine (9) cylinders shall be tested for each class of concrete used on the project and the average of any three (3) consecutive strength tests at 28 days shall be

equal to or greater than the specified strength with no test less than 500psi below the design strength.

- E. The contractor shall bear expense of all testing by a Laboratory approved by the Architect prior to award of the contract. Testing results shall be sent directly to the Architect's office, Contractor, and the Concrete Producer. Architect is to be notified of high slump concrete or low early strength (<75% of design at 7 days) immediately.
- F. Floor Flatness and Floor Levelness test shall be performed in accordance with "Standard Test Method for determining FF Floor Flatness and FL Floor Levelness Numbers" (ASTM E1155- Current Edition) for entire interior slab on grade.
- G. Floor Flatness test shall be performed in accordance with "Standard Test Method for determining FF Floor Flatness Numbers" (ASTM E1155- Current Edition) for entire elevated slab.

END OF SECTION

03 30 00-14

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CONCRETE MIX DESIGN SUBMITTAL FORM

(Section 03 30 00 - Cast-in-Place Concrete)

Submitted Mix Design

Date Submitted:

Location and Type (pump or chute) of Placement

Concrete Information

Supplier Mix Design #:	
Design Strength (f'c), psi	
Water/Cementitious Ratio	
Total Air Content, %	
(Entrapped or Entrained)	
Density:	
Wet, pcf	
Dry, pcf	
Slump:	
Without WR, in.	
With WE, in.	

Admixture Information

	ASTM		
	Designation	Product & Manufacturer	Dosage (oz/cy)
Water			
Reducing			
Accelerating			
Retarding			

Architect's Approval

Structural Engineer's Approval

Mix Design Proportions Per Cubic Yard

	Identification	Weight (lbs)	Density (SSD)	Volume (cubic ft)	% Aggregate
Cement	(1)pc, 52c, 50010c,	(103)			Absorption
Fly Ash					
C.A. #1					
C.A. #2					
C.A. #3					
F.A. #1					
F.A. #2					
Water					
% Air					
	Totals				

03 30 00-16

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Coarse and Fine Aggregate Gradation

		% Passing Each Sieve						(-	
		(All sieve sizes must be entered)				Combined % Retained			
Sieve	Size	C.A. #1	C.A. #2	C.A. #3	F.A. #1	F.A. #2	Combined% Passing	Cumulative	Individual
1-1/2"									
1"									
3/4"									
1/2"									
3/8"									
#4									
#8									
#16									
#30									
#50									
#100									
#200									
% of Vol.									

Required Attachments and Supplemental Documentation

Portland Cemen report/certificat Fly ash mill test	t mill test ion
report/certificat	ION
Separate aggreg	ate gradation reports including all required sieve sizes
Note:	* All gradation reports shall be dated within 60 days of submittal
	* Separate gradation reports required for each coarse and fine aggregate material in the
	mix
Product data for	all admixtures including, but not limited
to:	
	* WR
	* Set retarder
	* Set accelerator

* Air entrainer Concrete compressive strength data used for standard deviation calculations

Concrete Supplier Information

Supplier Name:	
Technical Contact:	Cell #
Sales Contact:	_ Cell #
Primary Plant:	
Location:	
Miles from Site:	
Travel Time to Site:	
NRMCA Certified (Y/N):	
AHTD Certified (Y/N):	
Batch Mixing Typer (Dry/Central Mix):	
Secondary Plant:	
Location:	
Miles from Site:	
Travel Time to Site:	
NRMCA Certified (Y/N):	
AHTD Certified (Y/N):	
Batch Mixing Typer (Dry/Central Mix):	

03 30 00-18

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 03 35 20

POLISHED CONCRETE FINISH SYSTEM

PART 1 GENERAL

- 1.1 WORK TO INCLUDE:
 - A. Grinding and Polishing of interior concrete slab.
 - B. Application of reactive surface densifier.
 - C. Joint filler and installation
 - D. Application of stain guard surface treatment.
 - E. Progressive polishing of slab surface.
 - F. Protection of polished concrete floors.
- 1.2 RELATED WORK:
 - A. Section 03 21 00 Concrete Reinforcement: Tapered plate dowel system
 - B. Section 03 30 00 Cast-in-place Concrete
- 1.3 **PROTECTION:**
 - A. Finished system shall be protected against undue soilage and damage by other trades by the use of reasonable care and precaution during process of installation and after completion of installation, prior to substantial completion of project.

1.4 SUBMITTALS:

- A. Provide shop drawings showing pour layout.
- B. Letter of Certification: Provide Letter of Certification by the manufacturer that Contractor is a current qualified installer.
- C. Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
- D. Installer Qualifications: Data for company, principal personnel, experience, and training specified in PART 1 "Quality Control" Article.
- E. Maintenance Data: For inclusion in maintenance manual required by Division 01.

- 1. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
- 2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.5 JOB MOCK-UP:

A. Prior to installation of polished concrete finish system, contractor shall provide minimum 12' x 12' mock-up at the job site in area where the floor will always be visible such as a storage or mechanical room. Provide larger mock-up area if required to accommodate pattern and number of colors. Architect shall approve color and workmanship of the mock-up, then retain as a standard for judging completed work. This shall not become part of the finished work. Mock-up to be polished for approval.

1.6 QUALITY CONTROL

A. Installer Qualifications:

- 1. Provide list of a minimum of 5 projects performed within last three years of similar type, size, and complexity. Submit project names, addresses, contacts, and phone numbers for each project. This is to be provided with data submittal.
- 2. Company experienced in performing specified work similar in design, products, and extent to scope of this Project; with a five-year record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
- 3. Submit letter of certification from manufacturers of all products and equipment specified herein, stating that the applicator is a certified applicator of the system and is familiar with proper procedures and installation methods as required by the manufacturer. All certifications must accompany the bid.
- 4. Polished concrete contractor has to have been regularly performing Polished Dyed Concrete work for at least 3 years prior to bid with manufacturer certifications or job history verifying this point. This is to be provided with data submittal.
- 5. INSTALLERS NOT MEETING THE AFORE-MENTIONED QUALIFICATION REQUIREMENTS WILL NOT BE APPROVED TO INSTALL POLISHED CONCRETE SYSTEM.
- B. All components of the polished concrete finish system shall be provided by one single system supplier / installer.
- C. Do not apply polished concrete finish system when temperature is at or below 32 degrees Fahrenheit or temperatures are projected to go below freezing before dye can have time to cure.
- D. Curing agents may only be used at elevated slabs where polished concrete system is to be installed. Test sample required per specification 03 30 00.
- E. Power and water to be available prior to beginning of work.

1.8 PRE-INSTALLATION MEETING

- A. The Contractor will schedule and conduct a pre-installation meeting <u>prior to pouring of</u> <u>concrete floors</u> where polished concrete is scheduled to be installed. Those attending are to include Contractor, Architect, Owner, Owner's floor maintenance representative, concrete finisher including supervisor, mason, concrete ready-mix plant representative, polished concrete installer and foreman, and other trades affected by the polished concrete system. Items to be discussed are as follows but are not limited to these:
 - 1. Schedule
 - 2. Concrete slab preparation and pouring.
 - 3. Required concrete mix design strength
 - 4. Initial grinding and polishing procedures
 - 5. Speed of operations for correct refinement of polished concrete
 - 6. Protection of floors and damage prevention during construction
 - 7. Project phasing and scheduling for each step of grinding, honing and polishing operations including, but not limited to:
 - a. Quality of qualified personnel committed to project.
 - b. Quality and size of grinders committed to project.
 - c. Proper disposal of concrete slurry and/or concrete dust.
 - 8. Control joint cutting
 - 9. Control joint filler
 - 10. Maintenance
 - 11. Other items associated with polished concrete system.

1.9 WARRANTY

- A. Furnish a written warranty covering both material and workmanship for period of ten (10) years from Date Of Substantial Completion.
- 1.10 MAINTENANCE
 - A. Provide owner and owners cleaning company with on site training. Instructional training video to also be provided.
 - B. Coordinate with owner a cleaning schedule.
 - C. Provide owner with a 2-month starter kit of cleaning products and pads. Cleaning products to be Amerpolish brand.

PART 2 PRODUCTS

2.1 MATERIALS/MANUFACTURERS

- A. Subject to compliance with project requirements, provide products and equipment by the following:
 - 1. Ameripolish (479) 725-0033 www.ameripolish.com

- B. Penetrating Hardener/Densifier: (Clear liquid reactive lithium-silicate based.)
 - 1. 3D HSL, by Ameripolish
- C. Protective Surface Treatment (Stain Guard):
 - 1. 3D SP, by Ameripolish
- D. Joint Filler:
 - 1. 2-part polyurea, Spal-Pro RS 88 manufactured by Metzger/McGuire, 807 Route 3-A Bow, NH 03304, 1-800-223-6680
 - 2-part polyurea, Versaflex SL/85, rapid curing, manufactured by Versaflex, Inc., 87 Shawnee Avenue, Kansas City, KS 66105 (913) 321-9000.
 - 3. 2-part polyurea, PE85, manufactured by Hi-Tech Systems, 1190 N. Del Rio Place, Onterio, CA 91764 (909)945-5530
 - 4. Approved alternate
- E. Crack Filler:
 - 1. 2-part polyurea, HT Spall-TX3, manufactured by Hi-Tech Systems, 1190 N. Del Rio Place, Onterio, CA 91764 (909)945-5530
 - 2. Approved alternate

2.2 EQUIPMENT

- A. Contractor is to furnish minimum three grinding/polishing machines (HTC 800, HTC 950, Sase Products or similar) in full operating condition during the duration of work.
 - 1. Planetary, counter rotating variable speed floor grinder (4 head).
 - 2. Minimum 700 pounds of downward pressure.
- B. Dust extraction system, pre-separator, and squeegee attachments with minimum flow rating of 322 cubic feet per minute.
- C. Generators are required to provide required power. The Polished Concrete Contractor is to provide a minimum of two, each capable of running two classic (HTC 800 or similar) grinding machines concurrently to expedite work.
- D. Allowable Grinding Heads:
 - 1. Metal Bonded Diamonds:
 - a. Grit Size: 16, 30, 70, 100.
 - b. Use of metal bonded diamonds shall be for removal of existing epoxy coating only, unless approved in writing prior to alternate use.
 - Hybrid and Resin Bonded, Phenolic Diamonds
 a. Grit Size: 50, 100, 200, 400, 800, 1500
 - Grinding/Polishing Pads:
 a. Grit Size: 60, 100, 120, 200, 400, 800, 1500, 3000.
- E. Hand grinder with dust extraction attachment and pads.

- F. High speed propane burnisher:
 - 1. Minimum 27 inch head generating pad speeds of 1,500 RPM or higher, as verified with tachometer
- G. Diamond Impregnated Pads
 - 1. Twister Diamond Cleaning System Pads, by HTC.
 - 2. Diamond Polishing Pads, by Norton.
 - 3. SpinFlex Diamond Polishing Pads, by CPS.
- H. Applicator pad:
 - 1. Professional Mighty Mop 077, by Quickie.
 - 2. 24" Microfiber Wet Room Pad, by Rubbermaid.

PART 3 EXECUTION

3.1 ADDITIONAL CONCRETE SLAB PROCEDURES FOR POLISHED CONCRETE

- A. Refer to Specification 03 30 00 Cast-In-Place Concrete for concrete slab requirements
- B. Additional Polished Concrete Floor Troweling Requirements:
 - 1. Final troweling shall be performed with finish blades.
 - 2. Finish blades shall be new or used steel finish blades that are in good shape.
 - 3. Finish blades may be steel reinforced plastic for the final pass only.
 - 4. Trowel as many times as possible.
 - 5. Lead finisher/foreman who finished the field sample shall be present for entire fresh concrete finishing process until final troweling is completed.
- C. Additional Control Joint Requirements:
 - 1. After saw cutting, immediately vacuum up and clean residues.
 - 2. Employ sufficient number of saws and workers to complete cutting saw joints before shrinkage produces cracking.
 - 3. Saw cut to width of 1/8 inch, depth at least 1/3 thickness of the slab.
 - 4. Use saws, blades, skid plates, and accessories by Soff-Cut International, Inc. or approved alternate.
 - 5. Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent raveling or dislodging of aggregates. This will typically be from 1 hour in hot weather to 4 hours in cold weather after completing finishing of slab in that joint location.
 - 6. Provide at least two "Soff-Cut" saws on site with blades capable of achieving the required depth of saw cut.
 - 7. Extend sawed joint to the slab boundaries and abutments, including columns, drains, and other penetrations in the path of a defined joint. Implement methods and timing of the saw cut beyond the limits of the Soff-Cut saw reach to provide a consistent depth of cut with minimal raveling of joint edges.
 - 8. Connect a dust collection system directly to each Soff-Cut saw being used.
 - 9. Remove all saw debris, either loose or compacted, from slab surface and joints prior to curing cover installation.

- D. Additional Slab on Grade Concrete Curing Requirements
 - 1. Start curing as soon as concrete surface will not be damaged by curing operations.
 - 2. Continuously wet cure concrete for at least 7 consecutive days.
 - 3. During curing period, do not allow any part of the concrete to become dry.
 - 4. Do not use polyethylene sheets on exposed interior floors.
 - 5. Wet Cure Only:
 - a. Use fine misting hoses to keep surfaces wet with a 1/8" nominal thickness film of water on concrete surface during entire curing period.
 - b. Provide continuous observation for 24 hours per day for the duration of the curing period.
 - c. Create a dam along the edge of pour to contain water on slab.
 - d. Employ methods to remove excess water from around site. Do not allow any part of the concrete surface to dry before end of curing period.

3.2 EXAMINATION

- A. Verify preparation conditions before beginning work.
- B. After concrete curing period (14 days minimum and 3500 psi cylinder break) has elapsed, surface must be clean and dry, physically sound and free of contamination. Surfaces must be free of holes, voids, or defects. Cracks and abrupt changes in surface profile must be corrected or accepted as is. Fins and projections must be removed.
- C. Contractor must report, in writing, surfaces left in improper condition by other trades. Application will constitute acceptance by the applicator.

3.3 PREPARATION

- A. Close areas to traffic during and after floor finish application for time period recommended by product manufacturer(s).
- B. Clean Substrate: Removal of surface contaminants to ensure penetration of reactive surface densifier. No hazardous, flammable, toxic or solvent based cleaning materials are permitted.
 - 1. Remove dust and loose material by brushing, sweeping, and vacuuming.
 - 2. Remove curing, sealing and coating agents, oil, breaking compound residue, wax, and grease by mechanically scraping off heavy deposits. Remove remaining residues using Wax and Curing Compound Remover.
 - 3. Remove deep-set oil and grease stains.
 - 4. Remove paint residue.
 - 5. Remove grease and general soiling with cleaner/degreaser diluted as recommended by manufacturer in an auto scrubber.
 - 6. Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water.
 - 7. Thoroughly rinse floor surface to remove soap residue and contaminants.
 - 8. Squeegee dry.

- C. Repair all slab defects.
- D. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and contaminants.

3.4 NEW CONSTRUCTION INSTALLATION PROCEDURE:

- A. System to be installed by approved and licensed applicators from manufacturer. Comply with flooring system manufacturer's recommendations and instructions regarding preparation and mixing of materials and application of each component of floor system. Coordinate with contractor, scheduling for installation of the polished dyed concrete finish system. <u>Initial grinding of polished floor system to be performed prior to wall installation to assure proper polishing of entire room or area.</u>
- B. For the initial grinding of the concrete slab, use coarse diamond segments bonded in a metallic matrix. These segments should be coarse enough to remove minor pits, blemishes, stains, or light coatings from the floor in preparation for final smoothing. A minimum of 4 passes with 70 grit metal bonded diamond grinding heads is required. Depending on the condition of the concrete and the specified aggregate exposure additional passes and lower grit metal bonded heads may be required.
- C. Protect surrounding and adjacent surfaces in accordance with floor finish manufacturer's written recommendations.
- D. Joint and/or crack filler to be installed in control joints, cracks, pitts, spalls and holes prior to final grinding and polishing. Joint filler must bond to clean, exposed concrete for the full intended filler depth. Joints must be free of saw laitance, dirt, debris, coatings, sealers, etc. The only effective means of proper joint cleaning is the use of a dry cut saw, vacuumequipped, with a diamond blade. The blade depth should extend to the intended filler depth. Run blade against each side wall on separate passes. After cleaning joints with saw, vacuum any remaining dust/debris from joint. Joint filler is designed to be placed to the full depth of the joint in saw-cut contraction/control or construction joints or at 2" minimum if joint depth exceeds 2". DO NOT USE COMPRESSIBLE BACKER ROD IN SAWCUT JOINTS. Follow all additional manufacturers installation instructions.
- E. Grind slab surface with 150 grit metal-bonded OR 50 grit hybrid resin metal-bonded diamond grinding heads. **2 passes.**
- F. Clean slab with wet auto scrubber with PH cleaner between <u>all</u> polishing passes.
- G. Progressively polish slab surface with 100 and 200 grit resin-bonded, phenolic diamond heads. 2 passes each grit level minimum for a total of **4 passes**.
- H. Apply reactive surface densifier per manufacturer's instructions to rejection.
- I. Polish slab with 400 and 800 grit resin-bonded, phenolic diamond heads. 2 passes each grit level minimum for a total of **4 passes**.

- J. Polish slab with 1,500 grit resin-bonded, phenolic diamond heads. 2 passes.
- K. Burnish slab with 3,000 grit resin-bonded, phenolic diamond heads. 2 passes.
- L. Gloss and DOI readings are required to be taken prior to the application of surface treatment (stain guard)
- M. Apply protective surface treatment (stain guard) per manufacturer's instructions. Draw out material to thin film with applicator pad.
- N. Slowly burnish slab with 3,000 grit diamond impregnated pad. 1 pass.
 - 1. Burnisher, pad and pace of forward movement shall combine to develop a minimum floor surface temperature of 91° F directly below the burnishing pad, as measured by the operator during installation.
- O. A minimum of **19 passes** are required. Additional passes may need to be provided dependent on condition of concrete, specified aggregate exposure and operation of machinery. Slurry being produced should become slightly milky to clear.
- P. Progressive edge grinding will be necessary along all vertical abutments.
- Q. At installer's option, water polishing can be implemented to aid in achieving specified reflective and finished requirements

3.6 GRIND ONLY AT SEALED CONCRETE FLOORS

- A. At sealed concrete floors
 - 1. Progressively polish slab surface with 200 grit resin-bonded, phenolic diamond heads. 1 pass.
 - 2. Seal with DNS-400 Sprayable Acrylic Sealer by Ameripolish.

3.6 FINISH REQUIREMENTS:

A. Aggregate Exposure:

Class C – Medium Aggregate: Medium aggregate exposure with little or no large aggregate exposure at random locations. All surface paste is removed. Approximate surface cut of 1/8"

 B. Gloss Level: All gloss levels are to be measured using a Rhopoint IQ Gloss & DOI reader. Reader must be factory calibrated yearly.

Level 3: Polished. Objects being reflected are sharp, crisp and easily identified. Gloss readings should range from 50 to 65 prior to surface treatment (stain guard)

C. DOI Value: All DOI (distinctness of image) values are to be measured using a Rhopoint IQ Gloss & DOI reader. Reader must be factory calibrated yearly.

DOI, Image Clarity Values should range from 70 to 85 prior to surface treatment (stain guard)
- D. Slip Resistance: Measured dynamic coefficient of friction (DCOF) shall be 0.42 or greater as measured in accordance with ANSI A137.1. Testing apparatus shall be the BOT 3000E
- E. Leave work complete and ready for final inspection by Architect.

3.7 **PROTECTION**:

- A. Contractors shall be advised that the concrete slab *is* the finished floor. Do not allow marking of the floor (even with pencil). Do not apply chemicals of any kind. No chemical process or cleaning system is known that will remove petroleum stains and certain other chemicals from concrete surfaces.
- B. Polished floor areas are to be protected by the general contractor/construction manager with taped hardboard or ram board for duration of project until time of final cleaning. Periodically inspect protection board for damage and keep it free from debris.
- C. Perform final cleaning of polished floor area after protection is removed.
- D. Coordinate with Contractor to protect exposed edges of construction joints immediately following form removal.
- E. Coordinate with Contractor to assure smooth, clean sawing of control joints to prevent chipping or aggregate pullout during sawing process.
- F. DO NOT allow trades to park vehicles on the slab without protection, such as plastic or non absorbent drop clothes, under the vehicles.
- G. ALWAYS DIAPER any hydraulic equipment used on the floor during the construction process. No exceptions.
- H. NO PIPE FITTING/cutting will take place on the floor slab.
- I. DO NOT place steel on the slab without protection beneath.
- J. Protect wet cured surfaces as follows:
 - 1. Barricade concrete surfaces immediately after finishing
 - 2. Do not allow light traffic, except for curing purposes, on concrete surfaces until concrete has obtained 1800 psi (approx 3 days).
 - 3. Do not allow heavy traffic on concrete surface until concrete has obtained, by test, its design strength, but not sooner than 9 days after placement.
 - 4. Permit concrete to dry minimum of 2 additional days after curing is completed before removing barricades.
- K. Provide access ramps of compacted earth or other means along exposed concrete edges of floor slabs to prevent equipment and machinery from impacting edges. Barricade all other

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exposed edges to vehicular traffic which may damage edges. Broken or chipped edges along construction joints will not be tolerated.

- L. When traffic is allowed on the slab tires must be WHITE. Tires shall be inspected to insure no foreign objects are embedded in tires such as rocks, screws, nails, etc., which could damage polished floor finish.
- M. DO NOT ALLOW BLACK TIRES on polished concrete slabs. If black tire equipment must access the slab the tires must be fitted with protective tire socks.
- N. Do not allow clay gravel, etc. to be tracked onto bare unpolished or polished concrete slab.
- O. Do not allow work resulting in oils dripping onto concrete slabs to occur without floor protection.

3.8 TESTING

- A. Using a Rhopoint IQ Gloss & DOI reader randomly test the floor with architect and contractor present. Floor polisher to provide instrument and show calibration. Equipment to be calibrated yearly by manufacturer. The minimum number of tests distributed across the polished surface should be three test for areas up to 1000 sf and one additional test for each 1000 sf or fraction thereof. This applies to both Gloss and DOI.
- B. Gloss readings at 60 degrees shall average a minimum of 55 with no area measuring less than 45 prior to stain guard application.
- C. Gloss readings at 60 degrees shall average a minimum of 70 with no area measuring less than 60 after stain guard application.
- D. Minimum DOI reading to be 70 or higher prior to stain guard application
- E. Minimum DOI reading to be 85 or higher after stain guard application
- F. Slip Resistance: Measured dynamic coefficient of friction (DCOF) shall be 0.42 or greater as measured in accordance with ANSI A137.1. Testing apparatus shall be the BOT 3000E

3.9 CLOSEOUT ACTIVITIES

A. Maintenance Training: Polish concrete company shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor. Training must include hands on demonstrations of all cleaning steps. Contractor must provide 2 months of care and maintenance products to the owner.

END OF SECTION

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A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 03 62 00

NON-SHRINK GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide non shrink, rapid setting, high strength repair mortar for horizontal structural patch and repair of existing concrete substrate.
- B. Provide high strength, non-metallic, Portland cement based non shrink grout.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation for each material and product used. Include manufacturer's Material Safety Data Sheets.

1.3 REFERENCES

- A. ASTM C 109: Compressive Strength of Hydraulic Mortars
- B. ASTM C 191: Setting time of Hydraulic Cement
- C. ASTM C 882: Slant Shear Bond Strength
- D. ASTM C 928: Rapid Hardening Cementitious Materials for Concrete Repairs
- E. ASTM C 939: Flow of Grout
- F. ASTM C 1107: Hydraulic Cement Grout (Non Shrink)
- G. Region III Test Method IV: Freeze/Thaw Testing
- 1.4 QUALITY ASSURANCE
 - A. Manufacturer's Qualifications: The manufacturer shall be a company with at least fifteen years experience in the manufacturer and marketing of pre-packaged cementitious repair materials.
 - B. Installer's Qualifications: The contractor shall be qualified to perform the work specified by reason of experience.
- 1.5 DELIVERY, STORAGE AND HANDLING
 - A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.

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- B. Store products in a dry area. Protect from direct sunlight.
- C. Handle products in accordance with manufacturer's printed recommendations.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Non Shrink rapid setting high strength, hydraulic cement based repair mortar and Non Shrink Grouts for horizontal applications. Comply with the following:
 - Manufacturer: Fastset[™] Non Shrink Grout (#1585-09) as manufactured by the QUIKRETE® Companies, One Securities Centre, 3490 Piedmont Road, NE, Suite 1300, Atlanta, GA 30305; telephone (404) 634-9100.
 - a. Substitutions: Comply with Section 01 11 00.
 - 2. Performance and Physical Properties at 73 degrees F and 50 percent relative humidity:
 - a. Compliance: ASTM C 928 R-3 specifications ASTM C 1107 CRD 621
 - b. Working Time, ASTM C 1107: 15-20 minutes.
 - c. Final Set Time, ASTM C 191: 20-45 minutes.
 - d. Compressive Strength, ASTM C 109 Modified:

<u>Fluid:</u> 2000 psi (13.8 MPa) @ 3 hours, 4000 psi (27.6 MPa) @ 24 hours, 5000 psi (34.5 MPa) @ 7 days and 6500 psi (44.8 MPa) @ 28 days.

<u>Flowable</u>: 2500 psi (19.2 MPa) @ 3 hours, 4500 psi, 4500 psi (31 MPa) @ 24 hours, 5500 psi (37.9 MPA) @ 7 days and 7500 psi (51.7 MPa) @ 28 days.

<u>Plastic</u>: 3000 psi (20.7 MPa) @ 3 hours, 5000 psi (34.5 MPa) @ 24 hours, 6000 psi (41.3 MPs) @ 7 days and 8000 psi (55.1 MPs) @ 28 days.

- e. Slant Shear Bond Strength, ASTM C 928: 1000 psi (6.9 MPa) @ 24 hours, 1500 psi (10.3 MPa) @ 7 days and 2500 psi (17.2 MPa) @ 28 days.
- f. Height Change, ASTM C 1090: 0-0.2%.
- g. Flow at Fluid Consistency, ASTM C 939: 20-30 seconds.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas landscaping from contact due to mixing and handling of materials.

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3.2 SURFACE PREPARATION:

Comply with manufacturer's printed instructions and the following:

- A. Remove all spalled and unsound concrete from area to be repaired. If rusty reinforcing steel is present; it must be abrasive blasted to remove rust.
- B. Remove enough material to completely expose reinforcing steel.
- C. Large vertical or overhead patches deeper than 2" (50 mm) should contain reinforcing steel. Additional steel should be inserted using appropriate techniques if none is present.
- D. Clean surface to be repaired of all materials including dust, oil, dirt and grease.
- E. Dampen with clean water before patching and remove standing water.

3.3 MIXING:

Comply with manufacturer's printed instructions and the following:

- A. Material should be mechanically mixed for a minimum of three (3) minutes using a five (5) gallon (19L) bucket with a ¹/₂" (12mm) drill and paddle mixer. For large grouting applications a standard mortar mixer should be used.
- B. Add 1 ¼ gallon (4.7L) of clean water for each 60lb (27.2 kg) bag to achieve a plastic consistency. (Flowable: 1½ gallon (5.7L), fluid 1¾ gal. (6.6L)). Add the powder to the water and mix to achieve the required placing consistency. Add water sparingly to reach the desired consistency. Do not mix more material than can be placed in 15 minutes.
- C. For repair deeper than 2" (50 mm), up to 30 lbs (13.6kg) of clean, high quality ½" (12mm) gravel may be added to the mix at the plastic consistency. The water required will be reduced to 1 gallon (3.8 L) per 60-pound (27.2 kg) bag.
- D. Do not re-temper with additional water.

3.4 APPLICATION:

Comply with manufacturer's printed instructions and the following:

A. Instructions for use as a Grout

- 1. The area to be grouted should be thoroughly flushed and soaked with clean water prior to grouting. Leave no standing water.
- 2. Place the grout quickly and continuously use light rodding or strapping is permitted to eliminate air bubbles.

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- 3. Grout temperature should be maintained from 50°F to 90°F (10°C 32°C) to achieve specified results. Use cold water in hot weather or hot water in cold weather to achieve desired grout temperature. Do not use it if temperature is expected to go below 32°F (0°C) within a 12-hour period.
- B. Instructions for use as a Repair Mortar
 - 1. Remove all areas of spalled and unsound concrete from surface to be repaired.
 - 2. Repair areas that are subject to heavy traffic should have a vertical edge of ¹/₂" (12 mm) or more, formed by use of a pneumatic jackhammer or sawing.
 - 3. Dampen surface with clean water before patching. Remove standing water.
 - 4. The repaired areas should be filled by placing material full depth, from one end to the other to eliminate partial depth lifts between batches.
 - 5. Consolidate the material by hand tamping or chopping with a shovel or trowel. This is particularly important around the edges.
 - 6. Screed and finish to create a surface that matches the surrounding finish.
 - 7. Repair Mortar temperature should be maintained from 50°F to 90°F (10°C 32°C) to achieve specified results. Use cold water in hot weather or hot water in cold weather to achieve desired grout temperature. Do not use if temperature is expected to go below 32°F (0°C) within a 12-hour period.

3.5 CURING

A. Grouting applications must be damp cured for at least one day. No special curing procedures are required for repair applications but sealing surface with QUIKRETE® Acrylic Concrete Sealer (No. 8800) after concrete has hardened will ensure proper curing and help prevent shrinkage cracking.

3.6 CLEANING

A. Remove excess material before material cures. If the material has cured, remove using mechanical methods that will not damage substrate.

END OF SECTION

03 62 00-4

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 04 05 13

MORTAR

PART 1 GENERAL

1.1 SUMMARY

- A. Examine all Drawings, General Conditions, and General Requirements which are part of this Contract. Furnish all labor, materials, and equipment necessary for masonry mortar.
- 1.2 RELATED SECTIONS
 - A. Section 04 22 00: Concrete Unit Masonry
- 1.3 REFERENCES
 - A. American Society for Testing and Materials (ASTM-most recent issue)

	2	0
1.	ASTM C94,	Specification for Ready-Mixed Concrete
2.	ASTM C109	Specification for Compressive Strength of Hydraulic Cement
		Mortars.
3.	ASTM C143,	Test Method for Slump of Hydraulic Cement Concrete
4.	ASTM C144,	Specification for Aggregate for Masonry Mortar
5.	ASTM C150,	Specification for Portland Cement
6.	ASTM C207,	Specification for Hydrated Lime for Masonry Purposes
7.	ASTM C270,	Specification for Mortar for Unit Masonry
8.	ASTM C404,	Specification for Aggregates for Masonry Grout
9.	ASTM C476,	Specification for Grout for Masonry
10.	ASTM C780,	Standard Test Method for Preconstruction and Construction
		Evaluation of Mortars for Plain and Reinforced Unit Masonry
11.	ASTM C1019,	Specification for Method of Sampling and Testing Grout
12.	ASTM C1142,	Specification for Ready-Mixed Mortar for Unit Masonry
13.	ASTM C1329,	Specification for Mortar Cement
		-

- B. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- C. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

1.4 SUBMITTALS

- A. Comply with Section 01 33 00.
- B. Submit Certification of mortar components and type for pre-blended masonry mortars such as "Spec Mix" or other approved manufacturers, dated within 12 months of contract date.

1.5 GENERAL REQUIREMENTS

- A. Deliver materials in unbroken bags or containers, plainly marked and labeled with Manufacturer's name, brand and mortar type.
- B. Storage of Materials
 - 1. Cement and hydrated lime: Stored in a manner to afford ready access for inspection and in suitable building to protect material from dampness. Insure protection against inclusion of foreign materials in cements and limes. MASONRY CEMENT WILL NOT BE ALLOWED IN MORTAR.
 - 2. Aggregates use only clean, dry materials. Use no frozen materials.
- C. Build in all sheet metal work, anchors, anchor bolts, hangers, sleeves, thimbles, frames, structural members, etc. as shown and as required for other trades.
- D. Environmental Requirements: See Section 04 22 00 for temperature and laying restrictions.
 - 1. Cold Weather Requirements
 - a. Comply with IMIAC Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
 - b. When the ambient air temperature is below 40 degrees F, heat mixing water to maintain mortar temperature between 40 degrees F and 120 degrees F until placed. When the ambient air temperature is below 32 degrees F and holding, dropping, or predicted to drop below 32 degrees, no mortar is to be mixed.
 - 2. Hot Weather Requirements
 - a. Comply with IMIAC Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.
- E. Remove any materials that have partially hardened or set. DO NOT USE.
- F. Build in door and window frames and their anchors. Slush steel door frame jambs and heads full of mortar. Slush cells full or mortar where excessive cutting for conduit or other devices has weakened masonry.

PART 2 PRODUCTS

2.1 MATERIALS

- A. The mortar for all masonry, block, and brick shall meet the minimum requirements of the International Building Code.
- B. Mortar shall conform to the minimum proportion requirements given in Table II of ASTM C270, based on 28-day laboratory testing ONLY. Select mortar type based on the criteria below:
 - 1. Type "S": For walls in contact with earth or below grade, and load-bearing interior and exterior walls.

- 2. Type "S": For load-bearing interior and exterior walls above grade.
- 3. Type "N": For non-load-bearing walls no higher than 20'-0".
- 4. Use Type "S" for non-load-bearing walls higher than 20'-0".
- 5. Use Type 'N' only for masonry veneer.
- C. The mortar for all masonry shall be standard gray color, color pigmented mortar where exposed to view, match existing color where final appearance will be exposed mortar. Use standard gray color in other areas.
- D. Provide only pre-mixed mortar of types specified manufactured by "Spec-Mix" or approved alternate substitution. <u>Mixing of any mortar on-site will not be allowed.</u>
- E. Use same manufacturer's products throughout project.
- F. Use of anti-freeze compound or other additives are not to be used without written approval of the Architect.
- G. Bond Beams and cells with vertical reinforcement shall be filled with 2000 psi concrete NOT MORTAR.
- 2.2 MORTAR MATERIALS
 - A. Portland Cement: ASTM C150, normal. Type I or III; gray color. Fly ash, slag, and pozzolans are NOT permitted as substitutes for Portland Cement.
 - B. Hydrated Lime: ASTM C 207, Type S, and UBC 21-13 hydrated lime for masonry purposes.
 - 1. Manufactured by Chemstar of approved equal.
 - 2. For pigmented mortars, use colored Portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of Portland cement by weight for mineral oxides nor 2 percent for carbon black.
 - C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4-inch (6.5 mm), use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.
 - 1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone, as required to match Architect's sample.
 - D. Aggregate for Grout: ASTM C404 with 100 percent passing the 3/8" (9.5mm) sieve.
 - E. Admixtures: NOT permitted unless approved by the Structural Engineer of Record, prior to construction.
 - 1. Calcium Chloride is NOT permitted in mortar. Admixtures and other chemicals containing Thiocyanates, Calcium Chloride or more than 0.1 percent chloride ions are NOT permitted.

F. Water: Potable

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions with installer present, for compliance with requirements for installation tolerances and other specific conditions, and miscellaneous conditions affecting performance of unit masonry.
- B. Examine rough-in and built-in construction to verify actual locations of piping and other penetrations prior to installation.

3.2 INSTALLATION

- A. Maintain an ambient temperature of the materials in contact with the mortar, of NOT less than 40 degrees F, unless otherwise recommended by the International Masonry All-Weather Council (IMIAC). Maintain this temperature limitation at every area and elevation of weather enclosures, when used.
- B. Lay solid brick-sized masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. DO NOT slush head joints.
- C. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings, piers, columns, and pilasters, and where adjacent to cells or cavities are to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- D. In existing construction, maintain joint widths shown, to match existing coursing, except for minor variations required to maintain bond alignment. If not shown, lay walls to match existing or 3/8" joints.
- E. Cut joints flush for masonry walls that are to be concealed or to be covered by other materials, unless otherwise indicated.
- F. Remove masonry units disturbed after lying; clean and reset in fresh mortar. DO NOT pound corners or jambs to shift adjacent stretcher units that have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- G. Grouting: DO NOT place grout until the entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
- H. Refer to Section 04 22 00 for maximum allowable grouting heights.

3.3 MIXING OF MORTAR

- A. Machine mix in an approved type of mixer in which quantity can be accurately and uniformly controlled. Only small batches of mortar may be mixed at one time. Mixing time is not less than five (5) minutes and not less than three (3) minutes after water has been added. If hydrated lime is used, use dry-mixed method (optional) of first consistently mixing hydrated lime into putty.
- B. Dry Blended in Silos: Mixing shall be done using a continuous, self-cleaning mixer mounted at the apex of the silo. The water flow valve shall be set to provide desired workability.
- C. Keep all mixers and equipment clean. Do not deposit mortar on the ground.

3.4 WORKMANSHIP

- A. Mortar having stood for more than one hour shall not be used or re-tempered.
- B. Lay no masonry when danger of freezing conditions exists before mortar sets.

END OF SECTION

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SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Concrete masonry units.
- 2. Reinforcement, anchorages, and accessories.
- 3. Procedure and preparation for exposed concrete and/or polished concrete floors

B. Products Installed but not Furnished Under this Section:

- 1. Section 03 21 00 Concrete Reinforcement
- 2. Section 05 50 00 Metal Fabrications: Loose steel lintels.
- 3. Section 07 62 00 Sheet Metal Flashings and Trim.

C. Related Sections:

- 1. Section 01 40 00 Quality Control: Required Special Inspections
- 2. Section 03 30 00 Cast-In-Place Concrete: grout.
- 3. Section 03 35 20 Polished Concrete Finish System
- 4. Section 04 05 13 Mortar
- 5. Section 07 27 26 Fluid-Applied Weather Barrier System
- 6. Section 07 21 00 Insulation
- 7. Section 07 92 00 Joint Sealers: Rod and sealant at control joints.
- 8. Section 09 91 00 Painting and Finishing.
- 9. Section 09 97 26 Special Coatings
- 1.2 REFERENCES
 - A. ASTM C90 Hollow Load-Bearing Concrete Masonry Units.
 - B. ASTM C145 Solid Load-Bearing Concrete Masonry Units.
 - C. Hot and Cold Weather Masonry Construction Guide Recommended Practices and Guide Specifications for Hot & Cold Weather Masonry Construction.
 - D. ASTM A153 Zinc Coating (Hot Dip).

1.3 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following installed compressive strengths (fm) at 28 days.
 - For Concrete Unit Masonry: As follows, based on net area:
 a. F'm = 2000 psi (13.1 Mpa).

1.4 SUBMITTAL

- A. Submit samples of actual units to be used for Architect's approval.
- B. Submit to Architect the insulation type proposed.
- C. Submit mix design for concrete grout
- 1.5 ENVIRONMENTAL REQUIREMENTS
 - A. Cold Weather Requirements: Hot and Cold Weather Masonry Construction Guide -Recommended Practices and Specifications for Cold Weather Masonry Construction.
 - B. Lay no masonry when the temperature is below 40 degrees F. without Architect's permission. Such permission shall not relieve the Contractor of responsibility for the work, however. If permitted to work below 40 degrees F., but above 32 degrees F., make provisions to heat and dry materials and protect work from freezing during the installation and curing period. No masonry is to be laid when temperatures are holding, dropping or are predicted to go below 32 degrees F. unless heated protection is provided during installation and curing period and has been approved by the Architect.
 - C. External exposed CMU: Provide units with integral water repellent

1.6 PRE-INSTALLATION MEETING

- A. The Contractor will schedule and conduct a pre-installation meeting <u>prior to</u> <u>construction of cmu walls</u>. Those attending are to include Contractor, Architect, Owner, Structural Engineer, mason, cmu grout-mix representative and 3rd party special inspector. Items to be discussed are as follows but are not limited to these:
 - 1. Schedule
 - 2. Installation of rebar
 - 3. Required grout mix design strength.
 - 4. Frequency of testing and inspections
 - 5. Placement of grout
 - 6. Construction height of CMU walls
 - 7. Control joints and corners
 - 8. Other items associated with cmu wall construction.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Units: ASTM C90, Grade N, Type 1:
 - 1. Common CMU: Light weight (ASTM C331) above grade; normal weight (ASTM C331) below grade.
 - 2. Split face & single scored CMU: Normal weight, use only above grade.

- B. Solid Load-Bearing Units: ASTM C145, Grade N, Type 1:
 - 1. Common CMU: Light weight (ASTM C331) above grade; normal weight (ASTM C331) below grade.
 - 2. Split face & single scored CMU: Normal weight, use only above grade.
- C. Masonry Units: Modular units sized as required to achieve details shown; provide special units for bond beams, control and expansion joints, and lintels.
 - 1. Common CMU: Where indicated on drawings.
- D. Quality Control: All standard masonry units shall be manufactured by one manufacturer and shipped from the same plant. All units are subject to inspection and rejection by the Architect for defects such as excessive porous surface, chipped corners, irregular faces or sizes, etc. Sample units submitted shall be retained and shall set the standard for quality expected. Meeting ASTM C90 minimum requirements is not considered to be adequate in the areas mentioned.
- E. Fire Resistance Classification: CMU walls and partitions shall have fire resistance ratios as indicated on the drawings. Units shall be of minimum equivalent thickness (ASTM C140) specified for the fire rating and corresponding aggregate type.

2.2 REINFORCEMENT AND ANCHORAGES

- A. <u>CMU Horizontal Joint Reinforcement:</u> Install horizontal joint reinforcement 16 inches on center, except space at 8 inches in parapet walls and below finished floor, or where otherwise indicated on Drawings. 120 Truss or 220 Ladder-Mesh LoxAll design, manufactured by Hohmann & Barnard, Inc., or approved alternate. Minimum 9-gauge welded steel wire; hot-dip galvanized after fabrication to 1.5 oz. Per ASTM A153 Class B-2 for use in exterior walls, mill galvanized wire for interior walls. Reinforcement width to be 1 1/2 to 2 inches less than wall thickness.
- B. Miscellaneous Masonry Anchors: Fabricated from 16 gage steel sheet or 3/8 inch steel rod, 1.5 oz. hot-dip galvanized after fabrication.
- C. Construction/Control Joints: Construction/Control joints shall be spaced as shown on the drawings. Caulk joints in accordance with Section 07 92 00. Unless shown otherwise less than 24'-0" on center. Provide control joints at corners no more than 12'-0" from corner or closer if shown on drawings. Coordinate locations with Architect and Structural Engineer.

2.3 ACCESSORIES

- A. Joint Filler: Closed cell foam, oversized 50 percent; self-expanding joints.
- B. Preformed Control Joint Filler:
 - 1. VS Series by Hohmann & Barnard, Inc.
 - 2. No. 2901 by Wire Bond.

- C. Reinforcing Bar Positioners:
 - 1. D/A 811; Dur-O-Wal, Inc.
 - 2. D/A 816; Dur-O-Wal, Inc.
 - 3. No. 376 Rebar Positioner; Heckman Building Products, Inc.
 - 4. #RB Rebar Positioner; Hohmann & Barnard, Inc
 - 5. #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.
 - 6. Double O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America
 - 7. O-Ring rebar Positioner; Masonry Reinforcing Corporation of America.
 - 8. Hot-dip galvanized after fabrication.

2.4 CONCRETE GROUT OR SPEC MIX GROUT

- A. Concrete grout to be produced at a ready-mix batch plant, capable of producing specified concrete grout or spec mix grout, each as listed below.
- B. Concrete Grout:
 - 1. Portland Cement: Type I Portland, meeting "Standard Specifications for Portland Cement", (ASTM C150-Current Edition) shall be used.
 - 2. Aggregates: All aggregates shall be clean, hard strong and durable particles free of chemicals or foreign material that may affect the bonding of cement paste and shall conform to "Specifications for Concrete Aggregates" (ASTM C33). Nominal maximum aggregate size for concrete grout shall be 3/8" diameter.
 - 3. Mixing Water: Water shall be fresh, clean and potable.
 - 4. Slump: 9 inch maximum: plus tolerance 1 inch, minus tolerance 1 inch.
 - 5. Mix proportioning: To produce 28 day minimum compressive strength of moist cured laboratory samples, 2,000 psi at all locations.
- C. Spec Mix Grout:
 - 1. Spec Mix Core Fill Grout, Coarse (CF-02), preblended product containing cementitious materials and dried aggregates to meet ASTM C 476 and CSA A179.
 - 2. Packaging: 80lb packages or 3,000lb bulk bags for use in Spec Mix silo system.
 - 3. Mixing Water: Water shall be fresh, clean and potable.
 - 4. Slump: 9 inch maximum: plus tolerance 1 inch, minus tolerance 1 inch.
 - 5. Mix proportioning: To produce 28 day minimum compressive strength of moist cured laboratory samples, 2,000 psi at all locations.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify items provided by other sections of work are properly sized and located.
- B. Establish lines, levels, and coursing. Protect from disturbance.
- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

3.2 COORDINATION WITH OTHER TRADES

A. It will be a requirement of this section to verify and coordinate work with other trades and specification sections. Do not begin work on concrete slabs on grade or elevated concrete slabs until minimum strength and cure time has been reached.

B. Procedure and preparation for exposed concrete and/or polished concrete floors

- Concrete floors in whole or in part as shown on drawings, are scheduled to be Polished Concrete. No masonry walls constructed on slab-on-grade are to begin erection until concrete slab has received initial grind from floor polishing contactor. Refer to Sections 03 35 20 for requirements. This requirement includes slabs-ongrade.
- 2. Where sealed concrete floors or polished concrete finish is scheduled, floor areas at the base of CMU walls are to be protected from concrete and mortar droppings during construction of CMU walls. Floors at base of CMU walls are to be cleaned at the end of each work day, free of concrete and mortar droppings.
- 3. Any equipment used on slabs to be sealed of polished, shall meet the requirements of Sections 03 35 20 concerning diapering of equipment to prevent fluid leak stains and utilizing tire socks to prevent tire marks.

3.3 COURSING

- A. Place masonry to lines and levels indicated.
- B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- C. Lay concrete masonry units in running bond unless adjoining work is involved, or called out on drawings otherwise. Course one block unit and one mortar joint to equal 8 inches vertically. Form flush mortar joints where joint will be covered by other construction. Mortar joints on concealed areas where fluid applied cavity wall weather barrier is to be applied must be fully filled with no voids, holes, or cracks, struck flush with the face of CMU. Provide tooled, concave joints where wall will be left exposed and painted, or is a finished product, unless specifically called out to be otherwise.

3.4 PLACING AND BONDING

- A. Lay solid concrete masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints. Remove excess mortar.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting courses on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

- C. Fully bond intersections, and external and internal corners.
- D. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- E. Perform job site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- F. Isolate masonry partitions from vertical structural framing members with a control joint.
- G. Where masonry is installed, all vertical and horizontal joints to align according to bond types. Where differing masonry types are installed in same wall, joints are to align between each masonry unit type unless noted otherwise.

3.5 TOLERANCES

- A. Alignment of Pilasters: Maximum 1/4 inch from true line.
- B. Variation from Unit to Adjacent Unit: 1/32 inch.
- C. Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet.
- D. Variation from Plumb: 1/4 inch per story non-cumulative.
- E. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
- F. Variation of Joint Thickness: 1/8 inch in 3 feet.

3.6 REINFORCEMENT AND ANCHORAGES

- A. Install horizontal joint reinforcement 16 inches on center, except space at 8 inches in parapet walls and below finished floor, or where otherwise indicated on Drawings.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 24 inches minimum each side of opening. Place joint reinforcement continuous in first and second joint below top of wall.
- C. Lap joint reinforcement ends minimum 6 inches. Discontinue at control joints. Extend 24 inches minimum each side of openings. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension.
- D. Cells that contain vertical reinforcing are to be grouted full. Lap vertical reinforcing a minimum of 48 bar diameters and ensure bar is positioned in the cell as indicated on the structural plans. <u>Fill cells in 5'-4" lifts maximum</u>. Power vibrate grout in each cell full height of each lift. Maximum diameter of power vibrator for grout consolidation is ³/₄".

Maximum allowable CMU height for installing grout in cells is 5'-4'' or to course immediately below bond beam, whichever is lower.

- E. Bar Positioners: As vertical reinforcing is being placed, the use of reinforcing bar positioners for correct bar positioning in the wall is required. Install at each bar, locating at maximum 8'-0" o.c. vertical, and/or at each bar splice point.
- F. Verify that anchorages embedded in concrete or attached to structural steel members are properly placed.
- G. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.7 LINTELS

- A. Install loose steel lintels as scheduled.
- B. Install reinforced unit masonry lintels over openings where steel or pre-cast concrete lintels are not scheduled. Construct lintels using concrete fill and reinforcing. Maintain minimum 8 inch bearing on each side of opening.
- C. Use reinforcing bars of one piece lengths only.
- D. Place and consolidate grout fill without disturbing reinforcing. Allow lintels to reach strength before removing temporary supports.

3.8 CONTROL JOINTS

- A. Do not continue horizontal joint reinforcing thru control joints. Continue bond beams across control joints by use of "Slip Joints" as detailed on plans. Ensure use of asphalt paper wrap to create bond break. 3/4" diameter x 24" dowels with expansion cap at each bond beam at each control joint.
- B. Install preformed control joint filler at locations indicated on Drawings. Space no further than 24'-0" o.c. or less if shown on drawings. Provide control joints at corners no more than 12'-0" or closer if shown on drawings. Use proper size material to create sealant joint space; See Section 07 92 00 for sealant performance.

3.9 BUILT-IN WORK

- A. As work progresses, build in metal door frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
- B. Build in items plumb and level.
- C. Bed anchors of metal door and glazed frames in mortar joints. Fill masonry cores with grout minimum 12 inches horizontally from framed openings.

- D. Build in door and window frames and their anchors. Slush steel door frame jambs and heads full of mortar. Slush cells full of mortar where excessive cutting for conduit or other devices has weakened masonry
- E. Do not build-in organic materials subject to deterioration.

3.10 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.
- C. <u>**Do not**</u> thin CMU walls to accommodate plumbing piping, electrical conduit of other items routed in CMU walls. Consult Architect if conditions are found that do not allow proper installation of CMU.

3.11 TESTING CMU CONCRETE GROUT OR SPEC MIX GROUT

A. Strength Tests:

- 1. Testing per ASTM C 1019.
- 2. Three (3) test specimens shall constitute one (1) sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.
- 3. Slump to be 9 inches, plus or minus one inch.
- 4. Specimens shall be tested at 7 and 28 days.
- 5. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 psi..
- B. Frequency: Minimum of Two (2) times a week from start of production.
- C. Testing Laboratory: The testing laboratory, in addition to meeting requirements of ASTM E-329, and must be an approved laboratory competent to perform cement physical testing. All tests must be performed in strict accordance with the applicable ASTM standard.
- D. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Architect, Contractor, masonry contractor, and the grout supplier if applicable.
- E. Test mix design prior to beginning construction of CMU walls. The compressive strength test of the laboratory mix design must meet or exceed the specified 28 day design compressive strength of **2,000** psi grout unless noted otherwise.
- F. Contractor shall bear costs for all masonry testing.

3.12 CLEANING

- A. Remove excess materials, mortar droppings. Remove mortar droppings on connecting or adjoining work before its final set.
- B. Exposed Masonry: At completion of work, point holes in joints of exposed masonry surfaces, completely fill with mortar, tool properly. After pointing has set, hardened, wet exposed masonry surfaces. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials equal to Sure Klean 600 manufactured by ProSoCo, Inc. Cleaner must be approved by CMU manufacturer. Apply with stiff fiber brush, leave masonry clean, free of mortar daubs, with tight mortar joints throughout. Immediately after cleaning, rinse masonry surfaces with clear water. DO NOT USE PRESSURE SPRAY WASHER TO CLEAN OR RINSE OFF MASONRY.
- C. Protect all other trade's work and other items set into wall.
- D. Remove, replace defective materials, correct defective workmanship, and leave masonry clean.
- E. Replace defective mortar. Match adjacent work.
- F. Remove excess mortar and smears.
- G. Use non-metallic tools in cleaning operations.

3.13 WATERPROOFING

- A. At completion of cleaning, apply waterproof coating at exposed exterior CMU walls and where called for unless noted otherwise. Refer to Section 09 97 26, Special Coatings.
- 3.14 AIR / MOISTURE BARRIERS
 - A. Prior to installation of veneer at cavity wall construction with CMU backup, or metal panel system with CMU backup, apply Liquid-Applied Cavity Wall Moisture/ Air Barrier on all CMU walls where concealed in cavity wall. Refer to Section 07 27 26, Fluid Applied Weather Barrier System.

3.15 PROTECTION

- A. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- B. Provide protection without damaging completed work.
- C. At day's end, cover unfinished walls to prevent moisture infiltration. Secure cover down to prevent blow-off and maintain protection for fresh masonry work.

3.16 OBSERVATION AND SPECIAL INSPECTIONS

- A. CMU placement and CMU reinforcement and placement shall be periodically observed by the Architect/Engineer during laying of CMU units. Inspection of CMU placement and CMU reinforcement and placement for conformance to the construction documents shall be completed by the designated third party Special Inspector at a minimum frequency of two (2) times per week from start of production.
- B. Special Inspector Qualifications: Latest Edition of Arkansas Fire Prevention Code/ IBC. Allowable certifications include: Arkansas Licensed PE, Arkansas EIT working under a PE, ICC masonry certified technician, or NCMA (National Concrete Masonry Association) certified technician.

END OF SECTION

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SECTION 05 12 23

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. This section shall cover the furnishing, fabrication, erection and connection of all structural steel complete.

1.2 WORK INCLUDED & FURNISHED

- A. All labor, tools, materials, scaffolding, bracing, cranes, hoist, and other construction equipment required for the completion of the structure.
- B. Preparation of shop drawings.
- C. Furnishing and fabrication of all structural steel and miscellaneous metal work including beams, columns base plates, cap plates, bearing plates, angles, struts, bracing, girts, girders, connection material, fasteners, anchor bolts, shims, loose lintels, stiffeners, hangers, brackets, rods, and welding material.
- D. Shop and field painting.
- E. Shop and field connections including temporary bracing.
- F. Section 01 40 00 Quality Control: Required Special Inspections.

1.3 QUALITY ASSURANCE

- A. Fabricator's Qualifications: A qualified fabricator that is AISC Certified for conventional steel building structures. If fabricator is not an AISC certified plant, then the fabricator must meet the protocol for special inspection requirements of IBC, Section 1704, paragraphs 1704.2.5 and 1704.2.5.1. Documentation that one of the above requirements is met must be submitted to the Architect before starting shop drawings.
- B. Fabricate structural steel members in accordance with AISC "ASD Manual of Steel Construction".
- C. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- D. Fabricator: Company specializing in performing the work of this section with minimum 10 years of documented experience.

- E. Erector: Company specializing in performing the work of this section with minimum 10 years of documented experience.
- 1.4 RELATED SECTIONS
 - A. Section 01 40 00 Required Special Inspections
 - B. Section 03 30 00 Cast-in-Place Concrete
 - C. Section 05 50 00 Metal Fabrications

1.5 FURNISHED BUT INSTALLED ELSEWHERE

- A. Anchor Bolts, Loose Bearing Plates: Refer to Sections 2 and 7d of AISC Code of Standard Practice.
- B. Loose Lintels: Refer to Section 7f of AISC Code of Standard Practice.

1.6 STANDARDS

- A. Structural Steel fabrication, connections, detailing and erection shall be in accordance with the specifications for the "Design Fabrication and Erection of the AISC Manual of Steel Construction, unless indicated otherwise in these specifications or on plans.
- B. All structural steel shall conform to standard specifications for structural steel, ASTM A36, except:
 - 1. Wide Flanges and WT Tees ASTM A992, Fy=50 ksi
 - 2. Structural steel tubing ASTM A500, Fy=50 ksi.
 - 3. Structural Steel Pipe ASTM A501, Fy=35 ksi.
 - 4. Anchor Rods ASTM F1554, Grade 36
 - 5. Headed Stud Anchors ASTM A108, Fy=50 ksi.
 - 6. High Strength Bolts ASTM A325N unless noted otherwise

1.7 SHOP DRAWINGS

- A. Comply with Section 01 33 00. When corrections are required, reproducibles will be returned noting such. Drawings will then be corrected and resubmitted until final approval is received. Items not noted as requiring corrections may be fabricated after return of a previous submittal even though drawings shall be such that corrections noted on one sheet that affect another drawing will be transmitted and made on all sheets and also resubmitted.
- B. The Contractor will be responsible for checking quantities and dimensions in accordance with contract drawings. Where discrepancies in dimensions are noted, the Contractor shall notify the Architect of such discrepancies and corrected dimensions then will be furnished by the Architect. Contractor shall coordinate any dimension changes or additions with fabricator.

- C. Contract drawings receive precedence over shop drawings unless authorized in writing. Approval of shop drawings does not grant authorization of change to contract.
- D. Standard AWS symbols shall be used and shown for all welded connection details for both shop and field welds. Joint reference numbers as noted in part 4 of 7th Edition of AISC "Manual of Steel Construction" shall be shown where full strength welds are required.
- E. All splices and connections, both shop and field, shall be detailed on shop drawings.

1.8 PRODUCT HANDLING

- A. Delivery of materials to be installed under other sections:
 - 1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work.
 - 2. Provide setting drawings, templates, and directions for the installation of the anchor bolts.
- B. Storage of Materials
 - 1. Structural steel members which are stored at the project site shall be above ground on platforms, skids or other supports.
 - 2. Steel shall be protected from corrosion.
 - 3. Other materials shall be stored in a weather-tight and dry place, until ready for use in the work.
 - 4. Packaged materials shall be stored in their original unbroken package or container.

1.9 COOPERATION WITH OTHER WORK

A. Fabricator shall punch all necessary holes and provide the connection material required for the attachment of miscellaneous items, such as nailers, hangers and mechanical equipment framing. Contractor shall coordinate such work with all plans.

1.10 WORKMANSHIP

- A. All welding, both shop and field welding, shall be made by welders qualified by tests as prescribed in the "Code for Welding in Building Construction" (AWS D1.1-Current Edition).
- B. All fabrication and erection work shall be performed by skilled workmen, working under experienced supervision.

1.11 UNIT PRICES

A. Provide allowance of \$10,000 per ton for five (5) tons of miscellaneous beams, channels, and angles in addition to the steel framing shown on the plans and details. Contractor shall include additional allowance cost for fabrication, design, installation and erection

cost for the additional framing. Construction Manager is to record use and credit back unused cost to Owner.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All structural steel shall meet the specifications for "Structural Steel" (ASTM A36). Except wide flanges and tees shall conform to ASTM A992, Fy=50 ksi, steel tubes shall conform to ASTM A500, Grade C, Fy-50 KSI, and steel pipe shall conform to ASTM A501.
- B. Purlins and eave struts shall have a minimum 55,000 psi yield strength. Purlin and eave strut supplier shall submit calculations sealed by an Arkansas Professional Engineer, meeting the load and deflection requirements shown on the drawings.
- C. Filler Metal for Welding shall conform to one of the following:
 - 1. Manual Shielded Metal Arc Welding E70 Series of the "Specifications for Mild Steel covered Welding Electrodes" (AWS A51-Current Edition).
 - 2. Submerged Arc Welding F70 AWS-flux Series of the "Specifications for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding" AWS 5.17-96.
- D. Bolts
 - 1. High Strength Bolts shall be A325 bolts meeting the requirements of "Specification for Structural Joints Using ASTM A325 or A490 Bolts", including suitable nuts and plain hardened washers.
 - 2. Other bolts shall conform to "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners" (ASTM A307).

2.2 CONNECTIONS

- A. Type
 - 1. Unless indicated and detailed otherwise on plans, all connections shall be detailed and designed by the fabricator as unrestrained flexible connections described as Type 2 construction in Section A2.2 of the most current edition of the AISC manual of Steel Construction, but provisions must be made for excessive eccentric connections. All connections shall be in accordance with Part 4 and Part 5 of the above cited AISC Manual.
 - 2. Bolted Connections
 - a. All bolted connections, unless noted otherwise, shall be A325 high strength steel bolts, nuts and harden washers, conforming to the "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
 - b. All bolted connections, unless noted otherwise, shall be of bearing type with threads included in the shear planes. These bolts shall be snug tightened. The snug-tight condition is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.

- c. Bolts, nuts and washers shall conform to Tables 1 and 5 of Specifications and Commentary for "Structural Joints, Using ASTM A325 or A490 Bolts" of Current Edition of AISC Manual of Steel Construction.
- d. Bolted parts shall be fitted tightly together before bolt installation.
- e. All bolts shall have one nut and a hardened washer under the turning element.
- f. When surface of bolted part in contact with nut or bolt head exceeds a slope of 1:20 with respect to a plane normal to the bolt axis, smooth beveled washers shall be used.
- g. Bolt assembly and contact surfaces shall be free from scale, burrs, dirt and other foreign matter which might prevent solid seating.
- h. Minimum bolt size, unless noted otherwise, shall be 5/8" in diameter. Adequate "stick through" for bolts must be provided in accordance with section C2 and Table 6, pages 5-201 and 5-202 of reference cited in part c) of the section.
- i. All bolts at the column cap plates shall be installed with the bolt on top and the nut below the cap plate.
- 3. Welded
 - a. Minimum size of fillet weld permitted shall be 3/16", unless noted otherwise.
 - b. All surfaces to be welded shall be free from loose scale, slag, rust, grease, paint and other foreign materials.
 - c. All welding shall be in accordance with AWS "Structural Welding Code" (AWS D1.1-Current Edition) and as illustrated and described in "Welded Joints" in Part 4 of the 7th edition of the AISC Manual of Steel Construction.
 - d. Shop welding and field welding shall be performed by a certified welder in accordance with AWS D1.1-2000, licensed in the State of Arkansas.

PART 3 EXECUTIONS

3.1 FABRICATION

- A. Connections and Splices
 - 1. Shop connections and splices may be bolted or welded.
 - 2. All holes for bolts shall be punched or drilled without ragged or torn edges. Finished holes for bolts shall be 1/16 inch larger than nominal diameter of the bolt.

B. Metal Preparation

- 1. All metal shall be properly prepared before shop connections are made in accordance with welding and bolting requirements of these specifications, AISC and AWS standards.
- 2. All completed members shall be straight, without kinks, twists, bulges, bends and open joints.
- 3. Shearing, punching and cutting of materials shall be without torn or ragged edges.
- 4. Holes too small to meet above requirements shall be enlarged without distortion to the metal by reaming.
- 5. Bolted parts, when assembled, shall be fabricated so that the bolts will enter without distortion.
- 6. Compression members shall have milled or sawed shop ends and joints.

- 7. Open holes necessary for connection of other work shall be provided at time of fabrication. Contractor shall coordinate work with that of other trades.
- 8. Grind all factory or field welds where exposed to achieve smooth consistent surface. Field-apply primer (or galvanized paint if metal is galvanized) immediately following grinding.
- C. Painting
 - 1. All steel work except that encased in concrete or otherwise noted, shall receive one shop coat of a rust inhibitive paint meeting Federal Specification TT-P-636 with a minimum dry paint film thickness of 2.0 mils.
 - 2. All metal shall be free of dirt, grease, rust, mill scale, oil and other foreign material, and shall be wire brushed before painting.
- D. Tolerances
 - 1. Fabrication tolerances shall be in accordance with AISC Manual of Steel Construction- Current Edition.

3.2 ERECTION

- A. Precautions
 - 1. The Contractor shall take necessary precautions to secure all steel against movement during erection and that bracing as noted in the remainder of this section of the specifications is installed.
- B. Base Connections
 - 1. Anchor rods shall be placed and accurately located in footings, piers, and walls in advance of column erection.
 - 2. Column bases shall be set level, using steel shims on four corners and grouted solid to ensure full bearing contact on foundation or support material.
 - a. Grout shall be a minimum of 1" thick, high strength, non-metallic, non-shrink, damp packed consistency construction grout.
 - 3. Column bases are designed as unrestrained and all columns require temporary bracing until all framing and erection work is secure and in place.
- C. Field Connections
 - 1. Field connections may be either welded or bolted.
 - 2. As erection work progresses, all steel work shall be secured and fastened with either temporary or permanent connections.
 - 3. Bolts exposed to weathering or to earth shall be dipped in a rust inhibitive paint prior to installation.
 - 4. Gas cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect.
 - 5. All beams with or without bearing plates shall be set in 1 to 1 mix of sand and Portland cement so as to ensure full contact bearing.

- D. Bracing All structural steel shall be braced, guyed and stayed to prevent lateral or vertical movement against construction loads, dead loads, wind forces and erection forces. Such bracing shall remain in place until secured and all exterior walls are in place.
- E. Field Painting
 - 1. Damage of shop paint or exposed rusted metal spots shall be cleaned and painted before erection. Paint shall be same as applied by fabricator.
 - 2. After erection, all steel exposed to earth or weather shall be painted with a 2nd coat of rust inhibitive paint.
 - 3. After erection, all abrasions or damaged paint marks, including bolts, nuts and welds, shall be touched up with shop paint by the erector.
 - 4. See Section 09 91 00 for finish coats required.
- F. Tolerances Erection tolerances shall conform to part b) of section 7 of AISC "Code of Standard Practice for Steel Buildings and Bridges", as stated in the 7th Edition of AISC Manual of Steel Construction or most current edition.
- G. Purlins: Alignment of purlins shall vary no more than ¹/₄" at mid-span for 20'-0" lengths or 3/8" for 40'-0" lengths, measured transverse to purlin/girt span. This shall be checked by string-line from ridge to eave for purlins. Verification shall be given to Architect prior to panel installation that these minimum requirements have been achieved. Notify Architect 24 hours prior to verifying alignment.

3.3 IMPROPER FIT OF STEEL WORK

A. All framing or connections that do not properly fit, or are not located according to plans, shall be modified or replaced at contractor's expense. Contractor shall submit to the Architect drawings and proposals for modifications and replacement, for approval. No work shall proceed until approval is received, but temporary shoring and bracing shall be placed until approved corrections are made. Do <u>NOT</u> field cut or alter structural members without approval of the Architect/Engineer.

3.4 SPECIAL INSPECTIONS

A. Inspection of Steel structure placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third party Special Inspector.

END OF SECTION

SECTION 05 31 23

METAL DECKING - ROOF

PART 1 GENERAL

1.1 SCOPE

A. This section shall cover all furnishing, fabrication, connection and erection of steel roof deck complete.

1.2 WORK INCLUDED AND FURNISHED

- A. All labor, tools, materials, scaffolding, bracing hoists and other construction equipment required for the complete erection and installation of roof deck.
- B. Shop drawings showing complete erection details shall be submitted in quadruplicate to the Architect for approval before fabrication is begun.
- C. Furnishing of steel deck, accessories and clips necessary for the completed deck, including rubber type and closures.
- D. Shop and field painting.

1.3 RELATED SECTIONS

- A. Section 01 40 00 Quality Control: Required Special Inspections
- B. Section 05 12 23 Structural Steel
- C. Section 05 50 00 Metal Fabrications

1.4 STANDARDS

A. Design properties shall be computed in strict accordance with the latest edition of "Specifications for the Design of Light Gage Structural Members" of the AISI. Steel decking shall meet SDI Specifications and Certification.

PART 2 PRODUCTS

- 2.1 MATERIALS
 - A. Roof deck shall be manufactured from steel conforming to A-1008 having a minimum yield value of 33,000 P.S.I.
 - B. Steel roof deck as installed shall be capable of supporting a total load of 50 P.S.F. with a maximum bending stress of 20,000 P.S.I. with a maximum deflection of L/240 of the

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span for a live load of 30 P.S.F., but in no case shall properties of the deck be less than that indicated on plans or herein these specifications.

- C. Deck shall be steel sheets with a shop coat of primer.
- D. Steel Deck Types
 - 1 ¹/₂" Steel Deck: Deck shall have continuous integral ribs 1 1/2" deep, spaced no more than 6 1/4" on center. Ribs at bearing points shall be commonly referred to as "wide rib". Gauge of material shall be as noted on contract plans, but in no case shall be less than 22 gauge, `B' deck.
- PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Install roof deck units and accessories in accordance with manufacturer's recommendations and shop drawings.
- B. Placing Roof Deck Units.
 - 1. Position roof deck units on supporting steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before being permanently fastened.
 - 2. Lap ends not less than 2 1/2 inches. Laps shall occur at a support.
 - 3. Do not stretch or compress the side lap interlocks.
 - 4. Place deck units flat and square, and secure to adjacent framing without warp or deflection.
- C. Fastening Deck Units
 - 1. Secure roof deck units to supporting members with 5/8" diameter puddle welds at spacing as noted in structural notes on structural drawings or as otherwise indicated on structural drawings.
 - 2. Welding to conform to AWS D1.1-Current Edition.
 - 3. Side laps shall have 2 #10 screw fasteners between each support or welded according to structural notes on structural drawing.
- D. Cutting and Fitting
 - 1. Cut and fit roof deck units and accessories around projections through roof decking.
 - 2. Make cuts neat, square, and trim.
 - 3. Cut openings in roof deck true to dimensions using metal saws, drills or cutting torches.
 - 4. Do not use cutting torches where a finished appearance is required.
- E. Closure Strips: Install closure strips at all open uncovered ends and edges of roof decking, and in voids between decking and other construction.
- F. All erection work shall be coordinated with other trades to provide the necessary vents, hangers, openings, etc. required.

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- G. After installation, deck shall be a continuous, clean, dry surface ready for roofing materials.
- H Architect and structural engineer shall observe the finished roof deck prior to placing of covering materials.

3.2 JOINT SEALING

- A. Remove dust, dirt, and moisture from joint surfaces.
- B. Apply sealant in accordance with manufacturer's instructions.
- 3.3 TOUCH-UP PAINTING
 - A. Wire brush, clean and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - B. Touch-up shop painted surfaces with same paint used in shop, and apply as recommended by manufacturer.
 - C. Touch-up paint shall match existing paint in exposed areas.
- 3.4 SPECIAL INSPECTIONS
 - A. Inspection of steel deck placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third party Special Inspector.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials for installation of all load bearing metal stud walls, metal floor joist, and metal roof joist framing as indicated on drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Quality Control Section 01 40 00 Required Special Inspections
- B. Submittals Section 01 33 00
- C. Insulation Section 07 21 00
- D. Clips and Bracing Structural Drawings
- E. Metal Studs Section 09 22 16
- F. Drywall Section 09 29 00

1.3 REFERENCES

- A. AISI Standard for Cold-Formed Steel Framing General Provisions.
- B. AISI North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members Current Edition.
- C. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- D. ASTM A 780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- E. ASTM A 1003 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- F. ASTM C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- G. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- I. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- J. ASTM E 413 Classification for Rating Sound Insulation.
- K. GA-600 Fire Resistance Design Manual.

1.4 DESIGN REQUIREMENTS

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members" or the North American Specification for the Design of Cold-Formed Steel Structural members, except as otherwise shown or specified.
- B. Design loads: As indicated on the Architectural and Structural drawings.
- C. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - 1. Upward and downward movement of $\frac{3}{4}$ inch.
- D. Design exterior wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- E. Cold-Formed Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 - 1. Floor and Roof Systems: AISI S210
 - 2. Wall Studs: AISI S211
 - 3. Headers: AISI S212
 - 4. Lateral Design: AISI S213
- F. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provides materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing laboratory, and by UL 263. Products used in the assembly shall carry a classification label from the testing laboratory.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Submit manufacturer's product literature and data sheets for specified products, including standard framing members and factory-made framing connectors, showing compliance with the requirements of this specification.
- C. Manufacturer's certification of product compliance with codes and standards.
- D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention, and connection details.
- E. Manufacturer's Data: Submit copies of manufacturer's calculations, specifications and

installation instructions for each type of steel stud and accessories, including other data as may be required to show compliance with these specifications.

- F. Shop Drawings:
 - 1. Submit shop drawings and calculations showing complete details for the fabrication and erection of members showing size and gage designations, number, type, location and spacing of members.
 - 2. Submit details, schedules, procedures, and diagrams showing the sequence of erection.
 - 3. Include all components required for a complete framing system.
 - 4. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.
 - 5. Submit shop drawings for review prior to starting any work. Work performed prior to shop drawing review is at contractor's risk.
 - 6. Shop drawings shall be signed and sealed by a structural engineer experienced in the design of load bearing cold formed metal framing systems registered in the state of Arkansas.

1.6 QUALITY ASSURANCE

- A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.
- B. Contractor to conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this section with minimum five years documented experience in erecting load bearing metal stud construction.
- B. Metal Stud Engineer: Licensed Engineer specializing in performing the engineering work of this section with minimum five years documented experience in the design of load bearing metal stud construction, registered in the state of Arkansas.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Notify manufacturer of damaged materials received prior to installing.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C754 section 8.
- 1.9 MOCK-UP SAMPLE PANEL
 - A. Before commencing any work, contractor shall erect mock-up wall panels. Panel is NOT part of the building and is to remain in place until removal is authorized by the Architect.

- B. Approval of the Architect is required before proceeding with any part of the building.
- C. Panel is to remain in place until completion of the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. ClarkDietrich Building Systems, 9100 Pointe Drive, Suite 210, West Chester, OH. Phone: 513-870-1100. <u>www.clarkdietrich.com</u>, info@clarckdietritrich.com.
 - 2. Other manufacturers as referenced in this section for specific products.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- C. All products to be manufactured by current members of the Steel Stud Manufacturers Association (SSMA), Steel Framing Industry Associates (SFIA), or the Certified Steel Stud Association (CSSA).
- D. All studs and/or joists and accessories shall be of the type, size, gauge and spacing shown on the drawings. Exterior studs and load bearing studs shall have a minimum 1-5/8" flange with 1/2" return lip.
- E. All framing members shall be formed from steel, corresponding to the requirements of ASTM A653, with minimum yield strength of 33 ksi. All studs shall be galvanized.
- F. Where fire blocking is required or called for on drawings, provide blocking equal to prefabricated fire blocking manufactured by Metal-Lite, Inc., Placentia, CA (800) 886-6824. Provide blocking same width as metal stud.
 - 1. Provide where stud frame bypasses floors and where studs bypass roof.
 - 2. For draft-stopping with mineral wool refer to specification section 07 84 00.

2.2 MATERIALS

- A. Studs and Track: Non-load bearing ASTM C645; load bearing ASTM C 955; studs formed to channel shape with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Material Thickness: By Metal Stud Engineer. Refer to structural drawings for minimum thickness.
 - 2. Stud Depth: Refer to structural drawings.
 - 3. Flange width: By Metal Stud Engineer. Refer to structural drawings for minimum flange width.
 - 4. Coating: Galvanized G60 (Z180) coating minimum, complying with ASTM A1003.
 - 5. Provide components fabricated from ASTM A1008, Designation SS steel.
 - 6. Comply with requirements of structural drawings and structural shop drawings.
- B. Fasteners: Self-drilling, self-tapping screws; complying with ASTM C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections. 05 40 00-4

- C. Touch-Up Paint: Complying with ASTM A 780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- 2.3. FRAMING ACCESORIES: Provide accessories as required in this project.
 - A. Flat Strapping for Backing Strip.
 - B. Flat Strapping and bridging for lateral bracing.
 - C. L-Angles.
 - D. Plates, Gussets, Clips: Formed Sheet Steel, thickness as indicated on structural shop drawings; finish to match framing components.
 - E. SwiftClip Fixed Connection Angles or approved alternate.
 - F. Deflection Slip Connectors: "Verticlip" Series, manufactured by Steel Network, Inc, or approved alternate. Provide clip as required for each situation to compensate for deflection of structure.
 - G. Furring Hat Channel: At exterior locations for metal panel attachment
 - 1. Size: 087F125-43 7/8 inch (22mm) furring channel 43 mils (18 ga). Attached to Z-furring at exterior walls for attachment of finish metal wall panels. Locate hat channels at 48" o.c. max and connect to Z-furring w/ (2) #8 TEK screws at each furring.
 - H. Z-furring or Z-channel (manufactured by MBA metal framing)
 - 1. Size 1-1/2", 43 mils (18 ga)
 - a. Exterior stud walls with finish metal wall panel. Locate Z-furring vertically at 16" o.c. attached to each stud with #8 TEK screws at 12" o.c. max.
 - b. Exterior CMU walls with finish metal wall panel. Locate Z-furring vertically at 16" o.c. max. and shall be attached to the wall with Hilti X-U Powder Actuated Fasteners at 12"o.c. max. with 1" embedment depth.

PART 3 EXECUTIONS

A.1 FABRICATION

- A. Prior to fabrication of framing, the contractor shall submit fabrication and erection drawings to the Architect to obtain approval.
- B. Refer to structural shop drawings for fabrication notes for load bearing wall construction.
- C. Method of construction may be either piece by piece (stick built), or by fabrication into panels either on or off the site.
- D. Prefabricated panels shall be square, with components attached in a manner as to prevent racking and to minimize distortion while lifting.
- E. All framing components shall be cut squarely for attachment to perpendicular members, or, as required, for an angular fit against abutting members.
- F. Axially loaded studs shall be installed in a manner which will assure that their ends are positioned against abutting members.
- G. Fastening of components shall be with welding or with minimum 1 #8 screw both sides of flange. Welds shall conform to the requirements of AWS D.1.1, AWS D.1.3 and AISI Manual Section 4.2. All welds shall be touched up using zinc-rich paint. Wire tying will not be permitted.
- H. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of load bearing studs will not be permitted.
- I. Install headers in all openings in axially loaded walls that are larger than the stud spacing in the wall. Form headers as shown on drawings.
- J. Unless shown otherwise on drawings, brace top of metal stud walls to structure above at max. 4'-0" O.C. with minimum 20 gauge stud bracing.
- K. Insulation equal to that specified elsewhere shall be provided in all double jamb studs and doubled headers not accessible to insulation contractors.
- L. Care should be taken to allow for additional studs at intersections, corners, doors, windows, steel joists, diagonal bracing and as called for in the shop drawings.
- 3.2 ERECTION (AXIAL LOAD-BEARING).
 - A. Runners shall be securely anchored to the supporting structure as shown on the drawings. Refer to structural shop drawings for attachment of runners at load bearing walls.
 - B. Complete, uniform and level bearing support shall be provided for the bottom runner.
 - C. Abutting lengths of runner shall be butt-welded or spliced.
 - D. Studs shall be plumbed, aligned and securely attached to flanges of both upper and lower runners. Assure that studs in load bearing walls are resting firmly on bottom of lower runners and top of upper runners. Do not rely on screw connections alone to transfer loads from studs to runners.
 - E. Align stud web openings horizontally.
 - F. Secure studs to tracks using screw fastening method at both flanges. Refer to structural shop drawings for fastener requirements at load bearing walls.

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- G. Framing of wall openings shall include headers and supporting studs as shown on the drawings. Refer to structural shop drawings for framing of wall openings at load bearing walls.
- H. Temporary bracing, where required, shall be provided until erection is completed.
- I. Resistance to bending and rotation about the minor axis shall be provided by gypsum board and gypsum sheathing as per manufacturer's recommendations. If diaphragm rated materials is used, it must be installed prior to loading the wall. At load-bearing walls, channel bridging shall be provided at 4'-0" for the full height of the wall. Bridging shall be screwed to each stud.
- J. Structurally sheathed stud walls, as indicated on the structural drawings shall be provided at locations designated as "shear walls" for frame stability and lateral load resistance. Additional studs, when necessary, shall be positioned as indicated on drawings to resist the vertical components.
- K. Splices in studs shall not be permitted.
- L. Fabricate corners using a minimum of three studs.
- M. Install double studs (minimum) at wall openings, door and window jambs, not more than 2 inches from each side of openings. See structural shop drawings for additional stud requirements and stud construction.
- N. Brace load bearing stud framing system rigid until shear wall sheathing is in place and secure.
- O. Coordinate erection of studs with requirements of door frames, window frames, and masonry; install supports and attachments.
- P. Coordinate installation of wood bucks, anchors, and wood blocking to be placed within stud framing.
- Q. Blocking: Secure wood blocking to studs using self drilling, self tapping screws.
- R. See Structural Drawings for the locations of the "Verticlip SLB Series" slide clip, indicated as "deflection clip", as manufactured by Steel Network or approved alternate. Coordinate with stud size. Alternate products may be considered through the engineered shop drawing submittal.
- S. See Structural Drawings for the locations of the "Stiff Clip LB Series" stationary clip, indicated as "rigid clip", as manufactured by Steel Network or approved alternate. Coordinate with stud size. Alternate products may be considered through the engineered shop drawing submittal.

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- T. Coordinate stud wall bracing placement to work with installation of ductwork, piping, etc.
- 3.3 ERECTION TOLERANCES
 - A. Maximum Variation from True Position: 1/4 inch.
 - B. Maximum Variation of any Member from Plane: 1/4 inch.
- 3.4 SPECIAL INSPECTIONS
 - A. Inspection of cold formed steel for conformance to the construction documents and the IBC shall be completed by the designated third party Special Inspector.

END OF SECTION

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SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials for installation of miscellaneous metal products as indicated on plans and/or specified herein.

1.2 INTEGRATION WITH OTHER TRADES

A. Each Trade shall provide all items necessary to be built into masonry, concrete, tile, etc., prior to when needed. Construction Manager is to be responsible for coordination and scheduling of such items and coordinate installation with other trades.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 40 00 Quality Control: Required Special Inspections
- B. Section 03 30 00: Cast-in-Place Concrete:
- C. Section 09 91 00: Painting and Finishing

1.4 QUALITY

- A. Welders: Use only certified welders in accordance with AWS D1.1-Current Edition., licensed in the State of Arkansas
- B. Codes and Standards
 - 1. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", A.I.S.C.
 - 2. "Code for Welding in Building Construction", American Welding Society.
 - 3. Applicable codes and ordinances.

1.5 SHOP DRAWINGS

A. Comply with requirements of Section 01 33 00.

PART 2 PRODUCTS

2.1 METALS

A. Metals shall conform to applicable ASTM specifications, including but not limited to:1. Steel wide flanges and tees ASTM A992 with 50 KSI yield strength

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- 2. Standard steel pipe ASTM A501
- 3. Steel tubing ASTM A500, Grade C
- 4. Steel plate ASTM A36
- 5. Other Structural Steel ASTM A36
- 6. Bolts ASTM A307
- 7. Anchor Rods ASTM F1554, Grade 36
- 8. Exterior steel angle lintels and exposed steel plates and bent plates Galvanized finish, hot dipped, ASTM 385/385M-15, grade 65.

2.2 PAINT

- A. Primer paint: Manufacturer's standard, compatible with finish coat paint specified in Section 09 91 00.
- B. Dissimilar metals shall be protected from galvanic action by coating with one coat of zinc chromate primer prior to assembly.
- 2.3 MISCELLANEOUS ANCHORS:
 - A. Furnish anchor rods and miscellaneous anchors as required except where such items are specified in other sections of these specifications, or where customarily furnished with the items to be attached.

2.4 MISCELLANEOUS ITEMS

- A. Furnish and install where shown in accordance with drawings and details other items of miscellaneous metals except where same are specified in other sections of these specifications. These items to include, but not be limited to:
 - 1. Slip angles, stiffener channels, equipment frames, legs, supports, etc.
 - 2. All other materials, not specifically described, but required for a complete and proper installation.

2.5 ROOF ACCESS LADDER

- A. Steel Wall Ladder:
 - 1. Side Rails: 3/8 x 2-1/2" steel bar at 20 inches apart.
 - Rungs: 3/4 inch square textured solid steel rods (steel texture on steel) at 12 inches on center. Rungs to be "SlipNOT round rungs, grade 2, manufactured by W. S. Molnar Company, 800-754-7668. Alternate Rung: Model M6LRST2448 steel "Traction Tread" ladder rung, 11 gauge, Manufactured by McNichols.
 - a. Weld each rung to stringers.
 - 3. Space rungs seven inches from wall.
 - 4. Attach with steel mounting brackets welded to side rails.
 - 5. Finish: field painted finish to match metal panel
 - 6. Each step or rung shall be capable of supporting a single concentrated load of at least 250 pounds.

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- 7. If ladder extends 24'0" in height or higher, a personal fall arrest system or ladder safety system is to be provided, per OSHA requirements.
- 8. Shop fabricate, welded construction.

PART 3 EXECUTION

- 3.1 QUALITY CONTROL
 - A. All material shall be new, of the best quality, and subject to the approval of the Architect.
 - B. Weld or rivet permanent connections; do not use screws or bolts where they can be avoided.
 - C. Fastenings shall be concealed where practical, and heads countersunk where required. Use lock washers to prevent loosening.
 - D. Provide holes and connections for the work of other trades.
 - E. Welds in flat surfaces, where exposed in finished rooms, or where noted shall be ground smooth and exposed corners or edges shall be rounded where practicable.
 - F. All items shall be properly located, set level, plumb, square and in alignment, and shall be securely attached.
 - G. Grind all factory or field welds where exposed to achieve smooth consistent surface. Fieldapply primer (or galvanized paint if metal is galvanized) immediately following grinding. Paint all exposed steel per section 09 91 00.
 - H. Provide galvanized finish on exterior, exposed angle lintels, exposed steel plates and steel bent plates unless noted otherwise, Provide galvanized finish on other items where specified and called for.

3.2 TOUCH-UP PAINTING

- A. Wire brush, clean and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.
- B. Touch-up shop painted surfaces with same paint used in shop, and apply as recommended by manufacturer.
- C. Touch-up galvanized welded areas with Galvilite By ZRC Products Company, or approved equal.

3.3 SPECIAL INSPECTIONS

A. Inspection of miscellaneous metal placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third party Special Inspector.

END OF SECTION

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SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install all wood framing members, stripping, blocking, grounds, pressure treated wood, equipment curbs and cants, and other miscellaneous.

1.2 PRODUCT HANDLING

A. Protection:

- 1. Store all materials in such a manner as to ensure proper ventilation and drainage, and to protect against damage and the weather. Store in a well-ventilated building where not exposed to extreme changes of temperature and humidity.
- 2. Keep all materials clearly identified with all grade marks legible. Keep all damaged material clearly identified as damages, and store separately to prevent its inadvertent use.
- 3. Do not allow installation of damaged or otherwise non- complying material.
- 4. Use all means necessary to protect the installed work and materials of all other trades.
- 5. Protect all metal products with adequate waterproof outer wrappings.
- 6. Use extreme care in off-loading of lumber to prevent damage, splitting, and breaking of materials.

1.3 ECOLOGICAL PRESERVATION

A. Contractor will not use old growth Western Red Cedar, Sitka Spruce, Western Hemlock, Pacific Fir, or Coastal Redwood unless it is recycled. Only upon written request, under unusual circumstances, will use of any of these species be considered by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials herein specified: The best of their respective grades, conforming to grading rules of lumber association under which they are produced, thoroughly seasoned or kiln dried. Protect and cover in shipment and on job site.
- B. Framing lumber and miscellaneous blocking No. 2 Grade Douglas Fir, or Southern Pine, S4S in conformance with ASTM 245- 69 grading, or as otherwise specified on plans.
- C. Pressure treated wood:
 - 1. Use arsenic-free pressure treated lumber, Copper Azole Type-B (CA-B), Alkaline Copper Quat (ACQ), or approved equivalent product conforming to American Wood Preservers Association standards for use above ground in all places where lumber is used in contact with masonry work and concrete. Where used with roofing, at roof curbs, parapet caps,

roof edge member or roof cant strips, whether noted on plans or not, type MCA treatment is acceptable.

- 2. Use minimum 0.40 Lbs./Cu. Ft. retention for ground contact lumber, and 0.25 for above ground applications.
- 3. Pressure treated wood shall leave no apparent odor or stain in the completed work.
- 4. Fasteners shall be stainless steel or hot-dipped, galvanized conforming to ASTM A-153.
- D. Plywood and Lumber:
 - 1. Plywood to meet performance standards for its type as described in Product Standard PS 1 for Douglas Fir plywood. Provide exterior type plywood for permanently exposed plywood in outdoor applications.
 - 2. Provide lumber for structural carpentry using the following species provided grade for each is not lower than minimum shown:

Fir, Douglas - WCLIB, Standard

Pine, Southern Yellow - SPIB Rules, No. 2 Common

- 3. Pressure treat concealed wood including lumber, grounds, nailers, blocking, backing, rough framing, and lumber in contact with the ground, in contact with concrete or masonry within 24" of the ground, installed on or above roof deck, and as required, complying with published standards or the American Wood Preserver's Association.
- 4. Plywood not otherwise specified or not on the drawings: Douglas Fir or Southern Yellow Pine panels, C-D grade for concealed applications and A-C grade for exposed applications, meeting US product standard PS1. Furnish plywood for underlayment using underlayment grade with exterior glue.
- 5. Exterior Plywood: APA CDX, exposure 2 with exterior glue thickness as called for. Butt joint and tongue & groove. See drawings.
- 6. Interior Plywood: Thickness & type indicated on drawings; APA A-D INT, where exposed one side (ie. shelving, panel boards, etc.)
- E. Backer Board: Provide at roof side of all metal stud roof parapet walls.
 - 1. Backer board to be 5/8" thickness, type X.
 - 2. Roofing installer is responsible for providing any required priming for adhesion of roofing membrane.
 - 3. Protect the backer board from moisture and weather per manufacturer's recommendations.
 - 4. Acceptable products:
 - a. DensDeck Prime Roof Board by Georgia Pacific
 - b. Securock Gypsum -Fiber Roof Board by USG
- F. Exterior Sheathing Board: Refer to Section 09 29 00 Drywall.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Framing: Frame, fit closely, set framing according to required lines, levels and secure rigidly in place.

- B. Grounds and Blocking: Provide wood grounds and blocking of size and shape required to secure other work or equipment in place. NO METAL STRAPPING WILL BE ACCEPTED AS A SUBSTITUTE FOR WOOD BLOCKING. Set grounds true to line, level or plumb and well secured in place. Wood blocking or nailer on steel framing shall be bolted thereto. Provide solid grounds blocking in walls for wall hung or attached items and equipment (i.e. cabinets, countertop brackets and supports, wall mounted hardware, coat hooks, toilet accessories, etc.) Also provide wood blocking in walls and/or ceilings for all owner-provided items. Verify and coordinate with owner actual locations.
- C. Nails, spikes, screws and other anchoring items shall be of the approved size and type to secure the member in place if not called out on drawings.
- D. If approved by Architect, fir dimensional lumber and fir plywood may be used in lieu of pressure treated wood in concealed areas unless pressure treated wood is required by code. If pressure treated wood is used, secure with 304 or 316 stainless steel fasteners or other corrosive-resistant fasteners approved for use with pressure treated wood and approved by manufacturer. Install 30# felt paper over metal substrates or coat with bituminous material prior to installation of pressure treated wood products.
- E. Metal products in contact with pressure-treated wood must be corrosion resistant. Examples include flashing, termite shields, fasteners (e.g. nails, screws, and bolts), and all connecting hardware (e.g. joist hangers, straps, hinges, post anchors, and truss plates). Provide non corrosive separation material between such as felt paper, bituminous material, etc.
- F. Install weather-resistant barrier equal to Tyvek Commercial Wrap over exterior side of all plywood sheathing. Where abutting to other types of exterior sheathing board, extend beyond plywood sheathing a minimum of 6 inches.
- G. Defective materials shall be removed from the job site and replaced with acceptable materials at no additional cost to the Owner.
- H. Draft Stopping:
 - 1. Install 2 x stud depth wood draft stop blocking between studs where balloon framing occurs, installing at elevated floors and at roof plane where studs continue beyond floor or roof plane.

3.2 PROTECTION OF INSTALLED PRODUCT

- A. Any exposed exterior or interior plywood sheathing to be covered with temporary or permanent weather barrier within 24 hours following sheathing installation to prevent exposure to moisture or sunlight. Gypsum sheathing to be covered with temporary or permanent weather barrier within minimum time allowed by sheathing manufacturer.
- B. No plywood roof decking will be left exposed to moisture and sunlight. Weather barriers are to be installed immediately following installation of roof deck.

C. Schedule work so that wood framing for roof and exterior walls are covered with decking or sheathing as soon as possible to prevent weathering and warpage of framing materials.

3.3 GRADE STAMPS

- A. Framing lumber: Identify all framing lumber by the grade stamp of the Southern Pine Inspection Bureau.
- B. Plywood: Identify all plywood as to species, grade, and glue type by the stamp of the American Plywood Association.
- C. Other: Identify all other materials of this Section by the appropriate stamp of the agency listed in the reference standards.

3.4 CLEAN UP

A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the work. Clean up and remove from site the debris, cut ends, and sawdust.

END OF SECTION

06 10 00-4

SECTION 06 20 23

FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install items of finish carpentry and miscellaneous millwork, including all finish trim; fitting and installing all wood doors and frames; installing all finish hardware, and construction of job-built shelving.
- 1.2 RELATED WORK
 - A. Section 06 10 00 Rough Carpentry
 - B. Section 08 14 16 Wood Doors
 - C. Section 08 71 00 Finish Hardware
 - D. Section 08 81 00 Glass and Glazing
 - E. Section 09 91 00 Finishes

1.3 SHOP DRAWINGS

- A. Submit complete shop drawings for Architect's approval prior to fabrication of any millwork or trim.
- 1.4 REFERENCESA. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.
- 1.5 FIELD DIMENSIONS & COORDINATION
 - A. The millwork manufacturer is responsible for details and dimensions set in accordance with field measurements. The Contractor and the Millwork Supplier shall coordinate and correct any discrepancies prior to fabrication or placement of any work.
 - B. Coordinate clearances of door hardware items with lites and lite frames.
- 1.6 PRODUCT HANDLING AND DELIVERY
 - A. Contractor and Millwork Supplier are to coordinate all phases of the work provided in under this section to insure timely delivery and setting after building is sufficiently dry and climate controlled to protect the work.

06 20 23-1

PART 2 PRODUCTS

2.1 FINISH WOOD MATERIALS:

- A. When painted, material shall be close grained, smooth surface, suitable for painting. Species to be Poplar or other similar closed grain species with Architect's approval.
- B. All materials shall be of select material, with no splits, knots, or other defects.

2.2. LAMINATED PLASTICS

A. Furnish laminated plastic as detailed on drawings in strict accordance with manufacturer's recommendations. Joints shall not be located in random fashion and entire, one piece application shall be used wherever possible. Provide plastic edges where shown. Laminated plastic: "Formica", "Pionite", "Nevamar", "Wilson Art", or alternate approved by Architect. Color, pattern and finish shall be as selected by Architect.

PART 3 EXECUTION

3.1 WORKMANSHIP

- A. Frame, fit closely, and set accurately to required lines, levels, and secure rigidly in place.
- B. All interior trim is to be sanded smooth at job so that no sand marks, scratches, blemishes, etc., are noticeable after finish is applied.
- C. All interior trim against concrete or masonry or solid backings is to have hollow backs.
- D. Joints are to be mitered or angled to conceal shrinkage. Butt joints are not acceptable.
- E. Trim and moldings are to be set with finish nails, screws or glue, where required. All fastening devices are to be set and holes filled with similar material not noticeable after finish.
- 3.2 FINISH HARDWARE: See Section 08 71 00.
 - A. Installation only by this section. Cut, fit, and install without marring or injuring work. Examine hardware at completion of work; test, oil, grease, adjust, and perform all necessary work to insure correct operation.
 - B. Doorknobs, pulls, kick plates, push plates, etc., are to be fitted and installed before finishing, then removed and re- installed after finish work is completed.
- 3.3 WOOD DOORS: See Section 08 14 16
 - A. Installation only under this section. Fit, hang, trim as required.

06 20 23-2

B. Provide the following clearances:

Sides	1/16"
Тор	1/16"
Base (with threshold)	3/16"
Base (without threshold)	3/8 "

C. Install hardware as specified. Locksets and latches to have centers at 38" above finish floor unless otherwise stated. Coordinate location of locks with approved Hardware Schedule.

END OF SECTION

06 20 23-3

SECTION 07 10 00

WATERPROOFING AND DAMPPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish labor and materials to complete waterproofing and dampproofing shown and specified.
- B. Section Includes:
 - 1. Horizontal joint waterproofing
 - 2. Expansion joint fillers
 - 3. Below-slab vapor barrier

1.2 RELATED SECTIONS

- A. Section 03 30 00 Cast-In-Place Concrete
- B. Section 04 22 00 Concrete Unit Masonry
- C. Section 05 40 00 Cold Formed Metal Framing
- D. Section 07 62 00 Flashing and Sheet Metal
- E. Section 09 29 00 Drywall-Sheathing
- 1.3 SUBMITTALS
 - A. Comply with Section 01 33 00.

1.4 WARRANTY

- A. The Contractor must guarantee all materials and workmanship for a minimum period of two (2) years from the date of Substantial Completion of the building unless longer warranty periods are specified for individual specified products.
- B. The Contractor will, at any time within the two (2) year period, remedy all leaks of any nature in any part of the building due to the use of faulty materials and/or workmanship, without additional cost to the Owner. The Contractor shall further reimburse the Owner for any damage occasioned by such leaks.
- C. The Contractor is cautioned to supplement the work, described in this section of the specifications, by any means necessary to permit the above guarantee, which he will be called upon to make as an obligation of the Contract.

1.5 PRE-INSTALLATION MEETING

- A. The Contractor will schedule and conduct a pre-installation meeting for the following items:
 - 1. Underslab moisture barrier
- B. The following shall be in attendance:
 - 1. Contractor
 - 2. Architect
 - 3. Product supplier and or manufacturer's representative
 - 4. Installer

PART 2 PRODUCTS

2.1 MATERIALS:

- A. Horizontal expansion joint waterproofing of exterior slabs or slabs on grade: Tremco Vulkem #45 SSL Sealant as manufactured by Tremco, W.R. Meadows, Inc., or approved alternate. Color to be coordinated with Architect.
- B. Horizontal expansion Joint Filler: Asphalt impregnated expansion joint material. Provide "Zip Strip" type filler so that top ½" can be removed for sealant installation.
- C. Underslab Moisture Barrier: 15 mil thick virgin polyethylene, Approved Products and Manufacturers:
 - "Stego Wrap Class A", vapor barrier (15-mil)by Stego Industries, LLC, 877-464-7834, <u>www.stegoindustries.com</u>
 - Vaporguard by Reef Industries, 713-507-4250, <u>www.reefindustries.com</u>
 - Moistop Ultra 15 by Fortifiber, 800-773-4777, <u>www.fortifiber.com</u>
 - Perminator HP 15 mil by WR Meadows, 800-342-5976, <u>www.wrmeadows.com</u>
 - 1. Use High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4 inches. Sealing tape shall be coated with a high tack natural rubber adhesive.
 - 2. Waterproofing adhesive or mastic equal to Stego Mastic shall be a high quality, long lasting, asphalt-based material and shall be applied in accordance with its manufacturer's specification. Waterproofing adhesive shall be compatible for use with the vapor barrier and shall meet the applicable standards for the intended use. The installation contractor shall submit the product specification for Architect's review and approval prior to using the product.
 - 3. References
 - a. ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - b. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - c. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
 - d. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
 - e. ASTM E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

- 4. American Concrete Institute (ACI):
 - a. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- 5. Vapor barrier must have all of the following qualities:
 - a. Permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with ASTM E 1745 Section 7.
 - b. Other performance criteria:
 - i. Strength: ASTM E 1745 Class A.
 - ii. Thickness: 15 mils minimum
- 6. Quality control/assurance (Submit the following for Architect's approval):
 - a. Summary of test results as per paragraph 8.3 of ASTM E 1745.
 - b. Manufacturer's samples, literature.
 - c. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.
- D. Above-Grade Wall Waterproofing Membrane: Refer to section 07 27 26.
- E. Refer to Section 07 19 00 for exposed CMU damp-proofing.

PART 3 EXECUTION

3.1 WORKMANSHIP:

- A. Horizontal expansion joint waterproofing:
 - 1. All horizontal expansion joints shall be 1/2 inch asphalt impregnated expansion joint material with "zip-strip" feature. Insulation-type material will not be acceptable. Install to provide 1/2"depth below finish surface and apply sealant as called for above.
- B. Expansion joint Filler:
 - 1. All vertical expansion joints shall be 1/2 inch asphalt impregnated expansion joint material. Not Insulation. The top 1/2 inch of material shall be omitted and joint filled with caulking as specified in Section 07 92 00. All caulking shall be installed flush with wall surface.
- C. Below-Slab Vapor Barrier (15 mil below-slab):
 - 1. Prepare surfaces in accordance with manufacturers instructions.
 - 2. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643. All lap joints and areas to be sealed shall be free from dirt, dust, and moisture. Sealing tape shall be applied in temperatures ranging from 41°F to 122 °F or according to its manufacturer specification. Where inconsistencies occur between the project plans and specification and ASTM E1643, the project plans and specification shall govern.
 - 3. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
 - 4. Lap vapor barrier over footings and seal to foundation walls or top of footings with manufacturer approved sealant.
 - 5. Overlap joints 6 inches and seal with manufacturer's tape.
 - 6. Seal all penetrations (including pipes) with manufacturer's pipe boot and sealant.

- 7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
- 8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.
- 9. Pipe/Conduit Boots and Penetration Sealing:
 - a) Cut a piece of vapor barrier. Width: minimum 12 inches Length: one and one-half times the pipe circumference
 - b) With scissors, cut slits half the width of the vapor barrier.
 - c) Wrap boot around pipe and tape onto pipe, completely taping the base to vapor barrier using the polyethylene tape.
 - d) Install mastic around and through groups of conduit, grade stakes or piping, which cannot be sealed by taping. Seal to vapor barrier. As an allowable alternate method of penetration sealing in lieu of taping, mastic may be used to seal around single penetrations such as pipe, conduit, floor drains, etc. Confirm that the material mastic is installed at is compatible with the mastic prior to application.
- 10. Seal vapor barrier to top of footings with mastic where vapor barrier terminates at perimeter or interior footings. When vapor barrier terminates at concrete or CMU walls, seal with mastic. Do not apply mastic above top of finished slab elevation.
- D. Vertical Expansion Joint Filler: Protect from adjacent finish application. Prep substrate and install per Emseal instruction for application in which it is being installed.

END OF SECTION

07 10 00-4

SECTION 07 19 00

WATER REPELLENT COATING

PART I GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Water repellent coating to exterior concrete and masonry surfaces.
- B. Related Sections:
 - 1. Section 03 30 00 Cast-In-Place Concrete
 - 2. Section 04 22 00 Concrete Masonry Unit.

1.2 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- 1.3 QUALITY ASSURANCE
 - A. Applicator: Acceptable to coating manufacturer.
 - B. Field Sample: Apply coating to field sample described for material water repellent is to be applied to.
- 1.4 ENVIRONMENTAL REQUIREMENTS
 - A. Follow manufacturer's recommendations for temperature range in which coating may be applied.
 - B. Comply with National Volatile Organic Compound Emission Standards for Architectural coatings, Rule 40 CFR, Part 59, established by Environmental Protection Agency for VOC limits unless stricter local regulations are required.

1.5 GUARANTEE/WARRANTY:

- A. Provide 10-year warranty for water repellent coating on brick, precast, stone, and 5 year warranty for CMU guaranteeing the installation waterproof and watertight, except for structural cracks or opening caused by settling, expansion or contraction.
- B. Warranty Period: 10 years from date of Substantial Completion. Non-prorated labor and materials.

07 19 00-1

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER/PRODUCT

- A. Concrete Masonry Unit application:
 - 1. Blok-Guard & Graffiti Control 9. Manufacturer: ProSoCo.
 - 2. Prime-a-Pell Plus. Manufacturer: Chemprobe Corporation.
- B. Concrete application
 - 1. Blok-Guard & Graffiti Control 9. Manufacturer: ProSoCo.
 - 2. Prime-a-Pell Plus. Manufacturer: Chemprobe Corporation
- 2.2 SUBSTITUTIONS
 - A. Refer to Specification Section 01 60 00 for product substitution requests.
 - B. No substitution will be accepted 10 days prior to bid date.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify joint sealants are installed and cured.
- B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Remove loose particles and foreign matter.
- B. Remove oil or foreign substance with a cleaning agent which will not affect coating.
- C. Scrub and rinse surfaces with water and let dry.
- D. Protect adjacent surfaces not scheduled to receive coating.
- E. If applied on unscheduled surfaces, remove immediately, by approved method.
- F. Protect landscaping, property, and vehicles from over spray and drift.
- 3.3 APPLICATION
 - A. Delay work until masonry mortar is cured for seven days and weather forecast calls for hot, dry conditions. Follow manufacturer's directions for masonry cure periods before applying water repellent.

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- B. Apply coating (minimum 2 coats) in accordance with manufacturer's instructions, using appropriate method and coverage rate.
- C. Application:
 - 1. Surface must be clean and dry.
 - 2. Air temperature must be 50° F or higher during application.
 - 3. Re-pointing shall be allowed to dry for 72 hrs. minimum before application.
 - 4. All caulking and sealant work must be done prior to application and have a minimum of 12 hours of curing time or until set.
 - 5. All alkali or efflorescence to be cleaned and/or treated prior to application.
 - 6. Material to be applied with a 12" rundown.
 - 7. Mask off other finish materials, aluminum storefronts, windows, glass,etc. that are not scheduled to receive water repellent coating.
 - 8. Coverage must meet or exceed normal coverage rates stated by the manufacturer.
 - 9. Application may be low pressure sprayer (less than 200 psi or lower as recommended by manufacturer.

END OF SECTION

07 19 00-3

SECTION 07 21 00

INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services necessary for and reasonably incidental to complete insulation as called for below.

1.2 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- 1.3 QUALITY CONTROL
 - A. All packages and containers of foam plastic and foam plastic ingredients shall bear the label of an approved agency showing either the flame spread rating and smoke developed rating of the product at the thickness tested or the use for which the product has been listed.
 - B. All foam plastics or foam plastic cores in manufactured assemblies used in building construction shall have a flame spread rating of not more than 75 and shall have a smoke developed rating of not more than 450 when tested in the maximum thickness intended for use in accordance with ASTM E84.
 - C. The potential heat of foam plastic in any portion of the wall or panel shall not exceed 6000 BTU/sq.ft. of projected area as described by tests conducted in accordance with NFPA 259.
 - D. Foam plastic insulation, exterior coatings and facings tested separately shall have a flame spread rating of 25 or less and a smoke developed rating of 450 or less as determined in accordance with ASTM E 84.
 - E. Results of diversified or full scale fire tests reflecting an end use configuration shall be submitted to the Building Official demonstrating the assembly in its final form does not propagate flame over the surface or through the core when exposed on the exterior face to a fire source.
 - F. The edge or face of each piece of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number of definitive information describing the product or materials performance characteristics and approved agency's identification.
 - G. Insulating materials, concealed as installed shall have a flame spread rating of not more than 75 and a smoke developed rating of not more than 450. Insulating materials exposed as installed shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 450.

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PART 2 PRODUCTS

2.1 MATERIALS:

- A. Fiberglass batt type as manufactured by Owens Corning, Certainteed, Johns Manville or approved equal of thickness or R-value as shown on drawings, un-faced or kraft-faced, meeting smoke and flame spread rating as specified this section. All concealed and exposed insulation to meet minimum flame spread and smoke development ratings per this specification and governing code requirements.
- B. Rigid Fiberglass Insulation Board

1. Type 703 (3.0 PCF) and type 705 (6.0 PCF) manufactured by Owens Corning, or approved alternate. Refer to drawings for insulation thickness and density locations.

- C. Sound Attenuation Batts: 3 1/2" thick, un-faced fiberglass "Sonobatts", manufactured by Owens Corning, or approved alternate.
 - 1. Provide sound attenuation batts in stud walls surrounding each toilet and walls surrounding offices.
 - 2. Refer to drawings and finish schedule notes for other areas where sound attenuation batts are called for.
- D. Rigid Roof Insulation: Refer to individual roofing sections for description or insulation.

2.2 ACCESSORIES:

- A. Unfaced Batt Insulation Fasteners: Approved Manufacturer- Midwest Fasteners, Inc., 450 Richard St., Miamisburg, OH 45342 PH: (800) 852-8352Fax: (937) 866-4174 Email: <u>sales@midwestfasteners.com</u>
 - 1. Adhesively attached spindle-type anchors with washers for batt insulation. Plate formed from perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square, welded to projecting steel spindle with a diameter of 0.105 inch and length capable of holding insulation of thickness indicated securely in position with 1-1/2 inch square or diameter self-locking washers complying with the following:
 - 1. Washers formed from 0.016 inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place.
 - 2. Where anchors are located in ceiling plenums provide capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.\
 - 3. Provide spindle length as required for insulation thickness.
- B. Anchor Adhesive: Approved Manufacturer/Product: IHA-177 fastener adhesive, Midwest Fasteners, Inc. 450 Richard St., Miamisburg, OH 45342 PH: (800) 852-8352Fax: (937) 866-4174

Email: sales@midwestfasteners.com

1. Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

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PART 3 EXECUTION

3.1 WORKMANSHIP

A. Batt Insulation between metal studs

Friction-fit insulation between studs after cover material has been installed on one side of the cavity. When unfaced insulation is used, and in applications without a cover material or where the stud depth is larger than the insulation thickness, use Spindle-type anchors and washers as specified and adhered to inside face of sheathing or substrate at 1'-0" o.c.-staggered. When faced insulation is used, the attachment flanges may be taped to the face of metal stud prior to applying the interior finish.

- 1. Provide supplementary support to hold the product in place until finish surface is applied when insulation is installed in heights over 8 feet.
- 2. Coordinate to assure electrical conduits and water piping are held to the interior face side of the wall.
- 3. Unless other types of insulation is called for, install minimum 6" thick batt insulation (additional thickness as called for on drawings) above ceilings where attic space exists, and at roof where no attic space exists. Provide complete thermal seal between exterior and conditioned space.
- 4. Unless noted otherwise and in addition to locations called for on drawings and in specifications, batt insulation shall be installed in exterior wall studs and interior walls separating conditioned space from non-conditioned spaces (i.e. offices from warehouse). Provide the following minimum R values:
 - a. R-19 at nominal 6" stud walls.
 - b. R-11 at nominal 3-5/8" stud walls.
- B. Fiberglass wall insulation and sound attenuation batts shall be friction fit, with electrical conduits and water piping held to the interior face side of the wall. When unfaced insulation is used, and in applications without a cover material or where the stud depth is larger than the insulation thickness, use wire or metal straps to hold insulation in place, maximum spacing 2'-0" o.c.
 - 1. Install tight to sides of studs.
- C. Rigid Fiberglass Insulation Board
 - 1. Install and adjust panels to lines and levels to provide accurate alignment and reveal widths as detailed.
 - 2. Provide an adhesive compatible with panel and substrate behind. Install panels using adhesive applied continuously across the back of the panel according to the manufacturer's recommendation. Core shall make continuous contact with substrate after installation.

END OF SECTION

07 21 00-3

SECTION 07 21 30

PRE-ENGINEERED BUILDING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pre-Engineered Building Insulation for New Construction.
- B. Pre-Engineered Building Insulation for Existing Construction.

1.2 RELATED SECTIONS / DIVISIONS

- A. Section 13 34 16 Pre-Engineered Metal Buildings.
- B. Division 21 Fire Suppression
- C. Division 22 & 23 Mechanical; Rough-in utilities.
- D. Division 26 Electrical; Rough-in utilities.

1.3 REFERENCES

- A. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E 96 Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure B).
- C. ASTM C 665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials.
- E. UL 723 Tests for Surface Burning Characteristics of Building Materials.
- F. ASTM C 1136 Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

1.4 DESIGN REQUIREMENTS

- A. Thermal Resistance of Installed System: R-Value of R-30
- B. Insulating system shall have a continuous vapor barrier inside of building purlins,

girts, and insulation to provide complete isolation from inside conditioned air.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. <u>Product Data</u>: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions.
- C. Shop Drawings: Indicate locations of connections and attachments, general details, anchorages and method of anchorage and installation.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square or long, representing actual products required for this project.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing product systems specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section.
- C. Insulation system components to include a ten-year limited material warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products indoors and protect from moisture, construction traffic, and damage.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Thermal Design, Inc., Simple Saver System. P.O. Box 468, 601 N. Main Street, Madison, NE 68748. ASD. Tel: (800) 255-0776 or (402) 454-6591. Fax: (402) 454-2708. Email: <u>sales@thermaldesign.com</u>, www.thermaldesign.com.
- B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

- A. Simple Saver System consists of Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components in a proprietary insulation system as follows:
 - 1. Batt Insulation: ASTM C 991 Type 1; preformed formaldehyde-free glass fiber batt. conforming to the following:
 - a. Batt Size: Equal to purlin/girt spacing by manufacturer's standard lengths.
 - b. Unfaced.
 - 2. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:
 - a. R-13 + R-13 as required by code.
 - 3. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as follows:
 - a. R-19; 6 inches (152 mm).
 - 4. Vapor Barrier Liner Fabric: Syseal® type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous colored polyethylene coatings, as follows:
 - a. Product complies with ASTM C 1136, Types I through Type VI.
 - b. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
 - c. Flame/Smoke Properties:
 - 1) 25/50 in accordance with ASTM E 84.
 - 2) Self-extinguishes with field test using matches or butane lighter.
 - d. Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
 - e. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - f. Provide with factory triple, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
 - g. Factory-folded to allow for rapid installation.

h. Color:

1) Gray

- 5. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.
- 6. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch (19 mm) wide by 1/32 inch (.79 mm) thick.
- 7. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches (76 mm) wide made from same material as Syseal® type liner fabric.
- 8. Thermal Breaks:
 - a. 3/16 inch (4.7 mm) thick by 3 inch (76 mm) wide white, closed-cell polyethylene foam with pre-applied adhesive film and peel-off backing.
 - b. Polystyrene Snap-R snap-on thermal blocks.
 - c. Minimum R value 3.5
- 9. Straps:
 - a. 100 KSI minimum yield tempered, high-tensile-strength steel.
 - b. Size: Not less than 0.020 inch (0.50 mm) thick by 1 inch (25 mm) by continuous length.
 - c. Color:
 - 1) Gray.
- 10. Fasteners:
 - a. For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
 - b. For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
 - c. For wood, concrete, other materials: As recommended by manufacturer.
- 11. Wall Insulation Hangers: Fast-R preformed rigid hangers, 32 inch (813 mm) long galvanized steel strips with barbed arrows every 8 inches (203 mm) along its length.

PART 3 EXECUTION

- 3.1 EXAMINATION
 - A. Verify that building structure including all bracing and any concealed building systems are completed and approved prior to installing liner system and insulation in the structure.
 - B. Correct any unsatisfactory conditions before proceeding.
 - C. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION - GENERAL

A. Install pre-engineered building insulation system in accordance with manufacturer's installation instructions and the approved shop drawings.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install in exterior spaces without gaps or voids. Do not compress insulation.
- D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- E. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.

3.3 ROOF INSULATION INSTALLATION

- A. Straps:
 - 1. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
 - 2. Tension straps to required value.
- B. Vapor Barrier Fabric:
 - 1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - 2. Position pre-folded fabric on the strap platform along one eave purlin.
 - 3. Clamp the two bottom corners at the eave and also centered on the bay.
 - 4. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.
 - 5. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
 - 6. Trim edges and seal along the rafters.
 - 7. All seams must be completely sealed and stapled seams not acceptable.
- C. Insulation:
 - 1. Unpack, and shake to a thickness exceeding the specified thickness.
 - 2. Ensure that cavities are filled completely with insulation.
 - 3. Place on the vapor barrier liner fabric without voids or gaps.
 - 4. Place top layer of insulation over and perpendicular to the purlins without voids or gaps, as roof sheathing is applied.
 - 5. Place thermal block on top of purlins or bottom of purlins for retrofit work, if no other thermal break exists.
 - 6. Place new insulation between purlins at the required thickness for the R-value specified.
- D. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.

3.4 WALL INSULATION INSTALLATION

A. Insulation:

- 1. Install thermal break to exterior surface of girts as wall sheathing is applied.
- 2. (Optional) Install self-sticking foam thermal break to interior surface of girts prior to installation of insulation.
- 3. Position and secure Fast-R hangers to girts on the inside face of the wall sheathing.
- 4. Cut insulation to required lengths to fit vertically between girts.
- 5. Fluff the insulation to the full-specified thickness.
- 6. Neatly position in place and secure to Fast-R hangers.
- 7. Ensure that cavities are filled completely with insulation.
- B. Vapor Barrier Fabric:
 - 1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - 2. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.
 - 3. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
 - 4. All seams must be completely sealed and stapled seams not acceptable.
- C. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.

3.5 CLEANING

- A. Clean dirt or exposed sealant from the exposed vapor barrier fabric.
- B. Remove scraps and debris from the site.

3.6 PROTECTION

- A. Protect system products until completion of installation.
- B. Repair or replace damaged products before completion of insulation system installation.

END OF SECTION

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FLUID-APPLIED WEATHER BARRIER SYSTEM

PART 1 GENERAL

1.1 SUMMARY:

- A. Work of this section includes window and door flashing, air and water-resistive barrier membrane system, and accessory materials for application to exterior building envelope substrates unless indicated otherwise on the drawings and specifications.
- B. Related work:
 - 1. 03 30 00 Cast in Place Concrete
 - 2. 04 22 00 Concrete Unit Masonry
 - 3. 06 10 00 Rough Carpentry
 - 4. 07 62 00 Sheet Metal flashing
 - 5. 07 92 00 Joint Sealants
 - 6. 08 11 13 Hollow Metal Doors & Frames
 - 7. 08 43 13 Alum Storefronts
 - 8. 09 29 00 Drywall: Exterior Sheathing
- 1.2 PERFORMANCE REQUIREMENTS:
 - A. Performance requirements: Comply with the specified performance requirements and characteristics as herein specified.
 - B. Performance description:
 - 1. The building envelope shall be constructed with a continuous, air and waterresistive barrier to control water and air leakage into and out of the conditioned space.
 - 2. Joints, penetrations and paths of water and air infiltration shall be made watertight and airtight.
 - 3. System shall be capable of withstanding positive and negative combined wind, stack and HVAC pressures on the envelope without damage or displacement.
 - 4. System shall be installed in an airtight and flexible manner, allowing for the relative movement of systems due to thermal and moisture variations.

1.3 SUBMITTALS:

- A. Product data: Submit manufacturer's product data including membrane and accessory material types, technical and test data, composition, descriptions and properties, installation instructions and substrate preparation requirements.
- B. Shop Drawings: Provide Installation Guideline Illustrations.

1.4 QUALITY ASSURANCE:

- A. Applicable standards, as referenced herein: ASTM International (ASTM).
- B. Manufacturer's qualifications: Air and water-resistive barrier systems shall be manufactured and marketed by a firm with a minimum of five (5) years experience in

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the production and sales of air and water-resistive barrier system. Manufacturers proposed for use, but not named in these specifications, shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

- C. Installer's qualifications: The installer shall demonstrate qualifications to perform the work of this section by submitting the following:
 - 1. Verification that installer has been trained by and is approved to perform work as herein specified by air and water-resistive barrier system manufacturer.
 - 2. A firm experienced in applying similar materials on similar size and scoped projects.
 - 3. Evidence of proper equipment and trained field personnel to successfully complete the project.
- D. Inspection and testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover installed products or assemblies until they have been inspected, tested and approved.
- E. Sole source: Obtain materials from a single manufacturer.
- F. Regulations: Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOC).
- G. Pre-installation conference: Prior to beginning installation of air and water-resistive barrier system, hold a pre-installation conference to review work to be accomplished.
 - 1. Contractor, Architect, installing subcontractor, membrane system manufacturer's representative, and all subcontractors who have materials penetrating membrane system or finishes covering membrane system shall be present.
 - 2. Contractor shall notify Architect at least seven days prior to time for conference.
 - 3. Contractor shall record minutes of meeting and distribute to attending parties.
 - 4. Agenda: As a minimum discuss:
 - a. Surface preparation.
 - b. Substrate condition and pretreatment.
 - c. Minimum curing period.
 - d. Special details and sheet flashing.
 - e. Sequence of construction, responsibilities, and schedule for subsequent operations.
 - f. Installation procedures.
 - g. Inspection procedures.
 - h. Protection and repair procedures.
 - i. Review and approval of all glazing applications.
 - 5. Applicator to prepare a mockup of system at an opening, showing all aspects of the weather barrier system.
- H. Mock-up:
 - 1 Prior to installation of the weather and air barrier system a field-constructed mockup shall be applied to verify details and tie-ins, to demonstrate the required installation.
 - a. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window, door frame, sill, penetrations, insulation, flashing and any other critical junction.

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- b. Allow 72 hours for inspection and testing of mock-up before proceeding with weather and air barrier work.
- c. Coordinate construction of mockups to permit inspection by Architect of air barrier before beginning installation.
- d. Approved, undamaged mock-up must remain as part of the work.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.
- B. Protect air and water-resistive barrier components from freezing and extreme heat.
- C. Sequence deliveries to avoid delays, and to minimize on-site storage.

1.6 **PROJECT CONDITIONS:**

- A. Weather conditions: Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used.
 - 1. Apply at surface and ambient temperatures recommended by the manufacturer. See manufacturer's product data sheets for best practices.
 - 2. Proceed with installation only when the substrate construction and preparation work are complete and in condition to receive the membrane system.
 - 3. Exposure limitations: Schedule work to ensure that air and water-resistive barrier system is covered and protected from UV exposure within 180 days of installation. If air and water-resistive barrier membrane system cannot be covered within 180 days after installation, apply temporary UV protection as recommended by membrane manufacturer.

1.7 WARRANTY:

- A. Manufacturer's warranty requirements: Submit manufacturer's written warranty stating that installed air and water-resistive barrier materials are watertight, free from defects in material and workmanship, and agreeing to replace defective materials and components.
- B. Warranty period: Five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER:

- A. PROSOCO, Inc, 3741 Greenway Circle, Lawrence, KS 66046. Phone (800) 255-4255; Fax: (800) 877-2700. E-mail: <u>CustomerCare@prosoco.com</u>
- B. Approved Alternate: AirShield LMP, manufactured by W.R. Meadows (800)-342-5976
- C. Substitutions: Comply with Section 01 60 00.

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2.2 R-GUARD GYPPRIME WATER BASED PRIMER FOR RAW GYPSUM BOARD EDGES:

A. PROSOCO R-GUARD[®] PorousPrep or equivalent by W.R. Meadows.

Description: PROSOCO R-Guard® PorousPrep seals the dry, cut edges of gypsum wall boards exposed in rough openings for windows and doors. PorousPrep brushes on easily and efficiently. Its glue-like viscosity reduces rundown and potential for spills. PorousPrep usually dries in less than 30 to 60 minutes when applied to dry surfaces. The sealed edge is a perfect surface for easy application of R-Guard Joint & Seam Filler or FastFlash.

- B. Characteristics:
 - 1. Form: light blue viscous liquid, mild odor
 - 2. Specific Gravity: 1.02
 - 3. pH: 9.0
 - 4. Weight per Gallon: 8.49 pounds
 - 5. Active Content: 16 percent
 - 6. Total Solids: 16 percent ASTM-D-2369
 - 7. Volatile Organic Content (VOC): less than 100 grams per Liter
 - 8. Flash point: greater than 212 degrees Fahrenheit (greater than 100 degrees Celsius) ASTM-D-3278
 - 9. Freeze Point: 32 degrees Fahrenheit (0 degrees Celsius)
 - 10. Shelf Life: 2 years in tightly sealed, unopened container
 - 11. VOC: Less than 100 grams per liter.
- 2.3 R-GUARD JOINT & SEAM FILLER FIBER REINFORCED FILL COAT AND SEAM FILLER:
 - A. Acceptable product: PROSOCO R-GUARD[®] Joint & Seam Filler or equivalent by W.R. Meadows.
 - B. Description: Joint & Seam Filler is a high modulus, gun-grade, crack and joint filler, adhesive and detailing compound that combines the best silicone and polyurethane properties. This single-component, 99% solids, fiber-reinforced, Silyl-Terminated-Poly-Ether (STPE) is easy to gun, spread and tool.

C. Characteristics:

- 1. Thickness: Apply according to manufacturer's instructions. See product data sheet.
- 2. Hardness: Shore A, 45-50 when tested in accordance with ASTM C661.
- 3. Water vapor permeability: Minimum 14 perms when tested in accordance with ASTM E-96.
- 4. Tensile strength: 225 psi when tested in accordance with ASTM D412.
- 5. Lap shear strength: 275 psi when tested in accordance with ASTM D1002.
- 6. Elongation at break: 275% when tested in accordance with ASTM D412.
- 7. Peel strength: 30 pli when tested in accordance with ASTM D1781.
- 8. Shrinkage: None.
- 9. Form: pale red, gun-grade sealant
- 10. Specific gravity: 1.40 to 1.50
- 11. pH: not applicable
- 12. Weight per gallon: 11.8 pounds

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- 13. Active content: 99 percent
- 14. Total solids: 99 percent
- 15. Volatile organic content (VOC): 30 grams per Liter, maximum
- 16. Flash point: no data
- 17. Freeze point: no date
- 18. Shelf life: 1 year in tightly sealed, unopened container

2.4 R-GUARD FASTFLASH[®] LIQUID-APPLIED FLASHING MEMBRANE

- A. Acceptable product: PROSOCO R-GUARD[®] FastFlash[®] or equivalent by W.R. Meadows.
- B. Description: FastFlash[®] is a gun-grade waterproofing, adhesive and detailing compound that combines the best of silicone and polyurethane properties. This single component, 99% solids, Silyl-Terminated-Poly-Ether (STPE) is easy to gun, spread and tool to produce a highly durable, seamless, elastomeric flashing membrane in rough openings of structural walls.
- C. Characteristics:
 - 1. Thickness: Apply according to manufacturer's instructions.
 - 2. Water vapor permeability: Minimum 14 perms when tested in accordance with ASTM E96.
 - 3. Water penetration (cyclical static air pressure difference): No uncontrolled water penetration when tested in accordance with ASTM E547.
 - 4. Hardness: Shore A, 40-45 when tested in accordance with ASTM C661.
 - 5. Tensile strength: 180 psi when tested in accordance with ASTM D412.
 - 6. Elongation at break: 400% when tested in accordance with ASTM D412.
 - 7. Peel strength: 25 pli when tested in accordance with ASTM D1781.
 - 8. Form: Brick Red, Gun Grade Sealant.
 - 9. Specific gravity: 1.45 to 1.60
 - 10. pH: not applicable
 - 11. Weight per gallon: 12.5 pounds
 - 12. Active content: 99 percent
 - 13. Total solids: 99 percent
 - 14. Volatile organic content (VOC): 30 grams per Liter, maximum
 - 15. Flash point: no data
 - 16. Freeze point: no data
 - 17. Shelf life: 1 year in tightly sealed, unopened container

2.5 R-GUARD SPRAY WRAP MVP (MAXIMUM VAPOR PERMEABILITY) AIR AND WATER-RESISTIVE BARRIER

- A. Acceptable product: PROSOCO R-GUARD[®] MVP or AirShield LMP, manufactured by W.R. Meadows
- B. Description: SPRAY WRAP MVP is a fluid-applied air and water-resistive barrier that stops air and water leakage in cavity wall, masonry veneer construction, as well as in stucco, EIFS and most other building wall assemblies. Once on the substrate, the easily applied liquid quickly dries into a rubberized, highly durable, water-resistant, vapor-permeable membrane.

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- C. Characteristics:
 - 1. Thickness: Apply in accordance with manufacturer's instructions. See product data sheet.
 - 2. Air infiltration: Less than 0.004 cfm per square foot (0.02 L/s/sq m) when tested in accordance with ASTM E2178 or ASTM E283.
 - 3. Air Barrier Assembly: pass when tested in accordance with ASTM E2357.
 - 4. Water vapor permeability: Minimum 17 perms when tested in accordance with ASTM E96.
 - 5. Structural performance: Air and water-resistive barrier system shall withstand positive and negative wind pressure loading when tested in accordance with ASTM E330.
 - 6. Water penetration (static pressure): No uncontrolled water penetration when tested in accordance with ASTM E331.
 - 7. Tensile strength: Greater than 15 psi or exceeds strength of substrate when tested in accordance with ASTM C297.
 - 8. Nail Sealability: pass when tested in accordance with ASTM D1970.
 - 9. Flexibility: pass when tested in accordance with ASTM D522.
 - 10. Form: thin, milky batter-like mixture
 - 11. Specific gravity: greater than 1.31
 - 12. pH: 7.5 to 10.0
 - 13. Weight per gallon: 12.2 pounds
 - 14. Active content: no data
 - 15. Total solids: 68 to 72 percent by volume, ASTM-D-2369
 - 16. Volatile organic content (VOC): less than 18 grams per Liter
 - 17. Flash point: not applicable
 - 18. Freeze point: 32 degrees Fahrenheit (0 degrees Celsius)
 - 19. Shelf life: 2 years in tightly sealed, unopened container
- 2.6 R-GUARD AIRDAM[®] AIR AND WATERPROOF SEALANT FOR WINDOWS AND DOORS:
 - A. Acceptable product: PROSOCO R-GUARD[®] AirDam[®]
 - B. Description: AirDam[®] is a medium modulus sealant that combines the best silicone and polyurethane properties. This single component, 98% solids Silyl-Terminated-Poly-Ether (STPE) is easy to gun and tool in all weather conditions. AirDam[®] cures quickly to produce a durable, high performance, high movement elastomeric interior air sealant

C. Characteristics:

- 1. Hardness: Shore A, 20-25 when tested in accordance with ASTM C661.
- 2. Tensile strength: 110 psi when tested in accordance with ASTM D412.
- 3. Elongation at break: 1300% when tested in accordance with ASTM D412.
- 4. Peel strength: 30 pli when tested in accordance with ASTM D1781.
- 5. Type: Type S, Grade NS, Class 50 when tested in accordance with ASTM C920.
- 6. Shrinkage: None.
- 7. Form: heavy white paste, mild odor
- 8. Specific gravity: 1.3 to 1.4
- 9. pH: not applicable
- 10. Weight per gallon: 11.648 pounds
- 11. Active content: 98 percent
- 12. Total solids: 98 percent
- 13. Volatile organic content (VOC): 30 grams per Liter, maximum
- 14. Flash point: greater than 200 degrees Fahrenheit (greater than 93 degrees Celsius)

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15. Freeze point: not applicable

16. Shelf life: 1 year in tightly sealed, unopened container

D. Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth.

PART 3 EXECUTION

3.1 EXAMINATION:

- A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify design professionals in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, clean and free of grease, dirt, excess mortar or other contaminants. Fill or bridge damaged surfaces, voids or gaps larger than one-half (1/2) inch with mortar, wood, metal, sheathing or other suitable material, as necessary. Fill voids and gaps measuring one-half (1/2) inch or less with R-GUARD Joint & Seam Filler as necessary to ensure continuity.
 - 1. Surfaces to receive R-GUARD MVP may be dry or damp. Do not apply to surfaces which are sufficiently wet to transfer water to the skin when touched. Surfaces must be protected from rain for 2 hours following application.
 - 2. Surfaces to receive FastFlash[®], Joint & Seam Filler, and AirDam[®] may be dry, damp or wet to the touch. Brush away any standing water which may be present before application. The products will tolerate rain immediately after application
- C. Where curing materials are used they must be clear resin based without oil, wax or pigments
- D. Condition materials to room temperature prior to application to facilitate extrusion and handling.
- E. Prior to installation of veneer at cavity wall construction or metal wall panels with CMU and/or exterior gypsum board sheathing backup, apply fluid-applied moisture barrier on all walls where concealed behind masonry veneer, metal wall panels, or similar material where a cavity is created unless called out otherwise.

3.2 SURFACE PREPARATION:

- A. Air, water-resistive and waterproofing membrane and accessories may be applied to green concrete 16 hours after removal of forms.
- B. Refer to manufacturer's product data sheets for requirements for condition of and preparation of substrates.
 - 1. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions.
 - 2. Remove contaminants such as grease, oil and wax from exposed surfaces.
 - 3. Remove dust, dirt, loose stone and debris.
 - 4. Use repair materials and methods that are acceptable to manufacturer of the air and water-resistive barrier system.
 - 5. The PROSOCO R-GUARD[®] product line includes several options for preparing structural walls to receive the primary air and water resistive barrier. Refer to

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manufacturer's product data sheets and R-GUARD Installation Guidelines for additional information.

- C. Exterior sheathing:
 - 1. Ensure that sheathing is properly installed with ends, corners and edges properly fastened.
 - 2. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing, fastened and spotted with R-GUARD Joint & Seam Filler and fastened into solid backing.
 - 3. Consolidate and seal the cut edges of gypsum wall boards exposed in rough openings for windows and doors at corners. The treated edge provides a suitable surface for application of R-GUARD Joint & Seam Filler fiber-reinforced coat and seam treatment.
- D. Masonry and concrete substrates:
 - 1. Mortar joints on concealed areas where fluid applied cavity wall weather barrier is to be applied must be fully filled with no voids, holes, or cracks, struck flush with the face of CMU.
 - 2. Mechanically remove loose mortar fins, mortar accumulations and protrusions, and debris.
- 3.3 INSTALLATION OF JOINT TREATMENT (PREPARE):
 - A. Before applying complete weather barrier system, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for PROSOCO R-GUARD[®] MVP. Refer to the Product Data Sheet for additional information about application.
 - B. Apply R-GUARD Joint & Seam Filler for seams, joints, cracks, gaps, primed rough gypsum edges at sheathing, rough openings:
 - 1. Fill or repair cracks larger than one-half inch.
 - 2. Fill surface defects and over driven fasteners with R-GUARD Joint & Seam Filler.
 - 3. Using a dry knife, trowel or spatula, tool and spread the product. Spread one inch beyond seam at each side to manufacturer's recommended thickness. See product data sheet.
 - 4. Allow to skin before installing other waterproofing or air barrier components.
 - 5. Apply in accordance with manufacturer's Application Guideline illustrations.
- 3.4 R-GUARD FASTFLASH[®] FLASHING AT WINDOWS, DOORS, OPENINGS AND PENETRATIONS (PREPARE):
 - A. Apply R-GUARD FastFlash[®] over surfaces prepared with R-GUARD Joint & Seam Filler to seal and waterproof rough openings:
 - 1. Apply a thick bead of R-GUARD FastFlash[®] over any visible gaps in the prepared rough opening.
 - 2. Immediately press and spread the wet product into gaps.
 - 3. Allow treated surface to skin.
 - 4. Starting at the top, apply a thick bead of R-GUARD FastFlash[®] in a zigzag pattern to the structural wall surrounding the rough opening.
 - 5. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural

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wall. Apply and spread additional product as needed to create an opaque, monolithic flashing membrane free of voids and pin holes.

- 6. Apply additional product in a zigzag pattern over a structural framing inside the rough opening.
- 7. Apply R-GUARD FastFlash[®] within temperature and weather limitations as required by manufacturer.
- 8. Apply R-GUARD FastFlash[®] to perimeters, sills and adjacent sheathing and building face, in accordance with manufacturer's product data sheet and R-GUARD Installation Guidelines illustrations.
- 9. Extend flashing onto building face 4 to 6 inches.
- 10. Install preparation products in accordance with manufacturer's Application Guideline illustrations.

3.5 R-GUARD AIR & WATER-RESISTIVE BARRIER INSTALLATION (PROTECT)

- A. Apply appropriate R-GUARD air and water-resistive barrier to a clean, dry substrate within temperature and weather limitations as required by manufacturer.
 - 1. Apply to recommended thickness. Proper thickness is achieved when coating is opaque.
 - 2. Allow product to cure and dry.
 - 3. Inspect membrane before covering. Repair any punctures, translucent or damaged areas by applying additional material.
 - 4. Specifier Note: If air or surface temperature exceed 95 degrees Fahrenheit (35 degrees Celsius), apply to shaded surfaces and before daytime air and surface temperatures reach their peak.
 - 5. On CMU wall construction back roll as necessary to ensure there are no pinholes, voids or gaps in the membrane.

3.6 R-GUARD FLASHING TRANSITIONS (TRANSITION)

- A. Apply R-GUARD Joint & Seam Filler and R-GUARD FastFlash[®] as a liquid flashing membrane to waterproof the transitions in rough opening and between dissimilar materials.
 - 1. Fill any voids between the top of the flashing leg and the vertical wall with R-GUARD Joint & Seam Filler. Tool to direct water from the vertical wall to the flashing.
 - 2. Apply a generous bead of FastFlash[®] to the top edge of the flashing leg.
 - 3. Spread the wet products to create a monolithic "cap-flash" flashing membrane extending 2 inches up the vertical face of the structural wall and 1 inch over the flashing membrane extending. Apply additional product as needed to achieve a void and pinhole free surface. This "liquid termination bar" helps secure the flashing and ensures positive drainage from the wall surface to the flashing.
 - 4. Allow treated surfaces to skin before installing other wall assembly, waterproofing or air barrier components.

3.7 R-GUARD AIRDAM[®] AIR AND WEATHER BARRIER SEALANT FOR WINDOWS AND DOORS INSTALLATION

- A. Install R-GUARD AirDam[®] with professional grade caulking gun in continuous beads without air gaps or air pockets.
 - 1. Apply R-GUARD AirDam[®] to a clean, dry or damp surface

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- 2. Install Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth
- 3. Install AirDam[®] to provide uniform, continuous ribbons without gaps or air pockets, with complete wetting of the joint bond surfaces.
- 4. Tool sealant immediately to ensure complete wetting of joint bond surface and to produce a smooth, concave joint profile flush with the edges of the adjacent surfaces. Where horizontal and vertical surfaces meet, tool sealant to create a slight cove so as to not trap moisture or debris.
- 5. Do not allow materials to overflow onto adjacent surfaces. Prevent staining of adjacent surfaces.
- 6. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to remove misplaced materials, without damage to adjacent surfaces or finishes.

3.8 CURING AND DRYING

A. Complete drying times vary with temperature, humidity and surface conditions. Protect from rain or freezing until completely dry. At 70°F (21°C) and 50% relative humidity, R-GUARD MVP dries to touch and can be over coated in 2-4 hours.

END OF SECTION

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SECTION 07 54 23

THERMOPLASTIC OLEFIN MEMBRANE ROOFING SYSTEM (TPO)

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install fully adhered elastomeric sheet roofing system over metal deck and concrete deck, including:
 - 1. Roofing manufacturer's requirements for the specified warranty.
 - 2. Preparation of roofing substrates.
 - 3. Insulation.
 - 4. Thermoplastic Olefin membrane roofing.
 - 5. Metal roof edging and copings.
 - 6. Flashings.
 - 7. Walkway pads.
 - 8. Roof drains
 - 9. Expansion Joint Covers
 - 10. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.
- B. Disposal of construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- C. Comply with the published recommendations and instructions of the roofing membrane manufacturer.
- D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 REFERENCES

- A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
- B. ASTM C 1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2004.
- C. ASTM C 1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2004.
- D. ASTM D 638 Standard Test Method for Tensile Properties of Plastics; 2003.
- E. ASTM D 1004 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2003.
- F. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2005a.
- G. ASTM D 6878 Standard Specification for Thermoplastic Polyolefin Based Sheet

Roofing; 2003.

- H. CAN-ULC-S770 Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams; 2003.
- I. FM 1-28 Design Wind Loads; Factory Mutual System; 2002.
- J. FM 1-29 Roof Deck Securement and Above Deck Roof Components; Factory Mutual System; 2005.
- K. PS 1 Construction and Industrial Plywood; 1995.
- L. PS 20 American Softwood Lumber Standard; 2005.
- M. SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1).
- **1.3 DEFINITIONS**
 - A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in the section.
 - B. LTTR: Long Term Thermal Resistance, as defined by CAN-ULC S770.
- 1.4 SUBMITTALS
 - A. Product Data:
 - 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
 - 2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
 - 3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
 - B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Flashings and membrane terminations.
 - 2. Insulation fastening patterns.
 - 3. Sheet layout with perimeter and corner defined.
 - C. Samples for Verification: For the following products:
 - 1. Thermoplastic (TPO) Membrane
 - 2. Insulation Board
 - D. Samples: Submit samples of each product to be used.

- E. Specimen Warranty: Submit prior to starting work.
- F. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
- G. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- H. Executed Warranty.
- I. Membrane must be Energy Star rated.

1.5 QUALITY ASSURANCE

- A. No private label products or products manufactured by second party are allowed.1. All roofing membrane products must be manufactured by Roofing Manufacturer.
- B. Applicator Qualifications: Roofing installer shall have the following:
 - 1. Current GAF Master or Master Select Contractor status.
 - 2. At least five years experience in installing specified roofing system.
 - 3. Capability to provide payment and performance bond to building owner.
- C. Contractor providing work under this section will install work specified in this section with their company's own installers, employed by the company. Subcontracting of installation will not be allowed.
- D. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
 - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
 - 2. Notify Architect well in advance of meeting.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

1.7 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not apply roofing membrane during inclement weather or when air temperature may fall below 40 degrees F.
 - 2. Do not apply roofing membrane to damp or frozen deck surface.
 - 3. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weather proofed during same day.

1.8 ROOFING CONTRACTOR'S QUALIFICATIONS

- A. Contractor shall submit written statement authorized by the roofing system manufacturer to be certified to install the specified manufacturer's materials and has been certified for two consecutive years.
- B. The contractor shall use adequate amounts of such qualified workmen who are thoroughly trained in the crafts and techniques required to properly install the type of roofing system proposed for use and other work required to complete the work specified and within the specified time.
- C. The contractor shall have a superintendent having five (5) years experience installing the roof system specified, who is familiar with the requirements of this project, on the job at all times when roofing system work is in progress.

1.9 ROOFING MANUFACTURER INSPECTION

- A. Final inspection by roofing manufacturer's representative is mandatory prior to substantial completion. <u>Architect to be notified a minimum of 24 hours prior to manufacturer's inspection and be performed in his presence.</u>
- B. Written proof of final inspection by roofing manufacturer's representative is to be included in closeout documents.
- C. <u>It will be mandatory</u> that the final roof inspection report containing items to be corrected be sent to Architect for his records.
- D. Upon date of Substantial Completion, a <u>No Dollar Limit Warranty</u> will be issued and begin for a Twenty (20) year period for the total system warranty. <u>No exceptions</u>.

1.10 PRE-ROOFING MEETING AGENDA

- A. Verifying roof type and insulation thickness with roofing sub.
- B. Warranty: 2 year-installer, 20 year NDL-manufacturer
- C. Manufacturer's scheduled inspection for warranty-Notification of Architect
 - 1. Warranty period does not start until date of Substantial Completion
 - 2. Distribution of inspection review to Architect
- D. Areas of concern:
 - 1. Covering over top of parapet walls with roofing membrane
 - 2. Temporary sealing of roofing membrane against walls until parapet wall membrane flashing or reglets are installed
 - 3. Installation of welded sub-flashing pieces at parapet corners
 - 4. Installation of crickets at equipment curbs
 - 5. Turning up roofing membrane to top of equipment curbs.

- 6. Sealing of roof penetrations at membrane
- 7. Keeping roof clean after roofing is installed (trash, screws, nails, etc.)
- 8. Positive slope all areas
- E. Schedule of installation for each area of building.

1.11 WARRANTY

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Warranty: GAF Diamond Pledge 20 -Year NDL Warranty covering membrane, roof insulation, and membrane materials and accessories.
 - 1. Limit of Liability: No dollar limitation.
 - 2. Scope of Coverage: Repair leaks in the roofing system caused by:
 - a. Ordinary wear and tear of the elements.
 - b. Manufacturing defect in GAF brand materials.
 - c. Defective workmanship used to install these materials.
 - d. Damage due to winds up to 55 mph (88 km/h).
- C. Roof flashings, metal work and expansion joint covers shall be covered under installer's two (2) year warranty.
- D. In addition to Mfg's Warranty, a Company 2-year Guarantee from the installer (included in this specification) shall be delivered to the Owner as a condition of Acceptance.
- F. Roofer will provide a letter stating the roof system meets or exceeds 1-90 uplift design requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Roofing System: GAF, Incl, Parsippany, NJ. <u>www.GAF.com</u>. (973-628-3884)
 - 1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
 - a. Specializing in manufacturing the roofing system to be provided.
 - b. Minimum ten years of experience manufacturing the roofing system to be provided.
 - c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.
 - d. ISO 9002 certified.
 - e. Able to provide isocyanate insulation that is produced in own facilities.
 - f. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions:
 - g. Able to provide membrane that is produced in own facilities.
- B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

- C. Manufacturer of Metal Roof Edging:
 - 1. Metal roof edging products by manufacturers other than roofing manufacturer are acceptable but must be approved by roofing manufacturer.
 - 2. Field- or shop-fabricated metal roof edgings are acceptable but must be covered under the scope of the roofing membrane system no dollar limit warranty.
- D. Acceptable alternate manufacturers (Must meet guideline requirements as specified this section)
 - 1. Johns Manville JM TPO, 717 17th Street, Denver, CO 80202 (800) 922-5922
 - 2. Carlisle Syntec Sure-Weld TPO, PO Box 7000, Carlisle, PA 17013, 800-479-6832
 - 3. Elevate .060 mil TPO, 26 Century Blvd., Nashville, TN 37214, 800-428-4442.
- E. Substitution Procedures: See Instructions to Bidders.
 - 1. Submit evidence that the proposed substitution complies with the specified requirements. Comply with Section 01 60 00.

2.2 ROOFING SYSTEM DESCRIPTION

- A. Roofing System:
 - 1. Membrane: Thermoplastic olefin (TPO).
 - 2. Thickness: .060 mil
 - 3. Membrane Attachment: Fully Adhered.
 - 4. Slope: 1/4 inch per foot by means of sloped roof deck and tapered insulation, refer to drawings.
 - 5. Comply with applicable local building code requirements.
 - 6. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
 - 7. Provide assembly complying with Factory Mutual Corporation (FM) Roof Assembly Classification, FM DS 1-28 and 1-29, and meeting minimum requirements of FM 1-90 wind uplift rating.
- B. Insulation:
 - 1. Total R Value: 30 minimum.
 - 2. Tapered: Slope as indicated; provide minimum R-value at thinnest point; place tapered layer on top.
 - Base Layers: Polyisocyanurate foam board, non-composite.
 a. Attachment: Mechanically fastened.
 - 4. Top Layer: Where shown and required: 1/4"/foot tapered Polyisocyanurate foam board, non-composite.
 - a. Attachment: Mechanically fastened.

2.3 TPO MEMBRANE MATERIALS

- A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
 - 1. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch (0.61 mm) plus/minus 10 percent.
 - 2. Sheet Width: Provide sheets of width necessary to accommodate batten spacing

required by manufacturer for project conditions.

- 3. Puncture Resistance: 380 lbf (1174 N), minimum, when tested in accordance FTM 101C Method 2031.
- 4. Solar Reflectance: 0.81, minimum, when tested in accordance with ASTM C 1549.
- 5. Color: White.
- 6. Acceptable Product: Energy Guard TPO by GAF.
- B. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
 - 1. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent.
 - 2. Tensile Strength: 1550 psi (10.7 MPa), minimum, when tested in accordance with ASTM D 638 after heat aging.
 - 3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D 638 after heat aging.
 - 4. Tearing Strength: 12 lbf (53 N), minimum, when tested in accordance with ASTM D 1004 after heat aging.
 - 5. Color: White.
 - 6. Acceptable Product: EverGuard Detailing Membrane by GAF.
- C. Tape Flashing 6 inch (140 mm) nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.045 inch (1.6 mm) nominal; EverGuard Cover Tape by GAF.
- D. Pourable Sealer: One Part Pourable Sealer by GAF.
- E. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane other substrate materials, including masonry, wood, and insulation facings; TPO Solvent Based Bonding Adhesive 1121 by GAF.
- F. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- G. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick; Termination Bar by GAF.
- H. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; Everguard TPO Cut Edge Sealant by GAF.
- I. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; Flex Seal Caulk Grade by GAF.
- J. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; Vent Boot Pipe Flashing by GAF.
- K. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch (3 mm) by 30 inches (760 mm) by 50 feet (15.24 m) long with patterned traffic bearing surface; TPO Walkway Rolls by GAF.
- 2.4 ROOF INSULATION AND COVER BOARDS
 - A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C 1289 Type II Class 1, with

the following additional characteristics:

1. Thickness: 5.3" = 2.8" + 2.5" + 1/4" per foot tapered iso where shown on drawings.

a. Insulation Joints must be staggered.

- 2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
 - a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
- 3. R-Value (LTTR):
 - a. 5.3 inch Thickness: (R30 minimum) 2.8" + 2.5"
- 4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C 1289.
- 5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
- 6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
- 7. Acceptable Product: EnergyGuard Polyisocyanurate Insulation by GAF.
- B. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

2.5 METAL ACCESSORIES

- A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer. 24 gauge steel with kynar finish. Designer to select color.
- B. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; 24 gauge steel with Kynar finish. Designer to select color.

2.6 ACCESSORY MATERIALS

- A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
 - 1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
 - 2. Thickness: Same as thickness of roof insulation.

2.7 MISCELLANEOUS ACCESSORIES

- A. Roofing Fasteners: Galvanized or non-ferrous type, size, and style as required to suit application.
- B. Mechanical Fasteners for Insulation: Appropriate to purpose intended and approved by Factory Mutual; length required for thickness of material; with metal washers. Type as required to fastening into metal, concrete, plywood deck.
- C. Grease Protection: Provide "G2 Grease Guard" around roof mounted exhaust fan for Shelf Life exhaust hood, provided by Facilitec Southwest, Fort Worth, TX,

Phone: (866) 466-3339, "Grease Gutter", manufactured by Omni Containment Systems, 1501 Commerce Drive Elgin, IL 60123 Phone (847) 468-1772, or approved alternate.

- 1. Size and type to coordinate with exhaust fan.
- 2. Provide deflective flashing at fan curb as required by manufacturer.
- 3. Grease protection system shall be designed so that grease containment material layers can be replaced.
- D. Roof Expansion Joint Cover:
 - 1. Expansion joint cover shall be a non-reinforced, foam- supported elastomeric bellows, insulated, with a bifurcated waterproof attachment to metal flanges. It shall be Expand-O-Flash Style (CF-EJ) (CF) (EJ) with bellows type "N" and flange metal of aluminum (copper) (galvanized steel) as manufactured by Manville, PO Box 5108, Denver, CO. or approved alternate.
 - 2. Install where indicated on plans in accordance with the manufacturer's recommendations and good roofing practices. All intersections shall be prefabricated by the manufacturer. All splices shall be made with materials supplied for this purpose by the manufacturer.

PART 3 EXECUTION

3.1 GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- D. Perform work using competent and properly equipped personnel.
- E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).
- G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
 - 1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.

- 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
- 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck. Observe and verify deck is not damaged prior to insulation installation.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.
- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.
- E. The total extent of preparation shall include the above and comply with the membrane manufacturer's recommendations.

3.4 INSULATION AND COVER BOARD INSTALLATION

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- C. Lay roof insulation in courses parallel to roof edges.
- D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable

insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.

3.5 THERMOPLASTIC OLEFIN MEMBRANE INSTALLATION

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- D. Install membrane adhered to the substrate, with edge securement as specified.
- E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
- F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
 - 1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
 - 2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.6 FLASHING AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.
- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
 - 1. Follow roofing manufacturer's instructions.
 - 2. Remove protective plastic surface film immediately before installation.
 - 3. Install water block sealant under the membrane anchorage leg.
 - 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
 - 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
 - 6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
 - 7. When the roof slope is greater than 1:12, apply seam edge treatment along the back

edge of the flashing.

- C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
 - 1. Use the longest practical flashing pieces.
 - 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
 - 3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
 - 4. Provide termination directly to the vertical substrate as shown on roof drawings.
- D. Roof Drains:
 - 1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
 - 2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
 - 3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
 - 4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
 - 5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
 - 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
 - 2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
 - 3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
 - 4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
 - 5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.
- F. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.
- G. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.

H. After constructing pitch pans for conduit and piping penetrating roof system, fill pitch pans with pourable sealer to completely waterproof penetrations.

3.7 FINISHING AND WALKWAY INSTALLATION

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
 - 1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches (150 mm) on either side.
 - 2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.8 FIELD QUALITY CONTROL

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
- B. Perform all corrections necessary for issuance of warranty.

C. <u>NEW ROOFING SYSTEM SHALL NOT ALLOW PONDING WATER.</u>

Architectural details are graphic in nature and do not show actual scale installation of roofing layers or flashing. Cut and/or taper wood blocking at roof edges along gutter side or at scuppers so that no ponding exists. Taper roofing insulation at perimeter of roof drains to allow proper drainage of surrounding roof, free of ponding.

3.9 CLEANING

- A. Clean all contaminants generated by roofing work from building, roof membrane, flashing, and surrounding areas, including bitumen, adhesives, sealants, clay, dirt and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

COMPANY LETTERHEAD

CERTIFICATE OF GUARANTEE FROM INSTALLER

mentioned building for the period indicated. This agreement is to render the roof and the flashing waterproof subject to the conditions outlined below.

Location of Building			
City	Roof Area	square feet	

This Guarantee effective this ______day of _____, 20____, for the term of two (2) years from this date, provided any defects result from defective material or workmanship and are not caused by other mechanics, fire, accidents, or by nature over which we have no control.

It is understood and agreed that the Contractor will not be responsible for leaks or failure in the roofing system or flashing due to sustained winds in excess of speeds stated in manufacturer's warranty, distortion of the foundation on which the roofing rests, excessive hail storms, or any other conditions over which we have no control as stated in manufacturer's exclusions.

Signed		
Name of Company		

By _____

Position

Company is a Corp./Partnership/Individual

NOTARY PUBLIC

Registered in the State of

SEAL

NOTE: Roof system manufacturer's NDL Twenty (20) year warranty from the manufacturer is to be submitted in addition to the guarantee from the installer found on this form. Manufacturer's Warranty is mandatory - NO EXCEPTIONS.

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 **DEFINITIONS**

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

- A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
- B. Safing slot gaps between edge of floor slabs and curtain walls.
- C. Openings between structurally separate sections of wall or floors.
- D. Gaps between the top of walls and ceilings or roof assemblies.
- E. Expansion joints in walls and floors.
- F. Openings and penetrations in fire-rated partitions or walls containing fire doors.
- G. Openings around structural members which penetrate floors or walls.

1.4 RELATED WORK OF OTHER SECTIONS

- A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
 - 1. Section 03 30 00 Cast-In-Place Concrete
 - 2. Section 04 22 00 Concrete Unit Masonry Units
 - 3. Section 07 92 00 Joint Sealers
 - 4. Section 09 29 00 Gypsum Drywall Systems
 - 5. Section 21 13 01 Fire Suppression Sprinkler Systems
 - 6. Section 22 01 00 Plumbing

- 7. Section 23 01 00 Basic Mechanical Materials and Methods
- 8. Section 23 07 13 Mechanical Insulation
- 9. Section 26 00 10 Basic Electrical Materials and Methods

1.5 REFERENCES

- A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"
- B. Test Requirements: UL 1479, "Fire Tests of Through-Penetration Firestops"
- C. Test Requirements: UL 2079, "Tests for Fire Resistance of Building Joint Systems"
- D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.
 - 1. UL Fire Resistance Directory:
 - a. Firestop Devices (XHJI)
 - b. Fire Resistance Ratings (BXRH)
 - c. Through-Penetration Firestop Systems (XHEZ)
 - d. Fill, Voids, or Cavity Material (XHHW)
 - e. Forming Materials (XHKU)
 - f. Joint Systems (XHBN)
 - g. Perimeter Fire Containment Systems (XHDG)
 - 2. Alternate Systems: "Omega Point Laboratories Directory" (updated annually).
- E. Test Requirements: ASTM E 1966, "Standard Test Method for Fire Resistive Joint Systems"
- F. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus"
- G. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops"
- H. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials"
- I. ASTM G 21, "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi"
- J. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
- K. All major building codes: IBC
- L. NFPA 101 Life Safety Code

M. NFPA 70 - National Electric Code

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.
- B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
- C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies or support live loads and traffic. The installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.
- F. Source Limitations: Obtain firestop products and systems from a single manufacturer.

1.7 SUBMITTALS

- A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00.
- B. Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.
- C. Submit material safety data sheets and certificates of compliance provided with product delivered to jobsite.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.9 PROJECT CONDITIONS

- A. Do not use materials that contain flammable solvents.
- B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet. For non-water resistant firestop materials, protect from exposure to water -- firestop materials that are water resistant shall be protected until fully cured.
- E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- C. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:
 - 1. Hilti, Inc., Tulsa, Oklahoma
 - 800-879-8000/www.us.hilti.com
 - 2. 3M, Inc.
 - 3. STI
 - 4. Provide products from the above acceptable manufacturers; *Refer to Section 01 60 00 for Product or Manufacturer Substitutions*.

B. Source all firestop products from a single-source manufacturer.

2.3 MATERIALS

- A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079, ASTM E 1966, ASTM E 2307 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- B. Pre-installed firestop devices for use with noncombustible and/or combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors, the following products are acceptable:
 - 1. Hilti CP 680P or CP 680M Cast-In Place Firestop Devices:
 - a. Add Aerator adapter when used in conjunction with an Aerator (Sovent system)
 - b. Add metal deck adapter kit if utilizing CP 680P or M on corrugated metal deck.
 - c. Add height extension if utilizing CP 680P or M in concrete slabs thicker then 8".
 - d. Add Hilti Water Module (2" up to 6") to achieve UL W-Rating
 - e. Add Hilti TOP SEAL (1/2" up to 2") to achieve UL W-Rating
 - 2. Hilti CP 681 Tub Box Kit for use with bathtub installations.
 - 3. Hilti Toilet Flange for use with floor outlet water closets.
 - 4. Hilti coupling sleeve for use with floor, shower, or general purposes drains
 - 5. Hilti CFS-DID Drop-in devise for use with cored holes.
- C. Pre-installed firestop devices containing built-in self-sealing intumescent inserts for use with data and communication cabling which allow for cable adds or changes without the need to remove or replace any firestop materials, the following product is acceptable:
 - 1. Hilti CP 653 Speed Sleeve
 - 2. Hilti CFS-CC Cable Collar for us in renovation work with existing cables.
- D. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
 - 1. Hilti FS-ONE Intumescent Firestop Sealant
 - 2. Hilti CFS-SIL SL: Self Leveling Silicone
 - 3. Hilti CP 620 Fire Foam

- 4. Hilti CP 606 Flexible Firestop Sealant
- 5. Hilti CFS-SIL GG: Gun Grade Silicone
- E. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
 - 1. Hilti CFS-SIL GG: Gun Grade Silicone
 - 2. Hilti CP 606 Flexible Firestop Sealant
 - 3. Hilti FS-ONE Intumescent Firestop Sealant
- F. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
 - 1. Hilti CFS-SP WB Firestop Spray
 - 2. Hilti CFS-SIL GG: Gun Grade Silicone
 - 3. Hilti CP 606 Flexible Firestop Sealant
 - 4. Hilti CFS-SIL SL: Self Leveling Silicone
- G. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck as a backer for spray material, the following products are acceptable:
 - 1. Hilti CP 777 Speed Plugs
 - 2. Hilti CP 767 Speed Strips
- H. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
 - 1. Hilti FS-ONE Intumescent Firestop Sealant
 - 2. Hilti CFS-PL Firestop Plug
- I. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 - 1. Hilti FS-ONE Intumescent Firestop Sealant
 - 2. Hilti CP 620 Fire Foam
 - 3. Hilti CFS-SIL GG: Gun Grade Silicone
 - 4. Hilti CP 606 Flexible Firestop Sealant
- J. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
 - 1. Hilti CP 618 Firestop Putty Stick
 - 2. Hilti-PL Firestop Plug
- K. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
 - 1. Hilti CFS-P PA Firestop Putty Pad
 - 2. Hilti Firestop Box Insert
 - 3. Hilti CFS-BL Firestop Block

- L. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
 - 1. Hilti CP 643 N Firestop Collar
 - 2. Hilti CP 644 Firestop Collar
 - 3. Hilti CP 648E Endless Wrap Strips
 - 4. Hilti CP 648S Single Wrap Strips
- M. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - 1. Hilti CP 637 Firestop Mortar
 - 2. Hilti CFS-BL Firestop Block
 - 3. Hilti CP 620 Fire Foam
 - 4. Hilti CP 675T Firestop Board
- N. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - 1. Hilti CFS-BL Firestop Block
 - 2. Hilti CP 675T Firestop Board
- O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
 - 1. Hilti CFS-SP WB Firestop Spray
 - 2. Hilti CFS-SIL GG: Gun Grade Silicone
 - 3. Hilti CP 606 Flexible Firestop Sealant
 - 4. Hilti CFS-SIL SL: Self Leveling Silicone
- P. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
 - 1. Hilti CFS-BL Firestop Block
 - 2. Hilti CFS-PL Firestop Plug
- Q. Draft stopping at floor or roof bypass studs:
 - 1. 4" or 6"(fill depth of stud) thick mineral wool safing cut oversize to friction fit into place between studs at slab and roof edge.
- R. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.
- S. Provide a firestop system with an Assembly Rating as determined by UL 2079 or ASTM E 1966 which is equal to the time rating of construction joint assembly.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - 4. Comply with the firestop manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 - 5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. Coordinate construction of openings, penetrations, and construction joints to ensure that the firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- C. Coordinate firestopping with other trades so that obstructions are not placed in the way prior to installation of the firestop systems.
- D. Do not cover up through-penetration and joint firestop system installations that will become concealed behind other construction until each installation has been examined by the building inspector, per requirements of IBC 2021.

3.3 INSTALLATION

- A. Regulatory Requirements: Install firestop materials in accordance with UL or Intertek approved systems.
- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
 - 1. Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.
 - 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 - 3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- E. Manufacturer's Field Services: During initial installation, firestop manufacturer should be present to assure proper installation/application.

3.5 IDENTIFICATION & DOCUMENTATION

- A. The firestop contractor is to supply documentation in the form of the Hilti CFS-DM Documentation Manager. The FTP is to include:
 - 1. Architectural details
 - 2. Firestop affidavit
 - 3. Firestop system snapshot
 - 4. Installation log
 - 5. Firestop systems
 - 6. IFC guidelines for Engineering Judgments
 - 7. Product Information of utilized products
 - 8. All other relevant documentation
 - 9. Building code excerpts
- B. Copies (electronic) of the FTP are to be provided to the general contractor, architect, inspector & owner at the completion of the project.
- C. Identify through-penetration firestop systems with self-adhesive, preprinted labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - 1. Installer/Contractor's name, address, and phone number.
 - 2. Date of installation.
 - 3. Through-Penetration firestop system and manufacturer's name.

3.6 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Preparing sealant substrate surfaces.
- 2. Concrete slab control joint filler
- 3. Sealant and backings
- 4. Special expansion and control joint fillers
- 5. Sill Sealer (Sealant between bottom of exterior stud track and substrate.)

1.2 RELATED SECTIONS

- A. Section 03 30 00: Cast-In-Place Concrete
- B. Section 04 22 00: Concrete Unit Masonry
- C. Section 06 41 16: Cabinetwork & Shelving
- D. Section 07 62 10: Gutters & Downspouts
- E. Section 07 84 00: Firestopping
- F. Section 08 11 13: Hollow Metal Doors & Frames
- G. Section 08 81 00: Glass & Glazing
- H. Section 09 29 00: Drywall
- I. Section 09 78 00: FRP Panels
- J. Section 13 34 19: Pre-engineered Metal Building System
- K. Section 32 16 00: Walks and Curbs

1.3 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM D1056 Flexible Cellular Materials Sponge or Expanded Rubber.
 - 2. ASTM C1087 Sealant Compatibility with Glazing Materials and Accessories.
 - 3. ASTM D1565 Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open Cell Foam).
 - 4. ASTM C920 Elastomeric Joint Sealants.
- B. Sealing and Waterproofer Institute(SWI):

1. SWI - Sealant and Caulking Guide Specifications.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not install solvent curing sealants in enclosed building spaces.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.
- 1.6 SEQUENCING AND SCHEDULING
 - A. Coordinate work of this Section with all Sections referencing this Section.

1.7 WARRANTY

- A. The Contractor must guarantee weathertightness for a period of two (2) years from the date of Substantial Completion of the building.
- B. The Contractor will, at any time within the two (2) year period, remedy all leaks of any nature in any part of the building due to the use of faulty materials and/or workmanship under this section, without additional cost to the Owner. The Contractor shall further reimburse the Owner for any damage occasioned by such leaks.
- C. The Contractor is cautioned to supplement the work, described in this section of the specifications, by any means necessary to permit the above guarantee, which he will be called upon to make as an obligation of the Contract.
- D. Provide Silicone sealant #4 manufacturer's twenty (20) year warranty. All other sealants to have manufacturer's minimum ten (10) year warranty provided.
- E. Butyl Rubber Sill Sealer: Provide subcontractor and manufacturers One (1) year warranty from date of substantial completion.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

- A. Polymer or Polyurethane Sealants:
 - 1. Polyurethane Sealant #1: ASTM C920, Type M, Grade NS, Class 25.
 - 2. ASTM C719, ASTM D412, ASTM C661, ASTM C679 and ASTM C510
 - 3. Polyurethane Sealant approved manufacturers:
 - a. MasterSeal NP-150 by BASF.
 - b. Note: A two-part sealant with custom color availability are to be provided where sealants are installed in exterior walls and interior walls with painted finishes so that color matches each finish color. Architect to approve color all sealant color matches.
 - 2. Polymer or Polyurethane Sealant #2: ASTM C920, Type S, Grade P, Class 25.

- a. Titebond "Weathermaster", self leveling, manufactured by Franklin International.
- b. MasterSeal SL1 or SL2 by BASF.
- c. Sikaflex 1c SL or 2c SL by Sika
- d. Approved alternate
- e. Provide standard color selections. Architect to approve color.
- B. Silicone Sealant:
 - 1. Silicone Sealant #1: Dow Corning No. 790 Silicone building sealant or approved equal (Verify that sealant is compatible and approved by E.I.F.S. manufacturer).
 - 2. Silicone Sealant #2: ASTM C920, Type S, Grade NS, Class 25, mildew resistant.
 - a. Sanitary 1702 by General Electric Silicone Products Division.
 - b. 786 by Dow Corning Corporation.
 - 3. Silicone Sealant #3: Dow Corning No. 795 Silicone building sealant or approved alternate (Verify that sealant is compatible and approved by E.I.F.S. manufacturer).
 - 4. Silicone Sealant #4: Dow Corning No. 756 Silicone building sealant, Dow Corning Corporation, P.O. Box 994, Midland, MI 48686-0994; (800) 248-2481; www.dowcorning.com/construction.
 - a. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant, ASTM C 920, Type S, Grade NS, Class 50, for Use NT; SWRI validation.
 - b. Type: One-component, ultra-low modulus, neutral-cure silicone rubber sealant; *Dow Corning*[®] 756 Silicone Building Sealant, as manufactured by Dow Corning Corporation.
 - 4. Note: Silicone sealants #1, #3 and #4 to have custom color availability, matching adjacent material where installed. Architect to approve color match.
 - 5. Acceptable Alternate Silicone Sealant Manufacturers: GE Sealants
- C. Concrete Slab Control Joint Filler:
 - 1. 2-part polyurea, Versaflex SL/85, rapid curing, manufactured by Versaflex, Inc., 87 Shawnee Avenue, Kansas City, KS 66105 (913) 321-9000.
 - 2. 2-part polyurea, PE85, manufactured by Hi-Tech Systems, 1190 N. Del Rio Place, Onterio, CA 91764 (909)945-5530
 - 3. Approved alternate
- D. Sill Sealer:
 - 1. Butyl rubber, continuous under bottom track of exterior stud walls.
- E. Provide fire rated sealant, where installed in fire rated walls. Refer to section 07 84 00.

2.2 ACCESSORIES

- A. Primer: Non-staining, clear type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Filler: Polyethylene foam rod, oversized 30% to 50%

- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- E. Backer Seal: "Greyflex" backer seal, manufactured by Emseal Joint Systems, LTD (800) 526-8365. No substitutions will be accepted.
- 2.3 SPECIAL EXPANSION / CONTROL JOINT FILLERS
 - A. 2" wide joints and larger: Provide 'COLORSEAL' joint filler system by Emseal Joint Systems, Ltd, 800-526-8365, or approved alternate. Provide custom color as selected by architect or paintable seal.
 - C. Install joint fillers per manufacturer's instructions.

2.4 SEALANT COLORS

A. Colors to be selected from manufacturer's standard color selection for each type of sealant specified with exception of two-part polyurethane sealants and silicone sealants, which are to match finishes as stated in 2.1 A & B. Architect to approve color matches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.
- B. Beginning of installation means installer accepts existing substrates

3.2 PREPARATION

- A. Clean and prime joints in accordance with manufacturer's instructions.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.
- D. Protect elements surrounding work of this Section from damage or disfiguration.

3.3 INSTALLATION

- A. Install sealant in accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.

- C. Install joint backing rods to achieve neck dimension no greater than 1/3 the joint width. For joints ½" to 7/8", install backer seal prior to installing backer rod material install backer seal and backer rods as required to keep a uniform depth along entire joint. For joints larger than 7/8", provide "Colorseal" joint filler system. Per manufacturer's instruction for joint size being filled.
- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges. In no case, allow the depth of sealant be less than ½".
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Tool joints concave.
- Interior sealants are not to be installed until building is tempered by HVAC system and temperature will remain constant. DO NOT PAINT POLYURETHANE AND SILICONE SEALANTS. Do not install sealants in walls or floors where paint, stain, etc is scheduled to be applied until after finishes are applied unless sealants are masked off during coating process.
- J. Concrete slab control joint filler:
 - 1. Use only at concrete floors which **do not** receive any floor coverings or polished concrete finish.
 - 2. Prior to final seal coat, install joint filler flush with top of slab. Remove any excess filler.

3.4 SCHEDULE

- A. General Exterior Construction (Non-stone or masonry construction):
 - 1. Polyurethane Sealant #1
- B. Horizontal Exterior Locations:
 - 1. Polyurethane Sealant #2
- C. Masonry Exterior Locations:
 - 1. Silicone Sealant #4
- D. General Interior Construction:1. Polyurethane Sealant #1 (All wall control joints.)
- E. Plumbing Fixtures:
 - 1. Silicone Sealant #2.
- F. Horizontal Interior Locations:
 - 1. Polyurethane Sealant #2.

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- G. Aluminum Storefront and Curtainwall Systems, Aluminum Windows:1. Silicone Sealant #3
- H. Exterior Insulation and Finish System (E.I.F.S.)
 - 1. E.I.F.S. to E.I.F.S.: Silicone Sealant #1.
 - 2. E.I.F.S. to Wood or Metal: Silicone Sealant #3.
- I. Concrete Slab Control Joint Filler
 - 1. All control joints for slab-on-grade and elevated slabs where no finish or floor coverings are scheduled.
- J. Butyl Rubber
 - 1. Continuous bead below bottom track of exterior stud walls and below metal thresholds.

END OF SECTION

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SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials to complete Hollow Metal Doors, Hollow metal frames, and related items as shown and specified.

1.2 RELATED SECTIONS

- A. Section 04 22 00 Concrete Unit Masonry
- B. Section 08 14 16 Wood Doors.
- C. Section 08 71 00 Finish Hardware
- D. Section 08 43 13 Aluminum Storefront, Doors, and Exterior Fixed Units.
- E. Section 08 81 00 Glass and Glazing
- F. Section 09 29 00 Drywall
- G. Section 13 34 19 Pre-Engineered Metal Building System
- H. Division 26 Electrical Requirements.

1.3 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- B. Shop Drawings: Submit prior to fabrication for approval of Architect detailed shop drawings, showing all doors, frames, other miscellaneous materials. Shop drawings to show all locations of reinforcement for door hardware in doors and frames.

1.4 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Hollow Metal Frames -
 - 1. Manufactured by Steelcraft, Ceco, Curries or Amweld, or approved alternate, constructed of cold rolled steel, commercial quality, annealed and temper passed. All frames, interior, exterior: 16 gauge all openings 3'-6" or less, and 14 gauge for all openings over 3'-6".
 - 2. Exterior Frames: **Fleming** or approved alternate, special galvanized, paintable. Field paint all doors and frames.
 - 3. Frames:
 - a. All frames shall be a one piece unit type with head and jambs completely mitered and face joints continuously welded in their entirety and ground smooth. Inside corners to

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be caulked prior to painting. The use of tenons or bent tabs is not acceptable. Where transoms and sidelights are required, frames: shop assembled for a proper fit, then shipped in largest size units permitted by shipping restriction. Mullions: assembled by sliding two sections together with continuous welded interior guides. Screwed on mullion covers and visible seams, not acceptable. All seams ground smooth. All exposed welding tabs ground smooth.

- b. No KD type frames shall be permitted.
- 4. Provide concealed reinforcements, drilled and tapped, to receive hardware. Hinge reinforcements: 10 gauge with top hinge high frequency usage hinge reinforcement, 10 gauge angle stiffener welded to both sides of the frame and hinge reinforcement. Lock reinforcement: spring type stabilizer to hold lock in place. Lock and surface applied hardware reinforcement 10 gauge. Clip angles: spot welded to bottom of each frame for anchoring to floor. Mortar 14 gauge anchors, one per each 2' of height, per jamb of a type to suit conditions and requirements. All other reinforcement for hardware to be minimum 10 gauge.
- 5. Frames where Underwriter Labeled doors are used: carry Underwriter Label frame.
- 6. Provide three (3) rubber silencers on strike side of all frames.
- 7. All exposed screws to be countersunk using flathead screws, flush with surface.
- B. Hollow Metal Doors:
 - Non-label and label steel doors: to be completely flush design with lights, louvers, etc., as required on schedule doors as manufactured by Ceco, Amweld, Steelcraft, Curries, Mesker, Dittco, Truscon, or approved equal. Provide type "A" series doors with flush door light frames where lights are called for on drawings.
 - 2. Exterior Doors: Fleming or approved alternate, 'D' Series, special galvanized, flush design, paintable. Field paint.
 - 3. Construction: Doors shall be constructed of 18 gauge sheets for interior applications, and 16 gauge for exterior applications. Leveled steel formed and rigidly connected and reinforced inside with continuous vertical interlocking 24-gauge stiffeners. All doors shall be continuously arc welded vertically where the two outer sheets are joined on edges and dressed smooth.
 - 4. All exterior doors shall be insulated and sound deadened with super-core expanded foam or approved alternate.
 - 5. Provide and properly locate required reinforcement in door for all door mounted hardware.
 - 6. For door leaf 3'-6" to 4'-0" or wider, provide preparation for 2 pairs butt hinges or continuous hinge as specified.
- C. Doors and frames shall be prepared to receive hardware as specified in section 08 71 00 and glass of type, size, and shape as shown on drawings. Use reinforcing plates welded to inner face of frames for all hardware.
- D. All exterior doors to receive aluminum thresholds. Supply with added aluminum spacer on exterior side if required. Threshold to be type and style to match details if shown on plans, but in no case on plans, no more than 1/2" in height with transition slope not to exceed 1:2 to meet Arkansas Architectural Barriers Law and Americans with Disabilities Act Guidelines.

08 11 13-2

- E. Coordinate frame throat sizes with wall thicknesses where frames are installed in stud and drywall partitions.
- F. Provide three (3) rubber door silencers for each single leaf door frame, and two (2) door silencers for each double leaf door frame.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordinate location and installation of reinforcement for all scheduled door hardware items attached to hollow metal doors and frames.
- B. Coordinate installation with Section 13 34 19.

3.2 FRAME ANCHORING

- A. Provide proper anchors for wall type frames are to be installed in.
- B. Hollow metal door frame jambs and heads are to be slushed full of mortar. Refer to Section 04 22 00 Concrete Masonry Units.

3.3 FINISHES

- A. All surfaces to be job finished shall be thoroughly cleaned, removing all rust, scales, grease, etc.
- B. All exterior hollow metal doors and frames: Given shop coat of rust resistant prime paint oven baked.

3.4 STORAGE AND ERECTION

A. Carefully store frames in an upright position, not on ground, protected from moisture and weather. Frames and doors that are dented or sprung, before, during, or after installation will not be accepted.

END OF SECTION

08 11 13-3

SECTION 08 14 16

WOOD DOORS

PART 1 GENERAL

1.1 SCOPE:

A. Furnish and install wood doors as shown and as specified herein. Doors are to be of type, size, and design shown and scheduled on drawings.

1.2 RELATED WORK:

- A. Section 08 71 00 Hardware
- B. Section 08 81 00 Glass & Glazing
- C. Section 09 91 00 Finishes
- 1.3 QUALITY REQUIREMENT:
 - A. All wood doors shall meet N.W.W.D.A. Industry Standard 1-A and Architectural Woodwork Institute Section 1300-G-3, Type FPC-7.

1.4 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- B. Submit shop drawings in accordance with General Requirements. Include full size molding section detail for light and louver installation. Show glazing material, louver type and thickness, and face veneer grade and species.

1.5 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

1.6 DELIVERY

- A. Package in heavy Kraft paper or polyethylene bags. Deliver and store in areas of Temperature and humidity such as will not adversely affect doors.
- B. Doors shall be packaged in individual cartons.

1.7 **PROTECTION**

A. Protect work from damage until final acceptance.

08 14 16-1
1.8 WARRANTY

- A. Manufacturer to provide lifetime warranty for interior duration, and two (2) year warranty for exterior duration.
- B. Door warp tolerance shall not exceed 1/4" in any section of the door.
- C. Stile, rail and core "telegraphing" shall not exceed 1/100" in any 3" span.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Masonite
- B. Oshkosh Architectural Door Company.
- C. VT Industries

2.2 MATERIALS

A. Doors shall be 1 3/4" thick, 5 or 7 ply, solid core, stain grade, rotary cut white birch. Top and bottom rails to be 1 1/8" min. width, stiles 1 3/8" min. Width prior to field fitting. Core shall be wood particle core meeting ANSI A208.1, Grade 1-LD-1, or 1-LD-2 with a 28-32 lb density, and type II adhesive. Veneer shall be provided on side edges and shall match species of face veneer. Where a pair of doors are called for, face veneer shall be book-matched grain. Provide mineral composition core when fire rating is required.

2.3 FABRICATION

- A. Fabricate premium type doors in accordance with requirements of WDMA Quality Standards (SCLC-5 or 7) unless specifically indicated otherwise.
- B. Fabricate fire rated doors in accordance with requirements of Underwriter's Laboratories (UL).
- C. Provide doors with edge strips, of wood species to match face veneers.
- D. Make cutouts and provide stops for glass.
- E. Pairs of doors shall be products of a manufacturer who can furnish such doors without astragals and meet the UL requirements.
- F. Pre-fit doors at factory with 1/8 inch tolerance on each vertical face, 1/8 inch tolerance at top, and ½ inch at bottom, except where undercuts are scheduled.

08 14 16-2

- G. Machine doors for hardware as required by Hardware Schedule listed in Section 08 71 00, which will be supplied together with all necessary templates for hardware requiring door preparation.
- H. Steel frame shop drawings will be furnished showing location and size of hardware preparation.
- I. Bevel strike edge of single acting doors 1/8 inch in 2 inches. Radius strike edge of double acting swing doors, 2-1/8 inches.
- J. All fire rated doors shall be factory prepped to receive hardware and glazing.
- K. Pre-finish doors at factory with clear WDMA System #6 finish.

PART 3 EXECUTION

- 3.1 INSTALLATION AND WORKMANSHIP:
 - A. Install doors plumb and true to operate without bind or drag with 1/8" clearance top and sides. Provide 3/4" undercut at bottom unless indicated otherwise.
 - B. Doors damaged before or after hanging will be replaced.
 - C. All edge and end surfaces will be sealed with two (2) coats of door manufacturer's standard sealer before final hanging. <u>This includes top and bottom ends</u>.
 - D. All necessary refitting or adjustment shall be the Contractor's responsibility during the guarantee period.
 - E. Provide moldings and glass stops of same species as face veneers.
 - F. If called for, wood louvers to be factory installed into properly prepared openings.
 - G. Pre-machine bevel on vertical edges of single doors or meeting stiles of pairs of doors.
 - H. Coordinate door light location with door hardware to assure no conflicts occur.
 - I. For door leaf 3'-6" to 4'-0" or wider, provide preparation for 2 pairs butt hinges or continuous hinge as specified.
- 3.2 PRODUCT DELIVERY, STORAGE AND HANDLING
 - A. Deliver: Protect doors at all times. Deliver doors to site after plaster and cement are dry And building has reached average prevailing relative humidity of locality.
 - B. Storage: Stack flat on 2 x 4 lumber, laid 12" from ends and across center. Under bottom door and over top of stack provide plywood or corrugated cardboard to protect door surface. Store doors in area where there will be no great variation in heat, dryness and humidity.

08 14 16-3

C. Handling: Do not drag doors across one another.

3.3 INSPECTION

A. Verify that door frames are of type required for door and are installed as required for proper installation of doors. Do not install doors in frames which would hinder the operation of the doors.

SPECIAL NOTE: THERE CAN BE NO GLASS OR GLASS KITS IN DOORS THAT WILL INTERFERE WITH THE MOUNTING OF ANY FINISH HARDWARE. ENOUGH STILE AND RAIL MUST EXIST SO THAT NO SHIMS ARE NEEDED.

END OF SECTION

08 14 16-4

SECTION 08 31 13

CEILING / WALL ACCESS PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials and equipment necessary for the furnishing and installation of access panels as required in gypsum board ceilings and walls and in masonry walls for mechanical or electrical equipment access. Provide proper model for panels installed in materials other than gypsum board.

1.2 SUBMITTALS

A. Comply with Section 01 33 00.

PART 2 PRODUCTS

2.1 MANUFACTURER/MODEL

- A. Nystrom Model NT (masonry), Model RW (Stud and gypsum board)
- B. Substitutions: Subject to compliance with requirements, one of the following may be substituted for that specified.
 - 1. Karp
 - 2. J.L. Industries
 - 3. Approved alternate.
- C. Provide fire rated models of type required where installed in fire rated ceilings and walls, or where called for on drawings.
- D. Panel size as needed for application, unless called out on drawings. Panel size and locations are to be approved by Architect prior to installation.

2.2 CONSTRUCTION

- A. Galvanized bonderized 16 ga. steel door and 16 ga. frame.
- B. Continuous piano hinge.
- C. Key operated cylinder lock by access panel manufacturer, unless otherwise noted.
- D. Panel finish: White powder coat

08 31 13-1

PART 3 EXECUTION

- 3.1 PREPARATION
 - A. Verify that rough openings are correctly installed to receive panels.
 - B. Make necessary preparation of surrounding materials to accept panel installation.
 - C. Coordinate locations and sizes of required access panels with Architect for approval.
- 3.2 INSTALLATION
 - A. Install panels in accordance with manufacturer's instructions and provide concealed framing as required to properly install access panel.
 - B. Adjust panel operation and locking mechanism to insure all features of access panel operate smoothly.

3.3 FINISH

- A. Paint panel per Section 09 91 00.
- B. Recessed perimeter grooves of panels installed in gypsum board walls or ceilings to be clean and free of drywall mud prior to painting. Gypsum board infill and perimeter of panel to be flush with gypsum board finish surrounding panel.

END OF SECTION

08 31 13-2

SECTION 08 33 13

COILING COUNTER SHUTTERS

PART 1 GENERAL

1.1 SUMMARY

- A. Supply and install all coiling counter shutters as shown on door schedule and door types and as specified herein.
- 1.2 RELATED SECTIONS
 - A. Section 08 71 00 Hardware.
- 1.3 SUBMITTALS:
 - A. Comply with requirements of Section 01 33 00.
 - B. Submit brochures and shop drawings of all items showing dimensions, materials, sizes, methods of construction and mounting techniques.
- 1.4 SAMPLES:
 - A. Submit two (2) samples of all actual material in color and texture selected by the Architect.
- 1.5 MEASUREMENTS:
 - A. Do not commence fabrication of any item until dimensions shown on Drawings have been field verified. Proper fit and anchorage of all parts is required.
- 1.6 COORDINATION:
 - A. Coordinate and cooperate with trades whose work relates in any way to items specified herein including timely delivery of materials to be installed under other divisions of the work so that work progresses smoothly and without delay.
- 1.7 DELIVERY AND STORAGE:
 - A. Deliver and store all items in dry, protected areas. Keep free of corrosion or other damage. Replace any damaged items or parts, at no cost to Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish and install rolling counter shutters as shown on plans. Shutters shall be by:

08 33 13-1

- 1. Overhead Door Company, model 652 (face of wall mounted)
- 2. Cookson ESC10 Series of San Francisco, CA.
- 3. Raynor Garage Doors of Dixon, IL, Model CS, Type N10 (push-up).
- 4. Cornell
- 5. Approved alternate.

2.2 CURTAIN

A. Comprised of interlocking flat-faced, midget-type slats. Slats to be extruded aluminum 6063 alloy not less than .050" thick. Alternate slats to be fitted with end locks to hold curtain in alignment. Bottom bar shall have continuous vinyl bumper to protect countertop.

2.3 GUIDES

A. Shall be extruded aluminum, face of wall mounted, and shall be of sufficient size for shutter sizes required. Guides shall extend above lintel so as to furnish support for brackets. Continuous strips of heavy nap stripping shall be constructed into guides to eliminate metal-to-metal contact and to provide dust seal around curtain.

2.4 HOOD

A. Shall be aluminum of sufficient gauge for shutter sizes required. Hood is to entirely conceal counterbalance mechanism and is to be constructed so as to provide longitudinal stiffness.

2.5 OPERATION

- A. Shutters under 16'-0" wide to be manually operated by means of lift handles.
- B. Provide removable stainless steel rod for manually operated lift handle shutters.

2.6 FINISH

- A. Shall be a natural satin anodized finish for all aluminum components and a satin finish on all stainless steel components to match aluminum finish.
- B. Paint door primed components per section 09 91 00.

2.7 LOCKING DEVICES

A. Shall be slide bolts at each end of bottom bar engaging into the shutter guides.

08 33 13-2

PART 3 EXECUTION

3.1 INSPECTION:

A. Examine all sub-surfaces to receive work and report in writing to the Construction Manager with a copy to Architect, any conditions detrimental to work. Commencement of work will be construed as acceptance of all sub-surfaces.

3.2 INSTALLATION:

A. Install as detailed in accordance with manufacturer's printed installation instructions and any additional requirements specified. All wall mounted items shall be securely fastened to solid backing or blocking, including anchor jamb and latching jamb.

3.3 ANCHORAGE:

A. Provide all anchorage devices required for complete installation. Provide anchorage at proper time required to be built in by other trades, including support headers, bracing, and jamb anchors.

END OF SECTION

08 33 13-3

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

- 1. Overhead coiling service doors.
- 2. Overhead coiling insulated doors.

1.2 RELATED SECTIONS

- A. Section 05 50 00 Metal Fabrications: Support framing and framed opening.
- B. Section 08 71 00 Door Hardware: Product Requirements for cylinder core and keys.
- C. Section 09 91 00 Painting: Field applied finish.
- D. Division 26 Raceway and Boxes: Conduit from electric circuit to door operator and from door operator to control station.
- E. Division 26 Wiring Connections: Power to disconnect.

1.3 **REFERENCES**

- A. NFRC 102 Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.
- B. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.
- C. ASTM E 330 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- D. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A 666 Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM A 924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- G. ASTM B 221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Overhead coiling service doors:
 - 1. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
- B. Overhead coiling insulated doors:
 - 1. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.
 - 4. Installation instructions.
- C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.
- 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years' experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. Store products in manufacturer's unopened packaging until ready for installation.
 - B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
 - C. Store materials in a dry, warm, ventilated weathertight location.
- 1.8 PROJECT CONDITIONS
 - A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- 1.9 COORDINATION
 - A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.
- 1.10 WARRANTY
 - A. Warranty: Manufacturer's limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.
 - B. Warranty: Manufacturer's limited door warranty for 5 years on door system materials and workmanship.
 - C. Warranty: Manufacturer's limited door system warranty for 2 years for all parts and components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: <u>www.overheaddoor.com</u>. E-mail: <u>arcat@overheaddoor.com</u>.
- B. Acceptable Substitutions: Subject to compliance with requirements. One of the following may be substituted for that specified.
 - 1. Cornell.
 - 2. The Cookson Company.
 - 3. North American Rolling Door.
 - 4. Approved Alternate
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- 2.2 OVERHEAD COILING SERVICE DOORS (Door type H)
 - A. Industrial Doors: Overhead Door Corporation, Model 610 Service Doors.
 - 1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
 - e. Flat profile type F-265 for doors up to 18 feet 4 inches (5.59 m) wide, fabricated of:
 - 1) 18 gauge galvanized steel.
 - 2. Finish:
 - a. Aluminum: Slats and hood shall be aluminum finished as follows.
 - 1) Finish: Powder coat, PowderGuard.
 - a) PowderGuard Weathered Finish: Industrial textured powder coat provides a thicker, more scratch resistant coat. Applied to entire door system including slats, guides, bottom bar and head plate.
 - 3. Weatherseals:
 - a. Vinyl bottom seal.
 - 4. Bottom Bar:
 - a. Extruded aluminum for doors up to 15 feet 4 inches (4.67 m) wide.
 - 5. Guides: Three structural steel angles.
 - a. Finish: PowderGuard Weathered finish with iron/black powder.
 - 6. Brackets:
 - b. Galvanized steel to support counterbalance, curtain and hood.
 - 7. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
 - 8. Hood:
 - a. Aluminum hood with intermediate supports as required.
 - 9. Manual Operation:
 - a. Chain Hoisted

10. Locking:

- a. Two interior bottom bar slide bolts for manually operated doors.
- 11. Wall Mounting Condition:
 - a. Face-of-wall mounting.

2.3 INSULATED OVERHEAD COILING SERVICE DOORS (Door Type G)

- A. Overhead Coiling Stormtite Insulated Service Doors: Overhead Door Corporation Model 625.
 - 1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
 - a. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
 - b. Front slat fabricated of:
 - 1) 18 gauge galvanized steel.
 - c. Back slat fabricated of:
 - 1) 24 gauge galvanized steel.
 - d. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
 - 1) R-Value: 7.7, U-Value: 0.13.
 - 2) Sound Rating: STC-21.
 - 2. Performance:
 - a. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
 - b. Installed System Sound Rating: STC-21 as per ASTM E 90.
 - c. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
 - 3. Finish:
 - a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
 - 1) Powder coat: PowderGuard
 - a) PowderGuard Premium: Weather resistant polyester powder coat color as selected by the Architect.
 - b) PowderGuard Weathered Finish: Industrial textured powder coat provides a thicker, more scratch resistant coat. Applied to entire door system including slats, guides, bottom bar and head plate.
 - 3) Non-galvanized exposed ferrous surfaces shall receive one coat of rustinhibitive primer.
 - 5. Bottom Bar:
 - a. Two prime painted steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
 - 6. Guides: Three Structural steel angles
 - a. Finish: PowderGuard Weathered finish with iron/black powder.
 - 7. Brackets:
 - a. Hot rolled prime painted steel to support counterbalance, curtain and hood.
 - 8. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
 - 9. Hood: Provide with internal hood baffle weatherseal.

- a. 24 gauge galvanized steel with intermediate supports as required.
- 10. Manual Operation:
 - a. Chain hoist.
- 11. Locking:
 - a. Chain keeper locks for chain hoist operation.
- 12. Wall Mounting Condition:
 - a. Face-of-wall mounting.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Division 26. Complete wiring from disconnect to unit components.
- F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 90 00.
- G. Install perimeter trim and closures.

H. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 **PROTECTION**

A. Protect installed products until completion of project.

END OF SECTION

SECTION 08 39 06

TORNADO RESISTANT DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Tornado Shelter Steel Doors.
 - 2. Tornado Shelter Steel Frames.
 - 3. Tornado Shelter Storm Door Hardware.
- B. Related Documents:
 - 1. The Contract Documents, as defined in General Conditions and modifications thereto, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.
- C. Related Sections:
 - 1. Section 04 22 00 Concrete Masonry Units: CMU shelter walls.
 - 2. Section 08 11 13 Hollow Metal Doors & Frames: Standard metal frames for doors.
 - 3. Section 08 71 00 Door Hardware: Door hardware groups.
 - 4. Section 09 91 00 Painting and Finishing: Field painting.

1.2 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A250.8 SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 336 Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold-Rolled.
 - 2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. Federal Emergency Management Agency (FEMA):
 - 1. FEMA 361 Design and Construction Guidance for Community Shelters.

D. National Association of Architectural Metal Manufacturers (NAAMM):

1. NAAMM HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers.

1.3 SYSTEM DESCRIPTION

- A. Tornado shelter storm doors, frames and hardware shall be provided as an integral FEMA 361 Tested and Certified assembly from a single supplier and installed by a single installer.
- B. Design Requirements:
 - 1. Shelter entry doors and frames shall resist design wind pressures for components and cladding as described in Section 1 and Missile Impact Loads of Section 2 of "National Performance Criteria for Tornado Shelters Federal Emergency Management Agency Mitigation Directorate", latest edition. Only single opening and paired opening doors, and frames that can resist calculated design wind pressures and laboratory tested missile impacts are acceptable.
 - 2. All doors shall have sufficient points of connection to frame to resist design wind pressure and impact loads. Unless specifically designed for, each door shall be attached to frame with a minimum six points of connection.
 - 3. Protective missile resistant barrier is permitted to protect door opening. Design door to resist wind pressures. Size and number of shelter doors shall be determined in accordance with applicable fire safety and building codes.
 - 4. Door systems, both single doors and paired openings, shall be tested and must comply with FEMA 361, and have verifiable third party conformance test results and be certified by a Nationally Recognized Independent Testing Laboratory such as Underwriter's Laboratories (UL).

1.4 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
 - 1. Product Data:
 - a. Doors and Frames: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
 - b. Hardware: Manufacturer's technical product data for each item of hardware. Include information necessary to show compliance with requirements, and include instructions for installation and maintenance of operating parts and finishes.
 - 2. Hardware Schedule: Submit hardware schedule for tornado shelter storm door hardware groups indicated in this Section.
 - 3. Shop Drawings: Details of each opening, showing elevations and frame openings. Show provisions for hardware conforming to FEMA 361 requirements.

- 4. Assurance/Control Submittals:
 - a. Independent Tests: Complete door, frame and hardware assembly shall have been tested and certified by Underwriter's Laboratories (UL) for compliance with FEMA 361 requirements.
 - b. Test Reports: Report for design wind pressure and missile impact tests in accordance with National Performance Criteria for Tornado Shelters Federal Emergency Management Agency Mitigation Directorate, latest edition.
 - c. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
 - 1) FEMA 361 requirements.
 - d. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.
- B. Section 01 77 00 Closeout Submittals: Procedures for closeout submittals.
 - 1. Warranty: Submit written warranty with forms complete in Owner's name and registered with manufacturer as specified in this Section.
 - 2. Door Hardware Inspection Report: Upon request, submit inspection report by AHC certifying that door hardware has been installed in accordance with manufacturer's instructions, has been adjusted and is functioning properly
 - 3. Installation Certification: Upon request, submit written certification of installation on form located at end of Section.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the products FEMA 361 storm doors and hardware as specified in this section with minimum five years documented experience.
- B. Regulatory Requirements:
 - 1. Tornado Shelter Door and Frame Construction: Conform to FEMA 361.
 - 2. Fire Door and Frame Construction: Conform to NFPA 252.
 - a. Listed and labeled by UL as suitable to for the purpose specified and indicated.
 - b. Listed and labeled as conforming to UL 10C.
 - c. Hardware installed on fire-rated doors shall be listed and labeled as conforming to UL 10C.
- C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

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- D. Manufacturer Installation Instructions: Contractor shall maintain current copy of tornado shelter storm door, frame and hardware manufacturer published installation instructions and FEMA 361 requirements in Project Field Office and refer to installation instructions at all times during installation.
- E. Severe Storm Shelter Openings: Provide complete door systems for hurricane or tornado resistant storm shelters and other areas of refuge complying and tested according to FEMA 361, Second Edition (2008), Design and Construction Guidance for Community Safe Rooms; and ICC 500 (2008), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Single Source for all door hardware is required. Door Hardware that is supplied under sections 08 39 06, 08 71 00, and 28 13 00 can be supplied under separate contracts but must all originate from the same manufacturer. No exceptions

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Section 01 60 00 Product Options: Transport, handle, store, and protect Products.
- B. Deliver doors in manufacturer's standard labeled protective packaging.
- C. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- D. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.
- E. Store in accordance with NAAMM HMMA 840.
- F. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

1.7 COORDINATION

A. Coordinate the work with door opening construction, door frames and door hardware installation.

1.8 WARRANTY

A. Section 01 77 00 - Closeout Submittals: Procedures for closeout submittals.

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B. Manufacturer Warranty: Provide one (1) year manufacturer warranty for defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. ASSA ABLOY Group: All tornado shelter storm doors, frames and hardware shall be provided from an ASSA ABLOY Group company.
- B. Single Source for Furnishing and Installation: Tornado shelter doors, frames and hardware shall be furnished and installed by tornado shelter door, frame and hardware supplier. Installation by any other entity not permitted.
- C. Doors and Frames:
 - 1. Ceco Door Products: <u>www.cecodoor.com</u>.
 - 2. Curries Companies: <u>www.curries.com</u>.
 - 3. Republic Doors & Frame: <u>www.republicdoor.com</u>.
 - 4. Steelcraft Paladin <u>www.steelcraft.com</u>
- D. Hardware:
 - 1. Corbin-Russwin: <u>www.corbin-russwin.com</u>.
 - 2. Sargent: <u>www.sargentlock.com</u>
 - 3. McKinney: <u>www.mckinneyhinge.com</u>.
- E. Section 01 60 00 Product Options: Product options and substitutions: Substitutions: Permitted. Only manufacturers that can provide doors, frames and hardware as an integral FEMA 361 Tested and Certified assembly may submit for consideration as a substitute manufacturer.
- F. Hurricane and Tornado Resistance Compliance: Conventional exit devices and tube steel removable mullions to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- G. Multi-Point Exit Devices for Severe Storm Shelters Openings: Multi-point exit devices specifically engineered for out-swinging door applications on tornado or hurricane resistant safe shelter rooms. Extra heavy duty steel component construction with each of the latching points automatically activated when the device is locked. The multi-point exit device is approved for usage as part of a complete ICC 500 (2008) and FEMA 361 door, frame and hardware assembly.
 - 1. Acceptable Manufacturers:
 - 2. Corbin Russwin Hardware (RU) FE5400S Series.

- H. Multi-Point Locksets, Security: Three-point locking system device engineered for in-swinging door applications on windstorm safe shelter rooms. Extra heavy duty steel component construction securing the door to the frame at top, bottom and center latch positions. All three latching points are automatically activated when the device is locked.
 - 1. Acceptable Manufacturers:
 - 2. Corbin Russwin Hardware (RU) FE6800 Series.

2.2 TORNADO SHELTER DOORS AND FRAMES

- A. Model: StormPro 361.
- B. Interior Door and Frame Material: ASTM A 366 cold-rolled carbon steel sheet, 14 gage, primed, ready for field painting.
- C. Exterior Door and Frame Material: ASTM A 653 steel sheet, zinc-coated galvanized, 14 gage, ready for field painting.
- D. Door Core: As required by FEMA 361.
- E. Door Opening Size: As indicated on Door Schedule. Field measure and verify dimensions of doorframe openings.
- F. Fire Rated Doors: Provide units listed and labeled by UL.
 - 1. Fire Rating: Indicated in Door Schedule.
 - 2. Fire Testing: UL 10C for positive pressure, smoke and draft requirements.
 - 3. Temperature Rise: Maximum 450 degrees F.

2.3 DOOR FINISH

- A. Galvanizing: All components hot-dipped zinc-iron alloy coated (galvannealed) in accordance with ASTM A 653, with manufacturer's standard coating thickness.
- B. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- C. Field paint as specified in Section 09 91 00 Painting and Coating, color selected by Architect. More than one color may be selected.

2.4 DOOR HARDWARE

- A. Tornado shelter storm door hardware is specified this Section.
- B. Tornado shelter storm door hardware shall be furnished and installed by tornado shelter storm door supplier.

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2.5 HARDWARE LOCATIONS AND REINFORCEMENTS

- A. Locate hardware on doors and frames in accordance with the system manufacturer's specific location.
- B. Hardware reinforcements are to be in accordance with the minimum standard gages as listed in SDI-100 and FEMA 361 requirements.
- C. Doors shall be mortised, reinforced and function holes provided at the factory in accordance with the hardware schedule and templates provided by the hardware supplier.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Execution: Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 - 1. Verify existing conditions and door frame opening dimensions before starting work.
 - 2. Verify that door opening sizes and tolerances are acceptable.
 - 3. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION

- A. Install doors in metal door frames in accordance with manufacturer's published instructions and requirements of FEMA 361.
- B. Install fire-rated doors in conformance with code requirements for compliance with NFPA 80 and UL 10C.
- C. Coordinate installation of doors with installation of frames and hardware.
- D. Install hardware in accordance with manufacturer's published instructions and requirements of FEMA 361.

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E. Use templates provided by hardware item manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 - 1. Inspect door installation, fit and clearance. Verify required FEMA 361 label.
 - 2. Inspect fire door label for specified fire test ratings and requirements.
 - 3. Inspect door hardware installation and operation for conformance with FEMA 361 requirements.
 - 4. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 5. Test and Inspection Reports shall be available to Architect upon request.
- B. Hardware Supplier Field Services: At completion of hardware installation provide an Architectural Hardware Consultant (AHC) to inspect tornado shelter storm door hardware installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's installation instructions and FEMA 361 requirements.
- C. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

3.4 ADJUSTING CLEANING

- A. Adjust for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Clean doors, frames and hardware immediately after installation.
- G. Clean doors and frames and polish door hardware just before Substantial Completion Inspection.

DOOR HARDWARE:

Notes: FEMA 361 - CERTIFIED BY THIRD PARTY. HARDWARE TO BE FURNISHED AS INTEGRATED ASSEMBLY WITH DOORS AND FRAME BY MANUFACTURER.

END OF SECTION

TORNADO SHELTER DOORS, FRAMES & HARDWARE INSTALLATION CERTIFICATION

PROJECT:	
LOCATION:	
ARCHITECT'S PROJECT NUMBER:	
OWNER:	
CONTRACTOR:	
DOOR, FRAME & HARDWARE INSTALLER Name:	R:
Address:	
Telephone Number:	
 UPON COMPLETION OF INSTALLATION I. Installer obtained a current copy of th FEMA 361 requirements for the specific of Installer reviewed and discussed manuface requirements with Project Field Superinte Installer furnished and installed specified with the Contract Documents. Installer installed tornado shelter doors, f hardware manufacturer's published install Installer provided door hardware inspect Report as required by the Contract Docum EXECUTED AND DELIVERED this 	NSTALLER CERTIFIES THAT: le manufacturer's published installation instructions and doors, frames and hardware being installed. cturer's published installation instructions and FEMA 361 endent before start of installation. tornado shelter doors, frames and hardware in accordance rames and hardware in conformance with door, frame and ation instructions and FEMA 361 requirements. ion by an AHC and submitted Door Hardware Inspection nents. day of .20
	duy 01, 20
	(Company name) BY:
	(Authorized signature)
Subscribed and sworn to before me this	day of, 20
Notary Public	
My Commission expires:	Affix Seal
END OF	CERTIFICATION

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SECTION 08 43 13

ALUMINUM STOREFRONT, DOORS, AND EXTERIOR FIXED UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum Storefront System, aluminum doors, accessories.
- B. Anchors, brackets, brake metal, and attachments.
- C. Door hardware.
- 1.2 RELATED SECTIONS
 - A. Section 07 92 00 Joint Sealers: Perimeter sealant.
 - B. Section 08 71 00 Finish Hardware: Cylinders.
 - C. Section 08 81 00 Glazing.
 - D. Division 26 Electrical Requirements

1.3 REFERENCES

- A. ANSI/ASTM E283 Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
- B. ANSI/ASTM E330 Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- C. FS TT-P-31-Paint, Oil: Iron Oxide, Ready Mixed, Red and Brown.
- D. FS-TT-P-641 Primer Coating; Zinc Dust-Zinc Oxide (for Galvanized Surfaces).
- E. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

1.4 SUBMITTALS

- A. Submit through Construction Manager to Architect.
- B. Product Data: Submit manufacturer's installation instructions.

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C. Shop Drawings: Include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass; door hardware requirements; and affected related work.

1.5 PERFORMANCE

- A. Each type of window system shall be designed and engineered by the manufacturer to meet or exceed the wind load criteria for the applicable building code with jurisdiction, based on the size, shape, performance and location of each window unit. Manufacturer shall provide all internal stiffeners, blocking, attachments, etc., as may be required to provide a complete system.
- B. Design Wind Loads:
 - 1. Ultimate Design Wind Speed: 115 MPH
 - 2. Nominal Design Wind Speed: 89 MPH
 - 3. Exposure Category: C
 - 4. Internal Pressure Coefficient: +/- 0.18

1.6 QUALITY ASSURANCE

- A. Manufacturer of aluminum storefront system shall have minimum of Ten (10) years experience in the manufacturing and installation of the system. Any substitutions shall follow requirements of Specification Section 01 60 00.
- B. Installer Qualifications: The installer shall have successful experience with installation of the same or similar units required for this project and other projects of similar size and scope for a minimum of ten (10) years.
- C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer, as well as other framing systems involved in complete building framing package.

1.7 WARRANTY

- A. Aluminum storefront system: manufacturer's two (2) year warranty.
- B. Aluminum entrances: Manufacturer's two (2) year warranty from date of substantial completion. In addition, welded door corner construction shall be supported with a Limited Lifetime Construction Warranty for the life of the door.
- C. Aluminum Storefront Installer's Warranty: Installer shall provide a five (5) year warranty covering air and water leakage, system failure. Installer will provide signed copy of installer's warranty found at the end of this specification section.

1.8 DOOR HARDWARE/KEYING MEETING

A. Prior to ordering of hardware items, Contractor shall arrange meeting between, hardware supplier, Owner, and Architect to review and verify door hardware submittals and keying suggestions. This review meeting shall be considered as the submittal review. Any changes shall be incorporated in the hardware submittals and then resubmitted to Contractor and Architect as **record copy**. Contractor to notify all parties one (1) week prior to meeting date.

1.9 PRE-INSTALLATION CONFERENCE

- A. Prior to aluminum storefront installation, Contractor will schedule pre-installation conference to review aluminum storefront systems and installation procedures. Required attendance shall include Contractor, aluminum storefront supplier and installer, Installer's foreman, aluminum storefront manufacturer's representative, and Architect. Owner may also attend if he desires. Contractor shall conduct conference in collaboration with manufacturer's representative.
- B. An actual mockup of a typical aluminum storefront installation shall be performed on site by installer immediately following the conference to assure proper installation methods and procedures are followed.
- 1.10 MANUFACTURER SITE VISITS
 - A. Contractor will schedule periodic site visits with aluminum storefront manufacturer's representative during installation to assure correct installation procedures are being followed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Kawneer Company, Inc.
- B. Tubelite
- C. YKK
- D. OldCastle Building Envelope

2.2 EXTERIOR ALUMINUM STOREFRONT SYSTEM

- A. Framing: Shall be extruded aluminum flush glazed framing system Tri-Fab 451T451 "Center-Plane" with Kawneer "IsoLock" thermal break with a ¹/₄" separation consisting of a two-part chemically curing, high density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections or similar systems by other named manufacturers.
 - 1. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

- B. Doors: Shall be medium stile in sizes as indicated on drawings. Model 350 as manufactured by Kawneer or similar by other named manufacturers.
 - 1. Top Rail: 6-1/2"
 - 2. Mid Rail: 0"
 - 3. Bottom Rail: 10"
 - 4. Vertical Stiles: 5"
 - 5. Provide manufacturer's standard 1 ³/₄" thick glazed doors with 0.0125 Inch thick extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and filet welded at all 4 corners of door with lifetime warranty.
- C. Finishes: Frame #1 shall be class I Anodized Aluminum (clear)
 - D. Provide water deflector and high performance thermally broken "high performance" sill supplied by manufacturer. Provide bellows-type flexible expansion joint material at all sill flashing expansion joints.
 - E. Provide water deflectors at each end of intermediate horizontal members, installed per framing manufacturer's installation instructions. Provide "L" profile end dams at each end of extruded sill flashing. Extruded sill flashing should be an integral part of the storefront framing system. Set in manufacturer approved sealant, seal all penetrations accordingly per manufacturer's instructions.
 - F. Brake Metal: .125, .090 and .062 thick extruded aluminum, sizes as required for details and conditions as called for on drawings. Manufacturer to provide detailing at mullions for integral appearance. Match finish and color of storefront system.
 - G. Provide 1" insulated glass. Refer to Section 08 81 00.

2.3 INTERIOR ALUMINUM STOREFRONT SYSTEM

- A. Framing: Shall be extruded aluminum flush glazed framing system Tri-Fab 451 "Center-Plane" with non-thermal as manufactured by Kawneer or similar systems by other named manufacturers.
- B. Doors: Shall be medium stile in sizes as indicated on drawings. Model 350 as manufactured by Kawneer or similar by other named manufacturers.
 - 1. Top Rail: 6-1/2"
 - 2. Mid Rail: 0"
 - 3. Bottom Rail: 10"
 - 4. Vertical Stiles: 5"
 - 5. Provide manufacturer's standard 1 ³/₄" thick glazed doors with 0.0125 Inch thick extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and filet welded at all 4 corners of door with lifetime warranty.
- C. Finishes: Frame #1 shall be class I Anodized Aluminum (clear)
- D. Brake Metal: .125 thick aluminum, sizes as required for details and conditions. Manufacturer to provide detailing at mullions for integral appearance. Match finish and color of storefront system.

E. Provide ¹/₄" glass. Refer to Section 08 81 00.

2.4 HARDWARE

Product Quality: Hardware items are to be ANSI Grade 1 Certification and are to be supplied by aluminum door supplier unless noted otherwise.

- A. Closers:
 - 1. Heavy duty surface closer, independently hung, with adjustable back check and 100 degree hold-open at exterior doors; slim line half covers, Standard Sprayed Aluminum Finish.
 - a. LCN 4040XP Spring Cush .
 - 2. Cover to be screw-attached to closer body in at least two locations on top and bottom of closer.
- B. Continuous Hinges:
 - 1. 780-224HD continuous aluminum hinge, manufactured by Roton, Markar, or approved alternate.
 - 2. Warranty: Manufacturer's lifetime warranty.
- C. Door Exit Device:
 - 1. Shall be Paneline II concealed rod device with keyed exterior trim as manufactured by Kawneer or approved alternate. Match storefront finish. Provide Paneline "XP-EL" electric latch where scheduled.
 - 2. Panic Device:

Manufacturer and Product: (All exit devices are hexhead doggable)

- a. Von Duprin 33 Series, Von Duprin 99EL Series where retractable latch exit device is called for.
- 3. Provide lever trim on all doors where panic devices are scheduled unless noted otherwise.
- 4. Provide keyed lever trim where called for on schedule.
- D. Locksets:
 - 1. Schlage (Rim Cylinder 26-072 Everest 29-T)
- E. Push/Pulls: Shall be Style CO-9/CPII as manufactured by Kawneer or approved alternate. Match storefront finish.
- F. Weather-stripping, for exterior doors only:
 - 1. Head and Jamb: Replaceable wool, or polypropylene, or nylon wool pile with aluminum strip backing, recessed in frame; AAMA 701.2.
 - 2. At exterior door applications, provide weather-stripping as required at door perimeters and where double doors meet in center to provide watertight seal.
 - 3. Sill: Semi-rigid polymeric material on aluminum anodized to match door; EPDM sweep strip; 38-560 by Kawneer or similar by other named manufacturers.
- G. Mullion Seal:

- 1. Model 5100S, gray color, manufactured by National Guard Products or approved alternate.
- 2. Install at all removable mullions.
- H. Threshold:

(Threshold height not to exceed 1/2" to meet ADAAG guidelines.)

- 1. Model 896N, 5" deep, manufactured by National Guard Products, or approved alternate, ADA compliant panic threshold.
- 2. Extruded aluminum, mill finish, neoprene seal, for exterior doors only.
- 3. Where "square back" type threshold is called for, provide ADA compliant panic with square back. These types are to be used where backing up to terrazzo, ceramic tile, or other similar floor materials.
- I. Overhead Stop (frame mounted)
 - 1. Glynn-Johnson Series 90, surface mount
 - 2. Dorma Series 900
 - 3. Approved alternate
- J. Removable mull (type as required for each door application)
 - 1. Corbin Russwin (keyed)
 - 2. Von Duprin (keyed)
- K. Door Shoe (with Rain Drip & Brush Sweep)
 - 1. 95WH Series by National Guard Products or approved alternate.
 - a. Color to match door finish.
 - b. Provide Door Shoe assembly at each exterior door leaf.
- L. Astragal Set
 - 1. 125N Series by National Guard Products or approved alternate.
 - a. One set astragals, aluminum with neoprene seals. Match door finish.
 - b. Install on each pair of exterior doors, extending from head to threshold.
- M. Drip Cap
 - 1. $1 \frac{1}{2}$ " tall x 2 $\frac{1}{2}$ " deep, anodized aluminum
 - 2. National Guard Series 16 or approved alternate.
 - 2. Approved alternate
- N. Drip Strip
 - 1. 3/4" wide x 1 $\frac{1}{2}$ " deep, aluminum.
 - 2. Model 17, manufactured by National Guard Products or approved alternate.
- O. Floor Stop:
 - 1. Rockwood Model 463. Drill 1" dia. X 2 3/4" deep hole. Replaceable rubber bumper with torx-type screw. Epoxy grout stem into place.
 - 2. Approved alternate.
- P. Latch/Lock Guard

- 1. Nominal 10 inches long, 13 gauge stainless steel manufactured by Ives or approved alternate.
- 2. Secure to door and frame per manufacturer's instruction for vandal-proof installation.
- 3. Provide stainless steel, US32D finish.
- 4. Provide type as required for door and latch type.
- 5. For vertical rod exit devices, provide latch guard (type as required) at top and bottom of door.
- R. Security Access System for security controlled doors
 - 1. <u>Panic Device:</u> Provide Von Duprin XP-EL electric with retractable latch, "Request to Exit" low current function, and cylinder dogging capability where security access doors are scheduled. Provide latch guard.
 - 2. <u>Power Supply:</u> Von Duprin PS914-2RS power supply with battery backup, installed in accessible, concealed location. Power supply to be capable of powering two latches, located no more than 200 feet from the power supply.
 - 3. <u>Power Transfer:</u> Von Duprin Model EPT-10 power transfer door-to-frame transfer device or approved alternate.
 - 4. <u>Reader Control Device:</u> Manufacturer Verkada, Refer to Specification Section 28 13 05 by electrical/low voltage subcontractor.
 - 5. Provide all low voltage control wiring as required from access control device junction box to power supply and to panic device. Conceal all wiring in walls, ceilings, doorframes, etc. Refer to electrical drawings and door/hardware schedule for locations.

2.5 HARDWARE FINISHES

- A. Aluminum Hardware items to match storefront finish.
- B. Painted Hardware items to match storefront finish color.

PART 3 EXECUTION

- 3.1 PREPARATION
 - A. Prep all doors and aluminum storefront members to accept and support specified and scheduled hardware items.

3.2 FABRICATION

- A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.
- B. Rigidly fit and secure joints and corners. Make joints and connections flush, hairline, and weatherproof.
- C. Develop drainage holes with moisture pattern to exterior.
- D. Prepare components to receive anchor devices. Fabricate anchorage items.

- E. Arrange fasteners, attachments, and jointing to ensure concealment from view.
- F. Prepare components with internal reinforcement for door hardware.
- G. All exposed screws to be countersunk using flathead screws, flush with surface.

3.3 EXECUTION

- A. Verify wall openings are ready to receive work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

3.4 INSTALLATION

- A. Install doors, frames, glazing, and hardware called for in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Install sill flashings and end dams.
- E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install hardware using templates provided. Refer to Section 08 71 00 for cylinders and installation requirements.
- G. Install perimeter flashings for storefront fabrications PRIOR TO storefront installation.
- H. Install perimeter sealant, backing materials, and installation requirements in accordance with Section 07 92 00. Provide sealant. DO NOT INSTALL SEALANT AT SILL DRAINAGE HOLES AND SLOTS.
- I. Adjust operating hardware and touch panels.
- J. Closers to have through-bolt connections at door and frame.
- K. Wiring for devices requiring electrical power shall be concealed within aluminum frame and doors.
- L. Cut thresholds at door jamb around stops or jamb trim.
- 3.5 LATCH/LOCK GUARDS

A. Latch and lock guards are to be installed on each exterior door.

3.6 TOLERANCES

- A. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet whichever is less.
- B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inches.
- 3.7 DOOR HARDWARE SCHEDULE
 - A. Refer to Architectural sheets for door hardware sets.
 - B. <u>Note the following:</u>
 - 1. All aluminum door hinges are to be continuous hinges.
 - 2. Panic devices are to be "doggable" (unless door is fire rated).
 - 3. Provide heavy-duty floor stops at all exterior doors unless noted otherwise on schedule.
 - 4. All exterior doors to have weatherstripping set capable of keeping blowing rain out of building.
 - 5. All exterior doors to have ADA closers, ADA threshold, door shoes, astragal set (if pair of doors), and drip caps.
 - 6. Mullion seal (where removable mullions are scheduled)
 - 7. All exterior single-leaf doors to have latch guard.
 - 8. Set exterior thresholds in full bed of butyl caulk.
 - 9. All exterior doors to have security access control hardware, low voltage wire and conduit, junction box for security access device. Reference electrical drawings.

END OF SECTION

COMPANY LETTERHEAD

CERTIFICATE OF GUARANTEE FROM INSTALLER

We,

(Name of Company or Contractor) agree to warranty aluminum storefront system on the below mentioned building for the period indicated. This agreement is to render the aluminum storefront system subject to the conditions outlined below.

City	Roof Area	square feet	
Location of Building			
OWNER OF BUILDING			

This Guarantee effective this ______ day of _____, 20____, for the term of FIVE (5) years from this date, provided any air and water leakage and system defects result from defective material or workmanship and are not caused by other mechanics, fire, accidents, or by nature over which we have no control.

It is understood and agreed that the Contractor will not be responsible for leaks or failure of the aluminum storefront system due to sustained winds in excess of speeds stated in manufacturer's warranty, or any other conditions over which we have no control as stated in manufacturer's exclusions.

Signed		
Name of Company		

By_____

Position _____

Company is a ______Corp./Partnership/Individual

NOTARY PUBLIC

Registered in the State of _____

SEAL

NOTE: Aluminum storefront system manufacturer's Two (2) year system warranty and Two (2) year door construction warranty from the manufacturer is to be submitted in addition to the guarantee from the installer found on this form. Manufacturer's Warranty is mandatory - **NO EXCEPTIONS**.

SECTION 08 45 23

TRANSLUCENT PANEL GLAZING SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Self supporting aluminum framed vertical glazing system.
- B. Sandwich panels of translucent skins separated with extruded plastic cellular panels.
- C. Perimeter sealant.

1.2 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealers: System perimeter sealant and back-up materials.

1.3 REFERENCES

A. AAMA 605.2 - Designation System for Aluminum Finishes.

1.4 SYSTEM DESCRIPTION

A. Panels shall be 2-3/4" thick and consist of glass fiber reinforced polymer faces bonded under controlled heat and pressure to a mechanically interlocked aluminum grid core.

1.5 PERFORMANCE REQUIREMENTS

- A. The Panels shall have the following minimum performance characteristics:
 - 1. Exterior face shall be color stable the full thickness, before and after application of protective film or coatings, and shall include a permanent glass erosion barrier, plus a fully field re-finishable and restorable self-cleaning surface applied under factory controlled conditions.
 - 2. Color stability from weathering is such that the exterior face shall not change more then 3.0 Units (Delta E by 'ASTM D-2244), determined by an average of three white samples after at least 60 months outdoor exposure in South Florida at 7 degrees facing South.
 - 3. Interior flame spread maximum 45, smoke developed maximum 350 by ASTM E-84 (Optional: 20 flame spread, 200 smoke; 25 flame spread, 100 smoke); Burn Extent 1" or less by ASTM D-635.
 - 4. Exterior face impact resistance minimum 60 ft. lbs.
 - 5. Laminate adhesive shall be heat and pressure resin type engineered for structural sandwich panel use and shall pass rigorous testing requirements specified by the International conference of Building Officials, "Acceptance Criteria for Sandwich Panel Adhesive." Minimum strength shall be 750 psi tensile strength by ASTM C-297 after two exposures to ASTM D-1037; and 500 PSI shear strength average by ASTM D-1002 after fiver prescribed exposures.

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- 6. "U" Factor by NFRC shall be .23.
- 7. Grid core shall be 6005-T5 or 6063-T6 thermally broken composite I-beams, 7/16" flange width, mechanically interlocked to insure even muntin-mullion intersection.
- B. System Assembly: Accommodate without damage to system, components or deterioration of seals; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; deflection of structural support framing, and tolerance of supporting components.
- C. Water Leakage: None, when measured in accordance with AAMA 501.
- D. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
- 1.6 SUBMITTALS FOR REVIEW
 - A. Section 01 33 00 Submittals: Procedures for submittals.
 - B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, panel configuration.
 - C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances.
- 1.7 QUALITY ASSURANCE
 - A. Perform Work in accordance with AAMA Window, Store Front and Entrance Guide Specifications Manual.
 - B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.
- 1.8 DELIVERY, STORAGE, AND PROTECTION
 - A. Section 01 60 00 Material and Equipment: Transport, handle, store, and protect products.
 - B. Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.
- 1.9 ENVIRONMENTAL REQUIREMENTS
 - A. Maintain this minimum temperature during and after installation of sealants.

08 45 23-2
PART 2 PRODUCTS

2.1 TRANSLUCENT PANEL SYSTEM

- A. Manufacturers:
 - 1. Kalwall 2-3/4" translucent panel system.
 - 2. Approved alternate.

2.2 MATERIALS and COMPONENTS

- A. Translucent panels to have .070" super-weathering white exterior faces, .045" white interior faces, 10" Verti-kal Grid system, thermally broken system.
- B. Sash fixed.
- C. Construction all components shall be pre-assembled and sealed into Panel-Units by Kalwall Corporation. Panel-Units shall be shipped to the job site in rigid structural units (except for removable components) and shall be ready for erection as units.
- D. Head, sill jamb and vertical closures shall be thermally broken Kalwall Clamp-tite system, with Kalwall corrosion resistant finish, per AAMA 605.2. Closures shall maintain continuous clamping action on sealing tapes. Sealing tapes shall be factory applied to system. All screws to be stainless steel.
- E. Fasteners: Stainless steel.

2.3 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07 92 00.

2.4 FABRICATION

- A. Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to ensure concealment from view.
- E. Reinforce framing members for external imposed loads.

2.5 FINISHES

A. Aluminum Finish Coatings: Conform to AAMA 605.2.

08 45 23-3

- B. Aluminum to be mill finish.
- C. Panel Color:
 - 1. Interior White
 - 2. Exterior White
- D. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining air barrier and vapor retarder materials are ready to receive work of this section.

3.2 INSTALLATION

- A. Install translucent panel system in accordance with manufacturer instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.
- E. Install sill and head flashings.
- F. Install perimeter sealant and backing materials, in accordance with Section 07 92 00.

3.3 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft noncumulative or 0.5 inches per 100 ft whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

A. Inspection will monitor quality of installation and glazing.

08 45 23-4

3.5 MANUFACTURER'S FIELD SERVICES

A. Translucent panel product manufacturers to provide field surveillance of the installation of their Products.

3.6 CLEANING

- A. Section 01 50 00 Closeout: Cleaning installed work.
- B. Remove protective material from prefinished aluminum surfaces.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Remove excess sealant by moderate use of mineral spirits or other solvents acceptable to sealant manufacturer.

3.7 PROTECTION OF FINISHED WORK

- A. Section 01 60 00 Material and Equipment: Protecting installed work.
- B. Protect finished Work from damage.

END OF SECTION

08 45 23-5

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SECTION 08 71 00

FINISH DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Door hardware.
 - 2. Miscellaneous finish hardware.
 - 3. Latch & lock guards

B. Related Sections:

- 1. Section 08 11 13 Hollow Metal Doors and Frames.
- 2. Section 08 14 16 Wood Doors.
- 3. Section 08 43 13 Aluminum Storefront and Doors

1.2 SUBMITTALS

- A. Comply with Section 01 33 00.
- B. Submit through Contractor to Architect. Prior to submitting, contact Architect to discuss door hardware/keying meeting. If Architect elects, submittal will be reviewed at time of meeting. Supplier will make corrections as a result of meeting and distribute record copies to Architect and Contractor.
- C. Hardware Schedule: Submit final hardware schedule organized by "sets", to indicate specifically product to be furnished for each item required on each door.
- D. Templates: Furnish templates to each fabricator of doors and frames, as required for preparation to receive hardware.

1.3 DOOR HARDWARE/KEYING MEETING

A. Prior to ordering of hardware items, Contractor shall arrange meeting between, hardware supplier, Owner, and Architect to review and verify door hardware submittals and keying suggestions. This review meeting shall be considered as the submittal review. Any changes shall be incorporated in the hardware submittals and then resubmitted to Contractor and Architect as <u>record copy</u>. Contractor to notify all parties one (1) week prior to meeting date.

1.4 PRE-INSTALLATION MEETING

A. Prior to installation of hardware items, Contractor shall arrange meeting between hardware installer, hardware supplier, and factory representatives of locks, locksets, exit devices, closers and specialty hardware items in order to review the installation requirements and procedures.

1.5 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features for all door hardware items used on this project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product Quality: Hardware items are to be ANSI Grade 1 Certification.

2.2 HINGES

- A. Manufacturers:
 - 1. Stanley
 - 2. Hagar
 - 3. Approved alternate

B. Material:

- 1. Provide full mortise-type hinges with stainless steel pins, except steel pins with steel hinges; non-removable for exterior and public interior exposure, non-rising for non-security exposure, flat button with matching plugs. Provide stainless steel hinges on exterior applications.
- 2. Ball-bearing Function: Swaged, inner leaf beveled, square corners.
- C. Continuous Hinges

1. Roton, model 780-224 HD series. (No substitutions accepted) 2.Warranty: Manufacturer's lifetime warranty.

2.3 LOCKS, LATCHES, AND BOLTS

- A. Manufacturers:
 - 1. Schlage (L9000 Series Vandlgard Mortise lockset with Rhodes style lever handle), No Substitutions.
 - 2. Special operation:
 - a. Provide mortise type privacy "OCCUPIED" indicator where called for.
 - b. Provide "Intruder" classroom security function for classroom doors and where called for.
 - 3. Note: Locksets and lock cylinders for aluminum doors are provided under this section.

- 4. Warranty: ND Series Cylindrical (10-Years); L Series Mortise (3-year), Elecromechanical (1-year)
- B. Materials:
 - 1. Strikes: Wrought box strikes, with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dustproof strikes for foot bolts.
 - 2. Locks: Cylindrical locksets equipped with 6-pin tumbler; with interchangeable cores and keyed alike. Provide 2-3/4" backset. Provide three keys for each lock.
 - a. Interior doors are to be mortise locks with standard interchangeable Schlage keyway.
 - b. Exterior cylinders are Primus locks with removable core.

2.4 DOOR CONTROL DEVICES

A. Panic Device:

Manufacturer and Product:

- 1. Von Duprin 99 Series, XP99 Series with Ives VR Series trim at exterior doors (Von Duprin XP-QEL99 Series where retractable latch exit device and security access control is called for). No Substitutions. Use Ives VR910 Series on exterior doors.
- 2. Corbin Russwin 5000 Series
- 3. Sargent 80 Series
- 4. Approved alternate.
- 5. Warranty: Provide minimum three (3) year manufacturer's warranty.
- 6. Unless called for otherwise, or where a fire door occurs, all panic devices will be cylinder.
- B. Wall Bumper:
 - 1. Rockwood 400 Series, Concave Style
 - 2. Glynn-Johnson 60 Series, Concave Style
 - 3. Approved alternate.
- C. Cabinet-Mounted Bumper:
 - 1. Rockwood 430, "Duraflex" bumper with solid brass trim, concealed mounting, finish color to match door lockset, mounted on countertop edge or window sill edge.
 - 2. Approved alternate.
- D. Straight Roller Stop:
 - 1. Rockwood 455 or 456L "Duraflex" roller bumper (style as required per application) with solid brass stem, finish color to match door lockset, installed 2" from top and latch side edge of door.
 - 2. Approved alternate.
- E. Closers:
 - 1. Interior Doors:
 - a. LCN 1460 Series (with extra duty arm where called for on hardware schedule)
 - b. Approved alternate
 - c. Warranty: Provide minimum 30 year warranty for closer operation.

- d. Install per 3.2.E
- 2. Exterior Doors:
 - a. LCN 4040XP-Spring Cush Series. No Substitutions.
 - b. Warranty: Provide minimum 30 year warranty for closer operation.
 - c. Install per 3.2.E
- 3. Provide with a minimum of ten (10) year manufacturer's warranty.
- 4. Provide all brackets and spacers necessary for all door and frame conditions.
- F. Security Access Controlled Doors (Reference 08 43 13)
- G. Materials:
 - 1. Provide grey rubber exposed resilient parts.
 - 2. Any floor stop other than that specified will not be accepted.
 - 3. All closer cylinders to be cast iron.

2.5 MISCELLANEOUS HARDWARE

- A. Silencers: Provide in metal door frames, unless not permitted for fire rating, or unless bumper-type weather-stripping is provided; three for each single door frame, two for double-door frame.
 - 1. 3M
 - 2. Hager
 - 3. Glynn Johnson
 - 4. Approved alternate.
- B. Door Flush Bolt:
 - 1. Rockwood #555 12"
 - 2. H.B. Ives #458
 - 3. Glynn-Johnson FB6
 - 3. Approved alternate.
- C. Automatic Flush Bolt
 - 1. Rockwood model 1840
 - 2. H.B. Ives model FB61T series (wood doors), model FB 31T series (hollow metal doors)
 - 3. Approved alternate.
- D. Pull and Push Manufacturers:
 - 1. Rockwood model 111 x 70C pull plate (.125" thick x 4" x 16"plate with 10" pull); model 73C push (.125" thick x 4" x 16")
 - 2. Approved alternate.
- E. Threshold:

(Threshold height not to exceed 1/2" to meet ADAAG guidelines.)

- 1. Model 896N, 5" deep, manufactured by National Guard Products, or approved alternate, ADA compliant panic threshold
- 2. Extruded aluminum, mill finish, neoprene seal, for exterior doors only.
- 3. Provide saddle-type threshold where threshold is called for at interior locations.
- 4. Where "square back" type threshold is to be provided, provide ADA compliant threshold, #415 series square back with #700EN stop strip. This type is to be used where backing up to terrazzo, ceramic tile, or other similar floor materials. Provide width as needed for door frame width.
- F. Weatherstripping:
 - 1. Model 135N series, aluminum with neoprene seal, manufactured by National Guard or approved alternate.
 - 2. Provide with natural anodized finish.
 - 3. Provide other models as required to coordinate with special door hardware items.
- G. Mullion Seal:
 - 1. Model 5100S, gray color, manufactured by National Guard Products or approved alternate.
 - 2. Install at all removable mullions.
- H. Door Coordinator Manufacturers & Products:
 - 1. Hager, #297D Coordinator. See drawings for size.
 - 2. Ives CO series
 - 3. Approved alternate.
- I. Wall-mounted Door Hold-open Manufacturers & Product:
 - 1. Ives FS 495
 - 2. Approved alternate.
- J. Frame-mounted Door Hold-open & stop Manufacturers & Product:
 - 1. Glynn-Johnson Series 90, surface mounted
 - 2. Dorma Series 900
 - 3. Approved alternate.
- K. Floor Stop:
 - 1. Rockwood Model 463. Drill 1" dia. X 2 3/4" deep hole. Replaceable rubber bumper with torx-type screw. Epoxy grout stem into place.
 - 2. Approved alternate.
- L. Sweep
 - 1. 198 Series by National Guard Products or approved alternate.
 - a. Neoprene sweep with natural anodized aluminum trim. Size as required to cover door undercut.
- M. Door Shoe (with Rain Drip & Brush Sweep)
 - 1. 95WH Series by National Guard Products or approved alternate.
 - a. Provide with natural anodized finish.

- b. Provide Door Shoe assembly at each exterior door leaf.
- N. Astragal Set
 - 1. 125N Series by National Guard Products
 - a. One set aluminum with neoprene astragal seals with natural anodized finish.
 - b. Install on each pair of exterior doors, extending from head to threshold.
- O. Kick Plates
 - 1. Trimco 9" kickplates
 - 2. Aluminum Finish
- P. Keyed Removable Mullion (Model as required to coordinate with each installation)
 - 1. Von Duprin (Keyed)
 - 2. Approved alternate. (Keyed)
- Q. Wall Stop
 - 1. Trimco #1205
 - 2. Ives #WS443
 - 3. Glynn-Johnson #WB35
 - 4. Approved alternate.

R. Drip Cap

- 1. $2\frac{1}{2}$ wide x $1\frac{1}{2}$ deep, anodized aluminum.
- 2. Model 16A, manufactured by National Guard Products or approved alternate.
- S. Drip Strip
 - 1. 3/4" wide x 1 $\frac{1}{2}$ " deep, aluminum.
 - 2. Model 17, manufactured by National Guard Products or approved alternate.

2.6 FINISH

- A. All exposed interior hardware and door control devices to be furnished with US26D Finish. Exterior hardware finish to be US32D.
- B. Painted hardware items to match color of door control devices.

2.7 FABRICATION

A. Finish and Base Material Designations: Number indicate BHMA Code or nearest traditional U. S. commercial finish. US26D & US32D or equivalent.

PART 3 EXECUTION

- 3.1 COORDINATION
 - A. Hardware supplier to verify and coordinate door and frame preparation, including required reinforcement in hollow metal doors and frames for hardware attachment.

3.2 INSTALLATION

- A. Hardware Mounting Heights: Door and Hardware Institute Recommended Locations for Builders Hardware for Standard Steel Doors and Frames, except as otherwise indicated.
- B. Install each hardware item to comply with manufacturer's instructions and recommendations.
- C. Door closers, door coordinators, and frame-mounted overhead stops shall be installed to <u>frames</u>, using machine thread type screws. Holes shall be tapped in hollow metal frames to accept threaded screws. Screws shall be of a size as recommended by hardware manufacturer.
- D. All other hardware items mounted to door shall be required to be mounted to door with appropriate through bolts for wood doors and machine thread type screws for hollow metal doors. Holes shall be tapped in hollow metal door reinforcement to accept threaded screws. Screws shall be of a size as recommended by hardware manufacturer.
- E. Door closers, door coordinators, and frame-mounted overhead stops at all <u>exterior and</u> <u>interior doors</u> shall have through-bolt connections at door. Exposed head of bolt shall be of a flush, smooth type.
- F. <u>**'TEK' TYPE SCREWS ARE NOT TO BE USED.</u>** Use fasteners provided by hardware supplier for each corresponding hardware device for door and frame type and as specified in this specification.</u>
- G. Install each hardware item per manufacturer's instructions. If any item fails to operate properly because of improper installation, it shall be the installer's responsibility to correct. If item continues to malfunction or if Contractor or Architect suspects any hardware item to be defective, hardware supplier shall examine item in question. If Supplier determines item is defective, he shall replace item at no extra cost to owner.
- H. Thresholds to be cut around jamb stops for snug fit to door jambs.

3.3 ADJUSTING

- A. Hardware Adjustment: Return to project one month after Owner's occupancy, and adjust hardware for proper operation and function.
- 3.4 KEYING
 - A. Locksets and cylinders are to be master keyed. Prepare and submit a detailed list of complete keying recommendations to the Architect, which will be discussed during keying meeting. Coordinate desired keying schedule with owner prior to submitting of keying recommendation. Furnish three (3) keys for each individual lock in addition to three (3) master keys.

- B. Each key for entire project to be stamped for identification.
- C. Provide a key cabinet 1200 Series, surface mounted, 2-1/2" deep cabinet, two-tag system, manufactured by Lund or approved equal. Size to be determined by key quantity. See Drawings for location.

3.5 HARDWARE ALLOWANCE: REFER TO SECTION 01 21 13

- A. Provide an allowance per section 01 21 13 for any changes or additions to door hardware. The hardware sets listed below are to be included in contract price.
- B. Items not included in above allowance.
 - 1. Rough Hardware
 - 2. Toilet Partition Hardware
 - 3. Hardware for doors specified elsewhere
 - 4. Millwork hardware

3.6 TYPICAL DOOR HARDWARE FOR EXTERIOR AND INTERIOR DOORS

- A. Each leaf of all exterior hollow metal doors, unless noted otherwise, is to receive the following hardware items:
 - 1. ADA Accessible closer.
 - 2. Continuous hinges
 - 3. Weatherstripping set
 - 4. ADA Threshold (Set in butyl rubber sealant)
 - 5. Astragal set (for pair of doors)
 - 6. Door shoe
 - 7. Mullion seal (for removable mullions)
 - 8. Drip cap
- B. Each leaf of all interior doors, unless noted otherwise, is to receive the following hardware items:
 - 1. Three butt hinges for doors up to 3'-4"; For door leaves 3'-6" to 3'-10", provide 2 pairs butt hinges. For leaves 4'-0" or wider provide continuous hinge as specified.
 - 2. Provide three silencers for single leafs, two silencers for double leafs.
- C. Refer to drawings for hardware sets schedule.

END OF SECTION

SECTION 08 81 00

GLASS AND GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, tools, equipment, services, operations and incidentals necessary to install, complete in every respect, all glass, glazing, and related work as indicated on Drawings and specified.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Glass and glazing, as required under various Sections of these Specifications including, but not limited to:
 - 1. Hollow Metal Work: Section 08 11 13.
 - 2. Wood Doors: Section 08 14 16.
 - 3. Aluminum Storefront: Section 08 43 13
 - 4. Aluminum Windows: Section 08 51 13
- B. Installation materials specified in Sealants and Caulking: Section 07 92 00.

1.3 REFERENCES

- A. ASTM C1048 "Standard Specification for Heat Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass."
- B. ASTM C1279 "Standard Test Method for Non-Destructive Photoelastic Measurement of Edge and Surface Stresses in Annealed, Heat-Strengthened, and Fully Tempered Glass" Requirements.

1.4 SUBMITTALS

- A. General: Comply with the provision of Section 01 33 00.
- B. Product Data: Within 30 calendar days after award of the Contract, submit:
 - 1. Complete materials list showing all items proposed to be furnished and installed under this Section.
 - 2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.
- C. Shop Drawings:
 - 1. Submit detailed shop and installation drawings of all work under this Section to Architect for approval prior to ordering materials.
 - 2. Indicate glass sizes, thickness, glazing details and where mirrors are to be installed in the building.

3. Shop Drawings shall include engineering data on the Aluminum Entry/Storefront and other glazing systems, including the size and spacing of setting blocks under the glass and wind load.

1.5 FIELD MEASUREMENTS

A. Accurately field measure all openings to receive glass and cut glass to correspond to each measured opening. The General Contractor and Glazing Contractor shall be responsible for overall coordination and accuracy of the Field Measurements.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.7 GUARANTEE

- A. Contractor shall furnish a written guarantee covering all mirror silvering from defects in material and workmanship for a period of five years from date of final acceptance of the building.
- B. All glazing work performed under this Section shall be guaranteed against defects in materials and workmanship for a period of one year from date of final acceptance of the building. This guarantee, however, shall not cover accidental breakage of glass subsequent to acceptance except where breakage is due directly to defective materials and/or inferior workmanship.
- C. All sealed insulating glass shall be warranted against failure of the air seal for a period of ten (10) years from the date of substantial completion.

PART 2 PRODUCTS

2.1 GLASS

- A. General: Glass is called for by "type" (i.e. Insulated, wire, etc.) on Details and Schedules in the Drawings. The "types" are defined herein.
- B. Tempered Glass: Provide Tempered Glass where called for on the Drawings or in these Specifications, and where such tempering would be required under provisions of the International Building Code, latest edition, or other applicable laws and regulations.
- C. Heat Strengthened Glass: Unless Tempered glass is required by code, glass at exterior walls shall be heat treated to have a surface compression between 3,500 and 7,500 psi to increase its strength to resist impact, mechanical loads and thermal stress breakage.

- D. All glass shall conform to the requirements of Federal Specification DD-G-451c, or as indicated with individual glass types.
- E. Unless noted otherwise, Glass will be manufactured by Vitro (formerly PPG), Guardian Glass or approved alternate. Each light shall bear the manufacturer's label designating the type and thickness of glass. "AFPC V2 2701.1 "Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed. Tempered spandrel glass is exempted from permanent labeling. This type of glass shall be identified with a removable paper label by the manufacturer.
- F. Individual glazed areas in hazardous locations shall meet requirements CPSC 16, CFR Part 1201.
- G. Size: Sizes of glass indicated on Drawings are approximate, actual sizes of glass shall be taken from actual frames. Labels shall remain on glass until after inspection by the Architect.
 - 1. Actual design sizing shall be the responsibility of the glass manufacturer. Sizes indicated herein and on the Drawings are approximate only. Where required, the manufacturer's recommended changes shall be made. Note all such changes or revisions on the Shop Drawings submitted for approval.

2.2 GLASS TYPES

- A. Single Thickness Plate Glass: Shall be 1/4" thick clear glazing quality float glass.
- B. Tempered/Safety Glazing: Shall be 1/4" thick clear Tuf-flex Tempered Safety Glass to meet the requirements of Federal Specifications DD-G-1403B, ANSI Z97, 1-1984 and the Federal Standard 15 CFR 1201.
- C. Laminated (shatter resistant) Glass: Shall be 7/16" thick clear composed of 3/16"(5mm) clear float glass, 0.06" clear PVB and 3/16"(5mm) clear float glass. Cat II (CPSC 16 CFR 1201, ANSI Z97.1) and UL972
- D. Insulated Glazing: Shall be 1" thick Thermopane Insulating Glass as follows, refer to drawings for locations:
 - 1. Tinted Low-E Glass:
 - a. Solarban 60 (2) Optigray ¹/₄"(6mm), ¹/₂" Air Space, Clear ¹/₄"(6mm). Manuf. By Vitro
 - b. Sunguard SN 68 (2) Gray ¹/₄"(6mm), ¹/₂" Air Space, Clear ¹/₄"(6mm). Manuf. By Guardian.
 - c. SHGC= 0.30 0.32
 - d. U value= 0.29

2.4 GLAZING COMPOUNDS AND SEALANTS

- A. General: Use glazing compounds and preformed glazing sealant approved for the particular application as described herein and shown on the Drawings or specified in the Related Work referenced in Paragraph 1 b) of the Section, unless otherwise noted.
- B. Glazing Compound shall be GE SILGLAZE, clear or neutral color, unless approved otherwise by the Architect.
- C. Setting Blocks and Gaskets shall be extruded hard neoprene, clear or neutral color unless noted otherwise.
- D. Tape shall be polyisobutylene base elastic compound with gauze reinforcement, equal to Presstite 162 Elastic Compound Tape, clear or neutral color unless noted otherwise.
- E. Sealants used for glazing shall be G.E. Silicone, Dow-Corning Silicone Structural Sealant, or as approved by the Architect. Silicone shall be clear or neutral color as approved by Architect.

2.5 GLAZING ACCESSORIES

A. Provide all glazing accessories required to supplement those accessories which accompany the items to be glazed, and as needed to provide a complete installation, including glazing points, clips, shims, angles, beads, settling blocks, and spacer strips. Use ferrous metal, which will be exposed in the finished work, which has a finish that will not corrode or stain while in service.

2.6 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify all field dimension openings prior to glass fabrication and cutting. Cut pieces to fit actual opening sizes.

PART 3 EXECUTION

- 3.1 INSTALLATION
 - A. General:
 - 1. All glass shall be accurately cut or sized to fit openings and locations and shall be set by skilled glazers. Extreme care shall be exercised in sizing the insulating glass to allow recommended clearances around glass.
 - 2. Cut and install glass with any visible lines or waves running in horizontal direction.

- 3. Fix movable and operating items securely, or in a closed, locked position until glazing compound has thoroughly set.
- 4. Use insulating units which do not have corners or edges ground, nipped, cut, or fitted after leaving the factory. Do not subject units to springing, forcing, or twisting during setting. Handle so as not to strike the setting frames or other objects.
- 5. Use beads or stops furnished with the items to be glazed to secure the glass in place.
- 6. Items to be glazed shall be shop-glazed or field-glazed with glass of the quality and thickness specified.

3.2 GLASS SETTING

- A. Wood Doors and Wood Frames: Field glaze all wood doors and wood frames with glazing sealant and flush solid wood stops as indicated on Drawings. (Metal stops where required for fire rating)
 - 1. Use sufficient glazing sealant to insure a complete seal between glass and stop.
 - 2. After stops have been installed and pulled up tight, trim bead of sealant resulting from setting operations away from face of glass. Retouch damaged compound after glazing.
- B. Aluminum Doors, Frames, Storefront and Windows:
 - 1. All openings shall be field-glazed in strict conformance with aluminum door frame and window manufacturer's written instructions.
 - 2. Install glass types as indicated on Drawings and described in this Section.
 - 3. Extruded EPDM elastomeric glazing gaskets shall be supplied with each aluminum door, frame or window by the manufacturer.
 - 4. All installations shall be completely watertight when finished.

3.3 REPLACEMENT AND CLEANING

- A. Replacement: Glass broken or glass damaged before completion of the building operations shall be replaced with glass of the like kind and quality at no cost to the Owner.
- B. Cleaning: Upon completion of all construction work and approval of all glazing installations, remove from the glass surfaces, surrounding framing materials and mirrors all labels, sealant and caulking compound smears, spots, etc. Do not use cleaning materials or agents which will damage glass or surrounding surfaces. After cleaning, wash all glass and mirrors completely.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-load bearing metal studs and accessories for wall assemblies.
- B. Wood Blocking for wall-mounted items.
- C. Draft Stopping

1.2 RELATED SECTIONS

- A. Section 03 35 20 Polished Concrete
- B. Section 05 40 00 Cold-Formed Metal Framing.
- C. Section 07 92 00 Joint Sealants-Sill Sealer below bottom track at exterior walls
- D. Section 09 24 00 Gypsum Plaster: Interior plaster applications.
- E. Section 09 29 00 Drywall: Gypsum interior sheathing.

1.3 REFERENCES

- A. AISI Standard for Cold-Formed Steel Framing General Provisions.
- B. AISI North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members 2001.
- C. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- D. ASTM A 780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- E. ASTM A 1003 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- F. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members 2006.
- G. ASTM C 754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- H. ASTM C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- I. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building

Materials.

- J. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- K. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- L. ASTM E 413 Classification for Rating Sound Insulation.
- M. GA-600 Fire Resistance Design Manual.

1.4 DESIGN REQUIREMENTS

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members" or the North American Specification for the Design of Cold-Formed Steel Structural members, except as otherwise shown or specified.
- B. Design loads: As indicated on the Architectural Drawings. 5 PSF minimum design lateral load is required for interior walls by the building code. Shaftwall framing minimum design lateral load is typically 5 15 PSF.
- C. Design framing systems to withstand design loads without deflections greater than the following:
 - 1. Interior Non-Load Bearing Walls: Lateral deflection of: L/240.
 - 2. Interior Non-Load Bearing Walls: Lateral deflection of: L/360 for walls with ceramic tile.
- D. Design framing system to accommodate deflection of primary building structure and construction tolerances.
- E. Responsibilities: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by, and displaying a classification label from, an independent testing agency acceptable to the authority having jurisdiction.
 - 1. Construct fire-resistance-rated partitions in compliance with tested assembly requirements indicated in drawings.
 - 2. Rated assemblies to be substantiated, from applicable testing using the proposed products, by Contractor.
 - 3. Both metal framing & wallboard manufacturers must submit written confirmation that they accept the other manufacturer's product as a suitable component in the assembly. Acceptance is as follows:
 - a. If installation of both products is proper, no adverse effect will result in the performance of one manufacturer's product by the other's products.
 - b. Combining products can be substantiated by required assembly tests.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

- B. Submit manufacturer's product literature and data sheets for specified products.
- C. Manufacturer's certification of product compliance with codes and standards.

1.6 QUALITY ASSURANCE

- A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.
- B. Contractor to conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. Notify manufacturer of damaged materials received prior to installing.
 - B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C754 section 8.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. ClarkDietrich Building Systems, 9100 Pointe Drive, Suite 210, West Chester, OH. Phone: 513-870-1100. www.clarkdietrich.com, info@clarckdietritrich.com.
 - 2. Other manufacturers as referenced in this section for specific products.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- C. All products to be manufactured by current members of the Steel Stud Manufacturers Association (SSMA), Steel Framing Industry Associates (SFIA), or the Certified Steel Stud Association (CSSA).

2.2 MATERIALS

- A. Steel: Galvanized Steel meeting or exceeding the requirements of ASTM A 1003.
 - 1. Coating: Galvanized G60 (Z180) coating minimum or equivalent, complying with ASTM C 645. Stud finish MUST be hot dipped galvanized. Galvanneal finish is not acceptable. G60 must be used at all EXTERIOR locations. G40 finish is allowed at interior locations.

2.3 COMPONENTS

A. Nonstructural Studs:

- 1. Flange Length: 1 1/4 inch (32mm) 125 flange.
- 2. Web Depth: As indicated on drawings.
- 3. Minimum Material Thickness: Gauge as required by stud legend shown on drawings.
- 4. Punch Outs: 12 inches (305mm) from base and every 48 inches (1219mm) thereafter.
- B. Nonstructural Track: Cold-Formed galvanized steel runner tracks
 - 1. Flange Length: 1 1/4 inch (32 mm) T125 flange.
 - 2. Web: Track web to match stud web size.
 - 3. Minimum Material Thickness: Unless noted otherwise on drawings match stud gauge.
 - 4. Minimum Material Thickness: Track thickness to match wall stud thickness.
- C. Deflection Track: Cold-Formed Deep Leg Runner Slotted Slip Track.
 - 1. Leg Length: 2 inch (51 mm) T200 flange.
 - 2. Leg Length: 2 1/2 inch (63 mm) T250 flange.
 - 3. Leg Length: 3 inch (76mm) T300 flange.
 - 4. Leg Length: 3 1/2 inch (89 mm) T350 flange.
 - 5. Leg Length: As required by design.
 - 6. Minimum Material Thickness: As required by design.
 - 7. Minimum Yield Strength: 33ksi (227 MPa) (for 33mils through 118mils).
 - 8. Minimum Yield Strength: 50ksi (345 MPa) (optional for 54mils and up).
 - 9. Minimum Yield Strength: As required by design.
- D. Furring Channel: Furring walls and suspended ceiling applications.
 - 1. Size: 087F125-30 7/8 inch (22mm) Furring Channel 30mils (20ga Drywall).
 - 2. Size: 087F125-33 7/8 inch (22mm) Furring Channel 33mils (20ga Structural).
 - 3. Size: 150F125-30 1 1/2 inch (38mm) Furring Channel 30mils (20ga Drywall).
 - 4. Size: 150F125-33 1 1/2 inch (38mm) Furring Channel 33mils (20ga Structural).
- E. Framing Accessories: Provide accessories as required in this project.
 - 1. Flat Strapping for Backing Strip.
 - 2. Flat Strapping and bridging for lateral bracing.
 - 3. L-Angles.
 - 4. SwiftClip Fixed Connection Angles.
 - Deflection Slip ConnectorsClarkDietrichTM Building Systems-Deflection Clips: Fast StrutTM / Fast TopTM Clips / FastClipTM Slide Clips / QuickClipTM / Slide ClipTM (SD), or approved alternate. Provide clip as required for each situation to compensate for deflection of structure.
- F. Fire or Draft Stop Blocking: Where fire or draft stop blocking is required or called for under this section or called for on drawings, provide blocking equal to prefabricated fire blocking manufactured by Metal-Lite, Inc., Placentia, CA (800) 886-6824. Provide blocking same width as metal stud.
 - 1. As an option to the prefabricated metal blocking, mineral wool fire safing may be provided. Refer to Section 07 84 00 Firestopping.
- G. Fasteners: Self-drilling, self-tapping screws; complying with ASTM C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- H. Touch-Up Paint: Complying with ASTM A 780 Standard Practice for Repair of

Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

PART 3 EXECTION

3.1 INSPECTION

A. Inspect supporting substrates and structures for compliance of proper conditions for installation and performance of the cold-formed structural framing.

3.2 PREPARATION

A. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the cold-formed structural framing.

3.3 COORDINATION WITH OTHER TRADES

- A. It will be a requirement of this section to verify and coordinate work with other trades and specification sections. Do not begin work on concrete slabs on grade or elevated concrete slabs until minimum strength and cure time has been reached.
- B. Procedure and preparation for exposed concrete and/or polished concrete floors
 - Concrete floors in whole or in part as shown on drawings, are scheduled to be Polished or Dyed Polished Concrete. No stud walls are to begin installation until concrete slab received initial grind from floor polishing contactor. Refer to Sections 03 35 20 for requirements. This requirement includes slabs-on-grade as well as elevated slabs.
 - 2. Any equipment used on slabs to be sealed or polished, shall meet the requirements of Sections 03 35 20 concerning diapering and tire marks.

3.3 FABRICATION

- A. Prior to fabrication of framing, submit product submittal sheets to the architect or engineer to obtain approval.
- B. Framing components may be preassembled into panels prior to erecting. Prefabricate panels so they are square, with components attached in a manner which prevents racking and minimizes distortion during lifting and transport.
- C. Cut all framing components square for attachment to perpendicular members or as required for an angular fit against abutting members.
- D. Plumb, align and securely attach studs to flanges of both upper and lower runners, except that in the case of interior, non-load bearing walls where studs need not be attached to upper or lower runners.
- E. Splices in members other than top and bottom runner track are not permitted.
- F. Provide temporary bracing where required, until erection is complete. Fastening of components shall be with welding or with minimum 1 #8 screw both sides of flange. Welds shall conform to the requirements of AWS D.1.1, AWS D.1.3 and AISI Manual

Section 4.2. All welds shall be touched up using zinc-rich paint. Wire tying will not be permitted.

- G. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of load bearing studs will not be permitted.
- H. Install headers in all openings in axially loaded walls that are larger than the stud spacing in the wall. Form headers as shown on drawings.
- I. Unless shown otherwise on drawings, brace top of metal stud walls to structure above at max. 4'-0" O.C. with minimum 20 gauge stud bracing.
- J. Insulation equal to that specified elsewhere shall be provided in all double jamb studs and doubled headers not accessible to insulation contractors.
- K. Care should be taken to allow for additional studs at intersections, corners, doors, windows, steel joists, diagonal bracing and as called for in the shop drawings.

3.4 INSTALLATION – DEFLECTION TRACKS AND DEFLECTION SLIDE CLIPS

- A. Unless noted otherwise, deflection tracks are to be installed at top of interior and exterior walls terminating directly below and/or attaching to beams joists, roof or floor deck, purlins, or other items subject to deflection.
- B. Provide deflection slip connectors attached to stud walls from structure where studs extend vertically past a structural item such as but not limited to a beam or elevated floor edge angle.
- 3.5 SILL SEALER
 - A. Install continuous bead of sill sealer as specified in Section 07 92 00 below bottom tracks of all exterior stud walls.
- 3.6 FIRE OR DRAFT STOP BLOCKING
 - A. Install fire or draft stop blocking at elevated floors where studs pass by floor, and at roof plane where studs pass by roofs to form parapets. Install between each stud.
- 3.7 PROTECTION
 - A. Protect installed products until completion of project.
 - B. Touch-up, repair or replace damaged products before substantial completion of final installation.

END OF SECTION

SECTION 09 29 00

DRYWALL

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish materials and labor to complete installation of all interior drywall and miscellaneous metal trim items as indicated on plans and specified herein.
- B. Gypsum board surface texturing
- C. Exterior sheathing board
- D. Wood Blocking

1.2 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- 1.3 RELATED SECTIONS
 - A. Section 05 40 00 Cold Formed Framing
 - B. Section 07 27 26 Fluid-Applied Weather Barrier System
 - C. Section 09 22 16 Non-Load Bearing Metal Stud Wall Framing
 - D. Section 09 91 00 Painting.

1.4 **REFERENCES**

- A. ASTM C1396-Standard specification for gypsum board
- B. ASTM E90- Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements (ISO 140, Part 3)
- 1.5 ACOUSTICAL PERFORMANCE
 - A. Gypsum board wall assemblies for academic and office areas to have a minimum sound transmission class (STC) of 41.

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PART 2 PRODUCTS

2.1 MATERIALS:

- A. All gypsum board shall be type "X" fire code, manufactured by Gold Bond, USG, or CertainTeed. Thickness as indicated on drawings. Provide water-resistant in damp areas and where called for. All gyp board shall be installed in accordance with manufacturer's printed instructions and as specified herein. Use water resistant materials in shower areas.
- B. Exterior Sheathing Board
 - Exterior stud walls 1/2" weather resistant sheathing board, in lengths as long as practical to minimize joints. Product to be Dens-Glass Exterior Sheathing manufactured by Georgia-Pacific, GlasRoc Sheathing manufactured by CertainTeed, "Securock "Glass Mat Sheathing manufactured by USG, "GreenGlass" fiberglass-faced Gypsum sheathing, manufactured by Temple-Inland, or approved alternate product and manufacturer.
- C. Cementitious Fiber-Mat Reinforced Sheathing (Cement Board): ASTM C 1325, ANSI A118.9, cementitious backer.
 - 1. Product: DUROCK Brand Cement Board by United States Gypsum Company, "Fiberock Aqua Tough" by USG, or approved alternate.
 - 2. Type and Thickness 5/8 inch thick.
 - 3. Size: Supplier's choice.
- D. Gypsum board thickness
 - 1. Unless noted otherwise in this specification or on drawings, gypsum board thickness to be 5/8".

PART 3 EXECUTION

3.1 INSTALLATION:

A. <u>Painted Gypsum Board:</u>

- 1. Attachment to be by screws 12 inch o.c. in the field and 8 inch o.c. along vertical abutting edges, and 7 inch o.c. on ceiling areas. Type `X' shall be attached 7 inch o.c. edges, ends, and field.
- 2. All taping and texture shall be done in accordance to printed instructions as supplied by Gold Bond and approved by the Architect. All texture shall be approved by the Architect before proceeding with the work.
- 3. At metal stud sound walls with multiple layers of gypsum board on one or both sides, each layer is to be taped and floated to deck. Outer layer to be finished as well. At deck, cut gypsum board to fit profile of deck. Seal joint at deck with continuous bead of polyurethane sealant.
- 4. Provide metal "J" mold where edge of gypsum board abuts a different material or edge of gypsum board is to remain exposed.
- 5. All painted gypsum board will be textured per this specification unless noted otherwise.
- 6. Suspended drywall framing shall be attached to structure with No. 12 gauge hanger wires spaced not more than 2'-0" on center in one direction and 2'-0" on center in the other.

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B. Exterior Sheathing Board

- 1. Wall sheathing shall be attached with electric-driven screwdriver with screws no closer than 3/8" from edges and ends. Apply sheathing in lengths as long as practical to minimize horizontal joints. Keep horizontal joints as high on wall as possible.
- 2. Install all sheathing board in strict accordance with manufacturer's instruction.

C. Cement Board

- 1. Install cement board backer in areas where wall tile is scheduled to be installed. Attach with screws, complying with Manufacturer's recommendation and instruction.
- 2. Prep for ceramic tile installation in accordance with applicable requirements of The Tile Council of North America.

D. Stud Framing

1. Align floor and ceiling tracks to assure plumb partition. Secure the track with suitable fasteners at 24" O.C. maximum. Stud spacing to be 16" o.c. for door and window openings up to 4'-0" wide, reinforcing shall occur through use of a 20 gauge stud screw attached to frame anchors. On openings 4'-0" wide and over, use 2-20 gauge studs back to back against frame and securely attached.

3.2 GYPSUM BOARD SURFACE TEXTURING:

- A. Where exposed to view, provide light to medium "orange peel" gypsum compound texture on gypsum board surfaces and where called for on drawings unless noted otherwise.
 - 1. Provide two 2' x 2' mockup boards with both light and medium orange peel finish for Architect's and Owner's review and approval.
- B. Texture to be uniform on walls throughout building.
- C. Contractor to apply orange peel texturing to sample mockup panel and be approved by Architect prior to any further application.

3.3 CONTROL JOINTS

- A. Galvanized metal control joint, Model 093 by USG or approved alternate.
- B. Control joints are to be provided at approximately 30'-0" o.c. horizontally and vertically at wall, ceiling, light coves and furrdown installations. Joints should be located at corner of door or window heads if spacing allows and where shown or called for on drawings. These shall be considered minimum requirements.
- C. Drywall contractor will repair any cracks in drywall for the one-year warranty period.

2.4 WOOD BLOCKING

A. Install 2 x wood blocking in walls where concealed behind drywall for anchoring of wallmounted items such as (but not limited to) wall mounted door hardware, markerboards,

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tackboards, projector screens, TV brackets, etc. Metal plate backing will not be accepted for anchoring of wall-mounted items.

B. Provide blocking treated for fire resistance where required by code and as specified or called for.

3.5 CLEAN-UP

A. The Contractor shall be responsible for complete clean up on his contract at completion of same.

END OF SECTION

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SECTION 09 31 13

CERAMIC TILE

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish all materials, labor, tools, equipment, services, operations and incidentals necessary to complete all ceramic tile work as indicated in the drawings and specified.
- B. Pre-Install meeting
- 1.2 RELATED SECTIONS
 - A. Gypsum Drywall Systems: Section 09 29 00.
 - B. Wall Tile Backer Board: Section 09 29 00
 - C. Performed Expansion Joints: Section 07 95 13
 - D. Sealing of Joints: Section 07 92 00

1.3 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this section.
- B Subcontractor / supplier providing work under this section will install work specified in this section with their company's own installers, employed by the company. <u>Subcontracting of installation will not be allowed unless approved by Architect prior to bid.</u>
- C. Qualifications of Manufacturer: Products used in the work of this section shall be produced by manufacturer regularly engaged in manufacture of similar items and with a history of successful production.
- D. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.4 SUBMITTALS

- A. Submit through Contractor to Architect, comply with Section 01 33 00.
- B. Manufacturers' Data: As soon as possible after award of the Contract, submit:
 - 1. Complete materials list of all items proposed to be furnished and installed under this section, including manufacturer's recommended installation procedures.

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2. Manufacturers' specifications and other data required to demonstrate compliance with the specified requirements.

1.5 SAMPLES

A. Contractor shall submit samples of all ceramic tile to be used on this work.

1.6 GUARANTEE

- A. All work under this section shall be guaranteed free from defects in material and workmanship for a period of one (1) year from date of final acceptance.
- 1.7 PRE-INSTALL MEETING
 - A. Prior to tile installation, Contractor will schedule a meeting with the tile installer, Owner and Architect.
 - B. Items for discussion will be topics such as expectations, tile patterns, verification of tile and grout colors, special conditions, and other items as deemed necessary.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Tile: Tile shall be Standard Grade in accordance with applicable requirements of the tile Council of North America (TCNA) 137.1-(current edition). Furnish a properly executed certificate of grade in the standard form of Master Grade Certificate. Tile shall be delivered to the work in the manufacturer's unopened package sealed with standard grade certificates, and shall be branded with or have sealed within the shipping marks and other designations corresponding to the information given on the executed certificate of grade.
- B. Unless specifically called for, tile shall be equal to those described below as manufactured by: Stonesource, Dal Tile, The American Olean Tile Company, or approved alternate.

2.2 TILE TYPES

The following tiles as manufactured by the Company listed, shall be the standard of equality design and color. Other manufacturers must meet or exceed the tile NOTED in each case and be approved by Architect. Appearance will be a definite factor in selection.

A. Wall Tile:

- 1. Provide 8" x 8" x 8mm glazed wall tile. Reference Drawings for manufacturer and color.
- B. Edge Trim: Provide "Schiene" series metal edge and transition strips manufactured by Schluter or approved alternate. Install "Schiene" series at all locations where tile transitions to a different flooring material.

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2.3 MORTAR

- A. Mortar/Adhesive: Tile wall installation (Interior wet areas):
 - 1. Manufacturer/Product:
 - a. Mapei
 - b. Laticrete Latapoxy SP-100 (700 series), meeting ANSI A108.6 and A118.3.
 - c. Approved alternate
 - 2. Provide where installing tile in toilets or similar areas with a potential of water intrusion.

2.4 GROUT

- A. Following setting and curing of installed wall tile, grout joints with epoxy grout for tile installation on interior walls:
 - 1. Manufacturer/Product:
 - a. Mapei Kerapoxy CQ, meeting ANSI A118.3.
 - b. Laticrete Spectralock Pro Premium, meeting ANSI A118.3.
 - c. Approved alternate.
- B. Cure installed tile as per manufacturer's written instructions prior to installation of grout.
- C. Water shall be fresh, clean and free from deleterious amounts of acid, alkali, or any organic matter.
- D. Grout color as selected by Architect from Mapei or Laticrete standard color selection. In room where more than one grout type is used, color grout shall be consistent throughout.
- E. Sealants for Tile:
 - 1. 100 percent silicone sealant, Mapei "Mapesil T" silicone sealant, Laticrete "Latisil" silicone sealant, or approved alternate.
 - 2. Provide sealant in place of grout where wall tile butts hollow metal or aluminum door and window frames.

2.5 GROUT SEALER

A. Water-based grout sealer, "Ultracare" manufactured by Mapei, (800)426-2734, Aqua Mix Grout Sealer manufactured by Custom Building Products, 800-272-8786, or approved alternate.

PART 3 EXECUTION

- 3.1. INSPECTION
 - A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the proper and timely completion of the work.

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- B. Calcium Chloride Moisture and ph Testing is required to be performed to the floor prior to tile installation. Perform test following industry standards. Architect to be notified of results as soon as results are ready.
- C. Do not begin work until surfaces scheduled to receive tile are acceptable. Surfaces shall be true with maximum variation not exceeding 1/8" in eight feet.
- D. Coordinate wall tile layout with ceiling installer to assure there will be no gaps between finished ceiling and wall tile.

3.2 INSTALLATION

A. General:

- 1. Thoroughly mix all materials and install mortar, tile and grout as per the manufacturer's written instructions.
- 2. All tile shall be set, grouted and cleaned in accordance with Tile Council of North America Specifications for Installation of Ceramic Tile for adhesive and grout specified and ANSI A108.1 A-C, A108.4-.13, A118.1-.10 and A136.1 (current addition).
- 3. At stud walls, thin-set wall tile will be installed over cement board. Refer to Section 09 29 00.
- 4. At CMU walls, thin-set wall tile will be installed to cement board, attached to CMU to provide smooth, uniform substrate for flush tile installation.
- B. Tile shall be neatly cut for proper fitting around all fixtures, pipe, accessories, etc. Rub cut edges with an abrasive stone to bring edge of glaze slightly back from body of tile. Where pipes pass through tile occurring on walls thoroughly caulk with sealant to completely seal around opening. Sealant shall be clear or match color of tile.
- C. When grout has thoroughly cured, apply minimum 2 coats grout sealer per manufacturer's instructions. Clean sealer from tile.
- D. Where tile is installed over cement board substrate, align with control joints and fill tile joints where control joints occur with polyurethane sealant, custom colored to match grout color.

3.3 CLEANING AND PROTECTION

- A. All work shall be thoroughly cleaned when completed.
- B. Contractor shall protect the work of other trades and shall be held responsible for any damage thereto.
- C. Protect tile surfaces for a minimum of 48 hours until tile is firmly set.
- D. Seal grout with clear approved sealer.

END OF SECTION

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SECTION 09 51 00

ACOUSTICAL TILE CEILINGS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish labor, materials, tools, equipment, scaffolding devices and incidentals necessary or required to install all acoustical tile ceilings and suspension system where shown or scheduled on the drawings.
- 1.2 RELATED WORK
 - A. Gypsum Wallboard: Section 09 29 00
 - B. Air Distribution Systems: Division 23
 - C. Lighting: Division 26
- 1.3 REFERENCES
 - A. ASTM E1264 Classification For Acoustic Ceilings
 - B. ASTM E84 Surface Burning Characteristics
 - C. ASTM C367 Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-In Ceiling Panels
 - D. ASTM C423 Sound Absorption
 - E. ASTM C636 Standard Practice for Installation of Metal Suspensions Systems for Acoustical Tile and Lay-In Panels
 - F. ASTM E1414 Sound Attenuation
 - G. 2010 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources. Using Environmental Chambers – Version 1.1 – California
 - H. ASTM C518-10 Thermal Transmission Properties
- 1.4 SUBMITTALS
 - A. Comply with Requirements of Section 01 33 00.
 - B. Submit through Contractor to Architect:

1.5 SAMPLES

- A. Submit one 6 inch x 6 inch piece of each type of acoustical tile to Architect for approval.
- B. Label tile with manufacturer's name, light reflection and noise reduction coefficient, flame spread rating and locations to be installed.

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C. Submit a sample of adequate size to show all component parts of the suspension assembly, including perimeter angles.

1.6 ACOUSTICAL PERFORMANCE

A. Acoustical ceiling tiles in academic and office areas to have a minimum noise reduction coefficient (NRC) rating of 0.55 and a minimum ceiling attenuation class (CAC) rating of 35.

1.7 GUARANTEE

- A. Acoustical ceiling boards shall have a manufacturer's limited system performance warranty against warping, shrinking or sagging, for minimum Thirty (30) years from date of final acceptance of the building. Grid system to be carry a manufacturer's Thirty (30) year guarantee.
- B. All work under this section shall be guaranteed free from defects in materials and workmanship for a period of one (1) year from date of final acceptance of the building, except where longer periods of time are specified.
- C. If during the material guarantee period, shrinkage, buckling or warping of acoustical ceiling occurs, tighten all joints, replace defective acoustical boards as required to maintain tight, neat ceiling.

PART 2 PRODUCTS

2.1 MATERIAL

A. Acoustical Tile Ceiling

<u>AC-1</u>

Acoustical tile ceilings as called for on plans to be exposed grid system, 24" x 48" x 5/8" noncombustible, mineral fiber, white ceiling board with factory applied white vinyl washable latex paint. USG Radar ClimaPlus, non-directional pattern, Armstrong Fissured HumiGuard Plus, or approved alternate, Class 'A', flame spread of 25. NRC rating: 0.55 CAC rating: 35. Panels contain a broad spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew.

- B. All suspended ceilings systems shall be grid system as manufactured by USG-Donn DX-24, Armstrong or approved equal manufacturer. Provide Donn ZXLA or approved equal for areas where vinyl covered gypsum board lay-in panels are called for. Components shall be formed from cold rolled steel, electrozinc coated and prepainted white. Main tee shall be double web design, .020 gauge, 1 1/2" in height. Wall angle shall be hemmed edge .024 gauge for galvanized grids. Equals: Chicago Metallic 200 series, Prelude 15/16" exposed tee system by Armstrong World Industries, Inc,or approved alternate.
- C. Provide hold down clips on all vestibules where ceiling tile is installed and on other areas where called for.

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D. Drywall Suspension System: Suspended gypsum board ceilings are to DGL or DGLW drywall suspension system by USG Interiors. Components shall be manufacturer's standard components and installed in strict accordance with manufacturer's specifications.

PART 3 EXECUTION

3.1 HANDLING OF MATERIALS

A. Deliver materials to job in manufacturer's original containers, properly store and protect before, during and after installation. Damaged or defective materials shall be removed and replaced.

3.2 EXAMINATION OF EXISTING CONDITIONS

- A. Contractor shall be responsible for examination and acceptance of all surfaces and conditions affecting installation of suspension system and acoustical ceilings. Unsatisfactory conditions shall be corrected before proceeding with the work.
- B. Start no work until glazing is complete, exterior openings closed in, cement work, plastering or other wet work is completed and dried out. <u>HVAC SYSTEM MUST BE IN PLACE</u> <u>AND PROPERLY OPERATING BEFORE ANY CEILING TILE IS INSTALLED</u>
- C. Uniform temperature of 60 degrees F. minimum shall be maintained before, during and after acoustical material installation. Humidity level shall not be any more that what is required by manufacturer's instructions for installation.

3.3 INSTALLATION OF SUSPENDED SYSTEMS

A. Exposed grid suspension system:

- 1. Wall molding shall be attached to all perimeter walls in accordance with manufacturer's recommendations.
- 2. Main runners shall be attached to structure with No. 12 gauge hanger wires spaced not more than 4'-0" on center in one direction and 4'-0" on center in the other.
- 3. Suspended drywall tees or framing shall be attached to structure with No. 12 gauge hanger wires spaced not more than 2'-0" on center in one direction and 2'-0" on center in the other.
- 4. Cross tees shall be installed at 24" on center and mechanically fastened to main runners.
- 5. The suspension system shall be installed to permit border units of the greatest possible size, but no less than 4" wide.
- 6. All members shall be aligned for true, level surface and straight lines.

3.4 INSTALLATION OF ACOUSTICAL TILE CEILINGS

A. Install units to sub-surfaces from set out points and to pattern shown. Verify location of work of other trades so their items occur within a whole unit or at joints as shown. Make cutouts for recessed items provided by other trades.

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- B. Provide additional hangers at two adjacent corners of 2'x 4' light fixtures. Provide two at each strip fixture or incandescent fixture.
- C. Install units in place, fitting snugly. Provide spacers or hold-down clips where required and within 12' of exterior doors.
- D. Paint all rivets exposed to view to match suspension system finish. After installation, clean any soiled surfaces. Replace any damaged units.
- **E.** Coordination with Ceramic Wall Tile: Ceiling installer shall coordinate with ceramic tile installer to assure when wall tile extends to finished ceiling, there is no gap between tile and ceiling.
- F. EXTRA STOCK: At project completion, provide one additional box of each type of acoustical unit specified, for maintenance use by the owner. These tiles are not to be used to replace tiles damaged as a result of failure of other items under warranty (i.e. roofing systems, HVAC systems, etc.).

3.5 CLEANING

- A. Following installation, clean soiled and discolored surfaces of units.
- B. Remove and replace units which are damaged or improperly installed. Do not use owner's extra stock for replacing damaged ceiling tiles damaged during construction and damage resulting from failed building components or assemblies during the warranty period.

END OF SECTION

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A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 09 64 66

WOOD GYMNASIUM FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. The work included under this section consists of furnishing and installing all materials, labor, equipment, accessories, and related items required to complete wood flooring required by the contract drawings and specifications, including the following:
 - 1. Preparation of surface to receive materials specified in this section.
 - 2. Installation of vapor barrier.
 - 3. Complete wood flooring system
 - 4. Sanding of wood floors.
 - 5. Marking of game lines.
 - 6. Sealing and finishing flooring.

1.2 RELATED WORK AND SECTIONS

- A. Related work specified under other sections.
 - 1. Concrete Slab Depression: 2 1/8" using 25/32 flooring and 7/16" pad
 - 2. Concrete Tolerance: 1/8" in radius of 10' surface-steel troweled
 - 3. Concrete and concrete Finishing Section 03 30 00
 - 4. Cast-In Place Concrete: Concrete slab moisture mitigation
 - 5. Membrane Waterproofing and Damp-proofing Section 07 10 00 Section 03 30 00 a. Concrete sub-floors on or below grade shall be adequately waterproofed beneath and at the perimeter of the slab and on the earth side of below grade walls.
- 1.3 QUALITY ASSURANCE:
 - A. Floor System Manufacturer Qualifications
 - 1. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years; Robbins, Inc., or approved equal.
 - 2. Manufacturer will be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).
 - B. Floor contractor/Installer Qualifications
 - 1. Flooring contractor shall be a firm with at least 10 years experience in the flooring field and approved by manufacturer.
 - 2. Submit a list of at least three (3) completed projects of similar magnitude and complexity.
 - C. Submit three (3) copies of MFMA recommendations for correct preparation, finishing and testing of concrete sub-floor surfaces to receive wood flooring.

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1.4 SUBMITTALS:

- A. Manufacturer's Product Data
 - 1. Submit per requirements of Section 01 33 00.

B. Samples

- 1. Submit one (1) sample of Bio Cushion Classic Floor System, if requested by architect.
- C. Maintenance Literature
 - 1. Submit three (3) copies of "MFMA Care and Preservation of Your Wood Floors".
- D. Certification
 - 1. Suppliers shall submit certificates attesting that materials furnished will meet specifications for grade, dryness and treatment, if required.
- E. Concrete Guidelines
 - 1. Submit three (3) copies of MFMA recommendations for correct preparation, finishing, and testing of concrete subfloor surfaces to receive wood flooring.
- 1.5 PRE-INSTALLATION MEETING
 - A. Contractor is to conduct pre-install meeting with Owner, Architect, installer and contractor present to review floor install and finish.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials
 - Materials shall not be delivered, stored or installed until all masonry, painting, plastering, tile work, marble, and terrazzo work are completed. All overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80 degrees Fahrenheit and relative humidity of 35-50% are to be maintained. Ideal installation/storage conditions are the same as those which will prevail when building is occupied.
 - 2. Materials shall not be stored at the installation location if the moisture content of the concrete slab exceeds 4% or vapor transmission exceeds 4.5 pounds per 1000 square feet.

1.7 JOB CONDITIONS - SEQUENCY

- A. Do not install floor system until concrete has been cured sixty (60) days and the requirements in 1.5A are obtained. Concrete floor moisture content must be tested and at a minimum level approved by floor installer.
 - Maximum acceptable moisture emission rate for concrete sub floors (unless wood flooring manufacturer requires more stringent rate):
 a. 4.5 lbs/1,000 sq. ft. per 24 hours or less

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- B. Permanent heat, light and ventilation shall be operating during and after installation. Maintain a temperature range of 55-80 degrees Fahrenheit and a relative humidity range of 35-50%. Consult MFMA guidelines for further information.
- C. After wood flooring is secured in place, installer to wait a minimum of three (3) weeks before sanding and finishing is to occur.
- D. After floors are finished, area to be kept locked by contractor to allow curing time for the finish. If after required curing time the general contractor or owner requires use of the gym, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by Architect of complete gymnasium floor.

1.8 GUARANTEE

- A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which materials is not designed; faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
- B. Robbins Inc., hereby warrants the BIO CUSHION CLASSIC FLOOR SYSTEM material to be free from manufacturing defects for a period of one (1) year. This warranty is in lieu of all other warranties, express or implied, including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of Robbins. In the event of breach of any warranty, the liability of Robbins shall be limited to repairing or replacing the Bio Cushion Classic Floor System material and system components supplied by Robbins and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.
- C. Installer shall warranty floor system for two (2) years against defects and failure.

PART 2 PRODUCTS

- 2.1 MATERIALS:
 - A. Membrane 15 mil polyethylene
 - B. Subfloor
 - 1. Robbins 7/16" Bio Sport 2 Pad.
 - 2. Two layers of 15/32" thick, 4'x8' Exposure 1, APA Rated Sheathing.
 - C. Maple Flooring
 - 1. 25/32" thick x 2-1/4" width, 2nd&Better grade, Unfinished TGEM, KD Northern Hard Maple, Continuous Strip® XL Flooring as manufactured by Robbins and graded in accordance with MFMA-FJ rules. Flooring will have XL plus TM technology to reduce or eliminate routine spacing for expansion.

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- 2. Fasteners
 - a. Flooring -2" 15 gauge cleats or staples
 - b. Subfloor
 - 1) 1" length, 7/16" (11mm) crown, coated staples or equivalent.
- D. Perimeter Base Molding: Robbins 3"x4" ventilating type. (black)
- E. Provide nominal 6" wide aluminum threshold covers (K20-41-11) by Architectural Arts Mfg., Wichita, KS, or approved alternate, at all openings where material meets other concrete or finished floors. Plates to be anchored to concrete with lead anchors and flat head screws.
- F. Finishing Materials
 - 1. Apply two (2) coats of Hillyard "Gold Medalist" Gym Seal and two (2) finish coats of Hillyard #285 "Gold Medalist" Gym Finish. Finishes by other manufacturers must be equivalent to specified finish and approved by Architect.
 - Prep and clean bare wood floor before sealer application and between each coat per manufacturer's instruction. Use Hillyard "Court Prep" tacking product or approved equal. Sand or abrade between coats per manufacturer's instruction, using degree of abrasion depending on time between coats.
 - 3. Paint game lines between seal and finish coats, using Hillyard Gym Line Marking Paint or approved equal. Paint shall be compatible with finish.
 - 4. Should dull spots appear, apply an additional coat of finish.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect concrete sub-floors for proper tolerance and dryness and report any discrepancies to the general contractor in writing.
- B. All work required to put the concrete sub-floors in acceptable conditions shall be the responsibility of the general contractor.
- C. Sub-floor shall be clean and free of all dirt and debris by the general contractor.

3.2 INSTALLATION:

- A. Subfloor
 - 1. Install Robbins shock absorbing pads per manufacturer's recommendations.
 - 2. Install the lower subfloor perpendicular to the intended finish flooring direction. All joints shall be staggered 4' and spaces ¹/₄" (6mm) apart.
 - 3. Install solid blocking at doorways.
 - Install the upper subfloor diagonal to the lower subfloor panels staggering joints 4' and spacing ¹/₄" (6mm) apart. Secure these panels using adhesive (Box X pattern) and 1" (25mm) staples placed 6" (150mm) on center (O.C. at panel perimeter and 12" (300mm) O.C. throughout interior.

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- B. Maple Flooring
 - Machine nail maple finish flooring 10" to 12" (250mm to 300mm) O.C. with end joints properly driven up and proper spacing provided for humidity conditions in specific regions. Consult your local Robbins "Certified" contractor. Provide 2" (50mm) expansion voids at the perimeter and at all vertical obstructions. Expansion rows will be evenly distributed with each row of flooring, with each space not exceeding 1/64" (0.4mm).

3.3 FINISHING

- A. Sanding
 - 1. Sand flooring with drum sander, edger, buffer, and hand scrapper.
 - a. Use coarse, medium, and fine grade sandpaper.
 - b. Floor shall present a smooth surface without drum stop marks, gouges, streaks or shiners.
 - 2. After sanding, buff entire floor using 100 grit screen or equal grit sandpaper with a heavy duty buffing machine.
 - 3. Sweep or vacuum floor before first coat of seal.
- B. Finishing Gymnasium
 - 1. Apply two coats of seal, let dry and abrade with 100-grit screen.
 - 2. Sweep or vacuum, and tack with waterless cleaner between each coat of seal.
 - 3. Layout all game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.
 - 4. Apply two coats finish, screen or steel wool between coats.
- C. Clean up all unused materials and debris and remove from the premises.

3.3 BASE INSTALLATION

A. Install vent cove base with cove base adhesive and/or mechanical attachment to walls. Use pre-molded outside corners and neatly mitered inside corners. Install aluminum threshold covers where adjacent finished floor meets wood floor.

3.4 VOLLEYBALL SLEEVE

A. Follow floor manufacturer's instructions and detailing for installation of volleyball sleeves.

END OF SECTION

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SECTION 09 65 00

RESILIENT FLOORING

PART 1 PRODUCTS

1.1 SUMMARY:

- A. Section includes:
 - 1. Resilient base
 - 2. Luxury Vinyl Tile
- 1.2 RELATED SECTIONS:
 - A. Section 03 30 00 Cast-In Place Concrete: Floor substrate surface and Concrete slab moisture mitigation
 - B. Section 06 41 16 Cabinet Work & Shelving
 - C. Section 09 68 00 Carpeting.
 - D. Section 06 10 00 Rough Carpentry: Floor substrate surface.

1.3 SUBMITTALS:

- A. Comply with Requirements of Section 01 33 00
- B. Submit through Construction Manager to Architect:
 - 1. Samples: Provide properly identified, actual samples of each material for approval and color selection prior to installation.
 - 2. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping and re-waxing.
- 1.4 QUALITY ASSURANCE:
 - A. Regulatory Requirements: Conform to applicable code for flame/fuel/smoke rating requirements in accordance with ASTM E84.
 - B. Subcontractor / supplier providing work under this section will install work specified in this section with their company's own installers, employed by the company. <u>Subcontracting of installation will not be allowed unless approved by Architect prior to bid.</u>

1.5 ENVIRONMENTAL REQUIREMENTS:

A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

- B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during and 48 hours after installation of materials.
- C. Furnish tile in 45-piece boxes. Do not deliver in bulk.
- 1.6 WARRANTY:
 - A. Rubber Base: Provide manufacturer's one-year warranty.
 - B. Luxury Vinyl Flooring: Provide 10 year limited wear warranty.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Luxury Vinyl Tile
 - 1. Patcraft "Timber Grove ii"
 - 2. Product Swatch: Sprout-V2 00173
 - 3. Product Style: Timber Grove II, 20 Mil 1421V
 - 4. ASTM F1700, class III printed film vinyl plank, type B embossed
 - 5. Wear layer thickness: 20 mil (0.5mm)
 - 6. Plank size: Nominal 6" wide x 48" long.
 - 7. Finish: "Exoguard"+
 - 8. Installation: Glue down, stagger pattern
 - 9. Warranty: 15 year limited commercial wear warranty.
- B. Coved Rubber Base
 - 1. Johnsonite/Tarkett "Traditional" coved wall base, Approved Alternate
 - ASTM F-1861, Type TP or better, group 1 (solid); 4" high, 1/8" thickness; class C fire resistance, with matching pre-molded outside corner units; top-set coved base; color as selected by Architect. Pre-molded corner units to match exactly, rubber base color selected. "Preformed" outside corners will not be allowed. Pre-molded outside corners must be provided.
 - 3. Provide base material in continuous rolls.
 - 4. Adhesive: Porous surfaces: Tarkett #960 Acrylic Cove base Adhesive; Non-porous surfaces: Tarkett #945 Contact Bond Adhesive. Provide adhesives for approved alternate products as approved by manufacturer for each substrate application.
- 2.2 ACCESSORIES:
 - A. Edge Strips: (Specific Powerhold products should be confirmed for individual projects. Refer to <u>www.professionalflooring.com</u>; Manufacturer/PowerHold/Products/Trim and Transitions))
 - 1. LVT to Concrete: Bevel Reducer Cap, LVT406, Etched Aluminum, Manufactured by Powerhold
 - 2. LVT to Epoxy: Zinc strip, re-epoxy flooring specification.
 - B. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION:

- A. Verify concrete floors are dry and clean and meet acceptance for installation per manufacturer's requirements. Moisture testing of concrete slabs is required to be performed in strict accordance with ASTM F2170 to determine in-situ Relative Humidity (RH) prior to resilient floor covering installation. Perform test following industry standards.
 - 1. Maximum acceptable moisture emission rate for concrete sub floors (unless flooring manufacturer requires more stringent rate):
 - a. Sheet vinyl -3 lbs/1,000 sq. ft. per 24 hours or less
 - b. VCT 5 lbs./1,000 sq.ft.
 - c. LVT not exceed 90% RH, and pH between 7.0 and 9.0

Do not proceed until satisfactory conditions have been achieved. Test reports are to be sent to Architect.

- B. Due to the many additives being used in or on concrete slabs. A bond test is to be performed prior to actual installation of resilient flooring to determine adhering quality. Some treatments could repel adhesive.
- C. Beginning of installation means acceptance of existing substrate and site conditions.
- D. Where new resilient material is to be installed over existing concrete floor, prepare surface as required to receive new resilient flooring material.

3.2 PREPARATION:

- A. Areas to receive flooring material will be clean, fully enclosed, weathertight and temperature maintained at 65 degrees F for a minimum of three days before installation begins and 48 hours after installation. This also includes adhesives, which will be conditioned in same manner.
- B. Cleaning: Immediately prior to installation of the work of this section, vacuum clean substrate. Thoroughly clean substrate and remove all wax, oil, grease, paint, varnish hardeners, and other items which would adversely affect the bond of the adhesive.
- C. Apply adhesive only to bare concrete substrates that are sound, smooth, dry and clean. Remove all existing adhesive residues, dirt, dust, paint, curing and sealing compounds and other foreign materials by use of mechanical means only, such as scraping, bead blasting, grinding or sanding. Be sure to follow all local, state and federal regulations for mechanical removal. Adhesive cannot be used over substrates that have been chemically cleaned.
- D. Remove subfloor edges and bumps. Fill low spots, cracks, joints, holes and other defects with subfloor filler. Transitions at construction joints or adjoining slabs to be smooth and uniform.
- E. Apply, trowel and float filler to leave smooth, flat, hard surface.

F. Prohibit traffic until filler is cured.

3.3 INSTALLATION

A. ADHESIVE APPLICATION

- Substrate preparation, moisture and alkalinity testing must comply with ASTM F710, industry standards, and floor-covering manufacturer's guidelines. The installation site must be acclimated with HVAC in operation. The floor and room temperature, as well as flooring materials and adhesive, must be maintained at 65°- 95° F, and the humidity below 65% for 48 hours prior to, during, and after the testing and installation. Follow the flooring manufacturer's guidelines for installation for proper adhesive application rate. Tiles and vinyl plank can be installed over non-porous substrates by allowing the adhesive to dry completely before placing flooring. Flooring should be rolled with a 100 lb. roller, ensuring 100% contact with adhesive. Loss of adhesion can result if the flooring is not installed within the working time of the adhesive. Adhesive to have no off gassing.
- B. FLOORING (Adhesive applied):
 - 1. Install to manufacturer's instructions.
 - 2. Open floor tile cartons, enough to cover each area; ensure shade variations do not occur within any one area.
 - 3. Spread only enough adhesive to permit installation of flooring before initial set.
 - 4. Set flooring in place, press with heavy roller to ensure full adhesion.
 - 5. Lay flooring from center marks established with principal walls. Adjust as required to avoid use of units less than 1/2 tile at perimeter.
 - 6. Lay tile with grain running alternate directions.
 - 7. Terminate resilient flooring at centerline of door openings where adjacent floor finish is dissimilar. Install edge strips at unprotected or exposed edges where flooring terminates.
 - 8. Scribe flooring to walls, columns, cabinets, floor outlets and other appurtenances to produce tight joints.
 - 9. Continue flooring under movable type partitions without interrupting floor pattern.
 - 10. Joints in excess of 1/64" not allowed.
 - 11. Flooring shall be laid in pattern shown, from colors selected by Architect.
 - 12. VCT joints in rooms shall align with joints in corridors at room doors unless shown otherwise.
 - 13. Provide flush transition between resilient flooring material and carpet

C. LUXURY VINYL FLOORING:

- The building's permanent HVAC system must be on and maintained consistently at a range of 65° - 85° F (20° - 29° C) for at least 7 days prior to, during and after installation. Complete any necessary floor prep.
- 2. Ensure moisture tests have been conducted and the results do not exceed 90% in-situ relative humidity when tested according to ASTM F 2170. PH of concrete sub-floor needs to be between 7 & 10.
- 3. Do not stack more than 5 cartons high.
- 4. Flooring material and adhesive must be acclimated to the installation area for a minimum of 48 hours prior to installation.

- 5. Use a 1/16" wide x 1/32" deep x 1/32" apart (U) notch trowel only (unless using S150-95 Spray Adhesive where no trowel is required)
- 6. Material should always be visually inspected prior to installation. Any material installed with visual defects will not be considered a legitimate claim as it pertains to labor cost.
- 7. Make sure all material is from the same batch number. Install tiles running in same direction (arrows on back of tile).
- 8. Ensure that all recommendations for sub-floor and jobsite conditions are met prior to beginning installation. Once the installation is started, you have accepted those conditions.
- 9. Plank products should have a minimum of 6-8" seam stagger. Working out of multiple boxes at a time is recommended.
- 10. Roll the plank/tile with a 3 section 100 lb. roller. Re-roll the entire glued floor area with the 100 lb. roller within the working time of the adhesive. Continue to roll the floor throughout the working day to ensure a proper bond.

D. BASE MATERIAL:

- 1. Areas to receive base will be clean, fully enclosed, weathertight and temperature maintained at 65 degrees F for a minimum of three days before installation begins and 48 hours prior to and after installation. This also includes adhesives, which will be conditioned in same manner. Use only Adhesive that is approved by rubber base manufacturer for specific substrate application.
- 2. Coiled wall base will be uncoiled and laid out flat for at least 24 hours at 65 degrees.
- 3. Installer to verify substrate rubber base is to be adhered to and coordinate with other trades. Do not install epoxy paint where rubber base is to be installed.
- 4. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints. Install continuous rolls with as few joints as possible. Use pre-molded corner units.
- 5. Install base on solid backing. Bond tight to wall and floor surfaces.
- 6. Scribe to fit door frames and other interruptions.
- 7. Install pre-molded corner units on all outside corners. Do not extend continuous base around outside corners unless approved by Architect.
- 8. Base will be mitered at all inside corners.
- 9. Pieces of base less than 8" not allowed.
- 10. Install at toe space at base of all cabinets unless otherwise shown.

3.4 **PROTECTION**

A. Prohibit traffic on floor finish for 48 hours after installation.

3.5 EXTRA STOCK

A. Provide one extra box of each type of accent color LVT, and 2 boxes of field color tile.

3.6 CLEANING AND FINISHING:

- A. Post Construction Cleaning:
 - 1. Dry mop floor using a microfiber mop pad or appropriate floor vacuum to remove dust particulate from the floor.

- 2. Spray neutral pH cleaner (true neutral pH is 7.0 it is important to be as close to 7.0 as possible to prevent soil attracting residue), such as Shaw TOTALCARE® Hard Surface Cleaner or Diversey Stride, onto the floor in manageable area (spray mist will dry quickly). Use a microfiber wet mop pad to mop the floor with cleaner. If the pad becomes dirty, be sure to replace the pad with a new microfiber wet mop pad. Work floor in sections.
- 3. Always rinse the floor by mopping it with water only to remove any remaining residue from the floor.
- 4. Avoid using mop and shine products on resilient flooring.
- 5. In the event where dry wall dust/construction dust is mopped with water only, a residue film will appear on the floor after drying. Use the process below to remove the film from the floor. Process to remove construction residue or cloudy film from resilient flooring:
 - a. In the event where dry wall dust/construction dust is mopped with water only, a residue film will appear on the floor after drying. Use the process below to remove the film from the floor.
 - b. Spray neutral pH cleaner, such as Shaw TOTALCARE® Hard Surface Cleaner or Diversey's Stride, onto the floor in manageable area (spray mist will dry quickly). Work floor in sections. For smooth surface, use a low rpm (175 rpm) buffer with a 3M red pad on flooring with neutral pH cleaner applied to the floor to remove the residue film. (Never Dry Buff). For embossed or textured flooring, use a cylindrical brush scrubber with red brushes and a neutral pH cleaner applied to the floor to remove the residue film.
 - c. Using a wet microfiber mop pad, rinse with water only to remove any remaining residue from the flooring. When a wet mop pad becomes dirty, be sure to replace the pad with a new microfiber wet mop pad.

END OF SECTION

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A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 09 67 26

EPOXY RESINOUS FLOORING

PART 1 GENERAL

1.1 QUALIFICATIONS

A. Contractor shall be an established firm regularly engaged in manufacturing and installation of specified polymer floor systems for the past 10 years. Installer must be an approved epoxy floor finish installer of the companies specified. Contractor shall have completed at least five (5) projects of similar size and complexity.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-In Place Concrete: Concrete slab moisture mitigation

1.3 SUBMITTALS

A. Comply with Section 01 33 00.

1.4 MOCKUP

A. Provide a 4' x 4' mockup showing texture, color and trim edges finishes for Architect's approval. This may be displayed on min. 3/4" plywood panel or small room as designated by Architect. Adjustment of the degree of slip resistance may be required to satisfy owner's requirements. Architect to also be notified when first installation begins.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.
- B. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained to meet manufacturer's recommendations.

1.6 JOB CONDITIONS

- A. Concrete substrate shall have cured 30 days utilizing a curing membrane. Concrete subfloor on or below grade shall have a minimum 10 mil vapor barrier installed beneath and at the perimeter of the slab. Concrete shall have a light steel trowel finish.
- B. Applicator will test and approve substrate for acceptable moisture content prior to applying epoxy system.

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- C. Job area to be free of other trades during and for a period of 24 hours after floor installation.
- D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.
- 1.7 APPROVED INSTALLERS
 - A. Desco, (installer & manufacturer) Cole Isbell, 501-786-5446
 - B. Pro Insco (installer), Tnemec Epoxy Flooring (manufacturer) Dave Patterson, 913-422-8001
 - C. Epoxy Coating Specialists (installer), Tennant Epoxy Flooring (manufacturer) Luke McNeil, 816-642-1892
 - D. Substitutions must be approved prior to bid. Installed work in local area must be viewed by the Architect as part of substitution review.

PART 2 MATERIALS

2.1 MATERIAL DESCRIPTION

- A. Epoxy Floor Type EF-1: A nominal 3/16" thick epoxy flooring with an "orange peel" SR Copolymer Top Coat surface finish, semi-gloss, Quartz 'Cremona' Series, Trowelled on application by Desco.
- B. Epoxy Floor Type EF-2: A nominal 1/8" thick epoxy flooring with an "orange peel" SR Copolymer Top Coat surface finish, semi-gloss, 'Granite" Series', Broadcast application by Desco.
- C. Zinc termination strip: Continuous zinc strip installed at top of coved base and where epoxy flooring transitions to another flooring material, furnished and installed by specified companies. Provide continuous bead of polyurethane sealant along top of cove base termination strip. Where installed in kitchens and other clean areas, termination strip must comply with local and state health department regulations.
- D. All resins and sealers are to be **<u>non-yellowing</u>**.

2.2 COLORS

A. Colors shall be custom as selected by Architect. Architect shall submit color formula to epoxy flooring company to create minimum 12" x 12" sample boards for color approval.

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PART 3 EXECUTION

3.1 INSPECTION

A. Calcium Chloride Moisture and ph Testing is required to be performed to the floor prior to epoxy installation. Perform test following industry standards. Do not proceed until satisfactory conditions have been achieved.

3.2 SURFACE PRIMING

A. All properly prepared substrates shall be primed using appropriate manufacturer's penetrating primers with strict adherence to application instructions.

3.3 MATERIAL INSTALLATION

- A. Floor installation shall strictly adhere to manufacturer's written instructions and directions.
- B. Provide integral 4" or 6" high (as scheduled on drawings) 1 inch cove base with epoxy material as indicated on drawings. Terminate at zinc strip, installed prior to installation of epoxy base.
- C. Provide slip resistant "orange peel" with SR Copolymer top coat finish on epoxy floors. Provide smooth finish for coved base, extending out from wall 6". No silica is to be used on epoxy floors unless approved by Architect. Terminate with Schluter aluminum termination strip where epoxy meets with different flooring materials or concrete slab. A ¼" vertical maximum transition is allowed.
- D. Immediately following completion of epoxy flooring system, floor shall be covered with adequate material to protect from damage. Remove prior to final inspection.
- E. All trash and debris shall be properly disposed of and arrangement shall be made to remove all unused material from the job site.

END OF SECTION

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A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 09 68 00

CARPETING

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Provide all carpeting and accessories complete, in place, as shown on the drawings, specified herein, and needed for a proper and complete installation.
- 1.2 RELATED SECTIONS
 - A. Section 03 30 00 Cast-In Place Concrete: Concrete slab moisture mitigation
- 1.3 QUALITY ASSURANCE:
 - A. Qualifications of manufacturer: Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production.
 - B. Qualifications of installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
 - C. Subcontractor / supplier providing work under this section will install work specified in this section with their company's own installers, employed by the company.
 <u>Subcontracting of installation will not be allowed unless approved by Architect prior to bid.</u>

1.4 REFERENCES

- A. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
- B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. CRI 104 Standard for Installation of Commercial Textile Floor-covering Materials; Carpet and Rug Institute.

1.5 SUBMITTALS:

- A. General: Comply with the provisions of Section 01 33 00
- B. Product data: As soon as possible after award of the Contract, submit:

- 1. Complete materials list of all items proposed to be furnished and installed under this section.
- 2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.
- 3. Shop drawings showing location of all seams and location and types of all carpet material and accessories.
- 4. Samples of the following carpet products and of exposed edge accessories available from the proposed manufacturer within the specified allowance qualities.
- 5. Manufacturer's recommended installation procedures.
- C. The manufacturer's recommended installation procedures, will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.
 - 1. Dealers/Installers must follow manufacturer's procedures for installation, using the recommended glues, seam sealers, and floor sealers (if needed).
 - 2. Seaming diagram must be submitted to Architect for approval. (for broadloom products)
 - 3. Seam sealers must be used. (for broadloom products)

PART 2 PRODUCTS

2.1 MANUFACTURERS:

<u>CPT 1</u>

- 1. Manufacturer/Product: Patcraft /
- 2. Product Style: Walk Right In II (Foot In The Door II Collection)
- 3. Style Number: 10304
- 4. Color: Sterling
- 5. Standard Size: 24" x 24"
- 6. Warranties: Carpet Tile Lifetime Commercial Limited Warranty for Ecoworkx with stain and color

2.2 MATERIALS

- A. All materials shall be new.
- B. All carpet shall be of first quality, of American manufacture and permanently mothproofed by manufacturer. Carpet must also have static controlled capabilities.
- C. Colors to be selected from manufacturer's standard range.
- D. All broadloom carpet to have performance warranted broadloom backing as a <u>minimum</u> requirement for the useful life of the original installation against product failure from:
 - 1. Tuft Bind (edge ravel, yarn pulls, zippering)

- 2. Delamination
- E. All modular carpet to have high performance reinforced vinyl composite closed cell polymer backing as a <u>minimum</u> requirement. Modular secondary backing for the useful life of the original installation against product failure from:
 - 1. Tuft Bind (edge ravel, yarn pulls, zippering)
 - 2. Delamination
 - 3. Moisture Penetration
 - 4. Dimensional Stability
- E. Edge Trim: Provide anodized metal edge and transition strips manufactured by Powerhold or approved alternate. "LVT125, LVT 130, LVT150, LVT160" where carpet transitions to VCT or LVT; "LVT160, LVT425, 406, 404, 405, 407" where carpet transitions to concrete or resin epoxy flooring. NOTE: Product number to be selected for specific thickness of flooring specified.
- F. Special Edge Trim: Carpeted Riser Nosing: Powerhold or Schluter anodized aluminum or approved alternate. Style as selected by Architect.

2.3. ADHESIVES:

- A. Broadloom Carpet: Waterproof cement as recommended by carpet manufacturer and equal in quality to Southland #400, P.O. Box 19410, Louisville, Ky. 40259, (502) 969-6366. Seaming adhesive around perimeter and along seams, Southland Contact Cement.
- B. Modular Carpet: Provide self adhering or manufacturer-approved adhesive, recommended by carpet manufacturer, compatible with carpet specified and provided, for releasable installation.
- C. Provide letter with carpet submittal, stating that adhesive for each type of carpet provided is approved by manufacturer for substrate in which it is applied.

PART 3 EXECUTION

3.1 INSPECTION:

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until satisfactory conditions have been achieved.
- B. Calcium Chloride Moisture and ph Testing is required to be performed to the floor prior to carpet installation. Perform test following industry standards.
 - 1. Maximum acceptable moisture emission rate for concrete sub floors (unless carpet manufacturer requires more stringent rate):

a. Carpet -3 lbs/1,000 sq. ft. per 24 hours or less

Do not proceed until satisfactory conditions have been achieved.

3.2 SURFACE PREPARATION:

- A. Cleaning: Immediately prior to installation of the work of this section, thoroughly clean all substrate and remove all wax, oil, grease, paint, varnish hardeners, and other items which would adversely affect the bond of the adhesive.
- B. Slabs must be thoroughly cured, and free of curing agents, hydrostatic pressure, excessive alkali as determined by manufacturer, and moisture.
- C. Smoothing: Make all substrate level and free from irregularities. Assure one constant floor height after carpet is installed, grinding high spots and filling in low spots as required.
- D. For areas where carpet is to be installed outdoors, surface must be kept dry for at least 96 hours prior to installation.
- 3.3 PRODUCT HANDLING:
 - A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.
 - B. Replacement: In the event of damage, immediately make all repairs and replacements needed at no additional cost to the Owner.

3.4 INSTALLATION:

- A. General:
 - 1. Install carpeting and accessories in strict accordance with the manufacturer's recommendations. method of installation for modular carpet monolithic
 - 2. Align the lines of broadloom carpet as woven, using no fill strips less than 16" in width, laying all carpet in same direction.

B. Seams:

- 1. Locate seams to the maximum practicable out of traffic.
- 2. Unless noted otherwise, locate carpet seams between rooms under bottom end of door where butting carpet of alike or different types, pattern, or color.
- 3. Fabricate seams by the compression method, using a butt joint, and properly bed and seal all carpet edges and seams. Do not stretch seams. Provide seam adhesive at all seams at least 6" wide.
- 4. Apply carpet adhesive as recommended by carpet manufacturer for the specified backing type. Lay carpet into adhesive as soon as possible and remove any trapped air bubbles. Do not use heavy roller. Use 35# to 70# linoleum roller. Be sure to roll width wise. Apply succeeding widths with firmly butted side joints to eliminate visible seams. Cross seams shall be held to absolute minimum. Apply Rubber Seam Adhesive to seams before they are butted together.

- C. Cleaning up: In addition to the requirements of Section 01 77 00, thoroughly clean all carpet surfaces prior to final acceptance of the carpeted areas by the Owner.
- 3.5 **PROTECTION**:
 - A. Provide a heavy non-staining paper or plastic walkway as required over carpeting in direction of foot traffic, maintaining intact until carpeted space is accepted by the Owner.
- 3.6 ATTIC STOCK:
 - A. Provide one additional box of carpet tile for attic stock.

END OF SECTION

09 68 00-5

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 09 78 00

FIBER REINFORCED PLASTIC COATED PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:1. Glass fiber reinforced plastic (FRP) coated panels as wall finish.

1.2 SUBMITTALS:

- A. Comply with Requirements of Section 01 33 00.
- B. Submit through Contractor to Architect:
 - 1. Samples: Provide properly identified, actual samples of material for approval and color selection, accompanying submittal.
- 1.3 WARRANTY:
 - A. One-year from date of substantial completion.
- PART 2 PRODUCTS

2.1 FRP PANELS

- A. Product Type: 3/32" Glasbord FRP Paneling system by Crane Composites, 23525 W Eames Street, Channahon, IL 60410 <u>sales@cranecomposites.com</u>] Ph: 800.435.0080|Fax: 815.467.8666
- B. Substitutions: Comply with Section 01 60 00
 - 1. Panels: Embossed FRP, Class A.
 - a. Flame spread 0-25
 - b. Smoke Development < 450
 - 2. Color: Color to be selected from standard colors.
- C. Trim: Standard trim pieces by Crane Composites.

Profile



09 78 00-1

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

- 1. Battens: DB
- 2. Inside Corners: IC.
- 3. Outside Corners: OC
- 4. Top, Bottom & Edge Cap: CP
- D. Attachments Materials:
 - 1. Mechanical Fasteners: Countersunk screws or Nylon drive rivets.
 - 2. Adhesive: Crane Titebond GreenChoice Advanced Polymer Adhesive.
 - 3. Sealant: Crane Composites ColorRite Silicone Caulk, color matched to panel color

PART 3 EXECUTION

3.1 INSTALLATION

- A. FRP Panels: Coordinate scheduling with Section 09 91 00.
 - 1. Install FRP panel vertically, resting 1/4" minimum above finished base.
 - a. Apply adhesive beads to face of substrate and back of panels.
 - b. Mechanically attach panel edges with countersunk screws.
 - c. Apply 'J' mold trim to top of panel before placing panel. Use bead of sealant to hold trim piece.
 - d. Leave 1/8 to 1/4 inch space at panel edges joint; fill with sealant.
 - e. Adhesive apply flat batten strips and inside and outside corners.
 - f. Install FRP panels behind hollow metal door and window frames so that frame wraps over panel.

3.2 CLEANING

- A. Remove all excess adhesive from panels and trim immediately.
- B. Replace all damaged or discolored components.
- C. Clean all completed walls as per manufacturer's instructions.

3.3 SCHEDULE

A. Install minimum 4'x4' panels on gypsum board walls at mop sink location.

END OF SECTION

09 78 00-2

SECTION 09 91 00

PAINTING AND FINISHING

PART 1 GENERAL

1.1 SUMMARY

- A. The work to be completed under this heading includes all labor, materials, equipment, and services necessary and reasonably incidental for painting throughout the building, both exterior and interior, for all wood, metal, masonry, or other surfaces as specified, to make a thoroughly complete job in every respect.
- B. Term "exposed" used herein refers to surfaces exposed at exterior of building and surfaces visible within building unless specifically called out. Materials in pipe chases, pipe tunnels and concealed above finish ceiling shall not be considered "exposed".
- C. Items included but not limited to Exposed concrete surfaces (as called for on the interior finish schedule. Exposed concrete masonry units, interior and exterior. Exposed ferrous metals at exterior and interior of building not specified to receive factory applied finish of baked-on enamel. Concealed ferrous metals, except for fasteners and electrical and mechanical items, shall have minimum of one coat of corrosion-resistant paint. Exposed aluminum: galvanized steel roof vents, exhaust fans, grilles and registers shall not be painted unless otherwise designated.
- D. Exposed insulated piping, ductwork and mechanical equipment shall be painted unless supplied from the factory with a finish coat in compliance with building decor and this specification.
- E. All exposed flues, vents, and extensions above prefinished metal roofs to be painted to match metal roof color.
- F. Exposed wood, hardboard and plywood surfaces unless otherwise designated shall be painted or stained. Walls requiring patching or showing defects shall be painted in their entirety.
- G. There shall be no painting of copper, prefinished aluminum, or other finished metal, except iron.

H. Refer to section 09 29 00 for gypsum board surface texturing.

I. Refer to Section 13 34 19 for pre-engineered metal building components to be painted.

J. Where vinyl-faced roof or wall insulation is provided in pre-engineered structures or similar installations, <u>do not paint vinyl facing.</u>

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Follow manufacturer's recommendations for temperature range in which coatings may be applied.
- B. Comply with National Volatile Organic Compound Emission Standards for Architectural coatings, Rule 40 CFR, Part 59, established by Environmental Protection Agency for VOC limits unless stricter local regulations are required.

1.4 PAINTING AND FINISHING PRE-INSTALLATION MEETING

- A. Prior to any wall or ceiling preparation, Contractor will schedule a pre-installation meeting. Required attendance will be Contractor or CM, Architect, Painter and drywall finisher, and suspended ceiling installer Contractor to conduct meeting.
- B. Discussion items:
 - 1. Gypsum board texturing and mockups
 - 2. Paint application.
 - 3. Protection of floors and surrounding finished items and finishes.
 - 4. Progression of installation following application of finished coat of paint. (i.e. switch and receptacle covers, millwork light fixtures, etc.)
 - 5. Accent painting clarification.
 - 6. Finishing of hollow metal doors and frames. (spray finish, not brushed.)
 - 7. Transparent finishes for woodwork, wood doors, etc.
 - 8. Painting of exposed structure of pre-engineered metal building.
 - 9. Other discussion items

PART 2 PRODUCTS

2.1 MATERIALS

- A. All paint and stain shall be manufactured by Benjamin Moore, Pittsburg or Sherwin Williams as specified.
 - 1. Other manufacturers listed below are approved, but must meet or exceed specifications for each type of paint or stain as specified in this specification.
 - a. Glidden
 - b. Kelly-Moore
 - c. Kwal.
 - 2. Substitutions: Comply with Specification Section 01 60 00.
 - 3. All colors shall be as selected by the Architect if not called out on drawings or specifications.

- B. All paint materials shall be delivered to the job in original unbroken manufacturer's packages with the labels intact and be kept in a locked room to which the Architect shall have access at all times.
- C. All materials shall be the best of their respective kinds and thoroughly mixed in the proper proportions to secure the best results.

2.2 SAMPLE PANELS

- A. After painters' materials have been approved and before any painting or finishing is done, submit panels as follows:
 - 1. Panels showing color and texture of finish coat.
 - 2. Panels showing clear finishes.
- B. Panels to show color: Composition board, 4 inch by 11 inch by 1/8 inch to show each color selected.
- C. Panel to show transparent finishes: Wood of same species and grain pattern as wood approved for use, 4 inch by 11 inch face by 1/4 inch thick minimum, and where both flat and edge grain will be exposed, 11 inches long by sufficient size (two by two inch minimum or actual wood member) to show complete finish. Panels shall show each type of finish specified.
- D. Attach labels to each panel stating where material is to be used, mfg. of finish material, and color or number of finish.

2.3 PAINTING AND FINISHING SCHEDULE

A. Paint Schedule provides for minimum two-coat application in addition to primer or filler coat. Additional coat may be required for certain items to give complete coverage and uniform appearance. Omit primer for items shop primed.

2.4 EXTERIOR FINISHING SCHEDULE:

A.	Ferrous Metal:	
	1st Coat:	Benjamin Moore HP Acrylic Metal Primer HP1100,
		Sherwin Williams B66W00310 – Pro Industrial Pro-Cryl Universal Acrylic Primer
		PPG/Pittsburgh Pitt-Tech Plus DTM Primer/Finish 4020-1000
	2nd & 3rd Coat:	Benjamin Moore HP DTM Acrylic Metal Enamel HP3000, gloss, Sherwin Williams B66W00311 – Sher-Cryl HPA High
		Performance Acrylic Gloss Coating
		PPG/Pittsburg Pitt-Tech Plus EP DTM Acrylic Gloss 90-1510

B. Ferrous Metal (exposed exterior mainframe):

1st & 2nd Coat: PPG Durethane DTM 95-3300 Series, Gloss, 2-component DTM Urethane Mastic.
1st & 2nd Coat: Benjamin Moore HP DTM Mastic Urethane HP5700 HP5720 Gloss/Semi-Gloss, 2- component

B. Galvanized Metal:

1st Coat:	Benjamin Moore HP Acrylic Metal Primer HP1100 Sherwin Williams B66W00310 – Pro Industrial Pro-Cryl Universal Acrylic Primer PPG/Pittsburgh Pitt-Tech Plus DTM Primer/Finish 4020-1000	
2 nd & 3 rd Coat:	Benjamin Moore HP DTM Acrylic Metal Enamel Gloss HP3000 Sherwin Williams B66W00311 – Sher-Cryl HPA High Performance Acrylic Gloss Coating PPG/Pittsburg Pitt-Tech Plus EP DTM Acrylic Gloss 90-1510	
1. Paint inside galva	Paint inside galvanized surfaces of guttering.	

C. Wood (Exterior):

1st Coat:	Beniamin Moore Fresh Start High-Hiding All Purpose Primer
	Sherwin Williams B51W00620 - PrepRite® ProBlock® Int/Ext
	Latex Primer/Sealer
	PPG/Pittsburg 76-45XI Sunproof Exterior Satin 100% Acrylic
	Latex Satin
2 nd & 3 rd Coat:	Benjamin Moore W448 Ultra Spec EXT Paint - Satin
	Sherwin Williams B51W00620 - PrepRite® ProBlock® Int/Ext
	Latex Primer/Sealer
	PPG/Pittsburg 76-45XI Sunproof Exterior Satin 100% Acrylic
	Latex Satin
1	

1. Do not apply finish coats on surfaces concealed after installation, top and bottom edges of wood doors and sash, or on edges on wood framed insect screens.

D. Concrete & Concrete Masonry Unit:

- 1. Painted Finish: Refer to Section 09 97 26 Special Coatings.
- 2. Clear Water Repellent Finish: refer to section 07 19 00 Water Repellent Coatings

2.5 INTERIOR FINISHING SCHEDULE:

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A. Ferrous Metals:
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1st Coat:	Benjamin Moore HP Acrylic Metal Primer HP1100 Sherwin Williams B66W00310 – Pro Industrial Pro-Cryl Universal Acrylic Primer
2nd and 3rd Coat	PPG/Pittsburgh Pitt-Tech Plus DTM Primer/Finish 4020-1000 Paniamin Maara Command Waterborne Aarylia Urathana Satin
2 and 5 Coat.	V392
	Sherwin Williams B53W01150 – Pro Industrial Waterbased Alkyd
	PPG/Pittsburg HPC Rust Preventative Alkyd 4306-0110

B. Exposed Overhead Steel (dry-fall type):

1	
Spot Prime:	Benjamin Moore HP Acrylic Metal Primer HP1100
	Sherwin Williams B66W00310 – Pro Industrial Pro-Cryl Universal
	Acrylic Primer
	PPG/Pittsburgh Pitt-Tech Plus DTM Primer/Finish 4020-1000
1 st & 2 nd Coats:	Benjamin Moore N110 "Super Kote 5000" Dry Fall Acrylic Latex Flat
	Finish.
	Sherwin Williams B42W00181 – Pro Industrial Waterborne Acrylic
	Dryfall Flat
	PPG/Pittsburg "Speedhide Super Tech" 6-725XI Water-based Dry-Fog
	Flat Latex

- 1. Apply over primed finish.
- C. Gypsum Board & Plaster: After application of approved texture.

Benjamin Moore 354 "Super Hide" ZERO VOC Interior Latex Primer
Sherwin Williams B28WJ0901 – Wasatch Interior Latex Hi Hide
Primer
PPG/Pittsburg "Speedhide" 6-2 Interior Latex Sealer
Benjamin Moore 537 Ultra Spec 500 Interior Low Sheen Finish
Sherwin Williams B20W02651 - ProMar® 200 Zero VOC Interior
Latex Eg-Shel
PPG/Pittsburg "Speedhide" Zero Interior Latex Eggshell 6-5310

- F. Concrete Unit Masonry/Concrete (other than epoxy coating):
 - 1st Coat:Benjamin Moore 571 Ultra Spec Masonry High-Build Block Filler
Sherwin Williams B25W00025 PrepRite® Block Filler
PPG/Pittsburg "Speedhide" Interior/Exterior Masonry HI Fill Latex
Block Filler 6-15XI
 - 2nd & 3rd Coat: Benjamin Moore 537 "Ultra Spec 500" Interior Zero VOC Low Sheen Finish Sherwin Williams B20W02651 - ProMar® 200 Zero VOC Interior Latex Eg-Shel

PPG/Pittsburg "Speedhide" Zero Interior Latex Eggshell 6-5310

- 1. 4th Coat: Will be required on accent colors for adequate coverage, same type as 3rd coat.
- 2. Back roll both filler and paint coats to ensure good coverage.
- G. Epoxy Coatings for CMU and Concrete:

1st Coat: Benjamin Moore 571 - Ultra Spec Masonry High-Build Block Filler Sherwin Williams B25W00025 - PrepRite® Block Filler PPG/Pittsburg "Speedhide" Interior/Exterior Masonry HI Fill Latex Block Filler 6-15XI

2nd& 3rd Coat Benjamin Moore HP3410/ HP3420 HP Pre-Catalyzed Waterborne Epoxy Semi-Gloss/ Eggshell Sherwin Williams K45W00151 – Pro Industrial PreCatalyzed Waterbased Epoxy Eg-Shel PPG/Pittsburg "Pitt-Glaze" WB1 Pre-Catalyzed Waterborne Acrylic Epoxy 16-510, Semi-gloss Finish

Acceptable

Alternate: Benjamin Moore Ultra Spec "Scuff-X" Satin N486, Semi-gloss N487.

- Finish coating shall have a vitreous-hard, tile-like surface with high resistance to impact, abrasion, stain chemical and acid corrosion and with a flame spread rating of not more than 15 when tested in accordance with ASTM Standard Specification E-84-61. Application on all surfaces shall be in solid color to be selected by the Architect or as listed on drawings or specifications.
- H. Epoxy Coatings for Gypsum Board:

1st Coat:	Benjamin Moore 354 "Super Hide" Zero VOC Interior Latex Primer
	Sherwin Williams B28WJ0901 – Wasatch Interior Latex Hi Hide
	Primer
	PPG/Pittsburg "Speedhide" 6-2 Interior Latex Sealer
2 nd & 3 rd Coat	Benjamin Moore HP3410/ HP3420 HP Pre-Catalyzed Waterborne
	Epoxy Semi-Gloss/ Eggshell
	Sherwin Williams K45W00151 – Pro Industrial PreCatalyzed
	Waterbased Epoxy Eg-Shel
	PPG/Pittsburg "Pitt-Glaze" WB1 Pre-Catalyzed Waterborne Acrylic
	Epoxy 16-510, Semi-gloss Finish

Acceptable

Alternate: Benjamin Moore Ultra Spec "Scuff-X" Satin N486, Semi-gloss N487.

- Finish coating shall have a vitreous-hard, tile-like surface with high resistance to impact, abrasion, stain chemical and acid corrosion and with a flame spread rating of not more than 15 when tested in accordance with ASTM Standard Specification E-84-61. Application on all surfaces shall be in solid color to be selected by the Architect or as listed on drawings or specifications.
- I. Concrete Floors (Sealer)
 - 1. Clear Sealer
 - a. Two coats -MasterKure CC 250SB by BASF, semi-gloss, or approved alternate.

PART 3 EXECUTION

3.1 MATERIAL AND SPACE CONDITIONS

A. Do not apply to wet or damp surfaces. Wait a minimum of 30 days or more as required by paint manufacturer before applying to new concrete or masonry. Follow manufacturer's procedures to apply appropriate coatings prior to 30 days to other substrate surfaces. Painter is required to test new concrete or masonry for moisture content prior to beginning of painting with a certified digital PH testing meter approved

by Architect. If moisture content is above manufacturer's minimum, surface must be allowed to dry to within levels required by paint manufacturer.

B. Interior of building must be dried in prior to painter primer application. Do not begin painting of surface when temperature is at or below or temperature is predicted to drop below that required by paint manufacturer before required paint drying period.

3.2 SURFACE PREPARATION

- A. General: Temporarily remove items interfering with surface to be painted for complete painting of such items and adjacent areas.
 - 1. See other sections of the specifications for requirements for surface conditions and prime coat.
 - 2. Surfaces to be finished shall be dry, clean, smooth and prepared as specified.
 - 3. Materials and methods used for cleaning shall be compatible with the substrate and specified finish. Remove any residue remaining from cleaning agents used.
 - 4. Method of surface preparation is optional provided results of finish painting produce solid even color and texture specified.
- B. Wood: Sand to a smooth even surface and then dust off.
 - 1. Where transparent finish is specified, finish sanding shall be with 220 grit sandpaper. Wipe surface with a tack rag prior to applying finish.
 - 2. Surface to be painted with an opaque finish shall have all knots, sap and pitch streaks coated with knot sealer before applying any coat of paint. Apply two coats of knot sealer over large knots.
 - 3. Surfaces showing raised grain shall be sanded smooth between each coat.
 - 4. After application of prime or first coat of stain, fill all cracks, nail and screw holes, depressions and similar defects with patching compound. Sand to make smooth and flush with surrounding surface.
 - 5. Before applying finish coat, reapply patching compound if required, and lightly sand surface to remove surface blemishes.
- C. Steel and Iron:
 - 1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter by use of solvents, emulsions, cleaning compounds, or by steam cleaning.
 - 2. Verify that all factory or field welds where exposed have been grinded to achieve smooth consistent surface and that primer has been applied on bare steel. Apply appropriate filler material where voids occur at welds and finish to achieve smooth consistent surface.
 - 3. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, except where high temperature aluminum paint is used, the surface shall be prepared in accordance with the manufacturer's instructions.
 - 4. Fill all dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items

specified to have semi-gloss or gloss finish with patching compound. Finish flush with adjacent surfaces.

- 5. Spot prime all abraded and damaged areas in shop prime coat which expose the bare metal, with same type of paint used for prime coat. Feather edge of spot prime as required to produce smooth finish coat. Spot prime all abraded and damaged areas which exposed the bare metal of factory finished items with paint as recommended by the manufacturer.
- D. Zinc-coated (Galvanized, Metal, Terne-Plate, Zinc, Lead, Aluminum, Copper and Copper Alloys): Prep galvanized surfaces specified to be painted per paint manufacturer's instructions. Surfaces specified to be painted shall be cleaned of all grease, oil and other deterrents to paint adhesion, with toluene, xylene or similar solvents.
 - 1. Spot prime all abraded and damaged areas of zinc-coating which expose the bare metal, using zinc rich paint on hot-dip zinc-coated items and zinc dust primer on all others.
 - 2. Spot prime, with red lead prime, all abraded and damaged areas of terne-plate which exposed the base metal.
- E. Masonry, Concrete, Cement Plaster and Stucco: Remove all dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
 - 1. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. The use of solvents, acid, or steam is not permitted.
 - 2. Remove all loose mortar in masonry work.
 - 3. Replace mortar and fill all open joints, holes, cracks and depressions with patching compound, finished flush with adjacent surface, with texture to match texture of adjacent surface.
 - 4. Concrete floors to be stained or sealed shall be etched and prepped per manufacturer's instructions. Allow required time to dry between applications.
 - 5. Concrete shall have all broken and spalled edged repaired with patching compound to match adjacent surfaces. Remove projections to level of adjacent surface by grinding or similar methods.
- F. Gypsum Plaster and Drywall: Remove efflorescence, loose and chalking plaster. Remove dust, dirt, and other deterrents to paint adhesion.
 - 1. Fill holes, cracks, and other depressions with patching compound, finished flush with adjacent surface, with texture to match texture of adjacent surface.

3.3 APPLICATIONS

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, paint shall be applied in three coats, prime, body, and finish.
- C. Before application of body and finish coats, surfaces shall be prepped and primed, except as otherwise specified. For primers to be used for field application, see **PRIMERS** paragraph in this specification.

- D. Additional field applied prime coats over shop or factory applied prime coats are not required, except for exterior steel which shall have a field applied prime coat in addition to the shop prime coat.
- E. Retouch damaged and abraded painted surfaces before applying succeeding coats.
- F. Apply each coat evenly and in full covering body.
- G. Not less than 48 hours shall elapse between application of succeeding coats except as allowed by the manufacturer's printed instructions, and approved by the Architect.
- H. Finish painted surfaces shall have solid even color, free from runs, lumps, brush marks, laps, or other defects.
- I. To prevent items from sticking in the shut position, operable items such as access doors and panels, window sashes rolling doors, and similar items shall not be painted when in the closed position.
- J. Painted or otherwise finished surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reasons shall be given two coats of primer.
- K. Surfaces of finishing woodwork, except shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish shall be given one coat of primer as soon as delivered to the site.
- L. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished. Primer shall be same kind of primer specified for exposed face surface.
- M. Prime rebates for stop and face glazing of wood, and for face glazing of steel.
- N. Paint is to be applied by brush, or roller on all surfaces except metal. SPRAY PAINTING MUST BE USED ON METAL SURFACES AND IS SUBJECT TO THE FOLLOWING:
 - 1. Spray painting will be allowed if occupied portion of the building completely sealed off and approved by the Architect.
 - 2. Painting materials specifically required by the manufacturer to be applied by spraying shall be so applied.
 - 3. In areas, where paint is applied by spray, all items specified in Article, Work Not To Be Painted, motors, controls, telephone, and electrical equipment, and similar items shall be masked, or enclosed with polyethylene, or similar air tight material with all edges and seams continuously sealed.
 - 4. Exterior steel receiving PPG Durethane DTM 95-3300 may be roller or brush applied due to the long amount of time the wet particle can remain airborne.
- 3.4 PRIMERS:

- A. After surface preparation, apply prime coat to various materials as follows: NOTE: Prime coat is not required for acrylic emulsion and latex emulsion finish.
 - 1. Steel and iron: Red lead primer
 - 2. Zinc-Coated Steel and Iron: Zinc dust primer.
 - 3. Aluminum: Zinc chromate primer.
 - 4. Lead and Terne Metal: Red lead primer.
 - 5. Copper and Copper Alloys: Zinc chromate primer
 - 6. Exterior Wood: Oil base primer.
 - 7. Interior Wood: (except for transparent finish: Enamel undercoat, thinned as recommended by the manufacturer.
 - 8. Gypsum Plaster Block Filler: Pigmented sealer, except use latex emulsion for alkyd flat finish.
 - 9. Cement plaster, Concrete, and Masonry: Latex emulsion except use two coats of latex primer when substrate has aged less than six months.
 - 10. Drywall: Latex primer, except use pigmented sealer in shower, dressing and locker rooms.

3.5 EXTERIOR FINISHES:

- A. On properly prepared and primed surfaces, apply the following finish coats. Prime coat is not required for acrylic emulsion finish.
 - 1. Wood: Two coats of specified paint generally on exposed surfaces, except where transparent finish is specified and as follows:
 - a. Two coats of exterior specified paint on plywood, wood siding and similar surfaces.
 - b. Do not apply finish coats on surfaces concealed after installation, top and bottom edges of wood doors and sash, or on edges on wood framed insect screens.
 - c. That portion of the sash runs of double hung wood windows, concealed by the sash when in a closed position, shall receive two coats of boiled linseed oil mixed with not more than 1/4 pint of dryer per gallon.
 - 2. Metal: Two coats of specified paint.
 - a. NOTE: All metal surfaces to receive paint shall be spray applied!
 - b. Exterior steel receiving PPG Durethane DTM 95-3300 may be roller or brush applied due to the long amount of time the wet particle can remain airborne.
 - 3. Concrete, Concrete Masonry Units: Refer to Section 09 97 26, Special Coatings.

3.6 INTERIOR FINISHES

- A. On properly prepared and primed surface, apply the following finish coats. Prime coat is not required on concrete for floor enamel finish.
 - 1. Metal Work: Apply two coats of specified paint on exposed surfaces, including surfaces of ferrous metal louvers and ferrous metal hardware, except as follows:
 - a. Two coats of high gloss sheen specified paint on specified surfaces, color as selected.
 - b. Omit body and finish coats on surfaces concealed after installation
 - c. NOTE: All metal surfaces to receive paint shall be spray applied. No exceptions!

- 2. Plaster: One coat of latex sealer plus two coats of latex satin on exposed surfaces.
- 3. Drywall: One coat of latex sealer plus two coats of specified paint on exposed surfaces.
- 4. Masonry and Concrete Walls: One coat of specified paint over block filler on surfaces where scheduled.
 - a. Third coat will be required on surfaces where accent colors are scheduled for adequate coverage.
- 5. Dry-Fall Paint Application: Apply over pre-primed surfaces. If steel surfaces are not primed, apply compatible primer for metal surface for dry-fall paint.

3.7 SPECIAL APPLICATIONS

- A. Unless noted otherwise, all exposed piping, conduit, ductwork, etc., exposed on interior of rooms shall be painted, matching color of walls or ceiling item is attached or adjacent to.
- B. Epoxy Paint
 - 1. Application of epoxy coating under this heading shall be done by trained applicators who are experienced in the use of the specific materials to be applied. Coating shall be applied in such quantity as will result in a dry film thickness of minimum 4 to 6 mils in uniform solid color or colors as selected. Floors and other adjacent surfaces which are not to be coated shall be protected during application, and special coating applicator shall clean and repair any adjacent surfaces damaged by his work.
 - 2. Coordinate termination of epoxy paint with installation of rubber base. No epoxy paint is to be applied where rubber base is to be installed.

3.8 SCAFFOLDS

- A. This Contractor shall provide all ladders, scaffolds, staging, etc., required for the proper execution of the work.
- 3.9 **PROTECTION**:
 - A. Protect all work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- 3.10 EXTRA STOCK:
 - A. Provide minimum one full gallon of each type and each color of paint specified and used on project. Each paint container to be properly labeled, identifying type and color.

3.11 CLEAN UP

- A. Upon completion, clean paint from all hardware, glass and other surfaces and items not required to be painted.
- B. Before final inspection, any work which has become damaged or discolored shall be touched-up or refinished in a manner to produce solid even color and finish texture, free from defects.

END OF SECTION

09 91 00-12

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 09 97 26

SPECIAL COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Masonry Weatherproofing System: Cementitious Waterproofing Coat with Decorative Acrylic Finish Coat.
 - 2. Protection of weeps, drainage and ventilation vents during coating application.
- B. Related Sections:
 - 1. Section 04 22 00 Concrete Unit Masonry.

1.2 REFERENCES

- A. American Society for Testing & Materials (ASTM):
 - 1. ASTM D968 Abrasion Resistance of Organic Coatings by the Falling Abrasive Tester.
 - 2. ASTM D822 Operating Light and Water Exposure Apparatus (Carbon Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.
 - 3. ASTM G26 Operating Light-Exposure Apparatus (Carbon Arc Type) With and Without Water for Exposure of Nonmetallic Materials.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: Properly trained and approved by the weatherproofing system manufacturer and have authorization to offer specified warranty. Submit installer letter of certification, signed by Technical Representative of system manufacturer.
- B. Field Sample:
 - 1. Apply masonry weatherproofing system to sample concrete block panel.
 - 2. Reflect proposed color, texture, and workmanship.
 - 3. Obtain acceptance of completed section from Architect before beginning work.
- C. Pre-installation Conference:
 - 1. Contractor shall arrange meeting no less than seven days prior to starting work.
 - 2. Attendance:
 - a. Construction Manager
 - b. Coating Contractor
 - c. Architect/Owner's Representative
 - d. Coating Manufacturer Representative/Distributor.
 - 3. Agenda:
 - a. Substrate condition.
 - b. Sequence and method of application of coating system.

09 97 26-1

1.4 SUBMITTALS

A. Comply with Section 01 33 00.

1.5 **PROJECT CONDITIONS**

A. Environmental Requirements:

- 1. Do not apply on frozen or frost-filled surfaces.
- 2. Do not apply if temperature is below 40 degrees F. or expected to fall below 40 degrees F within 24 hours.
- 3. Protect material from freezing.
- 4. Protect surfaces from rapid drying where windy, hot, and dry conditions exist.
- 5. Protect from precipitation for 24 hours after application.
- 6. Avoid applying material during rapid and extreme changes in temperature to prevent thermal shock cracks during the curing process.
- 7. The following conditions may require damping the surface prior to and during application.
 - a. Wind-caused rapid drying of surface.
 - b. Excessive surface temperature
 - c. Excessive air temperature
 - d. Direct sun
 - e. Low humidity.

1.6 WARRANTY

- A. Provide five year material and labor warranty to cover:
 - 1. Waterproofing above grade.
 - 2. Bonding.
 - 3. Weathering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide coatings of the following manufacturers:
 - 1. Master Builder Solutions by BASF (formerly Thoro System Products)
- B. Substitutions: Must be submitted to the Architect for review prior to bidding.

2.2 CEMENTITIOUS WATERPROOFING AND ACRYLIC FINISH COATINGS

- A. Master Builder Solutions, by Sika USA
 - 1. Sika Thoroseal 581 (Cementitious Waterproofing Coating)
 - 2. Sika Thorocoat C250 (Acrylic Finish Coating)

09 97 26-2

2.3 MIXING

A. If premixing is required, stir in strict accordance with printed instructions of manufacturer. Use approved mechanical mixer. Do not use frozen, caked, or lumped materials.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examination:
 - 1. Examine substrate to which finely textured coating is to be applied. Do not proceed if unsatisfactory conditions exist which hamper proper application.
 - 2. Beginning of application means acceptance of substrate condition.
- B. Preparation:
 - 1. Surfaces to receive system shall be free of defects such as honeycombs, form marks, tie holes, concrete dropping, laitance, dirt, dust, grease, form release treatments, efflorescence, curing compounds, paint and any other foreign material.
- C. Patch all cracks and holes with Master Builder Solutions MasterEmaco N424 prior to application of Cementitious Waterproofing Coating.
- D. Beginning of application means acceptance of substrate.
- 3.2 MASONRY WEEP VENT, DRAINAGE VENT AND VENTILATION VENT PROTECTION
 - A. Weep vents, drainage vents and ventilation vents are not to be coated. Protect as required during coating process.

3.3 APPLICATION

- A. General:
 - 1. Waterproof exterior walls with cementitious waterproofing coating. Ensure surface is thoroughly cured before starting finish application (48-72 hours under normal conditions)
 - 2. Acrylic Coating:
 - a. After Cementitious Waterproofing Coating has been applied and cured, apply Acrylic coating. Apply material at a rate recommended by manufacturer, directly as it comes from the can.
 - b. Apply material by brush, roller, plaster type sprayer, or low pressure sprayer.
 - c. Back roll brushed or sprayed material; cross roll roller-applied material.
 - d. Finish material so that brush and roller strokes are on one direction

09 97 26-3

3.4 FIELD QUALITY CONTROL

- A. Unless noted otherwise, all exterior CMU masonry and concrete surfaces shall receive complete and thorough coverage of specified masonry weatherproofing. Color to be selected by Architect.
- B. Maintain schedule of application of system in field office for Owner/Architect's review.

3.5 EXTRA STOCK

A. Provide minimum one gallon of each color of special coating used on project. Each container to be properly labeled, identifying color.

END OF SECTION

09 97 26-4

A New Facility Thaden Competition Gymnasium Bentonville, Arkansas

SECTION 09 97 27

EPOXY WALL COATING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. DESCO "Colortite" Technical Surfacing System by DESCO Coatings, Inc.

B. Related Sections:

- 1. Section 04 22 00 Concrete Unit Masonry.
- 2. Section 09 29 00 Drywall

1.2 REFERENCES

- A. American Society for Testing & Materials (ASTM):
 - 1. ASTM D968 Abrasion Resistance of Organic Coatings by the Falling Abrasive Tester.
 - 2. ASTM D822 Operating Light and Water Exposure Apparatus (Carbon Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.
 - 3. ASTM G26 Operating Light-Exposure Apparatus (Carbon Arc Type) With and Without Water for Exposure of Nonmetallic Materials.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Properly trained and approved by the system manufacturer and having authorization to offer specified warranty. Minimum of seven (7) years experience installing the system in similar size and function projects. Submit installer letter of certification, signed by Technical Representative of system manufacturer. Applicator shall provide to the Architect a list of projects, including architect, general contractor and owner with material used, quantity installed and date completed on similar projects.

B. Field Sample:

- 1. Apply system to sample substrate material panel.
- 2. Reflect proposed color, texture, and workmanship.
- 3. Obtain acceptance of completed section from Architect before beginning work.

C. Pre-installation Conference:

- 1. Contractor shall arrange meeting no less than seven days prior to starting work.
- 2. Attendance:
 - a. Contractor
 - b. Coating Contractor
 - c. Architect/Owner's Representative
 - d. Coating Manufacturer Representative/Distributor.

09 97 27-1
- 3. Agenda:
 - a. Substrate condition.
 - b. Sequence and method of application of coating system.

1.4 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Do not apply on frozen or frost-filled surfaces.
 - 2. Do not apply if temperature is below 55 degrees F. or expected to fall below 55 degrees F within 24 hours.
 - 3. Protect material from freezing.
 - 4. Protect surfaces from rapid drying where windy, hot, and dry conditions exist.
 - 5. Protect from precipitation for 24 hours after application.
 - 6. Avoid applying material during rapid and extreme changes in temperature to prevent thermal shock cracks during the curing process.
 - 7. The following conditions may require damping the surface prior to and during application.
 - a. Wind-caused rapid drying of surface.
 - b. Excessive surface temperature
 - c. Excessive air temperature
 - d. Direct sun
 - e. Low humidity.

1.5 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.6 WARRANTY

A. Applicator shall notify manufacturer of project requirements before bidding. Manufacturer shall provide written statement before bidding to the Architect that they accept single source warranty for the entire installation including labor for one (1) year. Warranty shall include removal and replacement if proven defective. Defective items are, but are not limited to, debonding, regionalized discoloration, excessive wear and staining by bodily fluids. Non-acceptance in writing by manufacturer is grounds for rejection of product.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Subject to compliance with requirements, provide Desco "Colortite" Technical Surfacing System, with foundation coat, a color coat, two (2) color spots, and a glaze coat as manufactured by Desco Coatings, Inc.
- B. Substitutions: Must be approved prior to bid. Installed work in local area must be viewed by the Architect as part of substitution review.

09 97 27-2

- C. Coatings shall be colors as selected by the Architect. Colors may not be from the standard line.
- D. Glaze coat shall be a separate non-yellowing, aqueous glaze coat having a gloss finish as selected by the Architect.
- E. Coating will conform to the following physical properties:

Test	Method	Results
Fire hazard	ASTM E-84	Flame spread – 0
		Fuel contributed 0-5
		Smoke developed 5
Scrubbability	CGSB 1.GP.71	40,000 cycles w/o
deterioration		
Impact resistance	CGSB 1.GP.71	50 inch-pounds
Colorfastness	100 hours in fedeometer	Unaffected
Toxicity	Dept. of Agriculture	Approved
Stain resistance	Exposure to lard, mustard and lipstick.	Unaffected
Chemical resistance	24 hour exposure	Unaffected
(to most chemicals, acids,	alkalis, detergents, oils, fats, so	lvents.)

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examination:

- 1. Examine substrate to which system is to be applied. Do not proceed if unsatisfactory conditions exist which hamper proper application.
- 2. Beginning of application means ACCEPTANCE OF SUBSTRATE CONDITION.

B. Preparation:

1. Surfaces to receive system shall be free of defects such as honeycombs, form marks, tie holes, concrete dropping, laitance, dirt, dust, grease, form-release treatments, efflorescence, curing compounds, paint and any other foreign material.

3.2 APPLICATION

A. General:

- 1. Technical Surfacing System:
 - a. Apply material at a rate recommended by manufacturer, directly as it comes from the can and by manufacturer-approved methods using equipment specifically designed for this purpose.

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- b. Finished work shall match approved samples, be uniform in thickness, sheen, color and texture and be free from defects detrimental to appearance or performance.
- c. The smoothness index of completed coating shall be at least 50% using a 60° Gardner Gloss-meter. The mode smoothness index of coated coarse substrates (concrete block) shall be at least 50% of that of same coating applied to a smooth substrate such as gypsum wall board).
- d. Total film thickness for primer, color coat and glaze shall be 45 to 60 mils over block and 15 to 20 mils over smooth surface. Verify the dry film thickness of completed coating system using a Tooke Mark II coating inspection gauge.

3.3 FIELD QUALITY CONTROL

- A. Maintain schedule of application of system in field office for Owner/Architect's review.
- B. The Contractor shall allow sufficient time to the specialty applicator to complete the coating application and at no time shall speed of project completion or unsuitable drying conditions be allowed to detrimentally speed up these operations. All substrates must be properly cured and dry. Moisture content of substrates shall not exceed 16%. Substrate temperature is to be maintained at a minimum of 55°F during application and for a minimum of 24 hours thereafter.
- C. The general contractor shall provide sufficient electric power, light and heat and working conditions to permit the proper application of these coatings. Areas to be coated must be kept free of traffic and no other trade may be allowed to work in area during application procedure.
- D. Plumbing fixtures, toilet and moveable partitions, radiators, grilles, etc., shall not be installed until the coatings have been applied.
- E. Painting and decorating, including installation of resilient floor covering shall be completed after the coatings have been applied.
- F. Hard floors and base, such as concrete, troweled epoxy, ceramic tile or terrazzo shall be completely finished before coatings application.
- G. Caulking, where necessary, is to be installed after coatings application. If caulking is to precede coatings, the caulking compound must be of the non-petroleum based type.
- H. Walls below grade shall be suitably waterproofed from the outside by others.
- I. At completion of the installation, an inspection shall be made jointly by the coatings contractor and general contractor to obtain approval that the coated surfaces are free of damage. It will then be the responsibility of the general contractor to protect this work from subsequent damage.

END OF SECTION

09 97 27-4

SECTION 10 00 00

MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish all items listed and specified below and where shown on drawings. Install per manufacturer's instructions.
- B. Section includes:
 - 1. Security Key Box (Knox Box)
 - 2. Electrical Power Shutdown (Knox Box)
 - 3. Corner Guards
 - 4. ADA Locker Bench

1.2 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

1.3 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- B. General: Submittals showing all details of script, fabrication, and installation.
- C. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

10 00 00-1

PART 2 PRODUCTS

2.1 MATERIALS

- A. Electrical Power Shutdown (Knox Box)
 - Model 4544 series small Key & data storage cabinet with swing door and building electrical shutdown switch, recessed mount,) manufactured by the Knox Company, 846 Production Place, Newport Beach, CA 92663, 1-800-552-5669. Color to be red. Provide with recessed mount kit. Verify and coordinate installation location with local fire department.
- B. Corner Guards Type 1 (Adhering)
 - Model "VA" Series Acrovyn colored plastic, 1-1/2" wing size, manufactured by Construction Specialties, Inc, Muncy, PA, (520)546-5941, InPro Corporation, Muskego, WI (800) 222-5556, Korogard G815 Vinyl, 1-1/2" wing size, manufactured by Koroseal Interior Products, Fairlawn, OH (855-753-5474), or approved alternate.
 - 2. Guards to be provided with self adhesive tape.
 - 3. Extend guards from top of base to ceiling unless noted otherwise.
 - 4. Color to be selected from manufacturer's standard colors and textures.

PART 3 EXECUTION

- 3.1 INSTALLATION
 - A. Verify that area to receive product is ready for installation.
 - B. Install items in strict accordance with manufacturer's instructions.
 - C. If required, provide training to owner.

END OF SECTION

10 00 00-2

SECTION 10 11 00

VISUAL DISPLAY SURFACES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:1. Porcelain Enamel Steel Markerboards

1.2 RELATED SECTIONS

- A. Section 05 41 00 Cold Formed Framing
- B. Section 06 10 00 Rough Carpentry Blocking
- C. Section 06 41 16 Cabinetwork & Shelving
- D. Section 06 40 23 Interior Architectural Woodwork
- E. Section 09 29 00 Drywall
- 1.3 SHOP DRAWINGS/SUBMITTALS
 - A. Complete materials list of all items proposed to be furnished under this section.
 - B. Comply with Section 01 33 00.
 - C. Manufacturer's recommended installation procedures.
 - D. Samples: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color and texture, where required.

1.4 DELIVERY AND STORAGE

- A. Deliver all manufactured materials in original containers bearing manufacturer's name and brand. Store materials within building in locations directed by Owner.
- 1.5 WARRANTY
 - A. Provide a manufacturer's standard "Life-Of-Building" warranty for markerboard surface.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

10 11 00-1

- A. The Manufacturer of products used in this section must have an established reputation and experience in production similar apparatus for at least five or more years in the United States, with a history of satisfactory production acceptable to the Architect.
- B. Conforms to applicable code for flame/smoke rating in tack boards in accordance with ASTM E84.

2.2 PRODUCTS

- A. Markerboards and tackboards specified are to be manufactured by Claridge Products and Equipment, Inc., Peter Pepper Products, Gamco, Greensteel, or approved alternate. Items specified herein will be Claridge models.
- B. Fixed Markerboard
 - 1. Arrangement as shown on drawings, Series 4, 4'-0" high Length as scheduled on drawings. Frame color to be standard anodized aluminum.
 - At Marker boards Provide with continuous flat tray and 1" map rail with cork insert at markerboard only.
 - 2. Markerboard to be LCS³ #100 Low Gloss White (marker and projection surface), 24 gauge, white porcelain enamel steel.

PART 3 EXECUTION

- 3.1 PREPARATION
 - A. Coordinate installation of all concealed blocking in wall for attachment.
- 3.2 INSTALLATION
 - A. Comply with manufacturer's instructions. Provide all accessories as required for complete installation
 - B. Hang units true and plumb.
 - C. All attachments are to be concealed. No exposed fastener clips.
- 3.3 **PROTECTION**
 - A. Protect units after installation from other trades.
- 3.4 SCHEDULES
 - A. Refer to drawings for sizes and locations

END OF SECTION

10 11 00-2

SECTION 10 14 00

IDENTIFYING DEVICES

PART 1 GENERAL

1.1 SUMMARY

- A. Provide all labor, materials, fabrications and coordination required to install complete, in place interior signage and exterior signage.
- 1.2 QUALITY ASSURANCE
 - A. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

1.3 SUBMITTALS

- A. Comply with requirements of Section 01 33 00.
- B. Manufacturers must submit 3 references showing products for projects completed within the last 6 years.
- C. Submit manufacturer's technical data and installation for each type of sign required.
- D. Submit shop drawings listing sign size, letterform and letter heights.
- E. Submit one full size sample sign of type, style and color specified, including method of attachment. If approved, the sample will become part of the job.
- F. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

1.4 SIGN TYPE DESCRIPTION

A. Signage shall consist of room number and room function to meet the requirements of the Americans with Disabilities Act (ADA).

1.5 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

10 14 00-1

1.6 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

PART 2 PRODUCTS

2.1 ROOM IDENTIFICATION:

- A. Provide products from Mohawk Sign Systems, Inc.® P.O. Box 966, Schenectady, NY 12301-0966. 518/ 370-3433 or FAX 518/ 370-3332, equivalent by Archway Graphic Designs, Little Rock, AR, Best Sign Systems, Montrose, CO, or approved alternate substitution.
- B. Substitutions: Other manufacturers must submit their signage products to the Architect 10 days prior to the bid date for approval to be considered for substitution.
- C. Colors: Architect to select colors from manufacturer's standard color selection.

2.2 GRAPHIC PROCESS

- A. All signs shall be manufactured using Graphic Process Series 200A Sand Carved® using Format D.
 - 1. Tactile characters shall be raised the required 1/32" inches from sign face. Glue-on letters or etched backgrounds are not acceptable.
 - 2. All text shall be accompanied by Grade 2 braille with domed dots. Braille shall be separated ¹/₂" from the corresponding raised characters or symbols. Grade 2 braille translation to be provided by signage manufacturer.
 - 3. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.
- B. Background color as selected by architect from manufacturer's actual color samples.
- C. Letterform shall be Gill Sans upper case letters and numbers
- D. Size of letters and numbers shall be as follows:
 - 1. Room numbers shall be 1 ".
 - 2. Lettering for room ID signs shall be 5/8" or as noted.
 - 3. Symbol size shall be 4".
 - 4. Standard Grade 2 braille shall be $\frac{1}{2}$ " below copy.
 - 5. Corners: ¹/₂" radius
- E. Copy position: As indicated on drawings.

2.3 SIGN DESIGN

A. Refer to drawings for sign types.

10 14 00-2

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas, conditions and surfaces where work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Cleaning: Immediately prior to installation of the work of this Section, thoroughly clean all substrata and remove all oil, grease, paint, varnish hardeners, and other items which would adversely affect the bond of adhesive.
- B. Smoothing: Make all substrata level and free from irregularities.

3.3 INSTALLATION

- A. Install all graphic materials and identifying devices in strict accordance with the approved shop drawings and the manufacturer's instructions.
- B. Signs shall be mounted using vinyl tape and silastic adhesive. Mechanical for Exterior signage. Unless noted otherwise, all signs shall be mounted 60" from the floor to the top of the sign on the latch side. Center of sign is to be 9" from doorframe or room opening and edge of sign. Installer user assumes responsibility for suitable installation of the signs.

3.4 CLEANING UP

A. Thoroughly clean all graphics and identifying devices after installation and prior to final acceptance by the Owner. Use only those cleaning materials and methods recommended by the respective manufacturers.

3.5 **PROTECTION**

A. Provide any and all necessary protective measures or materials to insure that graphic materials and identifying devices are not damaged prior to acceptance by Owner. Replacement or repairs caused by such damage shall be corrected immediately at this Contractor's expense.

3.6 COORDINATION

A. Throughout construction of substrate surfaces, use all means necessary to ensure proper and adequate provision for concealed support devices, and for finished openings, to receive the work of this Section.

END OF SECTION

10 14 00-3

SECTION 10 14 19

ALUMINUM NUMBERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:1. Furnishing and mounting of aluminum numerals.

1.2 SUMMARY

- A. Comply with requirements of Section 01 33 00.
- B. Submit letter layout following determination of verbiage through Contractor to Architect in accordance with General Conditions.
- 1.3 SIZE AND VERBIAGE
 - A. NAME: Numbers are to be 12" high1. Numbers: 911
 - B. Provide five (5) numerals 12" high. Numbers will be determined when address is announced.

PART 2 PRODUCT

2.1 MATERIAL

- A. Cast aluminum letters where shown on the drawings shall be as manufactured by A.R.K. Ramos Oklahoma City, OK, The Southwell Co., San Antonio, TX, OMC Industries, Inc., Gemini Incorporated, CannonFals, Minnesota, or approved alternate.
- B. Letters and numerals shall be Helvetica Medium 521.
- C. Letters and numerals shall be cast from F-214 aluminum alloy, 1" thick, with satin polished faces and matte sides.

PART 3 INSTALLATION

- 3.1 EXECUTION
 - A. Numerals shall be projected mounting, minimum ¹/₂" from mounting surface, using extended threaded screws. Provide blocking in wall as required for mounting.

END OF SECTION

10 14 19-1

SECTION 10 21 14

SOLID PLASTIC HEADRAIL BRACED TOILET PARTITIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Furnish, deliver and install all Toilet Partitions as indicated on the drawings and as required by actual conditions at the building. The Toilet Partitions shall include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields and all other devices necessary for the proper installation and application of the Toilet Partitions.
- B. Related Sections
 - 1. Section: 10 28 13 Washroom Accessories

1.2 REFERENCES

- A. Standard
 - All Toilet Partitions must be scheduled, supplied and installed in accordance with: Local Building Code, ANSI (American National Standards Institute), ADA (Americans with Disabilities Act). In all cases the above references shall be taken to mean the latest edition of that particular standard including all revisions.
 - 2. NFPA 286

1.3 SUBMITTALS

- A. General Requirements
 - 1. Make all submittals in accordance with Section: 01 33 00

B. Product Data

- 1. Submit (2) copies of product sheets and/or catalogue cuts, of all products listed in the shop drawings.
- C. Samples
 - 1. Upon request, a returnable sample of the Toilet Partitions shall be submitted to the Architect for approval not later than (10) days after requested. All samples must be properly identified including: name of supplier, and name of manufacturer.

- D. Operations and Maintenance Data
 - 1. At completion of the job, furnish to the owner (2) copies of an Owners Operation and Maintenance Manual. The Manual shall consist of a hard cover three ring binder with the project name in the front. Include in the manual the following information: Maintenance instructions, Catalogue pages for each product, Name/Address and phone number of the Manufacturer and their Sales Agent, Copy of the final shop drawings.

1.4 QUALITY ASSURANCE

- A. Substitutions
 - 1. Proposed substitutions must comply with Section 01 60 00.
- B. Supplier Qualifications
 - 1. Toilet Partition shop drawings and Toilet Partitions shall be procured from a source of supply approved by the Consultant/Owner/Architect. Supplier is responsible for the complete Toilet Partition subcontract.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Marking and Packaging
 - 1. Toilet Partitions must be delivered to the job site in the manufacturers' original packages and marked to correspond with the approved shop drawings.
- B. Delivery
 - 1. Toilet Partitions must be delivered in an amount of time deemed appropriate by the Consultant/Owner.

1.6 WARRANTY

A. Written Guarantee

1. The Toilet Partition manufacturer shall guarantee all Solid Plastic Toilet Partitions by written certification, for a period of 25 years against breakage, delamination, and corrosion of solid plastic parts. Warranty is for manufacturer's material only and does not include installation errors, improper usage or vandalism.

1.7 MAINTENANCE

- A. Maintenance
 - 1. Upon request, at completion of the project, the Toilet Partition supplier may be required to brief Owner's maintenance staff regarding proper care of Toilet Partitions, such as: required lubrications, adjustments, cleaning, etc...

PART 2 PRODUCTS

2.1 PRODUCTS

- A. Solid Plastic overhead braced toilet partition and urinal system manufactured by Hadrian Inc.
 - 1. Approved Alternate manufacturers:
 - a. Scranton Products Hiny Hiders
 - b. ASI Accurate Partitions Corporation
 - c. General Partitions
- B. Only those manufacturer's names and product numbers listed herein, are approved for use on this project. All other manufacturers must request approval as per Section 01 60 00.

2.2 MATERIALS

- A. Construction Features: Doors, panels and pilasters shall be polypropylene or polyethylene solid plastic. The material's self-lubricating surface is resistant to marking and can be maintained effectively with ordinary household cleaners. Material is ideal for toilet partition installations, especially in high abuse environments.
 - 1. Materials must pass NFPA 286 fire test standards.
- B. Doors: Shall be (25mm) 1" thick by (1397mm) 55" high straight cut with fine radius edges.
- C. Panels: Shall be (25mm) 1" thick by (1397mm) 55" high straight cut with fine radius edges.
- D. Urinal panel: 24" deep x 42" high. Provide floor-to ceiling mount pilaster at end.
- E. Pilasters: Shall be (25mm) 1" thick by (2083mm) 82" high straight cut with fine radius edges. Urinal pilaster height is to be coordinated with ceiling height.
- F. Headrail: Shall be 32mm (1.25") by 44mm (1.75") extruded anodized aluminum with anti-grip design. Wall thickness to be 1.5mm (0.060") and shall be securely attached to wall and pilasters with manufacturer's fittings in such a way as to make a rigid installation. All joints in headrails shall be made at a pilaster.
- G. Pilaster Fastening Method: Pilasters shall be securely and rigidly fastened to the floor on vertically adjustable floor brackets. The floor fastening shall be concealed and protected by a 4" (102mm) high stainless steel pilaster shoe. One full-height continuous aluminum channel shall be used at the pilaster to panel connection. Three heavy-duty aluminum brackets shall be used at the pilaster to wall connection.

- H. Hardware & Fittings: Doors shall be equipped with a full-height continuous 16-gauge stainless steel hinge with a stainless steel hinge pin, door latch, and bumper/coat hook. Door at accessible stall to have additional bumper on exterior side.
- 2.3 FINISH
 - A. Doors, panels, and pilasters shall be constructed of matte finished polypropylene or gloss finished polyethylene with uniform color throughout. Color to be selected from manufacturer's standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Preparation

- 1. The contractor must examine all site conditions that would prevent the proper application and installation of Toilet Partitions. Any defect must be immediately identified and corrected, prior to the installation of the Toilet Partitions.
- 2. Take site dimensions affecting this work. Verify correct spacing of plumbing fixtures.

3.2 INSTALLATION

- A. Mounting Locations
 - 1. All Toilet Partitions must be mounted according to Manufacturers standard locations and those specified on the drawings.

3.3 FIELD QUALITY CONTROL

- A. Inspection
 - 1. After installation has been completed, provide for a site inspection of all Toilet Partitions to determine that all items have been supplied and installed as per the enclosed details. Also, check the operation and adjustment of all Toilet Partitions. Any discrepancies, or malfunctioning product, must be reported to the Architect immediately.

3.4 ADJUSTMENT AND CLEANING

- A. Final Preparation
 - 1. At final completion, Toilet Partitions shall be left clean and free from disfigurement. Make all final adjustments. Where Toilet Partitions are found defective, repair or replace or otherwise correct as directed.
- B. Properly dispose of packing and waste created from installation of partition system.

3.5 **PROTECTION**

A. Site Protection

1. The Contractor must provide for the proper protection of all Toilet Partitions until the owner accepts the project as complete.

3.6 TOILET PARTITION SCHEDULE

A. Schedule

1. Provide Toilet Partitions as specified in all above sections and as per the detailed Architectural Drawings.

END OF SECTION

10 21 14-5

SECTION 10 28 13

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. The work to be completed under this heading consists of furnishing all labor, materials, equipment and services necessary for and reasonably incidental to the furnishing and application of all miscellaneous items as shown and as specified.
- B. All items shall be delivered in sound condition, properly installed and shall be clean, undamaged, and in proper working order.

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.3 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

PART 2 PRODUCTS

- 2.1 OWNER FURNISHED TOILET ACCESSORIES:
 - A. Owner will furnish soap dispensers and paper towel dispensers. These items are to be installed by contractor.
- 2.2 TOILET ACCESSORIES:
 - A. Mop Rack: (One for each mop or service sink shown on drawings.)
 - 1. Stainless steel, satin finish; anti-slip mop holders with spring loaded, rubber cam w/3 holders.
 - a. Bobrick Washroom Equipment, Inc., Model B-223 x 24
 - b. Bradley Corp. Model 9953.
 - c. Approved alternate.
 - B. Pre-manufactured Wall Mounted Mirrors: (One at each wall-hung lavatory.)
 - 1. Standard Stainless Steel Mirrors:
 - a. Surface mounted, center over each lavatory, 304 stainless steel, satin finish frame with No. 1 quality ¼" glass, mirror warranted against silver spoilage for 15yrs. Galvanized steel back, 18"x36". Secure to concealed wall hanger with theft-resistant mounting. Mounting height as scheduled on Drawings.

b. Acceptable Products:

Bobrick Washroom Equipment, Inc. - Model B-290-1836 Bradley Corporation, Model 780-1836

- C. Grab Bar-Toilet Rooms: (One set at each handicapped water closet.)
 - 1. 18 gage stainless steel; 1 1/2" diameter, safety grip surface; concealed mounting. One at each handicapped water closet.
 - a. Model No. B6806.99 x 42, B6806.99 x 36 & B6806.99 x 18 by Bobrick.
 - b. Model No. 8122-00142, 8122-00136 & 8122-00118 by Bradley.
 - c. Or approved alternate.
- D Grab Bar-Shower Stall: (One at each site-built shower stall.)
 - 1. 18 gage stainless steel; 1 1/2" diameter, safety grip surface; concealed mounting. One at each handicapped shower.
 - a. Model No. B-6861.99 (one piece, mounted on two walls, 15 7/8 x 30 7/8) by Bobrick, Bradley, or approved alternate.
- E. Toilet Tissue Dispenser Type 1 (one for each water closet)
 - 1. Surface mounted type; double roll, vandal and theft resistant locking mechanism for spindle; no key required; tension spring or other means for controlled delivery of roll; cast aluminum, satin finish.
 - Acceptable Product: Bradley Corporation - Model 5241 Bobrick Washroom Equipment, Inc., Model B-274 Approved alternate.
 - 3. For handicapped toilets, provide Bobrick, Model B-2740 or approved alternate.
- F. Sanitary Napkin Disposal:
 - 1. Min. 22 gauge, type 304 stainless steel, satin finish. Door to have full length piano hinge.
 - 2. Acceptable Product:
 - a. Bobrick Washroom Equipment, Inc., **Type 1:** Model B-254 (Surface mounted), **Type 2:** B-354 (Serves two compartments)
 - b. Bradley Corp., Type 1: Model 4722-15 (Surface mounted), Type 2: 4721-15 (Serves two compartments)
 - c. Approved alternate
- G. Shower Curtain Rod: (one, each site-built shower.)
 - 1. Model No. B6107 x 56" by Bobrick
 - 2. Model No. 9531 x 56" by Bradley
 - 3. Or approved alternate.
- H. Shower Curtains
 - 1. 80" high, 6 gauge vinyl, white, manufactured by Gary Manufacturing, 800-775-0804, or approved alternate.
 - 2. Provide with non-rusting hooks and aluminum grommets.
 - 3. Width as required to close opening of each shower stall.

- I. Folding Shower Seat (one each site-built handicapped shower)
 - 1. Acceptable Products
 - a. Bobrick Washroom Equipment, Inc., Model B-5181; B5171 (verify left hand or right hand seat) phenolic slats.
 - b. Approved alternate.
- J. Towel Hooks (1 for each shower stall)
 - 1. Acceptable Products
 - a. Bobrick Washroom Equipment, Inc., Model B-211
 - b. Approved alternate
- K. Shower Soap Holder (each shower)
 - 1. 16 gauge stainless steel with (2) drain holes.
 - 2. Acceptable Products
 - a. Model No. B-6807 by Bobrick
 - b. Model No. 9014 by Bradley
 - b. Approved alternate
- L. Adult Changing Station (Locate at Family Restroom)
 - 1. Full 304 brushed stainless steel exterior with vacuum formed polystyrene changing surface.
 - 2. A.D.A Compliant attached buckle.
 - 3. Acceptable product: Foundations Worldwide , Inc.; Model 100SSE-R (Horizontal Recessed Mount).
 - 4. Characteristics:
 - a. Entire body 16 gauge, 304 brushed stainless steel, seamless welds.
 - b. Provide Foundations Worldwide , Inc 200- SSLD; stainless steel liner dispenser.
 - 5. Equipped with pneumatic cylinders.
 - 6. Smooth nylon belt with Thermoplastic Polyurethane coating. Easy to sanitize and adjustable with one hand.
 - 7. 400 lb. (181 kg) load rating exceeds ASTM F2285 requirements for weight bearing changing stations.
- P. Adult Changing Station: Surface-mounted Adjustable Height Adult Changing Stations and associated accessories.
 - 1. Basis of Design: Model KB3000-AHL as manufactured by Koala Kare Products, a Division of Bobrick.
 - 2. Powered-Height Adjustability: Changing surface shall electronically adjust from 12" (300mm) to 41" (1,041mm) from floor.
 - 3. Unit shall have two sets of built-in electronic controls for height adjustment. One located on face of wall cover and one on the front of changing surface.
 - 4. Weight Capacity: Tested to support up to 500 lbs. (227 kg.) static load.
 - 5. Changing Surface shall be polyethylene and meet IK10 standard for resistance to high impact and sharp objects.
 - 6. Back-Up Battery: Unit shall have a built-in backup battery system that allows for continuous operation in the event of a power interruption.

- 7. Emergency Stop: Unit shall include a wall-mounted emergency stop to break power to actuator.
- 8. Unit shall have a safety rail with a curved dip in the center for easier patient changing by caregiver. Safety rail rotates and locks under changing bed when in closed position.
- 9. Unit shall withstand significant exposure to water without damage to electrical components. It shall include a grounded power cord and have a splash-proof control system. Electrical components and wiring shall not come in contact with station users or caregivers.
- 10. Changing surface shall not have covered areas to help ensure cleanliness.
- 11. Unit shall have ISO 60601-1 and -2 whole product certification.
- 12. Size:
 - a. Changing surface: minimum 75 1/4" long by 31 1/2" wide, and can be opened and closed with one-hand
- 13. Durability: Cycle tested through range of motion 28,000 times at 500lbs. Stress tested to 100,000 cycles with 500lbs. bounce load test.
- 14. Frame shall be constructed of 2" powder coated steel tubing.
- 13. Manufacturer's Warranties: Submit manufacturer's standard 3 year warranty for materials and workmanship.
- 14. Color to be selected by Architect from minimum 3 colors.

PART 3 EXECUTION

- 3.1 FABRICATION:
 - A. Stamped names or labels on exposed faces of toilet accessory units are not permitted. Wherever locks are required for particular type of accessory, provide same keying throughout project. Furnish two keys for each lock, properly identified.
 - B. Surface Mounted Accessories: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous piano hinge or minimum of two 1 1/2" pin hinges of same metal as unit cabinet. Provide concealed anchorage wherever possible.

3.2 INSTALLATION:

- A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit.
- B. Install units at location and heights as shown on drawings. Install as to comply with all national, state, and local codes and regulations. Units shall be plumb and level, firmly anchored.
- C. If mirrors are installed on ceramic tile, coordinate tile pattern and layout to accommodate mirrors. Mirror to be installed on single plane.
- D. <u>Molly-type anchors are not acceptable for securing accessories to walls or partitions.</u> Secure to gypsum board partitions with screws anchored in wood blocking. Anchor accessories to masonry walls with screws set in epoxy.

- E. Verify and coordinate location and installation of wood blocking concealed in gypsum board walls for attachment of wall-mounted toilet accessories.
- 3.3 ADJUSTING AND CLEANING:
 - A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.
 - B. Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION

10 28 13-5

SECTION 10 44 00

FIRE EXTINGUISHERS & CABINETS

PART 1 GENERAL

1.1 SUMMARY

A. Work under this heading consists of furnishing all labor, materials, equipment and services necessary to install fire extinguisher and cabinets as shown or called out on drawings.

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Furnish where called for on drawings, semi-recessed, enameled steel case with "Larsen-Loc" door latching mechanism, solid door, with red fire handle plate, Larsen 2409-6R, J.L. Industries 1017, or approved alternate. Where fire rated cabinets are called for, provide FS-2409-6R by Larsen, J.L Industries, or approved equal. Verify semi-recessed cabinet will fit in provided wall thickness. Break-glass doors will be acceptable only if approved company has no equal to "Larsen-Loc".
- B. Furnish multi-purpose dry chemical extinguisher, Larsen MP10, J.L. Industries Cosmic 10E, or approved equal in each fire extinguisher cabinet.

PART 3 EXECUTION

- 3.1 INSTALLATION:
 - A. Accurately locate all items, install level, plumb, and true. See Plans for required locations. Rigidly attach to the supporting surfaces in the manner recommended by the manufacturer. Install cabinet as required to provide 48" from finished floor to extinguisher handle.

END OF SECTION

10 44 00-1

SECTION 10 73 28

METAL CANOPY SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Perform all work necessary for the complete installation of the custom suspended hanger rod canopy shown on the architectural drawings and as hereinafter specified. The Work includes, but is not limited to the following principal items:
 - 1. All related flashings.
 - 2. Complete downspout and drainage system.
- 1.2 RELATED SECTIONS
 - A. Flashing and Sheet Metals: Section 07 62 00.
 - B. Sealants and Caulking: Section 07 92 00.

1.3 SYSTEM PERFORMANCE

- A. Loading Requirements
 - 1. Live loads: 30 psf
 - 2. Wind load: Refer to structural drawings.
- B. Deflection
 - 1. L / 180, maximum.
- 1.4 QUALITY ASSURANCE
 - A. Standards: Comply with standards specified in this Section and the NRCA (National Roofing Contractors Association) roofing manual.
 - B. Qualifications and Requirements for Manufacturer:
 - 1. The canopy manufacturer shall be a firm who has regularly and continuously engaged in this specialized type of work, and shall be as approved by the Architect.
 - 2. The canopy(s) shall be completely erected by the canopy manufacturer. The installation shall not be subcontracted but be performed by the General Contractor. This work shall be done with the standards set forth by the canopy manufacturer as approved by the Architect.

1.5 SUBMITTALS

- A. General: Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. As soon as possible after award of contract submit for Architect's approval:
 - a. Data of canopy system proposed to be furnished and installed under this Section.

- b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
- c. Manufacturer's recommended installation procedures.

1.6 GUARANTEE

- A. Should any defects develop during the guarantee period due to improper workmanship or materials, such defects will be repaired or replaced by the General Contractor at no expense to the Owner.
- 1.7 PRODUCT HANDLING
 - A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
 - B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCT

2.1 MANUFACTURER

- A. Super lumideck cantilever canopy as manufactured by Mapes Industries, Inc., PO Box 80069, Lincoln, NE 68501, 1-800-228-2391.
- B. Provide pre-finished flat soffit decking, standard 12" smooth fascia, Super Lumideck mounting for 5' maximum projection. Drain stub and downspout to tie into subdrainage
- C. Color to be selected from manufacturer's standard selection. Contractor to submit samples of standard blue colors
- D. Substitution: Comply with requirements of Section 01 60 00. Substitution must be approved in writing by the Architect.

2.2 SEALANT

- A. Sealant shall be Silicone as described in Section 07 92 00, Sealants and Caulking.
- B. Sealant application procedures shall be in precise conformance with manufacturer's printed instructions, and canopy manufacturer's recommendations.

2.3 ACCESSORIES

- A. Provide and install all flashings, trim and other accessories straight, true, without waves or buckling. All surfaces shall be free from burrs or rough edges. All shall be installed in neat and workmanlike manner.
- 2.4 FLASHING
 - A. Coordinate flashing work with installation of masonry work.

10 73 28-2

PART 3 EXECUTION

3.1 INSPECTION

- A. The General Contractor shall determine that the structure and substructure to receive the system are properly prepared and ready to receive the work included herein.
- B. Responsibility for the accuracy of benchmarks shall be that of the General Contractor.

3.2 FIELD DIMENSION VERIFICATION

- A. The General Contractor and the Canopy Supplier shall be responsible for the verification of precise field dimensions prior to fabrication.
- B. Any adjustments, correction or re-fabrications necessary to install canopy properly in the field shall be done at no additional expense to the Owner.

3.3 INSTALLATION

- A. The canopy shall be completely fabricated by the canopy manufacturer.
- B. Install canopy and accessories to sizes, shapes, types and finishes as indicated on Drawings and specified and in exact accordance with the approved Shop Drawings and Specifications.
- C. Installation shall be by the General Contractor.
- D. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

3.4 PROTECTION FROM DISSIMILAR SURFACES

A. Aluminum surfaces potentially in contact with masonry, limestone, steel or other dissimilar materials shall be protected by a heavy coat of zinc chromate, or similarly approved coating, to prevent electrolytic action and corrosion.

3.5 **PROTECTION**

- A. Caution shall be exercised that, subsequent to installation of the canopy, mortar, concrete, or runoff rain water containing lime or other substances deleterious to the metal surfaces are not permitted to lie or flow over the installed materials. Such damaging substances shall be removed or rinsed off immediately.
- 3.6 CLEAN-UP

- A. At time of installation, canopy shall be cleaned. No abrasive material of any kind shall be used.
- B. Any scratches or surface damage to finishes shall be repaired in accordance with manufacturer's printed instructions.
- C. Remove all rubbish, debris, cartons, crates, and the like from the premises.
- D. At the completion of the project, just prior to final inspection, the canopy shall be cleaned again.
- 3.7 TESTING
 - A. Upon request of the Architect, demonstrate by hose that the complete Canopy System installation produces a watertight assemble, capable of withstanding loading pressures and thermal / lateral loads.
 - B. Immediately repair or replace any defective areas and retest.

END OF SECTION

SECTION 11 66 19

WALL PADS

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish all labor, material and services required to completely furnish:
 - 1. Wall Pads
 - 2. Column Cover Pads
- 1.2 RELATED SECTIONS
 - A. Section 13 34 19: Pre-engineered Metal Building System

1.3 SUBMITTALS

- A. Submit product data sheets and shop drawings, complying with Section 01 33 00.
- B. Provide shop drawings showing pad layout

PART 2 PRODUCTS

2.1 WALL PADS

A. Wall Protection Pads

- 1. Type: Fabric covered foam wall protection pads; Wall Pads as manufactured by Draper, Porter, Performance Sports, ACI, or approved equal.
- 2. Pad size: 24-48" wide by 84 inches tall. Align top of pad with door opening.
- 3. Cushioning foam material:
 - a. 2 inches thick polyurethane or polyethylene foam
 - b. Flammability Class A
- 4. Backer: 7/16 inch wafer board
- 5. Cover: Solid vinyl coated polyester fabric with embossed pattern:
 - a. Weight: 14 ounces per SY.
 - b. Tear resistance: 65 pounds.
 - c. Resistant to rot, mildew, and ultraviolet light.
 - d. Flammability: Class A.
 - e. Color: To be selected from standard colors by the Architect.
 - f. Construction: Cushioning material adhered to backer and panel fully wrapped with fabric which is stapled to backer such that backer is not exposed on front or sides.
 - g. Attachment: Provide pads with Z mounting clips top and bottom.
- 6. Accessories
 - a. Provide molded inserts at all wall devices such as receptacles, switches, fire strobes, etc.

11 66 19-1

PART 3 EXECUTIONS

3.1 EXAMINATION

A. Verification of Conditions: Verify areas to receive equipment items free of impediments interfering with installation and conditions of installation substrates and structure are acceptable to begin installation.

3.2 INSTALLATION

- A. Install wall and column pads in accordance with manufacturer's installation instructions and final shop drawings. Provide accessories, anchors, fasteners, inserts and other items for installation and permanent attachment to adjoining construction.
- B. Wall and column padding is to be installed in alignment with adjacent wall pad to create level horizontal and vertical edges.
- C. Wall Pads: Field verify dimensions prior to fabrication. Coordinate fabrication of wall protection pads with size and location of switches, electrical outlets, and other wall mounted items; structural framing and bracing projecting from wall surface; and door and other wall openings. Align pads with door openings, reference interior elevations.

D. Wall Pads:

- 1. Install in accordance with manufacturer's written instructions and shop drawings.
- 2. Mount protection pads 4 inches above finished floor.
- 3. Secure to wall with fasteners along top and bottom. Type, size and spacing of fasteners as recommended by manufacturer.
- 4. Provide molded inserts for switches, electrical outlets, and other items on wall.

3.3 ADJUSTMENT AND CLEANING

A. Cleaning: Clean installed pads on both exposed and semi-exposed surfaces. Touch-up finishes to restore damaged or soiled surfaces.

3.4 **PROTECTION**

A. General: Provide final protection and maintain conditions to ensure pads are without damage or deterioration at time of substantial completion.

3.5 MAINTENANCE AND OPERATION

A. General: Transmit to Owner both operation and maintenance instructions of all wall and column padding.

END OF SECTION

11 66 19-2

SECTION 11 66 23

FOLDING BASKETBALL BACKSTOPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Two (2) roof structures suspended, forward folding, electrically operated basketball backstops with backboard, goal, winch, backboard edge padding, and net.
- B. Section includes: One (1) wall mounted basketball backstop with backboard edge padding and net.

1.2 RELATED SECTIONS

- A. Section 05 12 23 Structural roof framing to receive ceiling suspended backstops.
- B. Section 09 66 00 Athletic Vinyl Flooring: Layout and painting of court lines to be coordinated with installation of basketball backstops.
- C. Division 26: Electrical supply, conduit, and wiring for motorized winch.

1.3 REFERENCES

- A. ASTM A500 Formed Welded Seamless Structural Tubing in Rounds and Shapes.
- B. ASTM B85 Aluminum-Alloy Die Castings.
- C. ASTM B221 Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 Submittal Procedures:
 - 1. List of proposed products and product data.
 - 2. Shop drawings showing layout, dimensions, construction, electrical wiring diagrams, and method of anchorage.
 - 3. Calculations for actual vertical and horizontal loads to be transmitted to structural roof framing supporting backstop assemblies. Loads shall be calculated for specific support configuration shown on Drawings.
 - 4. Copy of warranties for review by Architect.
 - 5. Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- A. All components including framing, backboard, goals, electric winches, controls, and accessories for basketball backstop assemblies shall be products of a single manufacturer.
- B. Backstops shall be designed, fabricated, and installed to comply with National Collegiate Athletic Association (NCAA) and National Federation of State High School Associations (NFSHSA) regulations.

1.6 WARRANTY

- A. Provide under provisions of Section 01 77 00 Closeout Procedures:
 - 1. 25 years warranty for basketball backstop structure.
 - 2. Lifetime warranty against breakage for backboards installed with goal brace.
 - 3. 5 years warranty for bolt-on safety edge padding.
 - 4. 7 warranty for goals

PARTS 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Draper, Inc., 411 South Pearl Street, Spiceland, Indiana 47385-0425; 765-987-7999.
- B. Porter
- C. Performance Sports
- D. AALCO
- E. Manufacturers of equivalent products and warranty submitted and approved in accordance with Section 01 60 00 Product Substitution Procedures.

2.2 MATERIALS

- A. Structural steel tubing: Steel, mechanical, round tubing conforming to ASTM A500.
- B. Clamps:
 - 1. Beam clamps: Split-A type with 7 square inches minimum beam flange contact area and secured with 2 all thread bolts at each attachment point.
 - 2. Component attachment clamps: Full surface type fabricated from 1/4 inch thick steel.
 - 3. Goal brace: Type attaching behind goal mounting plate and directly to backstop main stem transferring load directly to structural frame.
- C. Extruded aluminum: ASTM B221, alloy 6063 Temper T5.
- D. Aluminum castings: ASTM B85.

E. Finish: Factory applied flat black enamel for steel parts.

2.3 CEILING SUSPENDED FORWARD FOLDING BACKSTOP

- A. Type: Ceiling suspended, side folding, side braced basketball backstop; Model EZ Fold TBS-26-B as manufactured by Draper, Inc.
- B. Distance from court floor to backstop attachment at roof structure: As indicated on Drawings. Contractor to coordinate with final pre-engineered metal building frame shop drawings.
- C. Main frame: Rigid T triangular design constructed by bolting together steel tubing of the following outside diameters and gauges. Parallelogram frames are not acceptable.
 - 1. Main center stem: 6 inches diameter, 11 gauge of length sufficient to allow backstop height adjustment of plus or minus 6 inches
 - 2. Top member of T frame: 4 inches diameter, 11 gauge steel tube. 3-1/2 inches inside diameter steel pipe.
 - 3. Diagonal front brace: Adjustable brace constructed from 2-1/2 inches diameter, 13 gauge outer tube and 2-1/4 inches diameter, 14 gauge inner tube.
 - 4. Folding side brace: Jackknife type, fully adjustable, self-locking in down position constructed from 2-1/2 inches 64 mm diameter, 13 gauge outer tube and 2-1/4 inches diameter, 14 gauge inner tube.
- D. Pivot point: 1-1/4 inches diameter solid steel shaft and 1/2 inch steel plate hangers.

2.5 ELECTRIC WINCH

- A. Provide for each folding basketball backstop separate electric winch mechanism.
- B. Type: Fully enclosed, direct drive, worm gear, electric winch designed to hold backstop at any position during raising and lowering; Model A503285 Motorized Winch as manufactured by Draper, Inc.
 - 1. Motor: 3/4 HP, 11.5 AMP, capacitor type, 60 cycle, 115 volt, single-phase with automatic thermal overload protection manufactured in compliance with NEMA specifications.
 - 2. Hoist cable: 1/4 inch diameter, 7 by 19, galvanized aircraft cable with 7,000 pounds ultimate breaking strength.
 - 3. Roller: Spring-load providing tensioning pressure to ensure cable tracks evenly on grooved drum.
 - 4. Limit switches: Rotary counting up and down type, pre-wired to motor as integral part of winch.

- C. Controls: Provide key lock, 3-position, momentary contact wall control switch to lower, raise, and stop backstop. Provide all control wiring as required for complete installation.
 - 1. Provide two keys.
 - 2. Provide with stainless steel cover plate.

2.6 SAFETY BELT AND LOCK

- A. Provide each front and rear folding basketball backstop with safety belt and lock test to withstand 1000 pounds free fall load.
- B. Safety lock: Inertia sensitive to automatically lock backstop in position at any time during storage, raising, or lowering. Sudden increase in either tension or speed shall activate lock.
- C. Safety belt: 2 inches wide nylon belt rated at 6000 pounds breaking strength; Safety Belt A0549 as manufactured by Draper, Inc.
- D. Belt shall extend 36 feet and shall be automatically retracted and stored on reel equipped with constant force spring. Operation and locking action shall be activated by centrifugal force to lock backstop before unit travels 12 feet of free fall.
- E. Unit shall incorporate automatic reset not requiring poles, ropes, levers, or buttons for resetting.

2.7 BACKBOARDS

- A. Rectangular, glass, official size backboard to be used with direct attachment goal; Model 503136 as manufactured by Draper, Inc.
 - 1. Size: 72 inches wide by 42 inches high.
 - 2. Construction: 1/2 inch thick fully tempered glass in extruded aluminum frame with mitered corners. Provide steel gusset type mounting corner brackets with slots for mounting backboard to support structure.
 - 3. Goal mounting assembly: Steel assembly secured to aluminum frame and equipped with steel sleeves through glass allowing rear structure to be secured to front mounting plate. Provide with holes and studs to secure backboard and goal directly to goal brace. Front plate provided with holes for goal attachment.
 - 4. Equip frame and goal mounting assembly with neoprene shock absorbing cushions.
 - 5. Permanently etch official white border and target area on front side of glass.

2.8 GOALS

- A. Type: Breakaway goal with tube-tie net attachment and designed to withstand shock loads from player slam dunking or hanging on rim; Model 503581 as manufactured by Draper, Inc.
- B. Rim shall deflect down when 230 pounds static load is applied and return to playing position when load is removed. Breakaway point shall be adjustable from 160 to 230

pounds

- C. Ring shall have rebound characteristics identical to those of non-moveable ring. Factory set proper flex and rebound requirements.
- D. Ring: Fabricated from 5/8 inch diameter steel rod formed into 18 inches ring. Rigidly brace with die cut steel braces welded to rim.
- E. Mounting plate: Heavy-duty steel plate bracket with mounting holes and designed to position inside of ring 6 inches from backboard.
- F. Provide series of small tubes welded to bottom of rim providing for attachment of net by threading 9 gage wire through tubes.
- G. Finish: Powder coated orange paint.
- H. Anti-whip net: Top half made of durable fibers encased in nylon to prevent net from whipping up on rim. Lower half all nylon. Color white.
- I. Mounting hardware: Zinc plated.

2.9 SAFETY EDGE PADDING

- A. Type: Foam padding for bottom edge and corners of backboard to provide safety. Safe-Edge Padding as manufactured by Draper, Inc. Color to be selected from manufacturer's standard color range, minimum 12 colors.
- B. Construction: Open cell foam, 2 inches wide and wrapping around edges 3/4 inch. Equip with molded-in steel track and bolt-on attachment system. Padding shall cover bottom edge of backboard and extend 15 inches up sides.

2.10 ACCESSORIES

- A. Provide backstop with backstop hangers, clamps, brackets, fasteners, and all other hardware required for complete, functional, rigid assembly and installation.
- B. Goal Height Adjusters
 - 1. Provide manual backboard height adjusters, Draper, Model 503092, or approved alternate for all three (3) goals.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate provision of basketball backstops with construction of roof framing supporting basketball backstop to ensure proper support and method of attachment.

- B. Coordinate support of backstops to ensure proper distribution of loads and adequacy of attachment points. Provide additional structural framing members as required.
- C. Coordinate electrical requirements for electrically operated winch to ensure proper power source, conduit, wiring, and boxes for keyed switches.
- D. Prior to installation, verify exact locations of backstops. Coordinate with lighting and mechanical ducts. Ensure top raised position does not conflict with lighting fixtures.

3.2 INSTALLATION

- A. Install folding basketball backstops in accordance with approved shop drawings and manufacturer's instructions.
- B. Install backstops, backboards, and goals plumb, level, and rigid. Attach to roof framing with anchors of size and type recommended by manufacturer.
- C. Install backboards such that goal is 10 feet above court floor. After installing, verify that mounting height is correct.
- D. Install electrically operated winches, hoisting cables, safety belt and lock securely to operate properly and smoothly to safely lower and raise folding backstops.

3.3 FIELD QUALITY CONTROL

A. Operate each folding basketball backstop a minimum of three times to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning

3.4 CLEANING

- A. Remove protective wrappings, wash surfaces, and attach nets.
- 3.5 DEMONSTRATION
 - A. Demonstrate to Owner's designated representatives complete operation and required maintenance for folding basketball backstops.
 - B. Submit operation and maintenance manuals in accordance with Section 01 77 00 Closeout Procedures.

END OF SECTION

11 66 23-6

SECTION 11 66 26

GYMNASIUM VOLLEYBALL SLEEVES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

- 1. Floor sleeves and cover plates.
- B. Related sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete: Concrete floor slabs and footings to receive floor sleeves.
 - 2. Section 09 64 60 Athletic Vinyl Flooring: Layout and painting of court lines to be coordinated with installation of floor sleeves.
- 1.2 REFERENCES
 - A. ASTM A500 Formed Welded Seamless Structural Tubing in Rounds and Shapes.
 - B. ASTM B85 Aluminum-Alloy Die Castings.
 - C. ASTM B221 Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 Submittal Procedures:
 - 1. List of proposed products and product data.
 - 2. Shop drawings showing volleyball court layout and floor sleeve locations, dimensions, and method of installation.
 - 3. Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- A. All volleyball equipment, components, and accessories shall be products of a single manufacturer.
- B. Volleyball equipment shall be designed, fabricated, and installed to comply with requirements for competition play of the following associations:
 - 1. Federal International de Volleyball (FIVB)
 - 2. National Collegiate Athletic Association (NCAA)
 - 3. National Federation of State High School Associations (NFSHSA).
 - 4. United States Volleyball Association (USVBA)

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PARTS 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Draper, Inc., 411 South Pearl Street, Spiceland, Indiana 47385-0425; 765-987-7999.
- B. Porter Athletic Equipment Company
- C. Performance Sports
- D. AALCO
- E. Manufacturers of equivalent products submitted and approved in accordance with Section 01 60 00 Product Substitution Procedures.

2.2 MATERIALS

- A. Structural steel tubing: Steel, mechanical, round tubing conforming to ASTM A500.
- B. Extruded aluminum tubing: Schedule 80, ASTM B221, alloy 6063 Temper T5.
- C. Aluminum castings: ASTM B85.
- 2.3 FLOOR SLEEVES AND COVERS
 - A. Floor sleeve: Round, mechanical steel tube sleeve welded to steel anchor plate for casting in concrete floor to receive volleyball standard; Floor Sleeve 501006 as manufactured by Draper, Inc.
 - B. Size: 3-1/2 inches inside diameter by 8-1/2 inches tube and 4 inches square anchor plate.
 - C. Cover plate: Cast aluminum recessed mounting flange and 5 inches diameter chrome plated cover; Cover Plate 501001 as manufactured by Draper, Inc.
 - 1. Equip cover with swivel type retaining screw and key to open and lock cover.
 - 2. Cover installed with flat head wood screws.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordinate layout of volleyball courts and location of floor sleeves with installation of floor surfacing and application of game lines and boundaries.
- B. Coordinate location of sleeves and required size of sleeve footing with trade responsible for placing concrete. Provide sleeves in adequate time to allow casting in concrete floor slabs. Ensure that setting of sleeve compensates for type of floor finish to be provided.

11 66 26-2
C. Ensure that sleeves for each volleyball court are spaced at 35'-6" on center.

END OF SECTION

11 66 26-3

SECTION 11 66 53

GYMNASIUM DIVIDERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Electrically operated fabric fold-up gymnasium divider.
- B. Related sections:
 - 1. Section 05 12 23-Structural Steel: Structural steel framing to support gymnasium divider.
 - 2. Division 26: Electrical supply, conduit, and wiring for motorized gymnasium divider.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 Submittal Procedures:
 - 1. List of proposed products and product data.
 - 2. Loads to be transmitted to building structural members and requirements for supplementary bracing and structural support members.
 - 3. Shop drawings showing layout, elevations, dimensions, fabrication details, method of attachment, and electrical wiring diagrams.
 - 4. Samples of fabric for selection by Architect.
 - 5. Manufacturer's installation and maintenance instructions.

1.3 QUALITY ASSURANCE

A. Source limitation: All components including curtain, suspension system, electric winches, and controls for divider shall be products of a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver divider until building is enclosed and other construction within gymnasium is substantially complete.

PARTS 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Draper, Inc., 411 South Pearl Street, Spiceland, Indiana 47385-0425; 765-987-7999.
- B. Manufacturers of equivalent products submitted and approved in accordance with Section 01 60 00 Product Substitution Procedures.

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2.2 GYMNASIUM DIVIDER

FOLD-UP GYM DIVIDER, use the following paragraphs.

- A. Type: Electrically operated, fold-up gymnasium divider including motor, cables, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation; Fold-Up Gym Divider as manufactured by Draper, Inc.
- B. Operation: Curtain moves by accordion fold-up action as bottom steel pipe is raised by hoist lines passing through grommets.
- C. Configuration: Rectangular shape with straight bottom and extending across room as indicated on Drawings.
 - 1. Stored divider dimensions from bottom of structural support to bottom of folded curtain:
 - a. Maximum: 42 inches.
 - b. Minimum: 30 inches
 - 2. Minimum required clearance between vertical curtain edges and adjacent fixed objects: 6 inches.
 - 3. Provide 36 inches space between curtain ends and walls or fixed objects to allow passage space around divider.
- D. Operating mechanism: Drive pipe winch powered with 3/4 HP, 110VAC, 60 cycle, single-phase, reversible capacitor, C-Face motor with thermal overload protection. Entire winch assembly to be UL listed and shall carry a five-year warranty.Provide with load holding worm gear reducer and integral limit switches to control curtain travel. Drive pipe shall rotate in pipe support assemblies spaced at approximately 111 inches.
- E. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2 inch diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor.
- F. Hoist lines: 1/8 inch diameter steel cable with 2,000 pounds minimum breaking strength attached to bottom batten and passing through curtain grommets at 18 inches to terminate at top drive pipe. Space lines at approximately 111 inches.
- G. Divider bottom: Hoist lines secured to 1-5/8 inches diameter steel pipe batten in 6 inches wide curtain pocket.

2.3 CURTAIN

- A. Bottom 8 feet: Opaque solid vinyl coated polyester fabric:
 - 1. Weight: 18 ounces per SY.
 - 2. Resistant to rot, mildew, and ultraviolet light.

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- 3. Flammability: Rated self-extinguishing in accordance with California State Fire Code F-31.5 and F-140.
- 4. Color: Selected by Architect from manufacturer's standard range.
- B. Upper curtain section: Vinyl coated polyester mesh.
 - 1. Weight: 9 ounces per SY.
 - 2. Resistant to rot, mildew, and ultraviolet light.
 - 3. Flammability: Rated self-extinguishing in accordance with California State Fire Code F-230.
 - 4. Color: Selected by Architect from manufacturer's standard range.
- C. Seams: Electronically welded with 1 inch full contact weld.
- D. Outer edge hems: Triple turned with double welds.
- F. Bottom edge cut square for attachment to roller pipe with aluminum stop strip.
- E. Top edge: Solid fabric in triple thickness and double welded to mesh to form 6 inches wide pocket for top pipe batten.
- F. Bottom edge: Padded Pocket to house bottom pipe batten.

2.4 CONTROLS

- A. Provide key lock, 3 position, momentary contact wall controls switch to lower, raise and stop gymnasium divider. Provide with switch box and plastic cover plate.
- A. Safety delay: Provide safety delay for motor such that when key is turned in opposite direction of curtain travel, motor shuts off momentarily and then reverses to opposite direction.

2.5 CURTAIN SAFETY DEVICE

A. Provide Draper Model 504301 Curtain Lok safety device. Curtain Lok to be directly speed sensitive to automatically lock divider curtain in position at any time during storage or operation. In the event of an over-speed situation (greater than 1.5 feet per second) caused by malfunction of the hoisting apparatus, whether sudden or gradual, device will immediately activate. Curtain Lok work regardless of direction of rotation and automatically resets when load is reversed or removed.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate support of gymnasium divider with roof structure to ensure proper distribution of loads and adequacy of attachment points. Ensure that building structure

11 66 53 - 3

has been designed for loads of specific gymnasium divider to be provided.

- B. Coordinate configuration, size, and installation of gymnasium divider with height, slope, and type of building structure and lighting fixtures, mechanical equipment, ductwork, fire-suppression system, bleachers, athletic equipment, and other potential obstructions.
- C. Field verify dimensions prior to fabrication.
- D. Coordinate electrical requirements for motorized operating mechanism to ensure proper power source, conduit, wiring, and boxes for keyed switches. Prior to installation, verify type and location of power supply.
- E. For installations made after wood gymnasium flooring is installed, provide protection and exercise care not damage flooring.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and shop drawings.
- B. Install even and level with curtain hanging 2 inches above floor in down position.
- C. Install controls such that operator has view of complete gymnasium divider during lowering and raising.
- D. Adjust limit switches of electric winch to ensure accurate position in both stored and lowered positions.
- 3.3 TESTING AND DEMONSTRATION
 - A. Operate divider curtains to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning.
 - B. Demonstrate to Owner's designated representatives complete operation and required maintenance.

END OF SECTION

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SECTION 12 66 13

TELESCOPING BLEACHER SEATING SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Telescoping Gym Seating includes, either manually or electrically operated systems of multiple-tiered seating rows comprising of seat, deck components, understructure that permits closing without requiring dismantling, into a nested configuration for storing or for moving purposes.
 - Typical applications include the following:
 a. Wall Attached Telescoping Gym Seats.
 - Special applications include the following:
 a. Media Platform
- B. Related Sections:
 - Division 9 finishes sections for adequate floor & wall construction for operation of Telescoping Gym Seats. Flooring shall be level and rear wall plumb within 1/8" [3mm] in 8'-0 [2438mm]. Maximum bleacher force on the floor, of a 25'-6" [7772] section, shall be a static point load of less than 300 psi [2.068 N/mm²].
 - 2. Division 26 Electrical sections for electrical wiring and connections for electrically operated Telescoping Gym Seats.
- C. Alternates: This section specifies alternates for Telescoping Gym Seat products. Refer to Part 2 products for alternate products, and to Division 1 Alternates sections and other bid documents, if any, for alternate requirements.

1.2 REFERENCES

- A. National Fire Protection Association (NFPA)
 - 1. NFPA 102 Standard for Assembly Seating, Tents and Membrane Structures.
- B. American Welding society (AWS):
 - 1. AWS D1.1 Structural Welding Code Steel.
 - 2. AWS D1.3 Structural Welding Code Sheet Steel.
- C. American Institute of Steel Construction (AISC):
 - 1. AISC Design of Hot Rolled Steel Structural Members.
- D. American National Standards Institute (ANSI).

- E. American Iron & Steel Institute (AISI):
 - 1. AISI Design Cold Formed Steel Structural Members.
- F. Aluminum Association (AA):
 - 1. AA Aluminum Structures, Construction Manual Series.
- G. American Society for Testing Materials (ASTM):1. ASTM Standard Specification for Properties of Materials.
- H. National Forest Products Association (NFoPA):1. NFoPA National Design Specification for Wood Construction.
- I. Southern Pine Inspection Bureau (SPIB):1. SPIB Standard Grading Rules for Southern Pine.
- J. National Bureau of Standards/Products Standard (NBS/PS):
 1. PS1 Construction and Industrial Plywood.
- K. Americans with Disability Act (ADA)1. ADA Standards for Accessible Design.

1.3 MANUFACTURER'S SYSTEM ENGINEERING DESCRIPTION

- A. Structural Performance: Engineer, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections. Apply each load to produce maximum stress in each respective component of each gym seat unit.
 - 1. Design Loads: Comply with NFPA 102, 1992 Edition, Chapter 5 and IBC for design loads.
- B. Manufacturer's System Design Criteria:
 - 1. Seating manufacturer is responsible for complying with current code requirements for jurisdiction they are installed in and verifying layout meets those requirements. If layout shown on drawings varies from manufacturer's layout, consult with Architect immediately.
 - 2. Gymnasium seat assembly; Design to support and resist, in addition to its own weight, the following forces:
 - a. Live load of 120 lbs per linear foot [162.69 N/m] on seats and decking
 - b. Uniformly distributed live load of not less than 100 lbs per sq. ft. [135.58N/m] of gross horizontal projection.
 - c. Parallel sway load of 24 lbs. [32.53 N/m] per linear foot of row combined with (b.) above
 - d. Perpendicular sway load of 10 lbs. [13.56 N-m] per linear foot of row combined with (b.) above

- 2. Hand Railings, Posts and Supports: Engineered to withstand the following forces applied separately:
 - a. Concentrated load of 200 lbs. [90.72 kg] applied at any point and in any direction.
 - b. Uniform load of 50 lbs. per foot [.344 N/mm²] applied in any direction.
- 3. Guard Railings, Post and Supports: Engineered to withstand the following forces applied separately:
 - a. Concentrated load of 200 lbs. [90.72 kg] applied at any point and in any direction along top rail.
 - b. Uniform load of 50 lbs. per foot [.344 N/mm²] applied horizontally at top rail and a simultaneous uniform load of 100 lbs. per foot [.689 N/mm²] applied vertically downward.
- 4. Member Sizes and Connections: Design criteria (current edition) of the following shall be the basis for calculation of member sizes and connections:
 - a. AISC: Manual of Steel Construction
 - b. AISI: Specification for Design of Cold Formed Steel Structural Members
 - c. AA: Specification for Aluminum Structures
 - d. NFOPA: National Design Guide For Wood Construction.

1.4 SUBMITTALS

- A. Section Cross-Reference: Required submittals in accordance with "Conditions of the Contract" and Division 1 General Requirements sections of this "Project Manual."
- B. Project Data: Submit per section 01 33 00. Manufacturer's product data for each system. Include the following:
 - 1. Project list: Five (5) seating projects of similar size, complexity and in service for at least five (5) years.
 - 2. Deviations: List of deviations from these project specifications, if any.
- C. Shop Drawings: Submit per section 01300. Indicate Telescoping Gym Seat assembly layout. Show seat heights, row spacing and rise, aisle widths and locations, assembly dimensions, anchorage to supporting structure, material types and finishes.
 - 1. Wiring Diagrams: Indicate electrical wiring and connections.
 - 2. Graphics Layout Drawings: Indicate pattern of contrasting or matching seat colors
- D. Samples: Seat materials and color finish as selected by Architect from manufacturers offered color finishes.
- E. Manufacturer Qualifications: Certification of insurance coverage and manufacturing experience of manufacturer and copy of a telescopic load test to all loads described in 1.03 above, observed by a qualified independent testing laboratory, and certified

by a registered professional structural engineer verifying the integrity of the manufacturer's geometry design and base structural assumptions.

- F. Installer Qualifications: Installer qualifications indicating capability, experience, and official Certification Card issued by manufacturer of telescopic seating.
- G. Engineer Qualifications: Certification by a professional engineer registered in the state of manufacturer that the equipment to be supplied meets or exceeds the design criteria of this specification.
- H. Operating/Maintenance Manuals: Provide to Owner maintenance manuals. Demonstrate operating procedures, recommended maintenance and inspection program.
- I. Warranty: Manufacturers standard warranty documents.

1.5 QUALITY ASSURANCE

- A. Seating Layout: Comply with current NFPA 102 Standard for Assembly seating, Tents, and Membrane Structures, and specifically with Folding and Telescopic Seating, except where additional requirements are indicated or imposed by authorities having jurisdiction.
- B. Welding Standards & Qualification: Comply with AWS D1.1 Structural Welding Code Steel and AWS D1.3 Structural Welding Code Sheet Steel.
- C. Manufacturer Qualifications: Manufacturer who has a minimum of 40 years of experience manufacturing telescoping gym seats and can demonstrate continual design enhancement and 25-year minimum product life-cycle support of telescopic seating.
- D. Installer Qualifications: Engage experienced Installer who has specialized in installation of telescoping gym seat types similar to types required for this project and who carries an official Certification Card issued by telescoping gym seat manufacturer.
- E. Engineer Qualifications: Engage licensed professional engineer experienced in providing engineering services of the kind indicated that have resulted in the successful installation of telescoping bleachers similar in material, design, fabrication, and extent to those types indicated for this project.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver telescopic gym seats in manufacturers packaging clearly labeled with manufacturer name and content.
- B. Handle seating equipment in a manner to prevent damage.

C. Deliver the seating at a scheduled time for installation that will not interfere with other trades operating in the building.

1.7 PROJECT CONDITIONS

A. Field Measurements: Coordinate actual dimensions of construction affecting telescoping bleachers installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

1.8 WARRANTY

- A. Manufacturer's Product Warranty: Submit manufacturer's standard warranty form for telescoping bleachers. This warranty is in addition to, and not a limitation of other rights Owner may have under Contract Documents.
 - 1. Warranty Period: Five years from Date of Acceptance.
 - 2. Beneficiary: Issue warranty in legal name of project Owner.
 - 3. Warranty Acceptance: Owner is sole authority who will determine acceptance of warranty documents.

1.9 MAINTENANCE AND OPERATION

- A. Instructions: Both operation and maintenance shall be transmitted to the Owner by the manufacturer of the seating or his representative.
- B. Service: Maintenance and operation of the seating system shall be the responsibility of the Owner or his duly authorized representative, and shall include the following:
 - 1. Operation of the Seating System shall be supervised by responsible personnel who will assure that the operation is in accordance with the manufacturer's instructions.
 - 2. Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the seating.
 - 3. An annual inspection and required maintenance of each seating system shall be performed to assure safe conditions. At least biannually the inspection shall be performed by a professional engineer or factory qualified service personnel.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Hussey Seating Company, U.S.A.
 - 1. Address: North Berwick, Maine, 03906
 - 2. Telephone: (207) 676-2271; Fax: (207) 676-9690
 - 3. Product: MAXAM Telescopic Gym Seat System by Hussey Seating Company
 - a. Model: MAXAM26 Series Telescopic Gym Seats, adjustable row spacing in two inch increments from 22 inches [559] to 26 inches [660].
 - b. Aisle Type: foot level aisles, front steps, intermediate aisle steps.

- c. Seat Type: Classic (wood seat), 10" or 12" MVP (plastic seat module), folding back rests, or Sentinel chairs
 - 1) Seat color finish: SELECT: manufacturers 15 standard and 7 select colors
- d. Rail Type: Self-storing end rail, removable end rails, front railings, rear rails, store-in-place aisle hand rails, folding aisle hand rails.
 - 1) Rail color finish: SELECT: Standard black
- e. Operation: electrical power
 - 1) Electrical Power System: Integral power with pendant control
- 4. Product Description/Criteria:
 - a. Bank Length: Reference Drawings
 - b. Aisle Widths: Reference Drawings
 - c. Number of Tiers: Reference Drawings
 - d. Row Spacing(s): 24"
 - e. Row Rise: 9-5/8"
 - f. Open Dimension:
 - g. Closed Dimension:
 - h. Overall Unit Height:
 - Net Capacity: ______ per seat

(18" [457] for MAXAM, 19-22" [483-559] for Sentinel Chairs.)

- 5. Miscellaneous Product Accessories: operating handles, front skirt, end panels, rear panels, ventilating grills, scorer's table, top seat filler, rear seats for reverse fold units, seat number's, row letters, end curtains, aisle closure curtains, Toprow-Basketball deflector curtains.
- 6. Special Applications: Media Platform.
- 7. Handicap Seating Provisions: SELECT: Provide first tier modular recoverable Flex-rows per requirements of (ADA) Americans with Disability Act located as indicated.
- B. Other Acceptable Alternate Manufacturers: Will be considered if in compliance with these specifications and complying with requirements of Section 01 60 00. Deviations must be submitted with bid in order that a fair and proper evaluation be made. Those bidders not submitting a list of deviations will be presumed to have bid as specified.

2.2 MATERIALS

i. -

- A. Lumber: ANSI/Voluntary Product 20, B & B Southern Pine
- B. Plywood: ANSI/Voluntary Product PS1, APA A-C Exterior Grade.
- C. Structural Steel Shapes, Plates and Bars: ASTM A 36.
- D. Uncoated Steel Strip (Non-Structural Components): ASTM A569, Commercial Quality, Hot-Rolled Strip.
- E. Uncoated Steel Strip (Structural Components): ASTM A570 Grade 33, 40, 45, or 50, Structural Quality, Hot-Rolled Strip.

- F. Uncoated Steel Strip (Structural Components): ASTM A607 Grade 45 or 50, High-Strength, Low Alloy, Hot-Rolled Strip.
- G. Galvanized Steel Strip: ASTM A653 Grade 40, zinc coated by the hot-dip process, structural quality.
- H. Structural Tubing: ASTM A500 Grade B, cold-formed.
- I. Polyethylene Plastic: ASTM D 1248, Type III, Class B; molded, color-pigmented, textured, impact-resistant, structural formulation; in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
- J. Fasteners: Vibration-proof, of size and material standard with manufacturer.

2.3 UNDERSTRUCTURE FABRICATION

- A. Frame System:
 - 1. Wheels: Not less than 5" [127] diameter by 1 1/4" [32] with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil-impregnated bushings to fit 3/8" [10] diameter axles secured with E-type snap rings.
 - 2. Lower Track: Continuous Positive Interglide System interlocks each adjacent CPI unit using an integral, continuous, anti-drift feature and through-bolted guide at front to prevent separation and misalignment. CPI units at end sections of powered banks and manual sections shall contain a Low Profile Posi-Lock LX to lock each row in open position and allow unlocking automatically. Provide adjustable stops to allow field adjustment of row spacings.
 - 3. Slant Columns: High tensile steel, tubular shape.
 - 4. Sway Bracing: High tensile steel members through-bolted to columns.
 - 5. Deck Stabilizer: High tensile steel member through-bolted to nose and riser at three locations per section. Interlocks with adjacent stabilizer on upper tier using low-friction nylon roller to prevent separation and misalignment. Incorporates multiple stops to allow field adjustment of row spacings.
 - 6. Deck Support: Securely captures front and rear edge of decking at rear edge of nose beam and lower edge of riser beam for entire length of section.
- B. Deck System:
 - 1. Section Lengths: Each bank shall contain sections not to exceed 25'-6" [7772] in length with a minimum of two supporting frames per row, each section.
 - 2. Nose beam and Rear Riser beam: Nose beam shall be continuously roll-formed closed tubular shape of ASTM A653 grade 40, Riser beam shall be continuously roll-formed of ASTM A653 grade 40. Nose and Riser beam shall be designed with no steel edges exposed to spectator after product assembly.
 - 3. Attachment: Through-Bolted fore/aft to deck stabilizers, and frame cantilevers.
 - 4. Decking: 5/8" [16], AC grade or BC grade polyethylene-top-coated tongue and groove plywood, interior type with exterior glue, 5-ply, all plies Douglas Fir or Southern Pine with plugged crossbands, produced in accordance with National

Bureau of Standards PS-1-97. Plywood shall be cut and installed with top, center and bottom ply grain-oriented from front of deck to rear of deck (nose beam to riser beam). Adjacent pieces shall be locked together with tongue and groove joint from front to rear of deck. Longest unsupported span: MAXAM 26, 21 ¹/₂" [546]; MAXAM 33, 28 ¹/₂" [724].

5. Deck End Overhang: Not to exceed frame support by more than 5'-7" [1702].

2.4 SEATING FABRICATION

- A. Plastic Seat System:
 - 1. Seat Modules: 18" [457] long assembled, injection-molded, high density polyethylene modules in mono or two-tone colors providing scuff resistant textured 10" [254] or 12" [305] wide seat surface with ½" [13] minimum interlock on seat and face. Unit structural tested to 360 lbs occupant load.
 - 2. Comfort Profile: Designed with anatomically contoured seat surface using multiple internal reinforcement ribs that allow form-fit deflection for maximum spectator comfort. Cantilevered to the rear to provide not less than 3" [76] smooth toe space beneath the seat.
 - 3. Seat Support: Each plastic seat module shall be supported by internal steel structural members secured against fore/aft movement by 3/8" grade 5 steel fasteners creating a steel-to-steel connection, tying the seat structure firmly to the steel nose beam.
 - 4. Number Plates: Seat module shall have recessed pockets to accept seat number plates.
 - 5. End Caps: Each end of row shall be enclosed with matching end caps. End caps shall be designed flush with end-edge of seat top and provide indent for row letters. Color to match seat top.

2.5 SHOP FINISHES

- A. Understructure: For rust resistance, steel understructure shall be finished on all surfaces with black "Dura-Coat" enamel. Understructure finish shall contain a silicone additive to improve scratch resistance of finish.
- B. Wear Surfaces: Surface subject to normal wear by spectators shall have a finish that does not wear to show different color underneath:
 - 1. Steel nosing and rear risers shall be pre-galvanized with a minimum spangle of G-60 zinc plating.
 - 2. Decking shall have use-surfaces to receive both a sealer coat and wear-resistant high gloss clear urethane finish. Optional decking to have 0.030" laminated polyethylene wear surface.

- 3. Injection Molded MVP seats to be selected from (15) fifteen standard and (7) seven select colors. Colors shall be per manufacturer's standards
- C. Railings: Steel railings shall be finished with powder-coated semi gloss black

2.7 FASTENINGS:

- A. Welds: Performed by welders certified by AWS standards for the process employed.
- B. Structural Connections: Secured by structural bolts with prevailing torque lock nuts, free-spinning nuts in combination with lock washers, or Riv-nuts in combination with lock washers.

2.8 ELECTRICAL OPERATION

- A. Integral Power: Furnish and install Hussey PF(2), an integral automatic electro-mechanical powered frame propulsion system, to open and close telescopic seating. Integral Power and Control System shall be Underwriters Laboratories, Inc. (UL) approved and listed.
 - 1. Operation shall be with a removable pendant control unit which plugs into seating bank for operator management of stop, start, forward, and reverse control of the power operation.
 - 2. Each Powered Frame unit shall consist of output shaft gear reducer with 6" [152] diameter x 4" [102] wide wheels covered with non-marring 1/2" [13] thick composite rubber. Reducers shall be fitted with 3 phase induction motors which will provide an average operating speed of (46/25) f.p.m [.23/.12 M/s].
 - 3. Operating Loads: Each Powered Frame provides (220 / 550) lbs pull force [978 / 2446 N] which equals approximately (28 / 35) psi [.192 / .241 N/mm²] lateral force on the floor.
 - 4. Limit Switches: Furnish and install both open and closed limit switches for the integral power system. The limit switches will automatically stop integral power operation when seating has reached the fully extended or closed position.
 - A. Power operation shall utilize a combination of contactors and limit switches to insure the wiring is not energized except during operation. Straight wired electric system is not allowed.

ED NOTE: CONSULT HUSSEY APPLICATION ENGINEERING FOR DETERMINING BELOW POWER SUPPLY AND WIRE SIZE FOR RUN LENGTHS REQUIRED OR IF OVER TWENTY TIERS

- 6. Electrical: Seating Manufacturer shall provide all wiring within seating bank including pendant control.
 - a. Each unit for PF(1/2/3/4) is power operated by a 1/2 horsepower, 1725 R.P.M., 208 Volts, 50/60 Hz., three phase 1.25 service factor motor. This motor draws a full load current of 2.2 amperes. Power supply required shall be 208 volts three phase 5 wire plus ground service with 20 amps. Motors,

housing, and wiring shall be installed and grounded in complete accord with the National Electrical Code.

- b. Each unit for PFe is power operated by a 1/4 horsepower, 1725 R.P.M., 117 Volts, 60 Hz., single phase 1.1 service factor motor. This motor draws a full load current of 4.2 amperes. Power supply required shall be 120 volts single phase 2 wire plus ground service with 20 amps. Motors, housing, and wiring shall be installed and grounded in complete accord with the National Electrical Code
- c. The electrical contractor shall provide required power source with no greater than 4% voltage drop at the seatings' junction box. The electrical contractor shall perform all wiring connections in junction box that are attached to or a part of the building.
- d. IT SHALL BE THE SEATING MANUFACTURER'S RESPONSIBILITY TO VERIFY AND COORDINATE ELECTRICAL REQUIREMENTS WITH THE ELECTRICAL SUBCONTRACTOR TO ASSURE CORRECT VOLTAGE, AMPERAGE AND PHASE.

2.10 ACCESSORIES

- A. Portable Modular Video Platform: 4'-0" x 4'-0" with safety rails. Include storage carts for portable video platforms.
- B. Deck Lock: Deck Lock is a performance enhancement feature consisting of a cast steel pawl welded to each stabilizer that mates to a nylon capture bracket pinned at the row spacing hole on the mating stabilizer. With the bleacher fully open, Deck Lock connects adjacent decks resulting in consistent nose to riser spacing across the platform. This eliminates the possibility of relative vertical movement and creates a quiet, solid walking surface, particularly with a lightly loaded bleacher.
- C. Graphic End Curtains.
- D. Access Panels (Hatchway): Provide access to unit at 4th or 5th tier.
- E. Operating Handles: Provide and install manual operating handles constructed of ³/₄" [19] OD steel tubing. Handles to engage pull-bar installed at the first tier.
- F. Flex-Row: Provide first row modular recoverable seating units to be utilized by persons in wheelchairs and able-bodied persons. Each Flex-Row unit shall have an unlock handle for easy deployment if wheelchair or team seating access is needed. Unlock handle shall lock the bleacher seats into position when fully opened.
 - 1. Provide a black full-surround steel skirting with no more than ³/₄" floor clearance for safety and improved aesthetics.
 - 2. Provide a black injection molded end cap for the nose beam for safety and improved aesthetics.
 - 3. Provide a mechanical positive lock when the Flex-Row system is in the open and used position.
 - 4. Flex-Row modular units are designed to achieve multi-use front row seating to accommodate team seating, ADA requirements and facility

specific requirements. Flex-Row units are available in modular units from 2 to 7 seats wide as well as full section widths.

- G. Permanent Handicap Cut-Outs: Provide first tier permanent handicap cutouts per requirements of Americans with Disability Act (ADA) located as indicated. Provide a full width front closure panel at handicap cutout, extending from underside of second tier to within 1 1/2" [38] of finished floor.
- H. Provide a removable belt barrier with or without signage for the rear of each recoverable Flex-Row module to assist with seating identification.
- I. Sure-Step (Flip-up Front Aisle Step): Permanently hinged to the front row to ensure availability and ease of operation. Two 3" diameter x ³/₄" wide non-marking front wheels are provided so that the system can be operated with the Sure-Step in the stored or deployed position. All edges coined, hemmed or radiused with front edge protective rubber bumpers. Abrasive-backed non-slip tread identifier on leading edge of nosing. For aisle widths greater than 6'-0", two side by side hinged steps are provided.
- J. Non-Slip Tread: Provide at front edge of each aisle location an adhesive-backed abrasive non-slip tread surface.
- K. Foot Level Aisles: Provide deck level full width vertical aisles located as indicated.
- L. Intermediate Aisle Steps: Intermediate aisle steps shall be of boxed fully enclosed type construction. Blow molded end caps shall have full radius on all four edges. Step shall have adhesive-backed abrasive non-slip tread surface. Quantity and location as indicated.
- M. Intermediate Aisle Handrails: Provide single pedestal mount handrails 34" [864] high with terminating mid rail. Handrails shall be attached to the socket and shall lift and rotate 90° for easy storage in socket. Aisle handrails that are detached from the socket for storage are unacceptable.
- N. Intermediate Folding Aisle Handrails: Provide single pedestal mount handrails 34" [864] high with terminating mid rail. Handrail to be permanently mounted to a rotating socket for rail storage on the intermediate aisle step.
- O. Skirt Panel: On 1st Row, provide galvanized steel front skirt panel to prevent players/objects from sliding underneath the first row.
- P. Front Panel: Provide front closure panels for truncated sections, permanent end cutouts or elevated front aisles. Panels shall extend vertically from underside of front row to within 1 1/2" [38] or floor. Paneling to be 5/8" [16] Southern Pine Plywood or grey Polydeck attached to a steel framework.

- Q. End Panel: Provide closure end panels for closed stack position at each exposed bank end. End panels shall be constructed of 5/8" [16] Southern pine plywood or grey Polydeck.
- R. Rear Panel: Provide required seating units with full width rear closure panels. Panels shall extend vertically full height or up to 8'-0" [2438] high to within 1 1/2" [38] of floor. Paneling to be 5/8" [16] Southern Pine Plywood or grey Polydeck attached to a steel framework. Rear panels cannot extend above 8'-0" [2438] on portable sections.
- S. Front Rail: Provide 38" [965] high above deck, steel rails with tubular supports and intermediate members designed with 4" [102] sphere passage requirements.
 i. Rails to be located at each required seating location.
- T. Self Storing End Rails: Provide steel self-storing 42" [1066] high above seat, end rail with tubular supports and intermediate members designed with 4" [102] sphere passage requirements.
- U. Scorer's Table: Provide one 8' [2438] x 15" [4572] scorer's table. Table top shall be tan high pressure laminate on 5/8" [16] balance veneer core with edge molding. Integral perimeter frame to include tubular folding steel legs permanently attached to top with screws.
- V. Top Seat Flush Filler: Provide at top seat level a flush filler board mounted between top seat and rear wall. Flush filler board shall be constructed of 4/4" nominal thickness Southern pine Grade "B & B" clear urethane finished.
- W. Seat Numbers: Provide each plastic seat module with a 1 3/4" x 1 1/4" [45 x 32] oval etched Lexan plate. Easy to read black numerals will be on the plate fitted in a vandal resistant recess.
- X. Row Letters: Provide at each row end of plastic seat a 1 3/4" x 1 1/4" [45 x 32] oval etched Lexan plate with black numerals. Plates to be fitted flush in vandal resistant end cap recess.
- ED NOTE: BELOW FOLDING BACKRESTS ARE TO BE USED ON MODEL MAXAM 33 ONLY.
- Y. Classic Wood Folding Backrests: Gym seating shall include 1" X 5" [25 x 127] (nominal size) grade "B & B" southern pine clear urethane finished wood backrests mounted on folding steel supports. Backrests shall manual fold into footwell for storage.
- Z. Contoured Plastic Folding Backrests: Gym seating shall include 18" [457] (nominal size) compound contoured plastic backrests mounted on folding steel supports. Plastic backs shall be one-piece double wall blow molded pigmented polyethylene shells. Backrests shall manual fold into footwell for storage.

- AA. Portable and Convertible Table and Bench Seats: Provide transportable wheeled 8' [2438] seating unit convertible from either a scorer's table with integral bench seat to a bench seat with integral backrest.
- BB. Top row ball deflector curtain: Include on gym seat units six (6) rows or more of single stack configuration, top row footwell closure curtain, secured with Velcro to prevent lodging of basketballs and foreign objects.
- CC. End Closure Curtains: Provide closure curtains fabricated of vinyl-coated 18oz Polyester fabric on open ends of telescopic seating. Curtains to be permanently attached to wall or rear closure panel and secured to individual rows of seating. Curtain to open with seating unit into taught secure configuration and fold automatically as seating unit closes.
- DD. Poly Deck: Decking panel to be a 0.030" [1] thick high-density polyethylene overlay panel fabricated with a skid-resistant textured top surface permanently bonded to a Western Fir plywood substrate meeting the requirements of NBS PS-1-97. Panel thickness shall be 5/8" [16] with tongue and grooved edge joints and top polyethylene surface of textured gray color.
- EE. Transitional Top Steps: Provide at each vertical aisle location top transition steps (last row of telescopic gym seats to level above). Steps shall be of boxed fully enclosed type with construction materials and finish coordinated with that of intermediate aisle steps.
- FF. Extended Rear Deck Filler: Provide at rear deck level an extended rear deck filler mounted between rear wall building columns. Select extended rear deck filler from (12) twelve standard sizes to meet site conditions.
- GG. Rear Wall Column Cutouts: Provide custom bleacher cutouts at rear wall building columns. Top row(s) to be cutout and scribe fitted to meet wall column conditions.
- HH. Cross Aisles: Provide continuous top cross aisle or elevated front cross aisle per plan of seating. Construction material and finish to match telescopic seating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify area to receive telescoping gym seats are free of impediments interfering with installation and condition of installation substrates are acceptable to receive telescoping gym seats in accordance with telescoping gym seats manufacturer's recommendations. Do not commence installation until conditions are satisfactory.

3.2 INSTALLATION

A. Manufacturer's Recommendations: Comply with telescoping gym seats manufacturer's recommendations for product installation requirements.

B. General: Manufacturer's Certified Installers to install telescoping gym seats in accordance with manufacturer's installation instructions and final shop drawings. Provide accessories, anchors, fasteners, inserts and other items for installation of telescoping gym seats and for permanent attachment to adjoining construction.

3.3 ADJUSTMENT AND CLEANING

- A. Adjustment: After installation completion, test and adjust each telescoping gym seats assembly to operate in compliance with manufacturer's operations manual.
- B. Cleaning: Clean installed telescoping gym seats on both exposed and semi-exposed surfaces. Touch-up finishes to restore damage or soiled surfaces.

3.4 PROTECTION

A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer to ensure telescoping gym seats are without damage or deterioration at time of substantial completion.

END OF SECTION

12 66 13-14

SECTION 13 34 19

PRE-ENGINEERED METAL BUILDING SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. The building shall include all primary and secondary structural framing members, connection bolts, roof and wall covering, flashing, gutter, rake trim, downspouts, closures, sealants, insulation, hollow metal doors, windows, and other miscellaneous items as called for on the contract.
- B. The building manufacturer shall provide installation and assembly drawings including anchor bolt setting plan, roof plan, elevation, cross section, etc., as required to assemble all parts, components and accessories furnished by the building manufacturer. Drawings shall indicate the piece marks of all parts to be erected or assembled for easy field identification.
- C. Refer to Structural Drawings for design load requirements.

1.2 QUALITY ASSURANCE

- A. All metal building components, including wall and roof panels shall be warranted by single metal building manufacturer, unless noted or specified otherwise. Pre-engineered metal building manufacturer/supplier shall submit in writing along with his proposed substitution, no later than 10 days prior to bid that he warrants all components as described within this specification.
- B. INSTALLER Metal building manufacturer/supplier must submit proof, in the form of a letter on company letterhead and signed by a representative of the roofing manufacturer, prior to bid, that the metal roofing installer has been approved by the metal roofing manufacturer as an approved installer. Installer must have been an approved installer three months prior to bid date and retain that approval at time of bid.

1.3 REFERENCES

- A. SMACNA: "Architectural Sheet Metal Manual", Sheet Metal and Air Conditioning Contractors National Association, Inc.LGSI: "Light Gage Structural Institute"
- B. AISC: "Steel Construction Manual", American Institute of Steel Construction, Current Edition.
- C. AISI: "Cold Form Steel Design Manual", American Iron and Steel Institute Current Edition.
- D. UL580: "Tests for Uplift Resistance of Roof Assembles", Underwriters Laboratories, Inc.
- E. FM: "Test requirements for Class 1 panel roofs", Factory Mutual Research Corporation.
- F. UL2218: Class 4 Impact Resistance Rating

- G. ICBO: Evaluation Report No. ER-5409. ICBO Evaluation Service, Inc.
- H. ASTM E 1592-95: "Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference", American Society for Testing and Materials.
- I. ASTM E 1680-95: "Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems, American Society for Testing and Materials.
- J. ASTM E 1646-95: "Standard Test Method for Water Penetration Through Exterior Metal Roof Panel Systems, American Society for Testing and Materials.
- K. ASTM A 792-83-AZ50 (Painted) & ASTM A792-83-AZ55 (Bare Galvalume Plus®): "Specifications for Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process, General Requirements (Galvalume®)", American Society for Testing and Materials.
- L. ASTM E 1514-93: "Standard Specification for Structural Standing Seam Steel Roof Panel Systems", American Society for Testing and Materials.
- M. ASTM E 408-71: Standard Test Method for Total Normal Emittance of Surfaces Using Inspection- Meter Techniques (Energy Star® for Roof Products).
- N. ASTM E 903-96 Standard Test Method for Solar Absorptance, Using Integrating Spheres. (Energy Star® for Roof Products)
- O. North American Insulation Manufacturer's Association (NAIMA)

1.4 SHOP DRAWINGS AND SUBMITTALS

- A. Comply with Section 01 33 00.
- B. Product Data: Provide on profiles, component dimensions and accessories.
- C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads, wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, method or installation and anchor bolt layout, framing anchor bolt settings, sizes, and locations from datum and foundation loads, indicate welded connections with AWS A2.0 welding symbols; indicate net weld lengths; provide professional seal and signature for state in which project is built.
- D. Samples: Submit actual color samples of pre-coated metal panels for each color selected, illustrating color and texture of finish.

1.5 RELATED SECTIONS

- A. Section 07 62 10 Gutters and Downspouts
- B. Section 07 92 00 Sealants
- C. Section 08 11 13 Hollow Metal Doors and Frames
- D. Section 08 36 13 Sectional Overhead Doors

- E. Section 08 71 00 Finish Hardware
- F. Section 09 91 00 Painting

1.6 GUARANTEE

- A. Installer to guarantee workmanship, durability, and weather-tightness of metal building system, including flashings and other associated items of the metal building system for a period of five (5) years.
- B. Provide 20-year weathertight warranty equivalent to Varco Pruden Optima Weathertightness Warranty. Provide proof of warranty to Architect prior to bid.
- C. A no dollar limit of the manufacturer's Roof System as invoiced to the manufacturer's customer. Warranty requires that a certified installer be on the job site at all times.
- D. Painted finish shall be guaranteed for a period of Twenty (20) years, and galvalume finish for 25 years by the panel and metal building manufacturer. A specimen of these warranty documents must be approved by the Architect and be submitted, prior to signing of the contract, clearly stating the conditions under which the guarantee is valid.

1.7 MANUFACTURER INSPECTION

- A. Final inspection by manufacturer's representative is mandatory prior to substantial completion. <u>Architect to be notified a minimum of 24 hours prior to manufacturer's inspection and be performed in his presence.</u>
- B. Written proof of final inspection by manufacturer's representative is to be included in closeout documents.
- C. <u>It will be mandatory</u> that the final roof inspection report containing items to be corrected be sent to Architect for his records.
- D. Upon acceptance through inspection, a **No Dollar Limit Warranty** will be issued and begin a period of (20) years for the weathertight warranty.

PART 2 PRODUCTS

- 2.1 MANUFACTURERS
 - A. Manufacturers must meet performance requirements as listed in this specification.
- 2.3 WALL, SOFFIT & ROOF PANELS
 - A. General

Panels shall be 24 gauge steel (other types of panel material may be used upon approval of Architect. Material for roof panels shall conform to ASTM A-446. Grade E (80,000 psi minimum yield strength). Material for panels shall conform to ASTM A-525, Designation G-90, 50 KSI minimum yield strength. The roof construction shall carry an Underwriter's laboratories construction (uplift) classification of not less than UL Class 90 (UL90).

- B. Wall Panel Description:
 - 1. MWP-1 (top) ('R Panel' by Alliance as guideline)
 - i. Precision roll-formed for 3'-0" wide coverage and shall have four major ribs on 12" centers, 1 1/8" to 1 1/4" high and minor ribs centered between major ribs.
 - ii. 24 gauge, nominal 1-1/2 inch thick profile, male/female edges, concealed fastener system.
 - 2. MWP-2 (bottom) ('7.2 Panel' by Alliance as guideline)
 - i. Precision roll-formed for 3'-0" wide coverage and shall have six ribs approximately 2" wide, equally spaced.
 - ii. 24 gauge, nominal 1-1/2 inch thick profile, male/female edges, concealed fastener system.
- C. Roof Panel Description (AS-24 Panel by Alliance as guideline)
 - 1. Roof panels shall be designed for a live load of not less than 20 psf, 50 psf uplift wind pressure and allowable deflection of L/240.
 - 2. Roll-formed hot-dip galvanized steel panels, 24 gauge standing seam, 3 inch trapezoidal profile, 24 inches wide, male/female edges, concealed fasteners, seamed together by means of a power closure machine, fitted with continuous gaskets.
 - 3. Provide thermal blocking for roof insulation.
 - 4. Anchoring Clip: Articulating clip, providing thermal expansion or contraction, correcting for out-of-plane sub-framing alignment to a maximum of 7 degrees (UL-90 rated Underwriters Laboratories).
 - 5. Provide panels in continuous length eave to ridge or in longest lengths possible.
- D. Soffit Panels (A12 by Alliance as guideline)
 - 1. Material: 24 gauge galvanized steel, 1.25 oz. coating (G90).
 - 2. Concealed anchorage.
 - 3. Continuous length across width of soffit. Provide edge trim.
 - 4. Color to be selected from manufacturers standard colors.

2.4 ACCESSORIES

- A. Eave Gutters and Downspouts
 - 1. Eave gutters shall be made from 24 gauge prefinished steel.
 - 2. Downspouts and rake trim shall be 26 gauge prefinished steel rectangular shaped. Downspouts shall have a 45 degree elbow at the bottom and shall be supported by attachment to the wall covering at 10' maximum spacing. Unless otherwise specified, downspouts terminate at the base plate elevation.
 - 3. Rainfall Intensity:

- a. As a minimum, all exterior gutters and downspouts shall be designed for rainfall intensity based upon a 5-year recurrence interval for a five-minute duration. All interior gutters, valleys and downspouts shall be designed for rainfall intensity based upon a 25-year recurrence interval based on a five-minute duration. Locate downspouts where shown on drawings.
- 4. Refer to Section 07 62 10 for additional requirements for gutters and downspouts.
- B. Equipment Curbs
 - 1. Curbs to coordinate with Division 23 and provided under this Section.
 - 2. Curbs to fit profile of roof panel and match color as manufactured by Acme Manufacturing Corp, Claremore, OK (918)266-3097 or approved alternate. Curb to be minimum 0.063" thick aluminum with cricket water diverter. Provide covers for standing seam ends, designed for watertight fit.
- C. Metal Building Insulation Reference Specification Section 07 21 30
- D. Panel End Closures:
 - 1. Provide metal closures only. Match wall or roof panel profile & finish closures are installed in. No foam closures are to be used. Secure per manufacturer's instructions. Seal completely around perimeter of each closure to provide weathertight fit.
 - 2. Provide closures for end of rake trim where transitioning from rake to gutter.
- E. Sealants
 - 1. Compliance: Sealant shall meet or exceed requirement of this standard:
 - a. ASTM C920, Type S, Grade NS, Class 50, Use NT, T, G, A and I
 - b. CAN/CGSB-19 13-M87 Canadian General Standards Board
 - c. ASTM D624: Tear strength 44.4lbf/in
 - d. ASTM D412: Elongation 300%
 - e. ASTM D412: Tensile strength 210psi
 - 2. Sealants for side laps, end laps, accessories, etc., shall be a preformed, butyl rubber based compound or Titebond[®] WeatherMasterTM Metal Roof Sealant. The material shall be non-hardening, non-shrinking and non-corrosive and shall have excellent adhesion to metals, painted surfaces and plastics at temperatures from -30°F to 160°F. These sealants shall be in tape mastic form, of shape and size recommended by panel and trim manufacturer for various applications, and shall have paper backing for easy handling.
 - 3. Tube sealants shall be used to supplement tape mastic sealants and shall be applied in locations indicated by erection instructions. Tube sealant shall be a synthetic, elastomer-based material which becomes tack-free in less than 2 hours at 75°F but retains flexibility equal to Titebond[®] WeatherMaster[™] Metal Roof Sealant.

2.5 SHOP/FACTORY FINISHING

- A. Pretreatment The metal shall be given a pretreatment prior to finishing, consisting of cleaning and creating a chemical reaction to form an inorganic coating for bonding of the finish.
- B. Framing Members: Shop primed.
- C. Exterior Prefinished Wall Panels and Accessories, Miscellaneous Trim, Gutters, Downspouts, and Rake Trim: Prefinished, Kynar 500, 20 year finish warranty.
- D. Wall & Soffit Panels: Kynar 500 factory painted finish.
- E. Roof Panels: Galvalume finish.
- F. Architect to select color from manufacturer's selection, minimum 8 colors for roof panels, wall panels, accessories trim, and all other prefinished metal building items.

2.6 FIELD FINISHING

- A. Unless noted otherwise, all pre-engineered metal framing components exposed to exterior are to be painted per Specification Section 09 91 00. This shall include, but not limited all door jambs and heads, extended exposed frame ends and any metal building frame component on an open-air structure.
- B. Unless noted otherwise, all pre-engineered metal framing components exposed in interior are to be painted per Specification Section 09 91 00. This shall include, but not limited all metal building frame components, main frames at roof and walls, purlins and girts.

PART 3 EXECUTION

3.1 COORDINATION WITH DESIGN

A. It shall be the responsibility of the pre-engineered metal building manufacturer to coordinate metal building components (i.e. mainframe depths and dimensions, flange brace locations, portal frame dimensions, etc.) with other architectural and structural building components. If metal building components differ from drawings or interferes with other building components (i.e. ceiling heights, furring around columns, door and windows, etc.), and cannot be adjusted to work with design as drawn, he is to contact Architect immediately prior to shop drawing submission. Every attempt is to be made to coordinate and adjust as needed in order to work with drawings and specifications.

3.2 STRUCTURAL STEEL FABRICATION

- A. General Fabrication
 - 1. All structural steel members shall be factory cut, formed, punched, welded, and prime-coat painted for bolted field assembly. All base plates, cap plates, stiffener

plates, and splice plates shall be shop fabricated complete with bolt connection holes. All building parts shall carry an identifying piece mark for easy field identification.

- 2. Flanges and webs of built-up welded members shall be joined by a continuous automatic submerged arc-welding process on one side of the web.
- B. Primary Structural Members
 - 1. Steel used in the fabrication of built-up primary structural members shall have a minimum yield of 50,000 psi. Hot-rolled wide flange members shall conform to ASTM A992 with a yield strength of 50,000 psi. All other hot-rolled primary structural members shall have a minimum yield of 36,000 psi.
 - 2. Primary framing shall be shop fabricated and shall include factory-welded purlin and girt clips. Holes shall be provided by the factory for attachment of secondary members and bracing.
 - 3. Bearing end wall frames shall be a rigid frame designed for no future expansion. All endwall columns may be used in the support of the endwall beam.
 - 4. Interior frames shall be substituted for bearing end wall frames when specified
 - 5. Limit lateral deflection of all columns to H/240 in any direction.
 - 6. Rigid frame beams shall be designed for a maximum live load deflection of L/360.
 - 7. No live load reduction will be allowed.
 - 8. Building will have no future expansion.
- C. Secondary Structural Members
 - 1. Steel used in the fabrication of cold-formed structural members shall have a minimum yield of 55,000 psi. Steel with a minimum yield different from the above may be used on individual members as required by design or as specified.
 - 2. Purlins and Girts Purlins and girts shall bolt to clips which are factory-welded to the frames. Purlins and girts shall be precision roll-formed of 16, 14, or 12 gauge steel with a minimum yield of 55,000 psi. Purlins and girts shall be 8" deep "Z" Sections 2 1/2" or 3 1/2" wide flanges with stiffening lips formed at any angle to 50 degrees with the flanges. Deflection of purlins shall not exceed L/240 of its span when supporting the applicable live loads. Deflection of girts shall not exceed L/180 of its span when supporting the applicable design wind loads. Refer to Structural Drawings for collateral, live, wind, and seismic loading.
 - 3. Eaves Struts Eave struts shall be "C" sections with one flange cold-formed to suit the roof slope and vertical wall condition and provide suitable fastening surfaces for both wall and roof sheets. Steel in eave struts shall be 14 gauge minimum yield of 55,000 psi.
 - 4. Wind bracing Buildings shall be designed to resist wind loads by portal columns. Diaphragm action of the wall panels shall not be allowed. Bracing at roofs shall be designed to resist wind loads by diagonal bracing consisting of either cables, rods, or angles.
 - 5. Metal building manufacturer shall coordinate with the General Contractor for the strap attachments to the metal building.

- 6. Flange Bracing The inside flange of all frames shall be adequately braced so that the allowable compressive stress is adequate for the design load combination.
- 7. Base Member A continuous base member shall be provided to which the base of the wall covering may be attached.
- 8. Framed Openings Framing members for all openings shall be adequate for the equipment specified.
- 9. No live load reduction will be allowed.

D. Structural Coating

All structural steel components shall be factory cleaned to remove all loose dirt, grease, mill scale, and other foreign matter and then coated with standard structural rust inhibiting red oxide primer that meets or exceeds Federal Specification TTP 636.

- E. Splices and Connections
 - 1. All structural steel shall be shop punched for bolted field assembly, except for field-located accessories.
 - 3. All bolts for field assembly of primary structural members shall be high strength bolts, indicated on drawings and finish will be electro zinc with bronze chemical chromate conversion coating. All high strength bolts shall conform to ASTM A-325, unless otherwise specified. Bolts for primary structural members shall not be less than 5/8" diameter. Bolts for secondary members shall be 1/2" electro-zinc plated machine bolts conforming to ASTM A-307 unless otherwise specified.
- F. Gymnasium equipment miscellaneous framing.
 - 1. Metal building supplier/fabricator shall be responsible for providing framing members as required to support basketball backstops and associated equipment. Refer to Section 11 66 23.
 - 2. Provide structural support for roll-up divider curtain. Refer to Section 11 66 53.

3.3 INSTALLATION OF WALL AND ROOF PANELS

- A. Wall panels shall be continuous from base to eave. If panel lengths exceed manufacturing and shipping limitations, splice shall occur over a wall girt.
- B. Roof panels shall be continuous from eave to ridge. If panel lengths exceed manufacturing and shipping limitations, splice end laps shall be installed per manufacturer's erection details. Sealant shall be used in all roof panel end laps.
- C. When specified, all ribbed, roof panel side laps shall be sealed with a field applied, continuous ribbon of tape mastic sealant. Eaves shall also be sealed when specified.

- D. Fastener population and pattern for both wall and roof panels shall be as shown on erection details.
- E. Roof panels to be installed with thermal clips, allowing a minimum 1" separation between purlin and roof panel.
- G. Roof and wall panels to be attached to frame to allow for panel movement from thermal expansion and contraction.
- H. Roof, wall, and soffit panel system to be weathertight, free from oil canning, waves, warps, buckles, fastening stresses, or any other type of panel distortion.
- I. When 6 inch thick wall insulation is provided, remove 4 ¹/₂" of the batt insulation at each girt, the depth of the girt (usually 3inches)

3.4 FRAMED OPENINGS

- A. Framed openings shall be furnished by metal building manufacturer to accommodate Overhead Doors or Roll-up Doors supplied by others. Framed openings shall consist of structural framing to provide a large opening in a wall, along with necessary trim to flash around this opening and provide a finished appearance.
- B. Size of opening shall be determined by size of door specified or as shown on drawings. Structural framing (jambs and header) shall consist of cold-formed, open "C" sections or hot-rolled channel sections, (prime painted if exposed) depending on structural requirements. Necessary clips and fasteners, for making connections for all members, shall be provided. Trim around opening shall be metal building manufacturer's standard to accommodate wall panel configuration. (Door track supports by door supplier).
- C. Provide color-coated trim to entirely cover shop-primed structural jambs and header.

3.5 INSTALLATION-GENERAL

- A. All components to be erected and installed per pre-engineered metal building manufacturer's instructions. Coordinate installation of other components and substrates to produce watertight assembly capable of withstanding inward and outward loading pressures and thermal and lateral loads.
- B. Isolate metals from dissimilar metals or corrosive substrates using bituminous coatings or other means of permanent separation to prevent electrolytic corrosion.
- C. Use extra precautions to not mar or damage prefinished panels and components. Leave protective covering on panels and components as long as possible.
- D. Provide method of attachment of panels and metal building components to substrate or structure to allow for thermal movement so that oil canning is avoided. Submit details with submittals.

E. Purlins and girts: Alignment of purlins and girts shall vary no more than ¼" at midspan for 20'-0" lengths or 3/8" for 40'-0" lengths, measured transverse to purlin/girt span. This shall be checked by stringline from ridge to eave for purlins, and eave to floor line for girts. Verification shall be given to Architect prior to panel installation that these minimum requirements have been achieved. Notify Architect 24 hours prior to verifying alignment.

3.6 ACCESSORIES INSTALLATION

- A. Follow metal building manufacturer's instructions for installation of all accessories.
- B. Install windows and door frames to form air-tight joints.
- C. All items installed in roof and wall panels provided by other trades are to be properly flashed and sealed. It will be the responsibility of the metal building supplier and erector to make these penetrations weathertight. Provide flashing details with shop drawing submittal.

END OF SECTION

13 34 19-10

LETTERHEAD

CERTIFICATE OF GUARANTEE FROM METAL ROOF SYSTEM INSTALLER

We,	agree to maintain the roofing, flashing,				
(Name of Company or Contractor)					
and associated items on the below mentioned bu	uilding for the period in	dicated. This agreement is			
to render the roof and the flashing waterproof su	bject to the conditions	outlined below.			
OWNER OF BUILDING					
Location of Building					
City	Roof Area	square feet.			

This Guarantee effective this day of ______, 20___, for the term Twenty (20) years from this date, provided any defects result from defective material or workmanship and are not caused by other mechanics, fire, accidents, or by nature over which we have no control.

It is understood and agreed that we will not be responsible for leaks in the roofing or flashing due to excessive winds, distortion of the foundation on which the roofing rests, excessive hail storms, or any other conditions over which we have no control.

Signed			
Name of C	Company		

By _____

Position _____

Company is a _____ Corp./Partnership/Individual

NOTARY PUBLIC

Registered in the State of:

My Commission expires:

(Seal)

NOTE: Standard twenty (20) year finish warranty from the manufacturer is to be submitted in addition to the guarantee from the installer found on this form. Manufacturer's Warranty is mandatory - **NO EXCEPTIONS.**

SECTION 21 01 00

GENERAL FIRE SUPPRESSION PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The work covered by Division 21 sections consist of furnishing all labor, equipment, appliances and material for the piping and plumbing systems in strict accordance with Codes, Specifications and the applicable drawings and subject to the terms and conditions of the contract. Include all appurtenances necessary to the proper operation of the systems and equipment specified.
- B. Some equipment may be furnished by other divisions. Fire Suppression Contractor is responsible to check the drawings and specifications for equipment that will be furnished by the others.
- C. General Contractor shall furnish and install all ceiling access panels required to service equipment, valves and controls above gyp board or hidden spline ceilings.
- D. General Contractor shall provide all site drive, sidewalk, and other surfaced areas, saw cutting, and repairs back to preexisting conditions for the required mechanical piping. Fire Suppression Contractor shall provide the trenching, bedding and backfill required for the pipe installation.

1.2 RELATED SECTIONS

- A. The General Conditions and Division 1, General Requirements, as bound in the specification preamble, apply to all work under Division 21. Carefully note its contents in performance of the work.
- B. The Architectural, Plumbing, Mechanical, Electrical and Structural plans and Specifications, including Information to Bidders and other pertinent documents issued by the Engineer are a part of the Specifications and the accompanying mechanical plans. Comply with them in every respect. Examine all the above carefully. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, electrical and structural details from the mechanical drawings.
- C. All electrical power wiring is specified under Division 26 of the Specifications. Fire Suppression Contractor shall furnish all motor starters required for the control and protection of all motors furnished for Division 21, any air compressors, or other fire

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suppression equipment to be wired by a licensed electrician.

D. All concrete pads and bases required for installing equipment are specified in another section of the Specifications. Advise the General Contractor as to the exact sizes required, location of anchor bolts, etc.

1.3 CODES, FEES AND LATERAL COSTS

- A. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations, and the applicable requirements of the following latest nationally accepted codes and standards:
 - 1. 2021 Arkansas Fire Prevention Code.
 - 2. 2021 AFPLB Rules and Regulations.
 - 3. IBC International Building Code; latest adopted edition.
 - 4. ASA American Standards Association.
 - 5. ASME American Society of Mechanical Engineers.
 - 6. ASTM American Society of Testing Materials.
 - 7. AWWA American Water Works Association.
 - 8. NBS National Bureau of Standards.
 - 9. NEMA National Electrical Manufacturers Association.
 - 10. NFPA National Fire Protection Association; the edition referenced by the governing Fire Code or else the latest edition.
 - 11. UL Underwriters' Laboratories, Inc.
 - 12. OSHA Occupational Safety and Hazard Association.
 - 13. IFC International Fire Code; currently adopted edition.
- B. In case of difference between building codes, Specifications, state Laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent governs. Promptly notify the Engineer in writing of any such difference.
- C. Remove any work installed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility

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company regulations, correct the deficiencies, and reinstall all work at no cost to the Owner.

- D. The architectural drawings show the general arrangement of all rooms and finishes. Follow as closely as actual building construction and the work of other trades will permit. Final layout will be governed by actual field conditions with all measurements verified at the site. Conform to the requirements shown on all of the drawings. General and structural drawings take precedence over mechanical drawings. Investigate the existing and finish conditions affecting the work and arrange the work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions. Contractor shall verify that all equipment, pipes and all other components will fit in the space provided before fabrication or ordering.
- E. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith. Arrange with the serving utility companies for the connections to all utilities and pay all charges for same including inspection fees and meters if required. Refundable deposits will be paid by the Owner.
- 1.4 GUARANTEE
 - A. Furnish a written certificate guaranteeing all materials, equipment and labor furnished to be free of all defects for a period of one (1) year from and after the date of final acceptance of the work by the Owner and further guarantee to replace such work without charges if any defects appear within the stipulated guaranty period.

1.5 SOIL CONDITIONS

A. The Specifications and the drawings in no way imply the conditions of the soil to be encountered. When excavating may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions affecting the work.

1.6 INSPECTION OF PREMISES

A. Before submitting a bid, visit the site of the proposed job and determine the conditions relating to this work.

1.7 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. Verify the location and elevation of all

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utilities and their relation to the work before entering into a contract.

B. Identify outdoor underground lines with continuous strip of plastic utility marker tape at regular intervals (maximum of 10 feet) "Caution FIRELINE below". Install one foot directly above pipe before backfilling to grade.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- Provide new materials bearing the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. Furnish the standard product of a manufacturer regularly engaged in the production of the required type of equipment. Provide the manufacturer's latest approved design.
- B. Deliver equipment and materials to the site and store in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage (such as controls) in dry, heated spaces.
- C. Provide equipment and materials of the same general type and of the same make throughout the work to provide uniform appearance, operation and maintenance.
- D. Tightly cover equipment and protect against dirt, water and chemical or mechanical injury and theft. At the completion of the work, clean fixtures, equipment and materials and polish thoroughly. Turn over to the Owner in a condition satisfactory to the Engineer. Repair damage or defects developing before acceptance of the work at no expense to the Owner.
- E. Insure that items to be furnished fit the space available. Make necessary field measurements to ascertain space requirements, including those for connections.
 Furnish and install such sizes and shapes of equipment that the final installation suits the true intent and meaning of the drawings and Specifications.
- F. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Promptly notify the Engineer in writing of any conflicts between any requirements of the Contract Documents and the manufacturers' directions. Obtain the Engineer's written instruction before proceeding with the work. Replace any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, at no cost to the Owner.
- G. Support all products by service organizations with adequate spare parts inventory and personnel located within fifty (50) miles of the site.

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H. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 EQUIPMENT ACCESSORIES

- A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.
- B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and Specifications.
- C. Support, plumb, rigid and true to line, all work and equipment furnished. Study thoroughly all fire sprinkler, general, structural, electrical and mechanical drawings, shop drawings and catalog data to determine how equipment, valves, piping, etc., are to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.
- D. If accessories are required to complete the work and meet the intent of the specification, it is the responsibility of the Contractor to provide such accessories.

2.3 MATERIAL AND EQUIPMENT SCHEDULE

- A. Submit to the Engineer as soon as practical, six (6) complete sets of the schedule of materials and equipment proposed for the installation. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front. Also, provide a CD containing PDFs of the materials and equipment proposed, fire sprinkler drawings, and all RFI correspondence. Use the following folders: Product Manual, FP Drawings, RFIs.
- B. Provide written certification that shop drawings are in accordance with the specifications and are dimensionally correct with reference to available space.
- C. All submittals will be reviewed a maximum of two (2) times. The cost of additional submittal reviews beyond those two specified will be charged to the Contractor.
- D. Shop drawings for the Engineer's files are required on the following items:
 - 1. Booster pumps, starters, controls and instrumentation, etc.
 - 2. Pipe hangers and supports, including any seismic bracing/restraints.

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- 3. Piping materials, including flexible connections, and valves.
- 4. Complete equipment electrical data and wiring details. Include specifications for pressure switches, flow switches, alarm devices, and air compressors.
- 5. Sprinkler heads, escutcheons, and guards. Include manufacturer's data sheets for all sprinklers and finish trim, indicating which sprinkler wrenches apply.
- 6. Sprinkler plans including calculations and approval from the Authorities Having Jurisdiction.
- 7. Include all information pertaining to any standpipe and hose systems required, such as hose connections, stations, and cabinets.
- 8. Include information for all exterior installation, such as joints, restraints, valves, tapping, fire hydrants, bedding, thrust blocking, and preliminary Contractor's Material Test Certificate, to be signed at later date.

2.4 EQUIPMENT AND MATERIAL SUBSTITUTIONS

- A. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The Fire Suppression Contractor shall be responsible for any changes required in mechanical, electrical, or structural systems and shall bear all cost for those changes whether the substitute equipment is named by manufacturer in the specifications or is submitted to the Architect for "or equal" consideration. All changes shall be accomplished in a manner acceptable to the Architect per Section 01 60 00 at no additional cost to the Owner.
- B. In order to obtain prior approval on equipment or material not specified in Fire Suppression Specifications or Equipment Schedules, Fire Suppression Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.
- C. If ANY substitute equipment is submitted to Engineer for approval, without said equipment having been pre-approved, the entire submittal will be rejected for resubmittal.
- D. Any equipment manufacturers which are a subsidiary to the listed acceptable manufacturers are not considered equal. Therefore, it is the responsibility of the Contractor and equipment supplier to obtain prior approval as described in paragraph 2.4, this Section.

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2.5 ELECTRICAL MOTORS

- A. Provide motors of a recognized manufacturer, wound for the voltage specified, and in conformance to latest standards of the manufacturer and performance of the National Electrical Manufacturers Association and the Institute of Electrical and Electronic Engineers. Provide motors as manufactured by General Electric, Westinghouse, Century or Siemens-Allis, Baldor or approved equal.
- B. Provide motors rated for continuous duty at 100% of rated capacity and temperature raise of 40 degrees Centigrade open type; 50 degrees Centigrade drip and splash proof; 55 degrees Centigrade explosion proof and totally enclosed above an ambient of 40 degrees Centigrade.
- C. Unless otherwise required, provide integral horsepower, polyphase motors, Class B, general purpose, squirrel cage, open type induction motors, T-frame.
- Provide single phase fractional horsepower motors of the open capacitor type. Generally, motors under 1/2 horsepower may be split phase type unless otherwise specified. Provide motors rated 1/2 horsepower or less with integral overcurrent protection.
- E. Insure the insulation resistance between stator conductor and frames of motors is not less than 1/2 megohm. Provide shop test of motors including temperature rise, insulation resistance, motor terminal voltage, normal operating line current, RPMs, breaker or switch size with fusing and overload relay sizes.

PART 3 EXECUTION

3.1 COORDINATION OF WORK

- A. Compare the Fire Suppression drawings and Specifications with the drawings and Specifications for other trades and report any discrepancies between them to the Engineer and obtain from him written instruction for changes necessary in the fire suppression work. Install the fire suppression work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. Make all changes required in the work caused either by neglect or existing field conditions at no cost to the Owner.
- B. It is the responsibility of the General Contractor, Mechanical Contractor, Electrical Contractor and Sprinkler Contractor to coordinate installation of all equipment. Equipment installed prior to proper coordination, which interferes with the harmony and intent of the specifications and drawings, will be removed and reinstalled at the cost of the responsible Contractor.

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- C. Furnish anchor bolts, sleeves, inserts and supports required for the fire suppression work. Locate anchor bolts, sleeves, inserts and supports as directed by the trade requiring them and insure that they are properly installed.
- D. Adjust locations of pipes, equipment, etc., to accommodate the work and for interferences anticipated and encountered. Determine the exact route and location of each pipe prior to fabrication.
 - 1. Provide right-of-way to lines that pitch over those that do not pitch. For example, Plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have the right-of-way over lines whose elevations can be changed.
 - 2. Make offsets, transitions and changes in direction in pipes as required to maintain proper head room and pitch.
- E. Install all Fire Suppression work to permit removal without damage to all parts requiring periodic replacement or maintenance. Insure proper clearance for the backflow prevention, fire sprinkler valves, alarm switches, and all such components. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

3.2 RECORD DRAWINGS

A. Maintain record drawings showing exact locations and sizes, as actually installed, of piping, drains, cleanouts, ductwork, controls and equipment as specified herein.
 Deliver to the Owner/Architect upon completion and acceptance of the work, one (1) complete set of contract drawings marked to indicate all deviations from intended installation.

3.3 CUTTING AND PATCHING

- A. The General Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any major structural element, beam or column without the written approval of the Engineer.
- B. Cut, patch, repair and/or replace pavements, sidewalks, roads and curbs as required to permit the installation of the work and pay all expenses incurred for this work.
- C. Pipes, conduits, cables, wires, pneumatic tubes and similar equipment that pass through fire or smoke barriers shall be protected by the Fire Suppression Contractor in accordance with NFPA 101.

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D. All fire stopping assemblies must be UL approved assemblies.

3.4 EXCAVATION AND TRENCHING FOR PIPING

- A. Excavate to the depths indicated on the Drawings or as required to provide adequate slope and burial depth. Excavated materials not required or suitable for backfill or fill shall be removed from the site. Do such grading as is necessary to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other method. Sheeting and shoring shall be installed as may be necessary for protection of the work and for safety of personnel. Excavation shall be by open cut except that short sections of a trench may be tunneled if the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections.
- B. Trench Excavation: Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil. Where rock is encountered excavate to a minimum overdepth of 4" below trench depths indicated on the Drawings or specified. Overdepth in rock excavation and unauthorized overdepths shall be backfilled. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe is encountered such soil shall be removed and the trench backfilled to proper grade as hereinafter specified.
- C. Depth of Cover: Trenches shall be of depth that will provide three feet (3') minimum cover or as required by the local utility authorities for fire lines from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.
- D. Utilities Locating: Locate existing utility lines prior to beginning any excavation
- E. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense.
- F. Trenches shall not be backfilled until required pressure and other tests have been performed and until the utilities systems as installed conform to requirements of Drawings and Specifications.
- G. Backfill trenches with excavated materials consisting of earth, sandy clay, sand, gravel, soft shale or other approved materials, free from clods of earth or stones 2-1/2" maximum dimension, deposited in 6" layers and compacted to 95% Standard Proctor Compaction Test of the maximum laboratory density determined in accordance with

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ASTM D698, Moisture-Density Relation of Soils. If fills fail to meet the specified densities, the Contractor shall remove and re-compact the fill until specified densities are achieved. Compaction test shall be performed for each fifty linear feet of trench.

H. Provide a 4-inch thick (minimum) layer of 3/4-inch No. 4 gravel aggregate bedding beneath all buried piping. Bedding shall be compacted and leveled to provide sloping required.

3.5 EQUIPMENT START-UP AND TESTING

A. Instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment. During the operating tests, prove the operation of each item of equipment to the satisfaction of the Engineer. Give at least seven (7) days notice to the Engineer of equipment start-up and operating tests.

3.6 CATALOG DATA FOR OWNER

- A. Provide, in looseleaf binders, two (2) sets of a compilation of catalog data of each manufactured item of equipment used in the Fire Suppression work and present this compilation to the Owner/Architect for transmittal to the Owner before final payment is made. Include descriptive data and printed installation, operating and maintenance instructions for each item of equipment. Provide a complete double index as follows:
 - 1. Listing of products alphabetically by name or by a clearly established, organized method approved by the engineer.
 - 2. Listing the names of manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the names and addresses of the local sales representatives.
 - 3. Certificates of Final Inspections.
 - 4. Complete spare parts data with current prices and supply sources.
 - 5. Extended warranties.
 - 6. As Built Drawings and calculations.
 - 7. Final Release of Lien confirming, or contingent upon, final payment.
- B. Deliver to the Owner all special tools, lubricants, extra materials and any other products necessary for the proper operation and maintenance of the fire suppression systems.

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- C. Provide project record documents indicating all changes from contract documents made during construction.
- D. Submit all Certificates of Final Inspections from the Administrative Authorities.

3.7 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. Instruct the representative of the Owner in the proper operation and maintenance of all elements of the fire suppression system.

3.8 PROTECTIVE COATINGS

- A. Paint exterior surfaces of steel piping run in or through concrete floor fill, under tile floors or underground, and aluminum surfaces in contact with masonry, with one coat of acid resisting bituminous base paint.
- B. Sprinkler Contractor shall clean and prep all exposed sprinkler piping. Painting by others with an acceptable color selected by the Architect.

3.9 CLEANING AND ADJUSTING

A. Do not allow waste material and rubbish to accumulate in or above the premises. After completion of this work, remove rubbish, tools, scaffolding and surplus materials from and about the building and leave all work clean and ready for use. Clean all equipment, pipes, valves and fittings of grease, metal cuttings and sludge. Repair any stoppage, discoloration or other damage to parts of the building, its finish or furnishings due to failure to properly clean the fire suppression systems, without additional cost to the Owner. Adjust all automatic control devices for proper operation.

3.10 ACCESS PANELS

A. General Contractor shall provide access panels as required in all walls and ceilings to service and have access to all valves and operating parts. For all ceiling and wall access doors that are required in gypsum board and plaster, provide minimum 24" x 24", unless noted otherwise, Milcor type appropriate for the construction involved. Sprinkler Contractor shall coordinate with the General Contractor required access locations. See paragraph 1.1C. this Specification Section for additional information.

3.11 FINALLY

A. It is the intention that this specification shall provide a complete installation except as herein before specifically excluded or noted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included.

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The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

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SECTION 21 05 01

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 RELATED REQUIREMENTS

- A. Section 21 05 53 Identification for Fire Suppression Piping and Equipment: Piping identification.
- B. Section 21 13 01 Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3 REFERENCE STANDARDS

- A. ASME (BPV IX) Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.
- B. ASME/ANSI B16.1 1998 Cast Iron Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; (R2006).C.ASME/ANSI B16.3 - 1998 -Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; (R2006).
- C. UL 668 Hose Valves for Fire Protection Service, 2004 rev 2008.
- D. ASME/ANSI B16.5 1996 Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers.
- E. ASME/ANSI B16.9 2001 Factory-Made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers.
- F. ASME/ANSI B16.11 2001 Forged Steel Fittings, Socket-Welding and Threaded; ; The American Society of Mechanical Engineers.
- G. ASME/ANSI B16.18 1984 (R1994) Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- H. ASME/ANSI B16.21 2005 Nonmetallic Flat Gaskets for Pipe.
- I. ASME/ANSI B16.22 1995 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

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- J. ASME/ANSI B16.24 1991 (R1998) Cast Copper Alloy Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers.
- K. ASME/ANSI B16.25 1997 Buttwelding Ends; The American Society of Mechanical Engineers.
- L. ASME/ANSI B16.42 1998 Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300; The American Society of Mechanical Engineers.
- M. ASME/ANSI B 36.10 Welded and Seamless Wrought Steel Pipe; The American Society of Mechanical Engineers; 1998.
- N. ASTM A47/A47M-99(2009) Standard Specification for Ferritic Malleable Iron Castings.
- O. ASTM A53/A53M-07 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- P. ASTM A 135/A 135M Standard Specification for Electric-Resistance Welded Steel Pipe; 2006.
- Q. ASTM A 183 Standard Specification for Carbon Steel Track Bolts and Nuts.
- R. ASTM A 193/A193M Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service.
- S. ASTM A 234/A 234M-07 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service R.
- T. ASTM A 449 Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
- U. ASTM A 536 Standard Specification for Ductile Iron Castings.
- V. ASTM A 563 Standard Specification for Carbon and Alloy Steel Nuts.
- W. ASTM A 795/A 795M Standard Specification for Black and Hot Dipped Zinc-coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- X. ASTM F 436 Standard Specification for Hardoned Steel Washers, 2009.
- Y. AWWA C110/A21.10 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association; 2003.

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- Z. AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).
- AA. AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2002, and Errata 2002 (ANSI/AWWA C151/A21.51).
- BB. NFPA 13 Standard for the Installation of Sprinkler Systems; National Fire Protection Association; edition adopted by the state.
- CC. NFPA 14 Standard for the Installation of Standpipes and Hose Systems.
- DD. NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
- EE. NFPA 1963 Standard for Fire Hose Connections, edition adopted by the state.
- FF. UL (FPED) Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.
- GG. UL 262 Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; 2004.
- HH. UL 312 Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; 2004.

1.4 SUBMITTALS

- A. See Section 21 01 00 General Fire Suppression Provisions.
- B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- D. Project Record Documents: Record actual locations of components and tag numbering.
- E. Operation and Maintenance Data: Include installation instructions and spare parts lists.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

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1. Extra Valve Stem Packings: Two for each type and size of valve.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience. approved by manufacturer.
- C. Conform to UL, FM, and Warnock Hersey requirements.
- D. Valves: Bear UL, FM, and Warnock Hersey label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver and store valves in shipping containers, with labeling in place.
 - B. Provide temporary protective coating on cast iron and steel valves.
 - C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Conform work to NFPA 13, with components being UL listed for 175 psig working pressure, made of materials compatible with piping. Where high pressure systems or regions are called out, such components shall be UL listed for 300 psig working pressure.
- B. Welding Materials and Procedures: Conform to ASME Code, meeting requirements set forth by NFPA 13.
- 2.2 BURIED PIPING
 - A. Cast Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: AWWA C110, standard thickness.
 - 2. Joints: AWWA C111, rubber gasket.

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- 3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.
- B. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Ductile Fittings: AWWA C110/A21.10 standard thickness.
 - 2. Joints: AWWA C111, rubber gasket with steel nuts and bolts.
 - 3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.
 - 4. Encasement shall apply and conform to ASTM A 674 or AWWA C105, PE Film, .008 inches (.20 mm) thick.

2.3 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A 135/A 135M Schedule 10, black for grooved piping.
 - 1. Grooved End Fittings: UL listed, ASTM A 536, ductile iron casting with OD matching steel pipe OD.
 - 2. Cast Iron Fittings: ASME B16.1, threaded fittings.
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 4. No XL pipe allowed.
 - 5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and Oring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.
- B. Steel Pipe: ASTM A 135/A 135M Schedule 30 or 40, black for threaded piping.
 - 1. Steel Fittings: Steel Fittings: ASME B16.5, B16.9, B16.11, B16.25 & A234
 - 2. Cast Iron Fittings: ASME B16.1 & B16.4
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 4. Pipe Nipples: ASTM A733 made of ASTM A 53 or A 106, Schedule 40, seamless steel pipe.

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- 5. Steel Threaded Couplings: ASTM A 865
- 6. No XL pipe allowed.
- 7. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and Oring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.
- C. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: AWWA C110/A21.10, standard thickness.
 - 2. Joints: AWWA C111, rubber gasket with steel nuts and bolts
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.4 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 6 inch: Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 8 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Trapeze Hangers: Should be attached to two (2) steel members.
- E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- G. Vertical Support: Steel riser clamp.
- H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.5 GATE VALVES

- A. Up to and including 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

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- B. Over 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged ends.
- C. Over 4 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.6 GLOBE VALVES (COMPLY WITH UL 262)

- A. Up to and including 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity.
- B. Over 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.7 BALL VALVES (COMPLY WITH UL 1091)

- A. Up to and including 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Bronze two piece body, brass or stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded ends.
- B. Over 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

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2.8 BUTTERFLY VALVES (COMPLY WITH UL 1091)

- A. Bronze Body:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.
- B. Cast or Ductile Iron Body
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper switch rated 10 amp at 115 volt AC.

2.9 CHECK VALVES (COMPLY WITH UL 312)

- A. Up to and including 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Bronze body and swing disc, rubber seat, threaded ends.
- B. Over 2 inches:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends.
- C. 4 inches and Over:
 - 1. Manufacturers: Nibco, Kennedy or equal.
 - 2. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.10 DRAIN VALVES

A. Size and install per NFPA 13. Must be readily accessible with location, elevations, and accessibility subject to approval.

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- B. Compression Stop:
 - 1. Manufacturers: Nibco, or equal.
 - 2. Bronze with hose thread nipple and cap.
- C. Ball Valve:
 - 1. Manufacturers: Nibco, or equal.
 - 2. Brass with cap and chain, 3/4 inch hose thread.
- D. Auxiliary Drain Valve:
 - 1. Manufacturers: Nibco, or equal.
- 2.11 POST INDICATOR VALVES (WALL TYPE OR UPRIGHT)
 - A. Comply with UL 789, upright post type, ductile iron body, with extension rod, locking device, and ductile iron barrel.
 - 1. Manufacturers: Nibco Model NIP-1AJ, NIP-2AJ, or equal.
 - 2. Bronze with hose thread nipple and cap.
- 2.12 INDICATING VALVES (COMPLY WITH UL 1091)
 - A. Integral indicating device, indoor/outdoor rated, ends matching connection piping.
 - 1. Electrical 115 V ac, prewired, single circuit, supervisory switch.
 - 2. All wiring to be performed by a licensed electrician.
- 2.13 DRY TYPE VALVES (COMPLY WITH UL 260)
 - A. Tyco DPV-1, or equal, with trim package. Install Quick Opening Device(s), if needed per NFPA 13.
 - B. Include Air Maintenance Device: UL 260, to correct air pressure in piping and keep such air at designed operating range.
 - C. Air Compressor: UL 753 shall be rated for 220 VAC, 60 HZ, Single Phase.
 - D. Include furnishing and installing PS-10, PS-40, flexible hose connectors, mounting kits, and all components required for a complete installation of the dry pipe system.

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PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure, sloping as required by NFPA 13. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Coordinate sprinkler piping installation with work of all other trades. Installation shall maintain harmony of entire mechanical, electrical and plumbing installation.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipes passing through partitions, walls, and floors. Fire walls should be fire caulked.
- G. Where pipes pass through fire rated walls, use UL listed assembly to maintain the fire rating of wall.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

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- 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- J. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- K. Slope piping and arrange systems as needed to drain at low points. Use eccentric reducers to maintain top of pipe level.
- L. Prepare pipe, fittings, supports, and accessories for finish painting where exposed to view (not concealed above ceilings, in walls, etc.). Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- M. Do not penetrate building structural members unless indicated.
- N. Provide sleeves when penetrating footings and floors. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- O. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- P. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- Q. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.
- R. Provide ball valves for shut-off or isolating service.
- S. Provide drain valves at main shut-off valves, low points of piping and apparatus.

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T. The Fire Sprinkler Contractor is responsible for calling into question any deficiencies or inconsistencies relating to remote areas, hydraulic calculations/pipe sizing, sprinkler coverages, and system riser/fire pump/standpipe locations PRIOR to submitting a bid.

END OF SECTION

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SECTION 21 05 53

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

- 1.1 SECTION INCLUDES
 - A. Nameplates.
 - B. Tags.
 - C. Stencils.
 - D. Pipe Markers.
 - E. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.3 SUBMITTALS

- A. See Section 21 01 00 General Fire Suppression Provisions, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

1.4 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags.
- B. Control Panels: Nameplates.
- C. Instrumentation: Tags.
- D. Major Control Components: Nameplates.

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- E. Piping: Tags.
- F. Pumps: Nameplates.
- G. Relays: Tags.
- H. Small-sized Equipment: Tags.
- I. Thermostats: Nameplates.
- J. Valves: Namplates and ceiling tacks where above lay-in ceilings.
- 1.5 NAMEPLATES
 - A. Manufacturers:
 - 1. Kolbi Pipe Marker Co.
 - 2. Seton Identification Products
 - 3. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.
 - B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/2 inch.
 - 3. Background Color: Black.
- 1.6 TAGS
 - A. Manufacturers:
 - 1. Advanced Graphic Engraving.
 - 2. Brady Corporation.
 - 3. Kolbi Pipe Marker Co.
 - 4. Seton Identification Products.
 - 5. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.
 - B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter. 21 05 53-2

- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

1.7 STENCILS

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Kolbi Pipe Marker Co.
 - 3. Seton Identification Products.
 - 4. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
 - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
 - 6. Equipment: 2-1/2 inch high letters.
- C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.
- D. Manufacturers:
 - 1. Brady Corporation.
 - 2. Kolbi Pipe Marker Co.
 - 3. MIFAB, Inc.

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- 4. Seton Identification Products.
- 5. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.
- E. Color: Conform to ASME A13.1.
- F. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- G. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- H. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

1.8 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark.
 - 2. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.
- B. Description: Steel with 3/4 inch diameter color coded head.
- C. Color code as follows:
 - 1. Standard colors.

PART 3 EXECUTION

2.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- 2.2 INSTALLATION
 - A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
 - B. Install tags with corrosion resistant chain.
 - C. Install plastic pipe markers in accordance with manufacturer's instructions.

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- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install metallic detection tape located approximately 12 inches above pipe, where in ground utility lines are buried outside building footprint. Tape shall be continuous and be marked, indicating utility type (ie. water, sewer, gas, electric, etc).
- F. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

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SECTION 21 13 01

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wet-pipe sprinkler system, submittals and quality control.
- B. System design, installation, and certification.
- C. Fire department connections, Life Safety System coordination and field quality control.
- 1.2 RELATED REQUIREMENTS
 - A. Section 28 31 04 Fire Detection and Voice Evacuation System
 - B. Section 21 05 01 Common Work Results for Fire Suppression: Pipe, fittings, and valves.
 - C. Section 21 05 53 Identification for Fire Suppression Piping and Equipment.
 - D. Division 26 Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. NFPA 13 Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.
- B. UL (FPED) Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.
- C. IFC International Fire Code, latest accepted edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

- A. See Section 21 01 00 General Fire Suppression Provisions, for submittal requirements.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, 21 13 01-1

weights, support requirements, and piping connections.

- C. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 3. Submit shop drawings, product data, and hydraulic calculations to Fire Marshall for approval. Submit proof of approval to Engineer.
- D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.
- F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 - 2. Sprinkler Wrenches: For each sprinkler type.

1.6 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.
- B. Conform to all code requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer.
- E. Equipment and Components: Provide products that bear UL label or marking.

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F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation. Keep all materials clean and free of debris and material damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tyco Fire Products.
- B. Grinnell.
- C. Star Manufacturing Company.
- D. Reliable Automatic Sprinkler.
- E. Substitutions: Approved equal.

2.2 SPRINKLER SYSTEM

- A. Sprinkler System: Contractor shall extend existing fire protection system as required to provide coverage for new building addition. Contractor shall field verify existing conditions to determine extent of the work, including required piping connection points and coverage calculations per NFPA 13, prior to bid and construction.
- B. Sprinkler System: Contractor shall rework existing fire protection system as required to provide coverage for remodeled areas within project scope. Contractor shall field verify existing conditions to determine extent of the work, including required piping connection points and coverage calculations per NFPA 13, prior to bid and construction.
- C. Refer to civil and mechanical plans, Sprinkler Contractor shall provide connections for future building expansions where indicated.
- D. Provide anti-freeze loop where required for coverage where wet system areas are exposed to freezing conditions. Include RPZ and expansion chamber as needed. Coordinate floor drain/sink locations and sizes needed for proper draining.
- E. Remote Area may be decreased where quick response sprinklers are at level, flat ceilings of light or ordinary hazard wet systems when such is the case, this SHALL

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BE THE FIRST modification made and shall be in accordance with this formula:

- 1. 675 + 22.5*H (where H is the peak ceiling height, up to 20 ft minimum remote area is 900 sf).
- F. Design Areas (Remote Areas) shall be increased 30% where dry systems are utilized.
- G. Where sprinklers are under slopes exceeding 2:12, the remote area (obtained by figures, tables, or the above formula) must be increased 30%.
- H. Occupancy per NFPA 13, Appendix A and elsewhere, and as clarified, amended and outlined below:
 - 1. Automobile Parking Areas: Ordinary Hazard, Group 1.
 - 2. Building Service Areas: Ordinary Hazard, Group 1.
 - 3. Churches: Light Hazard.
 - 4. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - 5. Dry-Cleaners: Ordinary Hazard, Group 2.
 - 6. General Storage Areas: Ordinary Hazard, Group 1.
 - 7. Laundries: Ordinary Hazard, Group 1.
 - 8. Libraries, Except Stack Areas: Light Hazard.
 - 9. Library Stack Areas: Ordinary Hazard, Group 2.
 - 10. Machine Shops: Ordinary Hazard, Group 2.
 - 11. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - 12. Office and Public Areas: Light Hazard.
 - 13. Plastics Processing Areas: Extra Hazard, Group 2.
 - 14. Printing Plants: Extra Hazard, Group 1.
 - 15. Repair Garages: Ordinary Hazard, Group 2.
 - 16. Residential Living Areas: Light Hazard.
 - 17. Restaurant Service Areas: Ordinary Hazard, Group 1.
 - Solvent Cleaning Areas: Extra Hazard, Group 2.
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- 19. Upholstering Plants: Extra Hazard, Group 1.
- 20. Laboratories, including Classroom Laboratories: Ordinary Hazard, Group 1 or 2 as determined by criteria set forth in NFPA 13.
- I. Minimum Density for Automatic-Sprinkler Piping Design:
 - 1. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft.
 - 2. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.
 - 3. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft.
 - 4. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft.
 - 5. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft.
- J. Maximum Protection Area per Sprinkler: Per UL listing.
 - 1. Office Spaces: 225 sq. ft. (20.9 sq. m).
 - 2. Storage Areas: 130 sq. ft. (12.1 sq. m).
 - 3. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
 - 4. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
 - 5. Other Areas: NFPA 13, unless otherwise indicated.
- K. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:
 - 1. Light-Hazard Occupancies: 100 gpm (6.3 L/s) for 30 minutes.
 - 2. Ordinary-Hazard Occupancies: 250 gpm (15.75 L/s) for 60 to 90 minutes.
 - 3. Extra-Hazard Occupancies: 500 gpm (31.5 L/s) for 90 to 120 minutes.
- L. Water Supply: Obtain static pressure and volumetric flow at residual pressure from a water flow test data conducted per NFPA 291.
- M. Margin of Safety for Available Water Flow and Pressure:
 - 1. Contact the Water Department to request a hydraulic model pressure based on maximum usage in peak season and maintain 20% safety margin unless flow test was conducted in peak season in the last 6 months, in which case 10% safety margin is acceptable. If a Fire Pump is required to meet the requirements of this

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section, fire sprinkler contractor shall submit a request for waiver of this requirement to the contractor.

- N. If pressure booster pump will be required for achieving required pressure in fire sprinkler system, sprinkler designer shall size pump to provide required flow and pressure unless such information is provided in Section 21 30 00.
- O. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve. Include water flow switch tamper resistant hex key (allen wrench), paperwork related to all riser switches, sprinkler wrenches for each type of sprinkler provided on the job, and spare sprinklers of number and ratio provided by NFPA 13.
- P. Standpipes: Provide wet type, manual, interconnected standpipes per the pipe schedule method or calculated and sized, in accordance with NFPA 14. Where Standpipes cover stage areas, Fire pump sizing shall be based upon NFPA 13 for the fire sprinkler demand and hose connections shall be provided on each side of the stage designed per the latest accepted edition of the Arkansas Fire Protection Code.
- Q. Provide standpipes and hose connections in all stairwells. In addition, provide hose connections at any point exceeding 100 feet of travel distance plus 30 feet of hose spray from egress or adjacent hose connections where locations of such hose connections are required by the fire department. Refer to fire protection drawings, details, and notations for standpipe and hose connection requirements and locations.
- R. Manual Wet-type, Class 1 Standpipe Systems: System includes NPS 2-1/2-inch hose connections with small water supply to maintain water in the standpipes. Piping is wet, however, water must be pumped into standpipes to satisfy demand.
- S. 175 PSIG Hose Connection: Comply with UL668, FM and UL approved bronze [no copper alloy (brass) allowed containing more than 15 percent zinc], 175 psig minimum pressure rating. Include angle pattern design; female NPS inlet and male hose outlet, and lugged cap, gasket and chain. Include NPS 1-1/2" or NPS 2-1/2" as required and hose valve threads according to NFPA 1963 and matching local fire department threads. Provide NPS 2-1/2" x 1-1/2" adapters where 1-1/2" male hose threads are furnished throughout the project, so the fire department connects to 2-1/2" NPS male thread.
- T. Reference FP drawings for other information pertaining to the design of this project.

2.3 SPRINKLERS (PER UL 199) SPECIFIED FIRE SPRINKLERS ARE SUBJECT TO TYPES AND LOCATIONS AS INDICATED BELOW.

A. Suspended Ceiling Type: Concealed pendant type with listed concealed plate.

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- 1. Finish: Enamel, color as selected.
- 2. Escutcheon Plate Finish: Enamel, color as selected.
- 3. Glass Bulb Ordinary Temperature Rating with listed Concealed Plate.
- 4. Fusible Link: Temperature rated for application.
- B. Sprinkler Guards: Finish to match sprinkler finish and to be listed with the fire sprinkler being protected. Wire cage type, including fastening device for attaching to sprinkler such guard is listed with. Provide Sprinkler Guards where sprinklers are less than 7'9 from finished floor and anywhere sprinklers are subject to being damaged (such as when located near shelving or racks, in or in proximity to gymnasiums, over conveyors, in trash chutes, etc...).
- C. Special Coatings: Use special coatings where required; however, do not utilize quick response sprinklers where special coatings are needed. In such cases, manufacturer's corrosion resistant paint will be sufficient.

2.4 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim, with test and drain valve.
- B. Water Motor Alarm per UL 753: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings, and inlet strainer.
- C. Electric Alarm per UL 464: Electrically operated red enameled 8" gong with pressure alarm switch, 24 VDC or as required by the Authority Having Jurisdiction.
- D. Water Flow Switch per UL 346: Vane type switch for mounting horizontal or vertical, with two contacts; rated to match fire alarm panel by others.
- E. Fire Department Connections per UL 405:
 - 1. Outlets: of type and model subject to the "first responder" fire department, with hardware; threaded dust cap and chain of matching material and finish as subject to same wall mounted or free standing, as required by the fire department with signage designating what is supplied (Auto Sprinkler System, Standpipes, Dry Standpipes Only, etc.). Lockable caps and signage required by Fire Code shall be provided.

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- 2. Drain: 3/4 inch automatic drip, outside.
- 3. Drain: 3/4 inch automatic drip, in gravel base at foot of 90 degree elbow below fire department connection.
- 4. Label: "Sprinkler Fire Department Connection".
- 5. Refer to drawings for proposed location of fire department's connection. Gain approval of fire department officials for location of fire department connection prior to commencing installation. Department connection must be within 100 ft of a fire hydrant by state code and may be required to be located even closer in some jurisdictions.
- F. Supervisory Switches per UL 753: As manufactured by Potter Model OSYSV-2 or approved equal.
- G. Room Temperature Supervisory Switches: As manufactured by approved supplier.
- H. Water Flow Switches per UL 346: As manufactured by Potter Model VSR-F2 or approved equal.
- I. 24 VDC Electric 8" alarm bell mounted at 9 ft elevation on exterior wall near riser unless other such means of notification are required by the local fire authority, whether mechanical, horn/strobe, or otherwise..

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator for each Lead In.
- D. Provide approved backflow preventer assembly at sprinkler system water source connection. Reduced pressure backflow preventer equipment and installation shall conform to the requirements of the city of Bentonville, the State in which the Project is located Backflow Prevention and Cross Connection Control Program.
- E. Locate remote fire department connection, as indicated on plans, with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Locate outside alarm notification device (bell, horn, strobe, or gong) on building wall.

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- G. Place pipe runs to minimize obstruction to other work. Coordinate with electrical and other mechanical trades. Refer to site utility plans.
- H. Place piping in concealed spaces above finished ceilings. In areas where there is a combination of exposed areas and finished ceiling spaces, piping shall be routed above the finished ceiling spaces. All piping shall be concealed wherever possible throughout entire project.
- I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required or locate concealed type sprinklers centered in tiles in one direction and not less than 6" off ceiling grids in any direction.
- J. Apply masking tape, or paper cover, or plastic caps to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- K. Install and connect to fire pump system per NFPA 13 as required.
- L. Flush entire piping system of foreign matter per NFPA standard.
- M. Install guards on sprinklers as required to prevent damage or injury.
- N. Hydrostatically test entire system. Furnish completed test results signed by all required authorities and furnish a Contractor's Material Test Certificate per State Rules and Regulations and NFPA 13.
- O. Test to be witnessed by the Authority Having Jurisdiction and/or fire official unless the Authority Having Jurisdiction waives the right to witness and thus defaults the responsibility solely to the Owner's representative. In such a case, the waiver shall be included in the closeout documents. In all cases, the signed test certificate shall be provided in the closeout documents.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.
- B. All fire sprinkler system components required to interface with the fire alarm system to be supplied and installed by the Fire Sprinkler Contractor. The Fire Alarm Contractor shall coordinate these components with the Fire Sprinkler Contractor and provide necessary equipment and wiring for connection of these components to the fire alarm system.

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3.3 LABELING AND IDENTIFICATION

A. Install in accordance with Section 21 05 53.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - Leak Testing: All systems to be hydrostatically tested for the greater of 200 psi OR 50 psi above the maximum anticipated normal system pressure at 2 hours per NFPA 13. Dry systems to be air tested per NFPA 13.
 - 2. Electronic/Alarm Equipment Testing: All alarm devices, fire pump controls, air compressors, and all such electrical equipment and devices interfaced with the fire sprinkler system to be tested and attested to in Contractor's Material Test Certificate, noting such tests were coordinated and verified.
 - 3. Fire Pump Testing: Where Diesel fire pumps are required, diesel fuel shall be supplied for testing and for continual operation after testing, and fire pump tests shall be conducted per NFPA 20 and reports shall be included in the Product Manual.
 - 4. Training and Educating: This Contractor shall train and educate the Owner, or his designated representative, by supplying NFPA 25, with highlighted sections corresponding to his responsibilities and information he should need to know, AND instructions shall be given for emergency procedures and general maintenance of the system, and test sheets shall be given for any periodic tests the Owner is responsible for, beyond the supplier's annual testing.
 - 5. Annual Inspection: Include a 1 year annual inspection to be conducted 1 year after this work is completed and the warranty has expired. Any Work revealed by such inspection that should have been included in the initial installation shall be so referenced in the inspection documents and completed as warranty work within 30 days of the inspection.

END OF SECTION

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SECTION 22 01 00

GENERAL PLUMBING PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The work covered by Division 22 sections consist of furnishing all labor, equipment, appliances and material for the heating, air conditioning, piping and plumbing systems in strict accordance with Codes, Specifications and the applicable drawings and subject to the terms and conditions of the contract. Include all appurtenances necessary to the proper operation of the systems and equipment specified.
- B. General Contractor shall install all concrete pads and bases required for installing mechanical equipment. Mechanical Contractor is responsible for the exact sizes required, location of anchor bolts, etc.
- C. Some equipment may be furnished by other divisions. Mechanical Contractor is responsible to check the drawings and specifications for equipment that will be furnished by others. Furnish the supplies (hot and cold water cut-offs), traps, drains, controls, gas piping, backflow preventers, pressure reducing valves, etc., on all equipment furnished by other divisions.
- D. General Contractor shall furnish and install all ceiling access panels required to service mechanical equipment, valves and controls above gyp board or hidden spline ceilings.
- E. General Contractor shall provide all site drive, sidewalk and other surfaced areas saw cutting and repairs back to preexisting conditions for the required mechanical piping. Mechanical Contractor shall provide the trenching, bedding and backfill required for the pipe installation.

1.2 RELATED SECTIONS

- A. The General Conditions and Division 1, General Requirements, as bound in the specification preamble, apply to all work under Division 22. Carefully note its contents in performance of the work.
- B. The Architectural, Fire Suppression, Mechanical, Electrical, and Structural plans and Specifications, including Information to Bidders and other pertinent documents issued by the Engineer are a part of this Specifications and the accompanying mechanical plans. Comply with them in every respect. Examine all the above carefully. Failure

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to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, electrical and structural details from the mechanical drawings.

- C. All electrical power wiring is specified under Division 26 of the Specifications. Mechanical Contractor shall furnish all motor starters required for the control and protection of all motors furnished for the Division 22.
- D. All concrete pads and bases required for installing mechanical equipment are specified in another section of the Specifications. Advise the General Contractor as to the exact sizes required, location of anchor bolts, etc.
- E. Paint all mechanical equipment, piping, supports and other exposed material. Do not paint indoor equipment supplied with painted finish, such as the main mechanical equipment unless damaged during handling and installation. In such cases, use touch-up paint of the same type and color as original paint. Conform to requirements in other sections of the Specifications and match wall finish to the room in which installed.

1.3 CODES, FEES AND LATERAL COSTS

- A. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations, and the applicable requirements of the following latest nationally accepted codes and standards:
 - 1. 2021 Bentonville, Arkansas City Building Code.
 - 2. 2021 Arkansas State Mechanical Code.
 - 3. 2018 Arkansas State Plumbing Code.
 - 4. 2009 Arkansas Energy Code.
 - 5. 2021 IBC International Building Code.
 - 6. IFC International Fire Code; latest accepted edition.
 - 7. IGC International Gas Code; latest accepted edition.
 - 8. IPC International Plumbing Code; latest accepted edition.
 - 9. IMC International Mechanical Code; latest accepted edition.
 - 10. IECC International Energy Conservation Code; latest accepted edition.

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- 11. AMCA Air Moving & Conditioning Association.
- 12. ASA American Standards Association.
- 13. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers.
- 14. ASME American Society of Mechanical Engineers.
- 15. ASTM American Society of Testing Materials.
- 16. AWWA American Water Works Association.
- 17. NBS National Bureau of Standards.
- 18. NEMA National Electrical Manufacturers Association.
- 19. NFPA National Fire Protection Association.
- 20. SMACNA Sheet Metal & Air Conditioning Contractors' National Association.
- 21. UL Underwriters' Laboratories, Inc.
- 22. AGA American Gas Association.
- 23. OSHA Occupational Safety and Hazard Association.
- 24. AABC Associated Air Balance Councils.
- 25. NEBB National Environmental Balancing Bureau.
- B. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.
- C. In case of difference between building codes, Specifications, state Laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent governs. Promptly notify the Engineer in writing of any such difference.
- D. Remove any work installed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, correct the deficiencies, and reinstall all work at no cost to the Owner.
- E. The mechanical drawings show the general arrangement of all piping, equipment and appurtenances. Follow as closely as actual building construction and the work of

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other trades will permit. Final layout will be governed by actual field conditions with all measurements verified at the site. Conform to the requirements shown on all of the drawings. General and structural drawings take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate the existing and finish conditions affecting the work and arrange the work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions. Contractor shall verify that all equipment, ducts, pipes and all other components will fit in the space provided before fabrication or ordering.

- F. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith. Arrange with the serving utility companies for the connections to all utilities and pay all charges for same including inspection fees and meters if required. Refundable deposits will be paid by the Owner.
- G. Mechanical Contractor shall provide and install, where applicable, seismic restraints for all piping and duct systems per the latest accepted Building Code.

1.4 GUARANTEE

A. Furnish a written certificate guaranteeing all materials, equipment and labor furnished to be free of all defects for a period of one (1) year from and after the date of final acceptance of the work by the Owner and further guarantee to replace such work without charges if any defects appear within the stipulated guaranty period.

1.5 SOIL CONDITIONS

A. The Specifications and the drawings in no way imply the conditions of the soil to be encountered. When excavating may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions affecting the work.

1.6 INSPECTION OF PREMISES

A. Before submitting a bid, visit the site of the proposed job and determine the conditions relating to this work.

1.7 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. Verify the location and elevation of all

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utilities and their relation to the work before entering into a contract.

B. Identify outdoor underground lines with continuous strip of plastic utility marker tape at regular intervals (maximum of 10 feet) "Caution (state utility) pipe below". Install one foot directly above pipe before backfilling to grade.

1.8 EQUIPMENT NOT SPECIFIED UNDER DIVISION 22

- A. Equipment which requires plumbing and other mechanical connections may be specified in another division of this Specification. Under these conditions, provide necessary utilities including waste, water and natural gas.
- B. Rough-in work from approved shop drawings only.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- Provide new materials bearing the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. Furnish the standard product of a manufacturer regularly engaged in the production of the required type of equipment. Provide the manufacturer's latest approved design.
- B. Deliver equipment and materials to the site and store in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage (such as controls) in dry, heated spaces.
- C. Provide equipment and materials of the same general type and of the same make throughout the work to provide uniform appearance, operation and maintenance.
- D. Tightly cover equipment and protect against dirt, water and chemical or mechanical injury and theft. At the completion of the work, clean fixtures, equipment and materials and polish thoroughly. Turn over to the Owner in a condition satisfactory to the Engineer. Repair damage or defects developing before acceptance of the work at no expense to the Owner.
- E. Insure that items to be furnished fit the space available. Make necessary field measurements to ascertain space requirements, including those for connections. Furnish and install such sizes and shapes of equipment that the final installation suits the true intent and meaning of the drawings and Specifications.
- F. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Promptly notify the Engineer in writing of

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any conflicts between any requirements of the Contract Documents and the manufacturers' directions. Obtain the Engineer's written instruction before proceeding with the work. Replace any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, at no cost to the Owner.

- G. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.
- H. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 EQUIPMENT ACCESSORIES

- A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.
- B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and Specifications.
- C. Support, plumb, rigid and true to line, all work and equipment furnished. Study thoroughly all general, structural, electrical and mechanical drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.
- D. If accessories are required to complete the work and meet the intent of the specification, it is the responsibility of the Contractor to provide such accessories.

2.3 MATERIAL AND EQUIPMENT SCHEDULE

- A. Submit to the Engineer as soon as practical, six (6) complete sets of the schedule of materials and equipment proposed for the installation. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front.
- B. Provide written certification that shop drawings are in accordance with the specifications and are dimensionally correct with reference to available space.
- C. All submittals will be reviewed a maximum of two (2) times. The cost of additional submittal reviews beyond those two specified will be charged to the Contractor.

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- D. Shop drawings for the Engineer's files are required on the following items:
 - 1. Commercial water heaters.
 - 2. Plumbing fixtures, floor and roof drains.
 - 3. Valves/Circulation pumps/flex connectors and other specialties.
 - 4. Water balance certification.
 - 5. Piping materials including valves.
 - 6. Piping insulation materials.
 - 7. Complete mechanical equipment electrical data and wiring details.
 - 8. Seismic restraints.

2.4 EQUIPMENT AND MATERIAL SUBSTITUTIONS

- A. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The Mechanical Contractor shall be responsible for any changes required in mechanical, electrical, structural or vibration isolation systems and shall bear all cost for those changes whether the substitute equipment is named by manufacturer in the specifications or is submitted to the Architect for "or equal" consideration. All changes shall be accomplished in a manner acceptable to the Architect per Section 01 60 00 at no additional cost to the Owner.
- B. In order to obtain prior approval on equipment or material not specified in Division 22 Specifications or Equipment Schedules, Mechanical Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.
- C. If ANY substitute equipment is submitted to Engineer for approval, without said equipment having been pre-approved, the entire submittal will be rejected for resubmittal.
- D. Any equipment manufacturers which are a subsidiary to the listed acceptable manufacturers are not considered equal. Therefore, it is the responsibility of the Contractor and equipment supplier to obtain prior approval as described in paragraph 2.4, this Section.

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2.5 ELECTRICAL MOTORS

- A. Provide motors of a recognized manufacturer, wound for the voltage specified, and in conformance to latest standards of the manufacturer and performance of the National Electrical Manufacturers Association and the Institute of Electrical and Electronic Engineers. Provide motors as manufactured by General Electric, Westinghouse, Century or Siemens-Allis, Baldor or approved equal.
- B. Provide motors rated for continuous duty at 100% of rated capacity and temperature raise of 40 degrees Centigrade open type; 50 degrees Centigrade drip and splash proof; 55 degrees Centigrade explosion proof and totally enclosed above an ambient of 40 degrees Centigrade.
- C. Unless otherwise required, provide integral horsepower, polyphase motors, Class B, general purpose, squirrel cage, open type induction motors, T-frame.
- Provide single phase fractional horsepower motors of the open capacitor type. Generally, motors under 1/2 horsepower may be split phase type unless otherwise specified. Provide motors rated 1/2 horsepower or less with integral overcurrent protection.
- E. Insure the insulation resistance between stator conductor and frames of motors is not less than 1/2 megohm. Provide shop test of motors including temperature rise, insulation resistance, motor terminal voltage, normal operating line current, RPMs, breaker or switch size with fusing and overload relay sizes.

PART 3 EXECUTION

3.1 COORDINATION OF WORK

- A. Compare the mechanical drawings and Specifications with the drawings and Specifications for other trades and report any discrepancies between them to the Engineer and obtain from him written instruction for changes necessary in the mechanical work. Install the mechanical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. Make all changes required in the work caused either by neglect or existing field conditions at no cost to the Owner.
- B. It is the responsibility of the General Contractor, Mechanical Contractor, Electrical Contractor and Sprinkler Contractor to coordinate installation of all equipment. Equipment installed prior to proper coordination, which interferes with the harmony and intent of the specifications and drawings, will be removed and reinstalled at the cost of the responsible Contractor.

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- C. Furnish anchor bolts, sleeves, inserts and supports required for the mechanical work. Locate anchor bolts, sleeves, inserts and supports as directed by the trade requiring them and insure that they are properly installed.
- D. Adjust locations of pipes, ducts, equipment fixtures, etc., to accommodate the work and for interferences anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.
 - 1. New work and remodeled areas are to interface with existing facility services. Contractor to familiarize himself with the extent of the work prior to submitting his bid. Failure to gain familiarity will not be grounds for additional compensation.
 - 2. Provide right-of-way to lines that pitch over those that do not pitch. For example, Plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have the right-of-way over lines whose elevations can be changed.
 - 3. Make offsets, transitions and changes in direction in pipes and ducts as required to maintain proper head room and pitch.
- E. Install all mechanical work to permit removal without damage to other parts, to coils, fan shafts and wheels, filters, belt guards, sheaves and drives and all other parts requiring periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

3.2 CHLORINATION OF DOMESTIC WATER LINES

- A. After the hot and cold water systems are complete, all fixtures connected, the system flushed out completely and the shut-off valve to the water main closed, fill the system with a solution containing 50 parts per million of available chlorine. Allow the solution to stand six (6) hours before flushing and returning to service.
- B. Then fill the system with a solution containing 100 parts per million of available chlorine. Allow this solution to stand two (2) hours before flushing and returning to service.
- C. Notify the Owner twenty-four hours prior to test so his representative can witness test. Obtain chemical analysis of the domestic water lines after chlorination from a Certified Chemist and submit the results of these tests to the Engineer and Owner.

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3.3 RECORD DRAWINGS

Maintain record drawings showing exact locations and sizes, as actually installed, of piping, drains, cleanouts, ductwork, controls and equipment as specified herein.
Deliver to the Owner/Architect upon completion and acceptance of the work, one (1) complete set of contract drawings marked to indicate all deviations from intended installation.

3.4 CUTTING AND PATCHING

- A. The General Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any major structural element, beam or column without the written approval of the Engineer.
- B. Cut, patch, repair and/or replace pavements, sidewalks, roads and curbs as required to permit the installation of the work and pay all expenses incurred for this work.

3.5 EXCAVATION AND TRENCHING FOR PIPING

- A. Excavate to the depths indicated on the Drawings or as required to provide adequate slope and burial depth. Excavated materials not required or suitable for backfill or fill shall be removed from the site. Do such grading as is necessary to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other method. Sheeting and shoring shall be installed as may be necessary for protection of the work and for safety of personnel. Excavation shall be by open cut except that short sections of a trench may be tunneled if the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections.
- B. Trench Excavation: Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil. Where rock is encountered excavate to a minimum overdepth of 4" below trench depths indicated on the Drawings or specified. Overdepth in rock excavation and unauthorized overdepths shall be backfilled. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe is encountered such soil shall be removed and the trench backfilled to proper grade as hereinafter specified.
- C. Depth of Cover: Trenches shall be of depth that will provide three feet (3') minimum cover for domestic water, fire lines, sanitary and storm sewers from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.
- D. Utilities Locating: Locate existing utility lines prior to beginning any excavation 22 01 00-10

- E. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor, at his expense.
- F. Trenches shall not be backfilled until required pressure and other tests have been performed and until the utilities systems as installed conform to requirements of Drawings and Specifications.
- G. Backfill trenches with excavated materials consisting of earth, sandy clay, sand, gravel, soft shale or other approved materials, free from clods of earth or stones 2-1/2" maximum dimension, deposited in 6" layers and compacted to 95% Standard Proctor Compaction Test of the maximum laboratory density determined in accordance with ASTM D698, Moisture-Density Relation of Soils. If fills fail to meet the specified densities, the Contractor shall remove and re-compact the fill until specified densities are achieved. Compaction test shall be performed for each fifty linear feet of trench.
- H. Provide a 4-inch thick (minimum) layer of 3/4-inch No. 4 gravel aggregate bedding beneath all buried piping. Bedding shall be compacted and leveled to provide sloping required.
- I. Tests for displacement of sewers: After the trench has been backfilled to 2 feet or more above the pipe, if the pipe shows poor alignment, displaced pipe, or any other defects, such defects shall be remedied by the Contractor at his expense.

3.6 EQUIPMENT START-UP AND TESTING

A. Instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment. During the operating tests, prove the operation of each item of equipment to the satisfaction of the Engineer. Give at least seven (7) days notice to the Engineer of equipment start-up and operating tests.

3.7 CATALOG DATA FOR OWNER

- A. Provide, in looseleaf binders, two (2) sets of a compilation of catalog data of each manufactured item of equipment used in the mechanical work and present this compilation to the Owner/Architect for transmittal to the Owner before final payment is made. Include descriptive data and printed installation, operating and maintenance instructions for each item of equipment. Provide a complete double index as follows:
 - 1. Listing of products alphabetically by name.

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- 2. Listing the names of manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the names and addresses of the local sales representatives.
- 3. Certificates of Final Inspections.
- 4. Complete spare parts data with current prices and supply sources.
- 5. Extended warranties.
- B. Deliver to the Owner all special tools, lubricants, extra materials and any other products necessary for the proper operation and maintenance of the mechanical and plumbing systems.
- C. Provide project record documents indicating all changes from contract documents made during construction.
- D. Submit all Certificates of Final Inspections from the Administrative Authorities.
- E. Submit TAB reports on approved forms. Final TAB report submittals shall include all required rebalances if any are required.

3.8 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. Instruct the representative of the Owner in the proper operation and maintenance of all elements of the mechanical system.

3.9 PROTECTIVE COATINGS

A. Paint exterior surfaces of steel piping run in or through concrete floor fill, under tile floors or underground, and aluminum surfaces in contact with masonry, with one coat of acid resisting bituminous base paint.

3.10 TEST AND ACCEPTANCE

- A. Water Piping System: Test with water at 100 psi for one (1) hour or with available city water pressure for twenty-four (24) hours to prove tight and free from leaks.
- B. Plumbing and Drainage System: Test the new system humidity and drain piping with water and prove tight. Test system with 10 feet of water for 24 hour period. Air test is not permitted.
- C. Storm Drainage System: Test storm drainage system with 10 feet of water for a 24hour period. If approved by the administrative authority and there is proof that no site water is available, an air test of 5 pounds for 24 hours without introduction of

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additional air may be used. The air test shall be conducted with a three-inch gage with a maximum scale of 100 psig. This test applies to new storm drains connecting to existing storm drain system. Any failures to the existing storm drain system shall be brought to the attention of the administrative authority prior to the completion of the installation.

3.11 NOISE CONTROL

A. It is intended that the mechanical systems as installed under this contract be free from objectionable noise when the system is operating. The system shall operate at noise levels below criteria recommended for the application by ASHRAE. Provide vibration isolation accessories and isolate equipment, pipeline, ductwork, etc., as required so as to insure an acceptable noise level in all of the mechanical systems.

3.12 CLEANING AND ADJUSTING

A. Do not allow waste material and rubbish to accumulate in or above the premises. After completion of this work, remove rubbish, tools, scaffolding and surplus materials from and about the building and leave all work clean and ready for use. Clean all equipment, pipes, valves and fittings of grease, metal cuttings and sludge. Repair any stoppage, discoloration or other damage to parts of the building, its finish or furnishings due to failure to properly clean the mechanical systems, without additional cost to the Owner. Adjust all automatic control devices for proper operation.

3.13 SYSTEM OPERATING TESTS

- A. After the successful completion of all equipment start-up and test requirements, perform the following tests on the complete mechanical systems:
 - 1. First Operating Test by Contractor: Prove the operation of the mechanical systems and of each individual item in the systems. Give at least 10 days prior notice to the Engineer of such tests. Adjust and set proper quantities to all items and equipment. Should any item of the systems fail to perform in an approved manner, repeat this test until approved by the Engineer. During this test, balance circulation of heating and cooling water to balancing cocks, valves, thermostats and similar Items to insure that the mechanical systems perform as intended.
 - 2. Checking by Owner and Engineer: Following the successful completion of first operating tests by the Contractor, the Owner and the Engineer have the privilege of making such tests as they may desire during a period of three weeks to ascertain in detail if any corrections are to be made to the system. At the end of

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the testing by the Owner and the Engineer, the Engineer may direct the Contractor in writing to make such corrections to the systems as are within the scope of the contract.

- 3. Contractor's Corrections to Systems: Make all required corrections to the systems and notify the Engineer in wiring that the corrections outlined have been completed. Give at least seven (7) days notice of a final three-day operating test.
- 4. Three-Day Operating Test: Perform an operating test to the satisfaction of the Engineer for a period of three (3) days. Should any element of the systems not perform properly, make all required corrections and repeat the test until successfully performed.
 - a. Submit the Form of Record proposed by the Contractor for the recording of all measurements to the Engineer for approval at least two weeks before the approved form will be required by the Contractor.
 - b. Measurements: Make the following measurements at two-hour intervals (5 measurements per 8-hour day) during the three-day operating test.
 - 1) Electrical: Running amperes and voltage of each motor 3/4 horsepower or larger.
 - 2) Air temperatures in each heated or air conditioned space and outdoor temperatures.
 - c. Instruments: Provide all instruments, materials and labor to perform the tests and to obtain and record the measurements specified herein, including the furnishing of all required record forms as approved by the Engineer. Submit for the Engineer's approval, complete shop drawings or catalog data for all instruments to be used for the three day operating test and obtain approval at least two weeks before the instruments will be required for test measurements.
 - d. Report: Submit four (4) copies of a written report of the three-day operating test on the approved Form of Record to the Engineer for approval and subsequent transmittal to the Owner.

3.14 MOTOR CONTROL

A. General: Provide each motor 1/8 horsepower or larger with a suitable controller and devices that will perform the functions as specified for the respective motors, together with manual reset thermal overload, protection in each undergrounded conductor.

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Provide the controller either integral with circuit protective device or mounted in separate enclosure. Starters shall be Allen-Bradley, G.E., Westinghouse, Square D or approved equal.

- Control: Automatic control devices such as thermostats, float or pressure switches B. may control the starting and stopping of motor directly, provided the device used is designated for that purpose and has an adequate horsepower rating. When automatic control device does not have such a rating, use a magnetic starter with the automatic control device actuating the pilot control circuit. When combination manual and automatic control is specified and the control device operates the motor directly, provide a manual motor starter and selector switch. When combination manual and automatic control is specified and the automatic control device actuates the pilot control circuit, a magnetic control device actuates the pilot control provided. Provide all magnetic starters with push buttons or selector switches in the covers. Provide connections to the selector switch such that only the normal automatic regulating control devices will be bypassed when the switch is in the manual position. Connect all safety control devices, such as low or high pressure cutouts, high temperature cutouts and motor overload protective devices in the motor control circuit in both the manual and automatic positions of the selector switch control circuit. Make connections to any selector switch or to more than one (1) automatic regulatory control device in accordance with wiring diagrams recommended by the manufacturer and approved by the Engineer. Where required for manual control, provide pushbutton stations consisting of two (2) momentary contact operators, 600 volts, 10 amperes installed and wired for three wire control to provide under-voltage relays, auxiliary contacts or other devices required for a complete system.
- C. Location: Where the controller is located within sight of the motor driven equipment (fifty feet or less), the controller and circuit protective device shall be capable of being locked in the open position. Where the controller is located out of sight of the motor driven equipment (more than fifty feet) provide a non-fused safety disconnect, suitable for the service, and which opens all ungrounded conductors simultaneously, at or on the motor driven equipment.
- D. Enclosure: Enclosure to be general purpose, NEMA Type 1 unless noted otherwise (NEMA Type 1 gasketed). The circuit breaker shall be operable by hand from outside the enclosure and shall be so interlocked with the door or doors that it must be returned to the "OFF" position before the door can be opened.
- E. Push-buttons: Provide maintained contact, standard duty type in a general purpose, NEMA Type 1 enclosure for surface mounting rated for 10 amperes continuous at 600 volts or less.

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3.15 ACCESS PANELS

A. Provide access panels as required in all walls, ceilings and ductwork to service and have access to all valves, and other operating parts. For all ceiling and wall access doors that are required in gypsum board and plaster, provide minimum 24" x 24", Milcor type appropriate for the construction involved. Contractor shall provide all access doors as required to provide adequate access.

3.16 FINALLY

A. It is the intention that this specification shall provide a complete installation except as herein before specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

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SECTION 22 05 13

MOTORS FOR MECHANICAL EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Applications.
- B. Single phase electric motors.
- C. Three phase electric motors.

1.2 RELATED REQUIREMENTS

- A. Division 26 Equipment Wiring: Electrical characteristics and wiring connections.
- B. Section 26 28 18 Motor and Circuit Disconnects.
- C. Section 26 05 73 Overcurrent Protective Devices.

1.3 REFERENCE STANDARDS

- A. ABMA STD 9 Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B. NEMA MG 1 Motors and Generators; 2014.
- C. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- 1.4 SUBMITTALS
 - A. See Section 22 01 00 General Plumbing Provisions, for submittal procedures.
 - B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
 - C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
 - D. Operation Data: Include instructions for safe operating procedures.
 - E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

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1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for commercial use, and their accessories, with minimum five years documented product development, testing, and manufacturing experience.
- B. Conform to NFPA 70.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.7 WARRANTY

A. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Baldor Electric.
- B. Lincoln Motors.
- C. A. O. Smith Electrical Products Company.
- D. Magnetek.
- E. Reliance Electric/Rockwell Automation.
- F. Substitutions: See Section 22 01 00 General Plumbing Provisions.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service: Refer to Division 26 for required electrical characteristics.
- B. Electrical Service:
 - 1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
 - 2. Motors Larger than 1/2 Horsepower: 460 volts, three phase, 60 Hz.

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- C. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 40 degrees C environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 - 4. Motors with frame sizes 254T and larger: Energy Efficient Type.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- E. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 APPLICATIONS

- A. Single phase motors for centrifugal pumps: Split phase type.
- B. Single phase motors for pumps: Capacitor start, capacitor run type.
- 2.4 APPLICATIONS
 - A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
 - B. Motors located outdoors: Totally enclosed weatherproof epoxy-sealed type.
- 2.5 SINGLE PHASE POWER SPLIT PHASE MOTORS
 - A. Starting Torque: Less than 150 percent of full load torque.
 - B. Starting Current: Up to seven times full load current.
 - C. Breakdown Torque: Approximately 200 percent of full load torque.

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- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.6 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitorrun motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated ball bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

PART 3 EXECUTION

4.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

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C. Check line voltage and phase and ensure agreement with nameplate.

4.2 SCHEDULES

- A. NEMA Open Motor Service Factors.
 - 1. 1/6-1/3 hp:
 - a. 3600 rpm: 1.35.
 - b. 1800 rpm: 1.35.
 - c. 1200 rpm: 1.35.
 - d. 900 rpm: 1.35.
 - 2. 1/2 hp:
 - a. 3600 rpm: 1.25.
 - b. 1800 rpm: 1.25.
 - c. 1200 rpm: 1.25.
 - d. 900 rpm: 1.15.
 - 3. 3/4 hp:
 - a. 3600 rpm: 1.25.
 - b. 1800 rpm: 1.25.
 - c. 1200 rpm: 1.15.
 - d. 900 rpm: 1.15.

END OF SECTION

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SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

- 1.1 SECTION INCLUDES
 - A. Nameplates.
 - B. Tags.
 - C. Stencils.
 - D. Pipe Markers.
 - E. Ceiling tacks.

1.2 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

- A. ASME A13.1 Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

1.4 SUBMITTALS

- A. See Section 22 01 00 General Plumbing Provisions, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Valve Schedule: Schedule of wording, symbols, letter size, and color coding for valve identification. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals as specified in Division 1.
- D. Product Data: Provide manufacturers catalog literature for each product required.

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- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

- 2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE
 - A. Pipe Markers: 3/4 inch diameter and higher.
- 2.2 IDENTIFICATION APPLICATIONS
 - A. Automatic Controls: Tags. Key to control schematic.
 - B. Piping: Pipe markers.
 - C. Pumps: Nameplates.
 - D. Small-sized Equipment: Tags.
 - E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.3 NAMEPLATES

- A. Manufacturers:
 - 1. Kolbi Pipe Marker Co.
 - 2. Seton Identification Products.
 - 3. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/2 inch.
 - 3. Background Color: Black.
 - 4. Plastic: Conform to ASTM D709.
- 2.4 TAGS
 - A. Manufacturers:
 - 1. Advanced Graphic Engraving.

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- 2. Brady Corporation.
- 3. Kolbi Pipe Marker Co.
- 4. Seton Identification Products.
- 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.5 STENCILS

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Kolbi Pipe Marker Co.
 - 3. Seton Identification Products.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Stencils: With clean cut symbols and letters of following size:
 - 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
 - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
- C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

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2.6 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Kolbi Pipe Marker Co.
 - 3. MIFAB, Inc.
 - 4. Seton Identification Products.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- F. Color code as follows:
 - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
 - 2. Fire Quenching Fluids: Red with white letters.
 - 3. Toxic and Corrosive Fluids: Orange with black letters.
 - 4. Flammable Fluids: Yellow with black letters.
 - 5. Combustible Fluids: Brown with white letters.

2.7 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark.
 - 2. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Description: Steel with 3/4 inch diameter color coded head.

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- C. Color code as follows:
 - 1. Green Plumbing valves.
 - 2. Blue Heating/cooling valves.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 22 07 19

PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

- A. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- C. ASTM C195 Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).
- D. ASTM C449 Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).
- E. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- F. ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).
- G. ASTM C534/C534M Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- H. ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- I. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

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- J. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- K. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

1.4 SUBMITTALS

- A. See Section 22 01 00 General Plumbing Provisions, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than five years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
- B. Deliver material to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness.

1.7 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.
- C. Perform work at ambient and equipment temperature as recommended by the adhesive manufacturer.

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PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER

- A. Manufacturers:
 - 1. Knauf Insulation.
 - 2. Johns Manville Corporation.
 - 3. Owens Corning Corp.
 - 4. CertainTeed Corporation.
 - 5. Armstrong World Industries, Inc.
 - 6. Rubatex Corp.
 - 7. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Insulation: ASTM C547 ; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 650 degrees F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive:
 - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
 - 1. ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:

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- 1. Cloth: Untreated; 9 oz/sq yd weight.
- 2. Blanket: 1.0 lb/cu ft density.
- 3. Weave: 5x5.
- H. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- I. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Outdoor Breather Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Insulating Cement:
 - 1. ASTM C449/C449M.

2.3 CELLULAR GLASS

- A. Manufacturers:
 - 1. Pittsburgh Corning Corporation.
 - 2. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Insulation: ASTM C 552.
 - 1. 'K' value: 0.37 at 100 degrees F.
 - 2. Service Temperature: Up to 900 degrees F.
 - 3. Water Vapor Permeability: 0.005 perm inch.
 - 4. Water Absorption: 0.2 percent by volume, maximum.

2.4 HYDROUS CALCIUM SILICATE

- A. Manufacturers:
 - 1. Johns Manville Corporation.

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- 2. PABCO.
- 3. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Insulation: ASTM C533 and ASTM C795; rigid molded, asbestos free, gold color.
 - 1. 'K' value: 2 and C518; 0.40 at 300 degrees F, when tested in accordance with 2 or 1.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Insulating Cement:
 - 1. ASTM C449/C449M.

2.5 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
 - 1. Armacell International.
 - 2. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 2; use molded tubular material wherever possible.
 - 1. 'K' value: ASTM C 177; 0.27 at 75 degrees F.
 - 2. Maximum Moisture Absorption Pipe Insulation: 3.5 percent, by weight, when tested in accordance with ASTM D 1056.
 - 3. Maximum Moisture Absorption Sheets: 6.0 percent, by weight, when tested in accordance with ASTM D 1056.
 - 4. Water Vapor Permeability: 0.20 perm-inches, when tested in accordance with ASTM E 96.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
 - 1. Air dried, contact adhesive, compatible with insulation.

2.6 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:

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- a. Johns Manville Corporation.
- b. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 15 mil.
 - e. Connections: Pressure sensitive color matching vinyl tape.
- 3. Covering Adhesive Mastic:
 - a. Compatible with insulation.
- B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
 - 1. Lagging Adhesive:
 - a. Compatible with insulation.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Embossed.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

- 3.1 EXAMINATION
 - A. Verify that piping has been tested before applying insulation materials.
 - B. Verify that surfaces are clean and dry, with foreign material removed. 22 07 19-6

C. Repair all insulation that is damaged during construction using the same materials.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with selfsealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. Inserts and Shields:
 - 1. Application: Piping 1 inch diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

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- J. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- K. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.3 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 2 inch and under: 1 inch thickness.
 - 2) Pipe Size Range: 2-1/2 inch and larger: 1-1/2 inch thickness.
 - 3) Thickness: 1/2 inch (in interior walls).
 - 2. Domestic Cold Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 2 inch and under: 1 inch thickness.
 - 2) Pipe Size Range: 2-1/2 inch and larger: 1 inch thickness.
 - 3) Thickness: 1/2 inch (in interior walls).
 - 3. Roof Drainage Above Grade:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: all sizes.
 - 2) Thickness: 1 inch.
 - 4. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.

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- 2) Thickness: 1 inch.
- 5. Sanitary Piping Above Ceilings:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: all sizes.
 - 2) Thickness: 1 inch.
- B. Cooling Systems:
 - 1. Condensate Drains from Cooling Coils: 1/2 inch thickness; flexible elastomeric cellular insulation.
 - 2. Refrigerant Suction: 3/4 inch thickness; flexible elastomeric cellular insulation.
 - 3. Refrigerant Hot Gas: 3/4 inch thickness; flexible elastomeric cellular insulation.
- C. Other Systems:
 - 1. Piping Exposed to Freezing with Heat Tracing: 1-1/2 inch thickness; glass fiber insulation

END OF SECTION

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SECTION 22 10 05

PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Storm water.
 - 4. Flanges, unions, and couplings.
 - 5. Pipe hangers and supports.
 - 6. Valves.
 - 7. Gas.
- 1.2 RELATED REQUIREMENTS
 - A. Section 22 01 00 General Plumbing Provisions.
 - B. Section 22 05 53 Identification for Plumbing Piping and Equipment.
 - C. Section 22 07 19 Piping Insulation.

1.3 REFERENCE STANDARDS

- A. ANSI Z21.22 American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
- B. ASME B16.3 Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- C. ASME B16.4 Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- D. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E. ASME B16.22 Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- F. ASME B16.26 Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

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- G. ASME B31.1 Power Piping; 2024.
- H. ASME BPVC-IV Boiler and Pressure Vessel Code, Section IV Rules for Construction of Heating Boilers; 2023.
- I. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- J. ASTM A74 Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
- K. ASTM A234/A234M Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
- L. ASTM B32 Standard Specification for Solder Metal; 2020.
- M. ASTM B42 Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.
- N. ASTM B68/B68M Standard Specification for Seamless Copper Tube, Bright Annealed; 2019.
- O. ASTM B75/B75M Standard Specification for Seamless Copper Tube; 2011.
- P. ASTM C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- Q. ASTM D2680 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2020.
- R. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.
- S. ASTM D2846/D2846M Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.
- T. ASTM D2855 Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.
- U. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.
- V. ASTM D3517 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe; 2019.

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- W. ASTM F437 Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2021.
- X. AWWA C105/A21.5 Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- Y. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.
- Z. AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service; 2020.
- AA. CISPI 301 Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- BB. CISPI 310 Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- CC. MSS SP-58 Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- DD. MSS SP-67 Butterfly Valves; 2022.
- EE. MSS SP-71 Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- FF. MSS SP-78 Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.
- GG. NFPA 54 National Fuel Gas Code; National Fire Protection Association; 2012.
- 1.4 SUBMITTALS
 - A. See Section 22 01 00 General Plumbing Provisions, for submittal procedures.
 - B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
 - C. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Arkansas, city of Bentonville,, standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

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- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of Arkansas and city of Bentonville, Arkansas plumbing code.
- B. Conform to city of Bentonville, Arkansas code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.

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2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets.
- B. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- 2.3 SANITARY SEWER PIPING, ABOVE GRADE
 - A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets.
 - B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
 - C. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - D. In Plenum-rated Areas:
 - 1. Cast iron.

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a. Fittings: Cast iron.

2.4 WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn type "K".
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B 32, alloy Sn95 solder.
- B. PVC SDR 21: pipe shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- 2.5 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING
 - A. Copper Pipe: ASTM B42, hard drawn type "K".
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: AWS A5.8M/A5.8, BCuP copper/silver braze.
- 2.6 WATER PIPING, ABOVE GRADE
 - A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
- 2.7 STORM WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING
 - A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets.
 - B. PVC Pipe: ASTM D 2729.
 - 1. Fittings: PVC.

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2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.8 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D 2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- 2.9 STORM WATER PIPING, ABOVE GRADE
 - A. Cast Iron Pipe in Fire Rated Assemblies Only: ASTM A 74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets.
 - B. Cast Iron Pipe in Fire Rated Assemblies Only: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
 - C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - D. In Fire-rated Walls:
 - 1. Cast iron.
 - a. Fittings: Cast iron.

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- E. In Plenum-rated Areas:
 - 1. Cast iron.
 - a. Fittings: Cast iron.

2.10 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
 - 2. Joints: ASME B31.1, welded.
- B. Polyethylene Pipe: ASTM D2513, SDR 11.
 - 1. Fittings: ASTM D2683 or ASTM D2513 socket type.
 - 2. Joints: Fusion welded.
- 2.11 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING
 - A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
 - 2. Fittings: ASTM A 234/A 234M, forged steel welding type.
 - 3. Joints: ASME B31.1, welded.
 - 4. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
- 2.12 NATURAL GAS PIPING, ABOVE GRADE
 - A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, forged steel welding type.
 - 3. Fittings: Press-connect fittings listed in accordance with ANSI LC4/CSA 6.32 and 125 psig pressure rated.

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- a. Press-connect fittings approved manufacturers:
 - 1) Viega MegaPressG.
 - 2) Pre-approved manufacturers.
- 4. Joints: NFPA 54, threaded or weldesd to ASME B31.1.
- 5. All gas piping over 2 inches in diameter shall be welded or press-connect.

2.13 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- E. Victaulic Devices:
 - 1. Couplings shall consist of a one or more piece ductile or malleable iron cast housing, a synthetic rubber gasket of a central cavity pressure-responsive design, with nuts, bolts, locking toggle or luggs to secure unit together.
 - a. Coupling housings shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12) or malleable iron conforming to ASTM A-47 (Grade 32510), hot dip galvanized to ASTM A-153, or zinc electroplated to ASTM

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B-633, as manufactured by Victaulic Company of America. Refer to Victaulic product specifications for other materials.

- b. Coatings shall consist of an alkyd enamel paint, or hot-dip galvanizing to ASTM A-153, or zinc electroplating to ASTM B-633, as specified.
- 2. Couplings for grooved end steel pipe shall be Victaulic couplings for grooved end steel pipe.
 - a. Line, fittings and valve joints shall be Victaulic flexible (styles 75, 77, 78, or 791) or rigid (styles 005, 07 or HP-70).
 - b. Rigid joints shall be Victaulic style 07 "Zero-Flex", style HP-70 or style 005 "FireLock" couplings.
 - c. Pin assembled joints shall be Victaulic style 791 "Vic-Boltless" couplings.
 - d. Reducing joints shall be Victaulic style 750 Reducing Couplings for pipe to pipe joints or to create reducing fittings using straight fitting configurations.
 - e. Outlets: All joints designated Outlet Couplings, or where feasible to replace reducing outlet tees, shall be Victaulic style 72 Outlet Couplings (specify grooved, female or male threaded outlet).
 - f. Flanged Connections shall be Victaulic style 741 (2-24") "Vic-Flange" adapters, engaging directly into grooved pipe and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components or style 743 (2-12") for ANSI Class 300 flanged components; installer to supply standard flange bolts.
 - g. Quick disconnects shall be Victaulic style 78 "Snap-Joint" Couplings or style 780/781 for double grooved pipe.
- 3. Gasket shall be molded of synthetic rubber in a central cavity, pressure-responsive configuration conforming to the pipe outside diameter and coupling housing, of elastomers having properties as designated in ASTM D-2000. Reference shall always be made to the latest published Selection Guide for Victaulic Gaskets for proper gasket selection for the intended service.
 - a. Water service: Gasket supplied for water services from -30 degrees F to +230 degrees F, shall be a Grade "E" EPDM compound, with green color code, molded of materials conforming to ASTM D-2000, designation 2CA615A25B24F17Z, recommended for hot water service within the

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specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Not recommended for petroleum services.

- 4. Bolts and nuts shall be heat treated carbon steel, track head, conforming to physical properties of ASTM A-183 minimum tensile 110,000 psi, black, or zinc electroplated to ASTM B-633, as supplied or specified.
- 5. Fittings shall be Victaulic full flow cast fittings, steel fittings or segmentally welded fittings with grooves or shoulders designed to accept Victaulic grooved end couplings.
 - a. Standard fittings shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12), or malleable iron conforming to ASTM A-47, Grade 32510, painted with alkyd enamel or hot-dip galvanized to ASTM A-153 or zinc electroplated to ASTM B-633 or cadmium plated to ASTM A-165 as required.
 - b. Standard steel fittings including large size elbows (16-24") shall be forged steel conforming to ASTM A-234 Grade WPB (0.375" wall), painted with alkyd enamel or hot-dip galvanized to ASTM A-153.
- 6. Branch outlets for hole cut steel pipe shall be Victaulic hole cut products.
- 7. Branch outlets shall be made with Victaulic style 920, 921 or 929 "Mechanical-T" branch connections with locating collar or foot engaging into hole. (Specify outlet/branch connection type grooved, female threaded or FIT, as available.)
- Sprinkler head connections: Branch connections, direct sprinkler head connections, drop nipples and sprigs shall be made with Victaulic style 922 "Hooker" outlet connections with locating collar engaging into hole, assembled with standard plated breakaway head bolt (specify 1/2, 3/4 or 1" female threaded outlet).
- 9. Gauge, meter outlets for hole cut steel pipe shall be Victaulic strapless mechanical outlet products style 923 "Vic-Let" or 924 "Vic-O-Well" and shall provide a pipe outlet without a need for a strap or lower housing to wrap around the pipe.
- 10. Flow indicators for hole cut steel pipe shall be Victaulic style 736 Waterflow Indicators for wet sprinkler systems, to sense water flow to 10 GPM or greater.
- 11. Fittings for plain end steel pipe shall be Victaulic FIT fittings (sizes 1", 1 1/4", 1 1/2" and 2") with internal pipe stop for uniform takeout dimensions, 1/4-turn positive locking lugs of heat treated carbon steel conforming to AISI C-1022,

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cadmium plated, with externally locked-position indicator for inspection or connection of plain end steel pipe. FIT fittings shall have self-contained, pressure responsive gaskets: for water service (-30 degrees to +230 degrees F) Grade "E"; FIT silicone Grade "L" (-30 degrees to +160 degrees F) are recommended for fire protection dry systems, all systems operating below 0 degrees F, plus dry heat, air without hydrocarbons, certain chemical services and water to +160 degrees F. FIT Nitrile gaskets Grade "T" (0 degrees to +180 degrees F) are recommended for petroleum products, hydrocarbons, air without hydrocarbons, except hot dry air over +140 degrees F, vegetable and mineral oils within the specified temperature range. Not recommended for hot water services.

- 12. Reducing outlet tees shall be Victaulic FIT style 96 with female threaded outlet (specify 1/2, 3/4 or 1" outlet) for direct sprinkler head, sprig or drop nipple connections.
- 13. 90 degree elbows shall be Victaulic FIT style 969.
- 14. FIT Outlet/Mechanical-T shall be Victaulic FIT style 929 with FIT locking lug branch outlet (specify 1 1/4, 1 1/2 or 2" outlet) for direct branch connections.
- 15. Straight tees shall be Victaulic FIT style 963.
- 16. Straight couplings shall be Victaulic FIT style 960.
- 17. Reducing elbows shall be Victaulic FIT style 966 with female threaded outlet (specify 1/2, 3/4, or 1" outlet) for direct sprinkler head, sprig or drop nipple connections.

2.14 MECHANICALLY FORMED TEE FITTINGS

- A. Mechanically extracted outlets shall have a height not less than three times the thickness of the branch tube wall.
- B. Branch tubes shall not restrict the flow in the main tube. Mechanical Contractor shall insure the branch tube penetration into the collar is of the correct depth.
- C. Mechanically formed tee fittings shall be cleaned and brazed with filler material conforming to AWS A5.8.

2.15 PRESS FITTINGS

A. Fittings shall comply with NSF 61, CSA, UPC and be approved by the local jurisdiction. Wrot copper press fittings shall be made from commercially pure copper mill products per ASTM B 75 Alloy C12200. Cast copper alloy press fittings shall be

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made from materials with a minimum of 78% copper and a maximum of 15% zinc. The press fittings connections shall be compatible with seamless K, L or M copper tube made to ASTM B 88. Fittings shall have a maximum non-shock working pressure of 200 PSI between the temperatures of -20°F and +250°F. Elastomeric seals shall be made of EPDM material, and the fittings shall be manufactured with an inboard bead design. All fittings shall be installed in accordance with the manufacturer's installation instructions and according to local plumbing and mechanical codes. The press-to-connect joint shall be made with pressing tools and jaw sets recommended and authorized by press fitting manufacturer.

2.16 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
- B. Plumbing Piping Drain, Waste, and Vent:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping Water:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.

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- 3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- 4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
- 5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
- 6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
- 7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
- 8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- 9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- 10. Vertical Support: Steel riser clamp.
- 11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- 12. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
- 13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.17 GATE VALVES

- A. Manufacturers:
 - 1. Conbraco Industries.
 - 2. Nibco, Inc.
 - 3. Milwaukee Valve Company.
 - 4. Crane Co.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Up To and Including 2 1/2 Inches:
 - 1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

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- C. 3 Inches and Larger:
 - 1. MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.18 GLOBE VALVES

- A. Manufacturers:
 - 1. Conbraco Industries.
 - 2. Nibco, Inc.
 - 3. Milwaukee Valve Company.
 - 4. Crane Co.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Up To and Including 2 1/2 Inches:
 - 1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.
- C. 3 Inches and Larger:
 - 1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.19 BALL VALVES

- A. Manufacturers:
 - 1. Conbraco Industries.
 - 2. Nibco, Inc.
 - 3. Milwaukee Valve Company.
 - 4. Crane Co.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box

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ring, blow-out proof stem, lever handle, threaded ends with union.

2.20 PLUG VALVES

- A. Manufacturers:
 - 1. Conbraco Industries.
 - 2. Nibco, Inc.
 - 3. Milwaukee Valve Company.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Construction 2-1/2 Inches and Larger: 1, 250 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.21 BUTTERFLY VALVES

- A. Manufacturers:
 - 1. Hammond Valve.
 - 2. Crane Co.
 - 3. Milwaukee Valve Company.
 - 4. Stockham.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, elastomer coated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 6 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.22 FLOW CONTROLS

- A. Manufacturers:
 - 1. ITT Bell & Gossett.
 - 2. Griswold Controls.

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- 3. Taco, Inc.
- 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi psi.

2.23 SPRING LOADED CHECK VALVES

- A. Manufacturers:
 - 1. Hammond Valve.
 - 2. Crane Co.
 - 3. Milwaukee Valve Company.
 - 4. Stockham.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.24 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
 - 1. Amtrol Inc.
 - 2. Cla-Val Co.
 - 3. Watts Regulator Company.
 - 4. Spence Engineering Co.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Up to 2 Inches:
 - 1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

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- C. Over 2 Inches:
 - 1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.25 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.26 RELIEF VALVES

- A. Pressure Relief:
 - 1. Manufacturers:
 - a. Cla-Val Co.
 - b. Henry Technologies.
 - c. Watts Regulator Company.
 - d. Spence Engineering Co.
 - e. Substitutions: See Section 22 01 00 General Plumbing Provisions.
 - 2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.
- B. Temperature and Pressure Relief:
 - 1. Manufacturers:
 - a. Cla-Val Co.
 - b. Henry Technologies.
 - c. Watts Regulator Company.
 - d. Spence Engineering Co.
 - e. Substitutions: See Section 22 01 00 General Plumbing Provisions.
 - 2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

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2.27 STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc.
 - 2. Green Country Filtration.
 - 3. WEAMCO.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Size 1-1/2 inch to 4 inch:
 - 1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.
- C. Size 5 inch and Larger:
 - 1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

- 3.1 EXAMINATION
 - A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

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- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.
- G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- H. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- P. Install water piping to ASME B31.9.
- Q. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- R. Sleeve pipes passing through partitions, walls and floors.
- S. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

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- 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- T. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Provide hangers adjacent to motor driven equipment with vibration isolation.
 - 10. Support cast iron drainage piping at every joint.
- U. Where water pressure within the building exceeds 75 psi static, install an approved water-pressure reducing valve conforming to ASSE 1003 with strainer to reduce the building pressure to 75 psi static or less.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

22 10 05-21

- E. Install globe valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide ball valves in natural gas systems for shut-off service.
- I. Provide flow controls in water recirculating systems where indicated.
- J. All sanitary waste and vent pipe installed above grade in fire-rated walls, fire-rated plenum spaces or return air plenums shall be cast iron.

3.5 TOLERANCES

- A. Drainage Piping: Maintain invert elevations within 1/4 inch vertically of location indicated on drawings. Slope to drain at minimum of 1/4 inch per foot slope for pipes 3 inch and smaller and 1/8 inch per foot slope for pipes larger than 3 inch.
- B. Contractor must maintain inverts as indicated on the drawings. The contractor shall employ the latest precision technology available to insure the accuracy of the installation. If the contractor is unable to maintain, the contractor should notify the engineer IMMEDIATELY to obtain direction.
- C. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Arkansas state and local codes.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

22 10 05-22

- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Connection of dissimilar pipe materials shall be made with the specified adapter couplings.
- C. Sewers shall be encased or cradled in concrete where shown on the plans or as directed by the Engineer. Unless otherwise noted on the plans, concrete encasement shall encircle the pipe and shall be a minimum thickness of four inches.
- D. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 5 psi. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.
- E. Contractor shall connect to existing gas service in accordance with the requirements of local gas service official and all applicable municipal and state regulations. All gas piping shall conform to and be tested in accordance with the local gas company and the Standard Gas Code. Gas piping shall have cathodic protection and all piping subject to natural gas pressure over 15 ounces must be welded. Any charge made by the gas company for placing the valves, piping, and connection to service main shall be borne by this contractor. See plans for extent of piping.
- F. This Contractor shall extend the system of gas piping, to the various outlets as indicated on plans, complete with stop ball valves, drip pockets, valves and other accessories that may be required to give proper and adequate service.
- G. Provide gas ball valves in final connection to all equipment. Unions will not be permitted, except in final connections to equipment. Proper reducing fittings shall be used. Bushings will not be accepted. Gas piping in building shall be standard weight schedule 40 black steel pipe with malleable fittings or approved press-connect fittings, unless contractor wishes to weld all joints. Welded rod shall be of same material as piping. No. 22 bronze welding will be permitted.

22 10 05-23

- H. All underground gas service exterior to the building (5 psi or less) shall be a polyethylene plastic pipe manufactured in accordance with ASTM No. D-2517 or D-2513 and shall be indicated on the pipe. Gas piping shall be laid at least 36" below grade at all points. Provide a #12 THN copper wire in trench with pipe and leave both ends exposed for future accessibility.
- I. All gas piping in ground, including service, shall be checked with a "Holiday" detector to assure that the coating is free of holes, voids, contamination, cracks, etc. This test shall be performed after the completion of joint and finish coating and touch-up. This test shall be conducted in the presence of the Owner's inspector and performed by experienced personnel.
- J. For corrosion protection, all underground steel pipe and fittings must be coated and wrapped.
- K. Test all gas piping operating at 6 oz. with air pump and mercury gauge to pressure that will maintain 25 psig for 20 minutes and inspected by gas service official.
- L. All gas piping operating at more than 1 psig shall be tested at 100 psig for steel and 50 psig for plastic, for a minimum of 15 minutes and inspected by gas service official.
- M. The pressure regulator at the building shall be sized, and approved by gas service official.
- N. All above ground piping shall be rigid steel pipe designated for natural gas use. Pipe shall be painted with a rust inhibiting primer and a final coat the color of which shall be determined by governing regulations or as directed by the Engineer if no governing regulations exist regarding finish color.
- O. All gas piping systems within a building and other above ground gas piping shall be electrically continuous and bonded to a grounded electrode as defined in NFPA 70.
- P. Medium and high pressure gas regulators installed in the medium and high pressure gas lines (2 psi or greater) shall comply with the following provisions:
 - 1. Shall be suitable for the inlet and outlet gas pressure.
 - 2. Shall comply with Code and gas official requirements.
 - 3. Shall be accessible for servicing.
 - 4. Shall be vented to outdoors when located indoors.

22 10 05-24

- 5. Shall be installed in the gas piping system so that it cannot be concealed by building construction.
- Q. Provide a listed shut off valve immediately ahead of and immediately behind each medium pressure regulator.
- R. Underground gas piping shall be installed in a separate ditch.

3.8 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum hanger spacing: 8 ft.
 - 2) Hanger rod diameter: 1/4 inch.
 - b. Pipe size: 1-1/2 inches to 2 inches:
 - 1) Maximum hanger spacing: 8 ft.
 - 2) Hanger rod diameter: 1/4 inch.
 - c. Pipe size: 2-1/2 inches to 3 inches:
 - 1) Maximum hanger spacing: 8 ft.
 - 2) Hanger rod diameter: 3/8 inch.
 - d. Pipe size: 4 inches to 6 inches:
 - 1) Maximum hanger spacing: 8 ft.
 - 2) Hanger rod diameter: 3/8 inch.
 - e. Pipe size: 8 inches to 12 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 1/2 inch.
 - f. Pipe size: 14 inches and Over:
 - 1) Maximum hanger spacing: 10 ft.

22 10 05-25

- 2) Hanger rod diameter: 7/8 inch..
- 2. Plastic Piping:
 - a. All sizes:
 - 1) Maximum hanger spacing: 6 ft.
 - 2) Hanger rod diameter: 3/8 inch.
- 3. Roof Supports:
 - a. Provide gas piping roof supports as indicated on the plans.
 - b. Provide condensate piping roof supports as indicated on the plans.
- 4. Roof Piping Supports:
 - a. All sizes:
 - 1) Maximum linear pipe spacing: 10 ft.
 - 2) At all changes in direction.

END OF SECTION

22 10 05-26

SECTION 22 10 06

PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof and floor drains.
- B. Floor sink
- C. Cleanouts.
- D. Hose bibbs.
- E. Hydrants.
- F. Washing machine boxes and valves.
- G. Refrigerator valve and recessed box.
- H. Backwater valves.
- I. Backflow preventers.
- J. Water hammer arrestors.
- K. Thermostatic mixing valves.

1.2 RELATED REQUIREMENTS

- A. Section 22 10 05 Plumbing Piping.
- B. Section 22 40 00 Plumbing Fixtures.
- C. Section 22 30 00 Plumbing Equipment.

1.3 REFERENCE STANDARDS

- A. ASME A112.6.3 Floor Drains; 2022.
- B. ASSE 1011 Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- C. ASSE 1012 Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

22 10 06-1

- D. ASSE 1013 Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
- E. ASSE 1019 Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- F. ASSE 1047 Performance Requirements for Reduced Pressure Detector Backflow Prevention Assemblies; 2021.
- G. NSF 372 Drinking Water System Components Lead Content; 2022.
- H. PDI-WH 201 Water Hammer Arresters; 2017.

1.4 SUBMITTALS

- A. See Section 22 01 00 General Plumbing Provisions, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors _____.
- F. Operation Data: Indicate frequency of treatment required for interceptors.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Loose Keys for Outside Hose Bibbs: Four.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

22 10 06-2

PART 2 PRODUCTS

2.1 DRAINS

- A. Manufacturers:
 - 1. Josam Company.
 - 2. Jay R. Smith Manufacturing Company.
 - 3. Zurn Industries, Inc.
 - 4. Wade Tyler Pipe.
 - 5. Watts.
 - 6. Mifab.
 - 7. Substitutions: See Section 22 10 00 General Plumbing Provisions.

B. Roof Drains:

- 1. Assembly: ASME A112.6.4.
- 2. Body: Lacquered cast iron with sump.
- 3. Strainer: Removable cast iron dome with vandal proof screws.
- 4. Accessories: Coordinate with roofing type, refer to roof section.
 - a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
 - d. Waterproofing flange.
 - e. Controlled flow weir.
 - f. Leveling frame.
 - g. Adjustable extension sleeve for roof insulation.
 - h. Perforated or slotted ballast guard extension for inverted roof.
- C. Roof Overflow Drains:

22 10 06-3

- 1. Assembly: ASME A112.6.4.
- 2. Body: Lacquered cast iron with sump.
- 3. Strainer: Removable cast iron dome with vandal proof screws.
- 4. Accessories: Coordinate with roofing type, refer to roof section.
 - a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
 - d. Waterproofing flange.
 - e. Controlled flow weir.
 - f. Leveling frame.
 - g. Adjustable extension sleeve for roof insulation.
 - h. Perforated or slotted ballast guard extension for inverted roof.
 - i. Provide with 2" tall overflow dam where indicated on drawings.
- D. Downspout Nozzles and Boots:
 - 1. Bronze round with straight outlet.
 - 2. Cast iron coated rectangular downspout boot with no-hub outlet and securing strap.
 - 3. Ancher flange.
 - 4. 3/16" Type 304 stainless steel perforated birdscreen, on 1/4" centers 51% open area.
- E. Floor Drain:
 - 1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.
- F. Floor Sink:

22 10 06-4

1. Sqaure porcelain coated cast iron with hinged top, seepage pan, expoxy coated interior, aluminum dome strainer, clamp collar, removable perforated sediment bucket; and nickle bronze frame with full grate.

2.2 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company.
 - 2. Josam Company.
 - 3. Ward Manufacturing, Inc.
 - 4. Zurn Industries, Inc.
 - 5. Wade Tyler Pipe.
 - 6. Watts.
 - 7. Mifab.
 - 8. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Cleanouts at Exterior Surfaced Areas:
 - 1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Exterior Unsurfaced Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed tractortype cover.
- D. Cleanouts at Interior Finished Wall Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.
- F. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.3 HOSE BIBBS

A. Manufacturers:

22 10 06-5

- 1. Jay R. Smith Manufacturing Company.
- 2. Watts Regulator Company.
- 3. Zurn Industries, Inc.
- 4. Wade Tyler Pipe.
- 5. Woodford Manufacturing.
- 6. Prier
- 7. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Interior Hose Bibbs:
 - 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lockshield and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.4 HYDRANTS

- A. Manufacturers:
 - 1. Arrowhead Brass Company.
 - 2. Jay R. Smith Manufacturing Company.
 - 3. Zurn Industries, Inc.
 - 4. Wade Tyler Pipe.
 - 5. Woodford Manufacturing.
 - 6. Prier.
 - 7. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Wall Hydrants:
 - 1. ASSE 1052; freeze resistant, self-draining type with chrome plated lockable recessed box hose thread spout, lockshield and removable key, and integral vacuum breaker.
- C. Roof Hydrants:
 - 1. Hydrant shall be freeze proof, self draining, Woodford, Model SRH-MS, or equal.

22 10 06-6

- 2. Hydrant shall meet ASSE 1057
- 3. The hydrant shall be automatic draindown styl with no requirement for drainage. Hydrant shall operate on the venturi principle to evacuate the reservoir when operated.
- 4. Pedestal shall be minimum 24 inches tall and be insulated minimum R-8 thermocell insulation.
- 5. Provide vacuum breaker.
- 6. Provide under deck mounting frame.

2.5 WASHING MACHINE BOXES AND VALVES

- A. Box Manufacturers:
 - 1. Guy Gray Manufacturing.
 - 2. IPS Corporation/Water-Tite.
 - 3. Oatey.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Valve Manufacturers:
 - 1. Guy Gray Manufacturing.
 - 2. IPS Corporation/Water-Tite.
 - 3. Zurn Industries, Inc.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- C. Description: Painted metal preformed rough-in box with brass with wheel handles, socket for 2 inch waste, slip in finishing cover.

2.6 REFRIGERATOR VALVE AND RECESSED BOX

- A. Box Manufacturers:
 - 1. Guy Gray Manufacturing.
 - 2. IPS Corporation/Water-Tite.
 - 3. Oatey.

22 10 06-7

- 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Valve Manufacturers:
 - 1. Guy Gray Manufacturing.
 - 2. IPS Corporation/Water-Tite.
 - 3. Zurn Industries, Inc.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- C. Description: Painted metal preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.7 BACK WATER VALVES

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company; Model _____: www.jayrsmith.com/#sle.
 - 2. Savko Plastic Pipe & Fittings, Inc; Model _____: www.savko.com/#sle.
 - 3. Zurn Industries, Inc; Model _____: www.zurn.com/#sle.
 - 4. Substitutions: See Section 01 60 00 Product Requirements.
- B. Cast Iron Back Water Valves: ANSI A112.21.2M; lacquered cast iron body and cover, brass valve, extension sleeve, and access cover.
- C. Plastic Back Water Valves: ABS body and valve, extension sleeve, and access cover.

2.8 BACKFLOW PREVENTERS

- A. Manufacturers:
 - 1. Conbraco Industries.
 - 2. Valve Solutions, Inc.
 - 3. Watts Regulator Company.
 - 4. Zurn Industries, Inc.
 - 5. FEBCO.
 - 6. Substitutions: See Section 22 01 00 General Plumbing Provisions.

22 10 06-8

- B. Reduced Pressure Backflow Preventers:
 - 1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.9 WATER HAMMER ARRESTORS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company.
 - 2. Watts Regulator Company.
 - 3. Zurn Industries, Inc.
 - 4. Wade Tyler Pipe.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Water Hammer Arrestors:
 - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.10 MIXING VALVES

- A. Thermostatic Mixing Valves:
 - 1. Manufacturers:
 - a. ESBE.
 - b. Leonard Valve Company.
 - c. Watts.
 - d. Honeywell Water Controls.
 - e. Powers Process Controls.
 - f. Substitutions: See Section 22 01 00 General Plumbing Provisions.

22 10 06-9

- 2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
- 3. Valve: Copper plated body, combination with wall supports.
- 4. Accessories:
 - a. Check valve on inlets.
 - b. Volume control shut-off valve on outlet.
 - c. Stem thermometer on outlet.
 - d. Strainer stop checks on inlets.
- 5. Cabinet: 16 gage stainless steel, for surface mounting with keyed lock.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade. Refer to plans for detail.
- D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; flush valves, interior and exterior hose bibs.
- F. Pipe relief from backflow preventer to nearest floor drain or floor sink.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, washing machine outlets and water closets.

22 10 06-10

H. Install city approved backwater valve on all building sewers at the exterior of the building and prior to connection to the public sewer system.

END OF SECTION

22 10 06-11

SECTION 22 10 08

PLUMBING SOLDER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Lead-free plumbing solder.
- 1.2 RELATED SECTIONS
 - A. Section 22 10 05 Plumbing Piping.
 - B. Section 22 40 00 Plumbing Fixtures.
 - C. Section 22 30 00 Plumbing Equipment.

1.3 REFERENCES

- A. ASTM B 32 Standard Specification for Solder Metal; 1996.
- B. NSF 61 Drinking Water System Components Health Effects; 2002 (ANSI/NSF 61).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Taracorp/IMACO, Inc; 1690 Lowery Street, Winston-Salem, NC 27101-5603. ASD. Tel: (910) 777-8600 or (800) 334-5266, Fax: (800) 637 6697
- B. Substitutions: See Section 22 01 00 General Plumbing Provisions for equipment and material substitutions.
- C. Provide all plumbing solder from a single manufacturer.

2.2 MATERIALS

- A. Plumbing Solder: Sterling® solder or equal, ASTM B 32, Alloy Grade TC; 95 percent tin, 4.85 percent copper, 0.15 percent selenium.
 - 1. Certified to comply with NSF 61.
 - 2. Melting Temperature: 410 degrees F.
 - 3. Tensile Strength: 7,130 psi.

22 10 08-1

- 4. Shear Strength: 5,979 psi.
- 5. Elongation Percent: 19.1.
- 6. Brinell Hardness: 15.1.
- 7. Burst Strength: 5,800 psi.
- 8. Pressure/Temperature Test Data on Copper Tube Assemblies comprised of 3 inch, 2 inch, 1 inch, 3/4 inch, and 1/2 inch Tubing with a Reducing Tee:
 - a. No leaks at 70 degrees F., 200 psi, held for 2 minutes.
 - b. No leaks at 180 degrees F., 200 psi, held for 2 minutes.
 - c. No leaks at 70 degrees F., 2,000 psi, held for 5 minutes.
- B. No lead in plumbing solder.

PART 3 EXECUTION

- 3.1 INSTALLATION
 - A. Apply plumbing solder as required by other Sections of these Specifications.

END OF SECTION

22 10 08-2

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water heaters.
- B. Pumps.
 - 1. Circulators.

1.2 RELATED REQUIREMENTS

A. Division 26 - Equipment wiring; electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.
- B. ANSI Z21.10.3 Gas-Fired Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous; 2019.
- C. ASME BPVC-VIII-1 Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.
- D. NFPA 54 National Fuel Gas Code; National Fire Protection Association; 2006.
- E. NFPA 70 National Electrical Code; National Fire Protection Association; 2008.

1.4 SUBMITTALS

- A. See Section 22 01 00 General Plumbing Provisions, for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

22 30 00-1
- 4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
 - 1. Indicate heat exchanger dimensions, size of tappings, and performance data.
 - 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- C. Standards: Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. American Gas Association (AGA).
 - 2. National Sanitation Foundation (NSF).
 - 3. American Society of Mechanical Engineers (ASME).
 - 4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - 5. National Electrical Manufacturers' Association (NEMA).
 - 6. Underwriters Laboratories (UL).
- D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.6 CERTIFICATIONS

A. Water Heaters: NSF approved.

22 30 00-2

- B. Gas Water Heaters: Certified by CSA International to 1 or 2, as applicable.
- C. Electric Water Heaters: UL listed and labeled to UL 174.
- D. Conform to AGA requirements for water heaters.
- E. Pressure Vessels for Heat Exchangers: ASME labeled, to ASME (BPV VIII, 1).
- F. Conform to ASME (BPV VIII 1) for tanks.
- G. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.8 WARRANTY

- A. Provide five year manufacturer warranty for domestic water heaters.
- B. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 WATER HEATER MANUFACTURERS

- A. A.O. Smith Water Products Co.
- B. Bock Water Heaters, Inc.
- C. Rheem Manufacturing Company.
- D. Chronomite.
- E. Takagi
- F. Substitutions: See Section 22 01 00 General Plumbing Provisions.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

- A. Type: Factory-assembled and wired, electric, vertical storage.
- B. Performance:
 - 1. As specified in drawing schedule.
- C. As specified in drawing schedule.

22 30 00-3

- D. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- E. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
- F. Accessories: Provide:
 - 1. Water connections: Brass.
 - 2. Dip tube.
 - 3. Drain Valve.
 - 4. Anode: Magnesium.
 - 5. Temperature and Pressure Relief Valve: ASME labelled.
- 2.3 COMMERCIAL CONDENSING TANKLESS GAS FIRED WATER HEATERS
 - A. Type: Automatic, condensing natural gas-fired, tankless, temperature controlled, continuous flow, direct vent, forced combustion, direct electronic ignition.
 - B. Performance:
 - 1. As specified in drawing schedule.
 - C. Accessories: Provide:
 - 1. Water Connections: Brass.
 - 2. Water flow sensor with electronic water control.
 - 3. Digital Controller.
 - 4. Manufacturer's concentric vent kit.
 - D. Approval: By AGA.

2.4 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc.

22 30 00-4

- 2. ITT Bell & Gossett.
- 3. Taco, Inc.
- 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.
- D. Size: Refer to plans or as required to match system volume.

2.5 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 - 1. Armstrong Pumps Inc.
 - 2. ITT Bell & Gossett.
 - 3. Sterling Fluid Systems.
 - 4. Grundfos.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Casing: Bronze, rated for 150 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Performance:
 - 1. As scheduled on drawings.

PART 3 EXECUTION

A. Install water heaters in accordance with manufacturer's instructions and to AGA or UL requirements.

22 30 00-5

- B. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.
- C. Pumps:
 - 1. Provide air cock and drain connection on horizontal pump casings.
 - 2. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
 - 3. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
 - 4. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.2 SCHEDULES

- A. Water Heaters:
 - 1. Refer to plan schedule.
- B. Recirculating Pumps:
 - 1. Refer to plan schedule.

END OF SECTION

22 30 00-6

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Electric water coolers.
- G. Showers.
- 1.2 RELATED REQUIREMENTS
 - A. Section 22 10 05 Plumbing Piping.
 - B. Section 22 10 06 Plumbing Specialties.
 - C. Section 22 30 00 Plumbing Equipment.
 - D. Division 26 Equipment wiring, electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.
- B. IAPMO Z124 Plastic Plumbing Fixtures; 2022, with Editorial Revision.
- C. ASHRAE Std 18 Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- D. ASME A112.6.1M Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- E. ASME A112.18.1 Plumbing Supply Fittings; 2018, with Errata.

22 40 00-1

- F. ASME A112.19.2 Ceramic Plumbing Fixtures; 2024.
- G. ASME A112.19.5 Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- H. ASSE 1014 Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.

1.4 SUBMITTALS

- A. Section 22 01 00 General Plumbing Provisions: Procedures for submittals.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

- A. Provide five year manufacturer warranty for electric water cooler.
- B. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

22 40 00-2

PART 2 PRODUCTS

2.1 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
 - 1. Flush Volume: 1.6 gallon, maximum.
 - 2. Flush Valve: Exposed (top spud).
 - a. Dual-Filtered Bypass.
 - 3. Flush Operation: Manual, oscillating handle.
 - 4. Manufacturers:
 - a. American Standard Inc.
 - b. Kohler Company.
 - c. Zurn Industries, Inc.
 - d. Sloan.
 - e. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Flush Valves: ASME A112.18.1, diaphragm type, dual-filtered bypass, complete with vacuum breaker stops and accessories.
 - 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - a. Valve shall be equal to Sloan Valve Company; Model Sloan #111-DFB.
 - 2. Manufacturers:
 - a. Sloan Valve Company.
 - b. Zurn Industries, Inc.
 - c. Substitutions: See Section 22 01 00 General Plumbing Provisions.
 - 3. Manual Operated:
 - a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type complete with vacuum breaker stops, and accessories.
 - b. Supplied Volume Capacity: 1.6 gal per flush. 22 40 00-3

- C. Seats:
 - 1. Manufacturers:
 - a. Beneke Magnolia.
 - b. Bemis Manufacturing Company.
 - c. Church Seat Company.
 - d. Olsonite.
 - e. Substitutions: See Section 22 01 00 General Plumbing Provisions.
 - 2. Solid white plastic, open front, extended back, stainless steel self-sustaining hinge, brass bolts, without cover.

2.2 WALL HUNG URINALS

- A. Wall Hung Urinal Manufacturers:
 - 1. American Standard Inc.
 - 2. Kohler Company.
 - 3. Zurn Industries, Inc.
 - 4. Sloan.
 - 5. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 - 1. Flush Volume: 1 gallon, maximum.
 - 2. Flush Style: Siphon jet.
 - 3. Flush Valve: Exposed (top spud).
 - 4. Flush Operation: Manual, oscillating handle As indicated on plans..
 - 5. Strainer: Integral. (Refer to Plumbing Schedule for Basis of Design)
 - 6. Trap: Integral.
 - 7. Supply Size: 3/4 inch.

22 40 00-4

- 8. Outlet Size: 2 inches.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with dual-filtered bypass, vacuum breaker stops and accessories.
 - 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop with dual filtered bypass.
 - a. Flush valve shall be equal to Sloan #186-1.0-DFB.
 - 2. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- D. Flush Valve Manufacturers:
 - 1. Sloan Valve Company.
 - 2. Zurn Industries, Inc.
 - 3. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- E. Manual Operated:
 - 1. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type, complete with vacuum breaker stops, and accessories.
 - 2. Supplied Volume Capacity: 1.0 gal per flush.
- F. Sensor-Operated:
 - 1. Type: ASME A112.19.5; chloramine-resistant, clog-resistant dual-seat diaphragm valve with vacuum breaker, stops and accessories.
 - 2. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical override or override push button.
 - 3. Supplied Volume Capacity: 1.0 gal per flush.
- G. Carriers:
 - 1. Manufacturers:
 - a. JOSAM Company.
 - b. Zurn Industries, Inc.
 - c. Wade Tyler Pipe.

22 40 00-5

- d. Mifab.
- e. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.3 LAVATORIES

- A. Lavatory Manufacturers:
 - 1. American Standard Inc.
 - 2. Kohler Company.
 - 3. Zurn Industries, Inc.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Vitreous China Wall Hung Basin:
 - 1. ASME A112.19.2; Virtreous china, D-shaped bowl with front overflow. Self draining deck area with contoured back and side splash shield.
 - a. Faucet ledge.
 - b. Drilling Centers: 4 inch.
- C. Supply Faucet Manufacturers:
 - 1. Zurn industries, Inc.
 - 2. Sloan.
 - 3. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- D. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
 - 1. Faucet shall be equal to Sloan model ETF-600 sensor operated faucet.
 - 2. Spout Style: Standard.
 - 3. Power Supply: 24 VAC.
 - a. Direct wired to junction box.
 - b. For 24V applications, provide transformer. 22 40 00-6

- 4. Mixing Valve: Thermostatic mixing valve.
- 5. Water Supply: 1/2 inch compression connections.
- 6. Aerator: Vandal resistant, 0.5 GPM, .
- 7. Automatic Shut-off: 30 seconds.
- 8. Sensor range: Automatically adjusts.
 - a. Accessory: Optional remote reprogrammer module to adjust pre-set factory functions.
- 9. Finish: Polished chrome.
- 10. Accessory: 4 inch deck plate.
- 11. Sensor Operated Faucet Manufacturers:
 - a. Sloan Valve Company.
 - b. Zurn Industries, Inc.
 - c. Substitutions: Not permitted.
- E. Accessories:
 - 1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
 - 2. Offset waste with plug and strainer where required.
 - 3. Quarter-turn angle stops.
 - 4. Flexible supplies.
 - 5. Carrier:
 - a. Manufacturers:
 - 1) JOSAM Company.
 - 2) Zurn Industries, Inc.
 - 3) Wade.
 - 4) Watts.
 - 5) Mifab.

22 40 00-7

- 6) Substitutions: See Section 22 01 00 General Plumbing Provisions.
- b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.4 SINKS

- A. Sink Manufacturers:
 - 1. American Standard Inc.
 - 2. Elkay.
 - 3. Just Manufacturing..
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Single Compartment Bowl:
 - 1. ASME A112.19.3; See schedule outside dimensions, 18 gage thick, Type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
 - a. Drain: 3-1/2 inch stainless steel drain.
 - b. ADA Compliant.
- C. Trim: ASME A112.18.1; chrome plated brass supply with high rise rigid spout, water economy aerator with maximum 2.2 gpm flow, indexed lever handles .
 - 1. Acceptable Faucet Manufacturers:
 - a. Just
 - b. Elkay
 - c. Zurn
 - d. Chicago Faucets.
 - e. T&S Brass.
- D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, quarter turn angle stops, flexible supplies.

2.5 SHOWERS

A. Shower Manufacturers:

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- 1. Temptrol.
- 2. Bradley.
- 3. Aqua Glass Corporation.
- 4. Jacuzzi.
- 5. Kohler Company.
- 6. Aquarius.
- 7. Hamilton.
- 8. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Cabinet: ANSI Z124.1.2 molded cast acrylic, size as indicated on plans, with folding seat removable chrome plated strainer, tail piece, color as selected by architect.
- C. Trim:
 - 1. ASME A112.18.1; concealed shower supply with thermostatic mixing valves, integral service stops, with maximum 2.5 gpm flow, and escutcheon.
 - 2. Provide ADA compliant shower head in all ADA Showers.
 - 3. Folding Seat.
 - 4. Shower rod and heavy duty vinyl weighted curtain.
 - 5. ADA Trim: Thermostatic mixing valve, single-handle shutoff, color-coded dial, adjustable temperature limit, inlet stops, soap dish, institutional shower head, inline diverter, hand shower with 60-inch hose, vacuum breaker.

2.6 SHOWERS (WALL MOUNTED SYSTEM)

- A. Manufacturers:
 - 1. Symmons.
 - 2. Leonard.
 - 3. Acorn.
 - 4. Chicago.
 - 5. T & S.

22 40 00-9

- 6. Bradley.
- 7. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Desciption:16 gauge shower panel and 18 gauge grab bar with phenolic seat constructed of type 304 stainless steel or polished chrome-plated brass. Valve bodies are brass casting. Supply hoses are 24" flexible stainless steel.
- C. Soap Dish: Type 304 stainless steel with seamless corners and burr-free corners.
- D. Flow Control: 1.5 gpm (standard) / 2.0 gpm max.
- 2.7 ELECTRIC WATER COOLERS
 - A. Electric Water Cooler Manufacturers:
 - 1. Tri Palm International/Oasis.
 - 2. Elkay Manufacturing Company.
 - 3. Haws Corporation.
 - 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
 - B. Water Cooler: ARI 1010; split level or single leve where indicated handicapped mounted electric water cooler with stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket, refrigerated with integral air cooled condenser and stainless steel grille.
 - C. Provide integral bottle filler where idicated on the plans.
 - D. Capacity: 8 gpm of 50 degree F water with inlet at 80 degree F and room temperature of 90 degree F, when tested in accordance with ASHRAE Std 18.
 - E. Electrical: Maximum 1/5 hp compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

2.8 SERVICE SINKS

- A. Service Sink Manufacturers:
 - 1. Williams.
 - 2. Crane-Fiat.

22 40 00-10

- 3. Florestone
- 4. Substitutions: See Section 22 01 00 General Plumbing Provisions.
- B. Bowl:
 - 1. 24 x 24 x 12 inch high white terrazo, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.
- C. Trim:
 - 1. ASME A112.18.1 exposed wall type supply with lever handles, spout wall brace, constant pressure rated vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps, hot and cold water supply check valves, and adjustable threaded wall flanges.
 - a. Acceptable Faucet Manufacturers:
 - 1) Just
 - 2) Elkay
 - 3) Chicago Faucets.
 - 4) T&S Brass.
- D. Accessories:
 - 1. 5 feet of 1/2 inch diameter plain end reinforced rubber hose.
 - 2. Hose clamp hanger.
 - 3. Mop hanger.
 - 4. 20 ga. stainless steel splash catcher panels for two walls.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

22 40 00-11

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid supplies to fixtures with quarter turn stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 92 00, color to match fixture
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- G. Install handicap valve handles to the accessible side.
- H. Provide HandiLav or approved equal molded trap and supply insulation kit for all exposed drain and supply handicap lavatories.
- I. Acrylic one piece showers to be installed inset into concrete to meet ADA requirements. Contractor shall coordinate slab relief to meet these requirements.
- J. Install a check valve in the hot and cold water supply at every service sink

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- 3.6 CLEANING
 - A. Clean plumbing fixtures and equipment.

22 40 00-12

3.7 **PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

3.8 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Water Closet Flush Valves:
 - a. Standard: 11 inches min. above bowl rim.
 - b. Youth: Refer to Architectural Plans.
 - 2. Urinal:
 - a. Standard: 22 inches to top of bowl rim.
 - b. Accessible: 17 inches to top of bowl rim.
 - 3. Lavatory:
 - a. Standard: 31 inches to top of basin rim.
 - b. Accessible: 34 inches maximum to top of basin rim.
 - c. Youth: Refer to Architectural Plans.
 - 4. Shower Heads:
 - a. Adult Male: 69.5 inches to bottom of head.
 - b. Adult Female: 64.5 inches to bottom of head.
 - c. Child: 58.5 inches to bottom of head.
 - d. ADA: Shower head to be hand held on metal clad hose with slide bar. Control shall be installed minimum of 38 inches above shower floor to bottom of control and 48 inches maximum above shower floor to top of control.
- B. Minimum fixture rough-in sizes or as required for particular fixtures.
 - 1. Water Closet (Flush Valve Type):
 - a. Cold Water: 1 Inch.

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- b. Waste: 4 Inch.
- c. Vent: 2 Inch.
- 2. Urinal (Flush Valve Type):
 - a. Cold Water: 3/4 Inch.
 - b. Waste: 2 Inch.
 - c. Vent: 1-1/2 Inch.
- 3. Lavatory:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 1-1/2 Inch.
 - d. Vent: 1-1/4 Inch.
- 4. Sink:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 1-1/2 Inch.
 - d. Vent: 1-1/4 Inch.
- 5. Service Sink:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 3 Inch.
 - d. Vent: 2 Inch.
- 6. Drinking Fountain:
 - a. Cold Water: 1/2 Inch.
 - b. Waste: 1-1/4 Inch.

22 40 00-14

- c. Vent: 1-1/4 Inch.
- 7. Shower:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 2 Inch.
 - d. Vent: 2 Inch.

END OF SECTION

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SECTION 23 01 00

GENERAL HVAC PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The work covered by Division 23 sections consist of furnishing all labor, equipment, appliances and material for the heating, air conditioning, piping and plumbing systems in strict accordance with Codes, Specifications and the applicable drawings and subject to the terms and conditions of the contract. Include all appurtenances necessary to the proper operation of the systems and equipment specified.
- B. General Contractor shall install all concrete pads and bases required for installing mechanical equipment. Mechanical Contractor is responsible for the exact sizes required, location of anchor bolts, etc.
- C. Mechanical Contractor shall furnish and install roof-mounted air handler and exhaust fan bases and shall be the manufacturer's base.
- D. Some equipment may be furnished by other divisions. Mechanical Contractor is responsible to check the drawings and specifications for equipment that will be furnished by the Owner. Furnish the duct, insulation, controls, etc., on all equipment furnished by other divisions.
- E. General Contractor shall furnish and install all ceiling access panels required to service mechanical equipment, valves and controls above gyp board or hidden spline ceilings.

1.2 RELATED SECTIONS

- A. The General Conditions and Division 1, General Requirements, as bound in the specification preamble, apply to all work under Division 23. Carefully note its contents in performance of the work.
- B. The Architectural, Fire Suppression, Plumbing, Electrical, and Structural plans and Specifications, including Information to Bidders and other pertinent documents issued by the Engineer are a part of this Specifications and the accompanying mechanical plans. Comply with them in every respect. Examine all the above carefully. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, electrical and structural details from the mechanical drawings.

23 01 00-1

- C. All electrical power wiring is specified under Division 26 of the Specifications. Mechanical Contractor shall furnish all motor starters required for the control and protection of all motors furnished for the Division 23. Provide and install all automatic temperature and interlock wiring required for controlling mechanical equipment furnished under Division 23, in compliance with Division 26 of the Project Manual.
- D. All concrete pads and bases required for installing mechanical equipment are specified in another section of the Specifications. Advise the General Contractor as to the exact sizes required, location of anchor bolts, etc.
- E. Paint all roof top mechanical equipment ducts, supports and other exposed material. Do not paint indoor equipment supplied with painted finish, such as the main mechanical equipment unless damaged during handling and installation. In such cases, use touch-up paint of the same type and color as original paint. Conform to requirements in other sections of the Specifications and match wall finish to the room in which installed.

1.3 CODES, FEES AND LATERAL COSTS

- A. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations, and the applicable requirements of the following latest nationally accepted codes and standards:
 - 1. 2021 Bentonville, Arkansas City Building Code.
 - 2. 2021 Arkansas State Mechanical Code.
 - 3. 2018Arkansas State Plumbing Code.
 - 4. 2020 Arkansas Energy Code.
 - 5. 2021 IBC International Building Code.
 - 6. IFC International Fire Code; latest accepted edition.
 - 7. IGC International Gas Code; latest accepted edition.
 - 8. IMC International Mechanical Code; latest accepted edition.
 - 9. IPC International Plumbing Code; latest accepted edition.
 - 10. IECC International Energy Conservation Code
 - 11. AMCA Air Moving & Conditioning Association.

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- 12. ASA American Standards Association.
- 13. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers.
- 14. ASME American Society of Mechanical Engineers.
- 15. ASTM American Society of Testing Materials.
- 16. AWWA American Water Works Association.
- 17. NBS National Bureau of Standards.
- 18. NEMA National Electrical Manufacturers Association.
- 19. NFPA National Fire Protection Association.
- 20. SMACNA Sheet Metal & Air Conditioning Contractors' National Association.
- 21. UL Underwriters' Laboratories, Inc.
- 22. AGA American Gas Association.
- 23. OSHA Occupational Safety and Hazard Association.
- 24. AABC Associated Air Balance Councils
- 25. NEBB National Environmental Balancing Bureau
- B. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.
- C. In case of difference between building codes, Specifications, state Laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent governs. Promptly notify the Engineer in writing of any such difference.
- D. Remove any work installed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, correct the deficiencies, and reinstall all work at no cost to the Owner.
- E. The mechanical drawings show the general arrangement of all piping, equipment and appurtenances. Follow as closely as actual building construction and the work of other trades will permit. Final layout will be governed by actual field conditions with all measurements verified at the site. Conform to the requirements shown on all of the

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drawings. General and structural drawings take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate the existing and finish conditions affecting the work and arrange the work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions. Contractor shall verify that all equipment, ducts, pipes and all other components will fit in the space provided before fabrication or ordering.

- F. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith. Arrange with the serving utility companies for the connections to all utilities and pay all charges for same including inspection fees and meters if required. Refundable deposits will be paid by the Owner.
- G. Mechanical Contractor shall provide and install, where applicable, seismic restraints for all piping and duct systems per the latest accepted Building Code.

1.4 GUARANTEE

A. Furnish a written certificate guaranteeing all materials, equipment and labor furnished to be free of all defects for a period of one (1) year from and after the date of final acceptance of the work by the Owner and further guarantee to replace such work without charges if any defects appear within the stipulated guaranty period.

1.5 SOIL CONDITIONS

A. The Specifications and the drawings in no way imply the conditions of the soil to be encountered. When excavating may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions affecting the work.

1.6 INSPECTION OF PREMISES

A. Before submitting a bid, visit the site of the proposed job and determine the conditions relating to this work.

1.7 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. Verify the location and elevation of all utilities and their relation to the work before entering into a contract.

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1.8 EQUIPMENT NOT SPECIFIED UNDER DIVISION 23

- A. Equipment which requires plumbing and other mechanical connections may be specified in another division of this Specification. Under these conditions, provide necessary utilities including waste, water, natural gas, duct, insulation and controls.
- B. Rough-in work from approved shop drawings only.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- Provide new materials bearing the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. Furnish the standard product of a manufacturer regularly engaged in the production of the required type of equipment. Provide the manufacturer's latest approved design.
- B. Deliver equipment and materials to the site and store in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage (such as controls) in dry, heated spaces.
- C. Provide equipment and materials of the same general type and of the same make throughout the work to provide uniform appearance, operation and maintenance.
- D. Tightly cover equipment and protect against dirt, water and chemical or mechanical injury and theft. At the completion of the work, clean fixtures, equipment and materials and polish thoroughly. Turn over to the Owner in a condition satisfactory to the Engineer. Repair damage or defects developing before acceptance of the work at no expense to the Owner.
- E. Insure that items to be furnished fit the space available. Make necessary field measurements to ascertain space requirements, including those for connections.
 Furnish and install such sizes and shapes of equipment that the final installation suits the true intent and meaning of the drawings and Specifications.
- F. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Promptly notify the Engineer in writing of any conflicts between any requirements of the Contract Documents and the manufacturers' directions. Obtain the Engineer's written instruction before proceeding with the work. Replace any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, at no cost to the Owner.

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- G. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.
- H. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 EQUIPMENT ACCESSORIES

- A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.
- B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and Specifications.
- C. Support, plumb, rigid and true to line, all work and equipment furnished. Study thoroughly all general, structural, electrical, fire suppression and mechanical drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.
- D. If accessories are required to complete the work and meet the intent of the specification, it is the responsibility of the Contractor to provide such accessories.

2.3 MATERIAL AND EQUIPMENT SCHEDULE

- A. Submit to the Engineer as soon as practical, six (6) complete sets of the schedule of materials and equipment proposed for the installation, or electronic submittals as detailed below. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front.
 - 1. If Electronic files are submitted, a <u>complete</u> set of the schedule of materials and equipment proposed for the installation shall be included. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data. All information shall be submitted electronically in "pdf" format, and shall be separated into electronic "pdf" files according to the corresponding specification section (i.e. "23 40 00 Air Cleaning Devices.pdf"). Unless incomplete submittals are authorized by the project engineer, all Division 23 submittals shall be electronically sent at one time. Without authorization, incomplete submittals shall be rejected.
- B. Provide written certification that shop drawings are in accordance with the specifications and are dimensionally correct with reference to available space.

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- C. All submittals will be reviewed a maximum of two (2) times. The cost of additional submittal reviews beyond those two specified will be charged to the Contractor.
- D. Shop drawings for the Engineer's files are required on the following items:
 - 1. Roof Top Air Handling Units.
 - 2. Electric Wall Heater.
 - 3. Furnace Units.
 - 4. Condensing Units.
 - 5. Mini-Split HVAC Units.
 - 6. Filters.
 - 7. Exhaust Fans.
 - 8. Grilles and Registers.
 - 9. Variable Air Damper Boxes.
 - 10. Controls and Instrumentation.
 - 11. Air Balance Certification.
 - 12. Ductwork Materials Including Duct Accessories.
 - 13. Duct Insulation Materials.
 - 14. Complete Mechanical Equipment Electrical Data and Wiring Details.
 - 15. Seismic Restraints.

2.4 EQUIPMENT AND MATERIAL SUBSTITUTIONS

A. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The Mechanical Contractor shall be responsible for any changes required in mechanical, electrical, structural or vibration isolation systems and shall bear all cost for those changes whether the substitute equipment is named by manufacturer in the specifications or is submitted to the Architect for "or equal" consideration. All changes shall be accomplished in a manner acceptable to the Architect per Section 01 60 00 at no additional cost to the Owner.

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- B. In order to obtain prior approval on equipment or material not specified in Division 23 Specifications or Equipment Schedules, Mechanical Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.
- C. If ANY substitute equipment is submitted to Engineer for approval, without said equipment having been pre-approved, the entire submittal will be rejected for resubmittal.
- D. Any equipment manufacturers which are a subsidiary to the listed acceptable manufacturers are not considered equal. Therefore, it is the responsibility of the Contractor and equipment supplier to obtain prior approval as described in paragraph 2.4, this Section.

2.5 ELECTRICAL MOTORS

- A. Provide motors of a recognized manufacturer, wound for the voltage specified, and in conformance to latest standards of the manufacturer and performance of the National Electrical Manufacturers Association and the Institute of Electrical and Electronic Engineers. Provide motors as manufactured by General Electric, Westinghouse, Century or Siemens-Allis, Baldor or approved equal.
- B. Provide motors rated for continuous duty at 100% of rated capacity and temperature raise of 40 degrees Centigrade open type; 50 degrees Centigrade drip and splash proof; 55 degrees Centigrade explosion proof and totally enclosed above an ambient of 40 degrees Centigrade.
- C. Unless otherwise required, provide integral horsepower, polyphase motors, Class B, general purpose, squirrel cage, open type induction motors, T-frame.
- D. Provide single phase fractional horsepower motors of the open capacitor type. Generally, motors under 1/2 horsepower may be split phase type unless otherwise specified. Provide motors rated 1/2 horsepower or less with integral overcurrent protection.
- E. Insure the insulation resistance between stator conductor and frames of motors is not less than 1/2 megohm. Provide shop test of motors including temperature rise, insulation resistance, motor terminal voltage, normal operating line current, RPMs, breaker or switch size with fusing and overload relay sizes.

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PART 3 EXECUTION

3.1 COORDINATION OF WORK

- A. Compare the mechanical drawings and Specifications with the drawings and Specifications for other trades and report any discrepancies between them to the Engineer and obtain from him written instruction for changes necessary in the mechanical work. Install the mechanical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. Make all changes required in the work caused either by neglect or existing field conditions at no cost to the Owner.
- B. It is the responsibility of the General Contractor, Plumbing Contractor, Mechanical Contractor and Electrical Contractor, and Sprinkler Contractor to coordinate installation of all equipment. Equipment installed prior to proper coordination, which interferes with the harmony and intent of the specifications and drawings, will be removed and reinstalled at the cost of the responsible Contractor.
- C. Furnish anchor bolts, sleeves, inserts and supports required for the mechanical work. Locate anchor bolts, sleeves, inserts and supports as directed by the trade requiring them and insure that they are properly installed.
- D. Slots, chases, openings and recesses in existing structure shall be cut, patched and repaired by the Contractor.
- E. Adjust locations of pipes, ducts, equipment fixtures, etc., to accommodate the work and for interferences anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.
 - 1. Provide right-of-way to lines that pitch over those that do not pitch. For example, Plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have the right-of-way over lines whose elevations can be changed.
 - 2. Make offsets, transitions and changes in direction in pipes and ducts as required to maintain proper head room and pitch.
- F. Install all mechanical work to permit removal without damage to other parts, to coils, fan shafts and wheels, filters, belt guards, sheaves and drives and all other parts requiring periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

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G. Change the cross sectional dimensions of ductwork when required to meet job conditions, but maintain at least the same equivalent cross sectional area. Secure the approval of the Engineer prior to fabrication of ductwork requiring such changes. Sizes shown on the plans are clear dimensions; add for internal insulation if specified.

3.2 RECORD DRAWINGS

- A. Maintain record drawings showing exact locations and sizes, as actually installed, of piping, drains, cleanouts, ductwork, controls and equipment as specified herein. Deliver to the Owner/Architect upon completion and acceptance of the work, one (1) complete set of contract drawings marked to indicate all deviations from intended installation.
- B. Record drawings shall be provide in hard copy form, as well as, on a DVD in PDF form.

3.3 CUTTING AND PATCHING

A. The General Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any major structural element, beam or column without the written approval of the Engineer.

3.4 EQUIPMENT START-UP AND TESTING

- A. Instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment. During the operating tests, prove the operation of each item of equipment to the satisfaction of the Engineer. Give at least seven (7) days notice to the Engineer of equipment start-up and operating tests.
- B. Refer to Section 23 08 00 for additional information.

3.5 CATALOG DATA FOR OWNER

- A. Provide, in looseleaf binders, two (2) sets of a compilation of catalog data of each manufactured item of equipment used in the mechanical work and present this compilation to the Owner/Architect for transmittal to the Owner before final payment is made. Include descriptive data and printed installation, operating and maintenance instructions for each item of equipment. Provide a complete double index as follows:
 - 1. Listing of products alphabetically by name.
 - 2. Listing the names of manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the names and addresses of

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the local sales representatives.

- 3. Certificates of Final Inspections.
- 4. Complete spare parts data with current prices and supply sources.
- 5. Extended warranties.
- B. Deliver to the Owner all special tools, lubricants, extra materials and any other products necessary for the proper operation and maintenance of the mechanical and plumbing systems.
- C. Provide project record documents indicating all changes from contract documents made during construction.
- D. Submit all Certificates of Final Inspections from the Administrative Authorities.
- E. Submit TAB reports on approved forms. Final TAB report submittals shall include all required rebalances if any are required.

3.6 INSTRUCTION OF OWNER'S REPRESENTATIVE

- A. Instruct the representative of the Owner in the proper operation and maintenance of all elements of the mechanical system. Spend not less than five (5) days in such formal instruction and additional time as directed by the Engineer to fully prepare the Owner to operate and maintain the mechanical equipment.
- B. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated. Provide the following training as required to fully qualify the Owner's designated personnel. All training must be video taped to a CD and a copy included in each operation and maintenance closeout manual.
 - 1. Return Fan/Relief Fan Units.
 - 2. Furnace Units.
 - 3. Condenser Units.
 - 4. Electric Wall Heater.
 - 5. Mini-Split HVAC Units.

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3.7 PROTECTIVE COATINGS

- A. Paint exterior surfaces of steel piping run in or through concrete floor fill, under tile floors or underground, and aluminum surfaces in contact with masonry, with one coat of acid resisting bituminous base paint.
- B. Paint all exposed galvanized ducts behind grilles flat black.

3.8 NOISE CONTROL

A. It is intended that the mechanical systems as installed under this contract be free from objectionable noise when the system is operating. The system shall operate at noise levels below criteria recommended for the application by ASHRAE. Provide vibration isolation accessories and isolate equipment, pipeline, ductwork, etc., as required so as to insure an acceptable noise level in all of the mechanical systems.

3.9 CLEANING AND ADJUSTING

A. Do not allow waste material and rubbish to accumulate in or above the premises. After completion of this work, remove rubbish, tools, scaffolding and surplus materials from and about the building and leave all work clean and ready for use. Clean all equipment, pipes, valves and fittings of grease, metal cuttings and sludge. Repair any stoppage, discoloration or other damage to parts of the building, its finish or furnishings due to failure to properly clean the mechanical systems, without additional cost to the Owner. Adjust all automatic control devices for proper operation.

3.10 SYSTEM OPERATING TESTS

- A. After the successful completion of all equipment start-up and test requirements, perform the following tests on the complete mechanical systems:
 - 1. First Operating Test by Contractor: Prove the operation of the mechanical systems and of each individual item in the systems. Give at least 10 day prior notice to the Engineer of such tests. Adjust and set proper quantities to all items and equipment. Should any item of the systems fail to perform in an approved manner, repeat this test until approved by the Engineer. During this test, balance circulation of heating and cooling water to balancing cocks, valves, thermostats and similar Items to insure that the mechanical systems perform as intended.
 - 2. Checking by Owner and Engineer: Following the successful completion of first operating tests by the Contractor, the Owner and the Engineer have the privilege of making such tests as they may desire during a period of three weeks to

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ascertain in detail if any corrections are to be made to the system. At the end of the testing by the Owner and the Engineer, the Engineer may direct the Contractor in writing to make such corrections to the systems as are within the scope of the contract.

- 3. Contractor's Corrections to Systems: Make all required corrections to the systems and notify the Engineer in wiring that the corrections outlined have been completed. Give at least seven (7) days notice of a final three-day operating test.
- 4. Three-Day Operating Test: Perform an operating test to the satisfaction of the Engineer for a period of three (3) days. Should any element of the systems not perform properly, make all required corrections and repeat the test until successfully performed.
 - a. Submit the Form of Record proposed by the Contractor for the recording of all measurements to the Engineer for approval at least two weeks before the approved form will be required by the Contractor.
 - b. Measurements: Make the following measurements at two-hour intervals (5 measurements per 8-hour day) during the three-day operating test.
 - 1) Electrical: Running amperes and voltage of each motor 3/4 horsepower or larger.
 - 2) Air temperatures in each heated or air conditioned space and outdoor temperatures.
 - c. Instruments: Provide all instruments, materials and labor to perform the tests and to obtain and record the measurements specified herein, including the furnishing of all required record forms as approved by the Engineer. Submit for the Engineer's approval, complete shop drawings or catalog data for all instruments to be used for the three day operating test and obtain approval at least two weeks before the instruments will be required for test measurements.
 - d. Report: Submit four (4) copies of a written report of the three-day operating test on the approved Form of Record to the Engineer for approval and subsequent transmittal to the Owner.

3.11 MOTOR CONTROL

A. General: Provide each motor 1/8 horsepower or larger with a suitable controller and devices that will perform the functions as specified for the respective motors, together

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with manual reset thermal overload, protection in each undergrounded conductor. Provide the controller either integral with circuit protective device or mounted in separate enclosure. Starters shall be Allen-Bradley, G.E., Westinghouse, Square D or approved equal.

- B. Control: Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motor directly, provided the device used is designated for that purpose and has an adequate horsepower rating. When automatic control device does not have such a rating, use a magnetic starter with the automatic control device actuating the pilot control circuit. When combination manual and automatic control is specified and the control device operates the motor directly, provide a manual motor starter and selector switch. When combination manual and automatic control is specified and the automatic control device actuates the pilot control circuit, a magnetic control device actuates the pilot control provided. Provide all magnetic starters with push buttons or selector switches in the covers. Provide connections to the selector switch such that only the normal automatic regulating control devices will be bypassed when the switch is in the manual position. Connect all safety control devices, such as low or high pressure cutouts, high temperature cutouts and motor overload protective devices in the motor control circuit in both the manual and automatic positions of the selector switch control circuit. Make connections to any selector switch or to more than one (1) automatic regulatory control device in accordance with wiring diagrams recommended by the manufacturer and approved by the Engineer. Where required for manual control, provide pushbutton stations consisting of two (2) momentary contact operators, 600 volts, 10 amperes installed and wired for three wire control to provide under-voltage relays, auxiliary contacts or other devices required for a complete system.
- C. Location: Where the controller is located within sight of the motor driven equipment (fifty feet or less), the controller and circuit protective device shall be capable of being locked in the open position. Where the controller is located out of sight of the motor driven equipment (more than fifty feet) provide a non-fused safety disconnect, suitable for the service, and which opens all ungrounded conductors simultaneously, at or on the motor driven equipment.
- D. Enclosure: Enclosure to be general purpose, NEMA Type 1 unless noted otherwise (NEMA Type 1 gasketed). The circuit breaker shall be operable by hand from outside the enclosure and shall be so interlocked with the door or doors that it must be returned to the "OFF" position before the door can be opened.
- E. Push-buttons: Provide maintained contact, standard duty type in a general purpose, NEMA Type 1 enclosure for surface mounting rated for 10 amperes continuous at 600

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volts or less.

3.12 ACCESS PANELS

A. Provide access panels as required in all walls, ceilings and ductwork to service and have access to all valves, operating parts and duct mounted fire dampers. For all ceiling and wall access doors that are required in gypsum board and plaster, provide minimum 24" x 24", unless due to structural restraints the access door can be reduced to a minimum of 18" x18", Milcor type appropriate for the construction involved.

3.13 TEMPORARY HEATING AND COOLING

- A. Permanent heating and cooling systems may be used to provide temporary heating and cooling to the building during construction, if the following requirements are met:
 - 1. Provide filters in equipment filter racks.
 - 2. Provide filter material at entrance to all return air ducts or over permanent return air grilles. All return air ductwork is to be protected from construction dust and debris. If return air duct work is not protected prior to equipment startup for temporary use, the Contractor will pay to have the entire ductwork system of the affected equipment thoroughly cleaned prior to Owner occupancy.
 - 3. Contractor shall provide and pay for operation, maintenance, regular replacement of filters and worn or consumed parts.
 - 4. Shall replace any equipment that is damaged during temporary usage with new equipment.
 - 5. All warranty periods shall not begin until Certificate of Substantial Completion is issued.
 - 6. Verify with engineer that the installation is ready and approved for operation.
- B. Just prior to turning the building or portions of the building over to the Owner, Contractor will replace all filters on equipment used for temporary ventilation, heat or cooling during construction.
- C. Do not turn water into the system until the systems have been thoroughly cleaned and approved by the Engineer.

3.14 FINALLY

A. It is the intention that this specification shall provide a complete installation except as herein before specifically excepted. All accessory construction and apparatus 23 01 00-15

necessary or advantageous in the operation and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

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SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.
- E. Ceiling tacks.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number. Valve locations with tag numbers shall also be indicated on "as-built" drawings.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Automatic Controls: Tags. Key to control schematic.

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- D. Control Panels: Nameplates.
- E. Dampers: Ceiling tacks, where located above lay-in ceiling.
- F. Ductwork: Stencilled painting.
- G. Instrumentation: Tags.
- H. Major Control Components: Nameplates.
- I. Relays: Tags.
- J. Small-sized Equipment: Tags.
- K. Thermostats: Nameplates.
- L. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving.
 - 2. Kolbi Pipe Marker Co.
 - 3. Seton Identification Products.
 - 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/2 inch.
 - 3. Background Color: Black.
 - 4. Plastic: Conform to ASTM D709.
- 2.3 TAGS
 - A. Manufacturers:
 - 1. Advanced Graphic Engraving.
 - 2. Brady Corporation.

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- 3. Kolbi Pipe Marker Co.
- 4. Seton Identification Products.
- 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame. Valve tag chart should should indicate valve size, valve model and valve location. Valve locations with tag numbers shall also be indicated on "as-built" drawings.

2.4 STENCILS

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Kolbi Pipe Marker Co.
 - 3. Seton Identification Products.
 - 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Stencils: With clean cut symbols and letters of following size:
 - 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
 - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
 - 6. Ductwork and Equipment: 2-1/2 inch high letters.

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2.5 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Kolbi Pipe Marker Co.
 - 3. MIFAB.
 - 4. Seton Identification Products.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Color: Conform to ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- F. Color code as follows:
 - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
 - 2. Toxic and Corrosive Fluids: Orange with black letters.

2.6 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark.
 - 2. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Description: Steel with 3/4 inch diameter color coded head.
- C. Color code as follows:
 - 1. Yellow HVAC equipment.
 - 2. Red Fire dampers/smoke dampers.

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3. Blue - Heating/cooling valves.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 91 00 for stencil painting.

3.2 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.2 REFERENCE STANDARDS

- A. AABC MN-1 AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.
- C. NEBB (TAB) Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.
- D. SMACNA (TAB) HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.3 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Architect.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other

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installers to sufficiently understand the design intent for each system.

- 4. Include at least the following in the plan:
 - a. Preface: An explanation of the intended use of the control system.
 - b. List of all air flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - d. Identification and types of measurement instruments to be used and their most recent calibration date.
 - e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - f. Final test report forms to be used.
 - g. Detailed step-by-step procedures for TAB work for each system and issue, including:
 - 1) Terminal flow calibration (for each terminal type).
 - 2) Diffuser proportioning.
 - 3) Branch/submain proportioning.
 - 4) Rechecking.
 - 5) Diversity issues.
 - h. Expected problems and solutions, etc.
 - i. Criteria for using air flow straighteners or relocating flow stations and sensors .
 - j. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

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- k. Specific procedures that will ensure that air side is operating at the lowest possible pressures and methods to verify this.
- 1. Confirmation of understanding of the outside air ventilation criteria under all conditions.
- m. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
- n. Method of checking building static and exhaust fan and/or relief damper capacity.
- o. Methods for making coil or other system plant capacity measurements, if specified.
- p. Time schedule for TAB work to be done in phases (by floor, etc.).
- q. Description of TAB work for areas to be built out later, if any.
- r. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
- s. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
- t. Procedures for formal progress reports, including scope and frequency.
- u. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least once a week to Construction Manager and Engineer. Field logs should be submitted with weekly progress reports and include a record of all discrepancies and issues encountered during the period covered.
- E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- F. Progress Reports.
- G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

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- 1. Submit to the Construction Manager, HVAC controls contractor, and Engineer within two weeks after completion of testing, adjusting, and balancing.
- 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
- 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
- 4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
- 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
- 7. Units of Measure: Report data in I-P (inch-pound) units only.
- 8. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Project altitude.
 - j. Report date.

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PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
 - 5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of two years documented experience.
 - 3. Certified by one of the following agencies or methods:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.
 - d. Test and Balance under direct supervision of a Professional Engineer registered in the State of Arkansas.

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- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.
- F. Acceptable TAB Agencies:
 - 1. NEBB.
 - 2. AABC.
 - 3. SMACNA.
 - 4. TABB.
 - 5. Substitutions: Not permitted.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

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C. Beginning of work means acceptance of existing conditions. Since work will occur in phases, provide listing of system deficiencies for systems to be balanced during the specified phases.

3.3 **PREPARATION**

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply and outside air systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- 3.5 RECORDING AND ADJUSTING
 - A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
 - B. Ensure recorded data represents actual measured or observed conditions.
 - C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
 - D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

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- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.
- I. After all adjustments and corrections have been performed to balance system as designed, additional readjustment shall be performed to satisfy desired temperature.

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities. Test and balance all air handlers for the three design positions i.e. minimum (5% adjustable) outside air, design outside air and economizer operation.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

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- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- L. Measure building static pressure and adjust supply, return, barometric relief dampers, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. Measure and record supply, return, outside and exhaust air cfm, fan rpm, motor amps, coil entering and leaving air, temperatures (both wet and dry bulb temperatures), outside air (wet and dry bulb temperatures) for cooling and heating operations, system static pressures shall be measured at the required conditions at the minimum and maximum fan speeds.
- O. Measure and record the following air handling and distribution systems.
 - 1. Supply, return, outside air and exhaust when system is in the economizer operation. Measure and record supply air and outside air temperatures (both wet and dry bulb).

3.7 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Forced Air Furnaces
 - 2. Mini-Split HVAC Units.
 - 3. Air Cooled Refrigerant Condensers
 - 4. Packaged Roof Top Heating/Cooling Units
 - 5. Air Coils
 - 6. Fans.
 - 7. Air Filters.

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8. Air Inlets and Outlets.

3.8 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer
 - 2. Model/Frame
 - 3. HP/BHP
 - 4. Phase, voltage, amperage; nameplate, actual, no load
 - 5. RPM
 - 6. Service factor
 - 7. Starter size, rating, heater elements
 - 8. Sheave Make/Size/Bore
- B. V-Belt Drives:
 - 1. Identification/location
 - 2. Required driven RPM
 - 3. Driven sheave, diameter and RPM
 - 4. Belt, size and quantity
 - 5. Motor sheave diameter and RPM
 - 6. Center to center distance, maximum, minimum, and actual
- C. Combustion Equipment:
 - 1. Boiler manufacturer
 - 2. Model number
 - 3. Serial number
 - 4. Firing rate
 - 5. Overfire draft

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- 6. Gas meter timing dial size
- 7. Gas meter time per revolution
- 8. Gas pressure at meter outlet
- 9. Gas flow rate
- 10. Heat input
- 11. Burner manifold gas pressure
- 12. Percent carbon monoxide (CO)
- 13. Percent carbon dioxide (CO2)
- 14. Percent oxygen (O2)
- 15. Percent excess air
- 16. Flue gas temperature at outlet
- 17. Ambient temperature
- 18. Net stack temperature
- 19. Percent stack loss
- 20. Percent combustion efficiency
- 21. Heat output
- D. Cooling Coils:
 - 1. Identification/number
 - 2. Location
 - 3. Service
 - 4. Manufacturer
 - 5. Air flow, design and actual
 - 6. Entering air DB temperature, design and actual
 - 7. Entering air WB temperature, design and actual

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- 8. Leaving air DB temperature, design and actual
- 9. Leaving air WB temperature, design and actual
- 10. Saturated suction temperature, design and actual
- 11. Air pressure drop, design and actual
- E. Air Moving Equipment:
 - 1. Location
 - 2. Manufacturer
 - 3. Model number
 - 4. Serial number
 - 5. Arrangement/Class/Discharge
 - 6. Air flow, specified and actual
 - 7. Return air flow, specified and actual
 - 8. Outside air flow, specified and actual
 - 9. Total static pressure (total external), specified and actual
 - 10. Inlet pressure
 - 11. Discharge pressure
 - 12. Sheave Make/Size/Bore
 - 13. Number of Belts/Make/Size
 - 14. Fan RPM
- F. Return Air/Outside Air:
 - 1. Identification/location
 - 2. Design air flow
 - 3. Actual air flow
 - 4. Design return air flow

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- 5. Actual return air flow
- 6. Design outside air flow
- 7. Actual outside air flow
- 8. Return air temperature
- 9. Outside air temperature
- 10. Required mixed air temperature
- 11. Actual mixed air temperature
- 12. Design outside/return air ratio
- 13. Actual outside/return air ratio

G. Exhaust Fans:

- 1. Location
- 2. Manufacturer
- 3. Model number
- 4. Serial number
- 5. Air flow, specified and actual
- 6. Total static pressure (total external), specified and actual
- 7. Inlet pressure
- 8. Discharge pressure
- 9. Sheave Make/Size/Bore
- 10. Number of Belts/Make/Size
- 11. Fan RPM
- H. Duct Traverses:
 - 1. System zone/branch
 - 2. Duct size

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- 3. Area
- 4. Design velocity
- 5. Design air flow
- 6. Test velocity
- 7. Test air flow
- 8. Duct static pressure
- 9. Air temperature
- 10. Air correction factor
- I. Flow Measuring Stations:
 - 1. Identification/number
 - 2. Location
 - 3. Size
 - 4. Manufacturer
 - 5. Model number
 - 6. Serial number
 - 7. Design Flow rate
 - 8. Design pressure drop
 - 9. Actual/final pressure drop
 - 10. Actual/final flow rate
 - 11. Station calibrated setting
- J. Terminal Unit Data:
 - 1. Manufacturer
 - 2. Type, constant, variable, single, dual duct
 - 3. Identification/number

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- 4. Location
- 5. Model number
- 6. Size
- 7. Minimum static pressure
- 8. Minimum design air flow
- 9. Maximum design air flow
- 10. Maximum actual air flow
- 11. Inlet static pressure
- K. Air Distribution Tests:
 - 1. Air terminal number
 - 2. Room number/location
 - 3. Terminal type
 - 4. Terminal size
 - 5. Area factor
 - 6. Design velocity
 - 7. Design air flow
 - 8. Test (final) velocity
 - 9. Test (final) air flow
 - 10. Percent of design air flow

END OF SECTION

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SECTION 23 07 13

DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.
- B. Duct Liner.
- C. Insulation jackets.
- D. Adhesive, tie wires, tape

1.2 RELATED REQUIREMENTS

- A. Section 23 01 00 General HVAC Provisions.
- B. Section 23 05 53 Identification for HVAC Piping and Equipment.
- C. Section 23 31 00 Ducts: Glass fiber ducts.

1.3 REFERENCE STANDARDS

- A. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C. ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- D. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- E. ASTM C916 Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- F. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- G. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

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- H. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- I. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- J. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2020.
- K. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than five years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with a minimum five years of documented experience and approved by manufacturer.
- C. Perform work at ambient and equivalent temperatures as recommended by the adhesive manufacturer. Work shall be performed only by mechanics who regularly perform this type of work only.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

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1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.
- B. Adhesives to be waterproof.
- C. Recovering jackets 6 ounce per square yard canvas attached with a lagging fire retardant adhesive. Install on exposed ductwork insulation. Cover thoroughly with several coats of sizing.

2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Knauf Insulation.
 - 2. Johns Manville Corporation.
 - 3. Owens Corning Corp.
 - 4. CertainTeed Corporation.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 450 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
 - 4. Maximum Moisture Absorption: 0.20 percent by volume.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.

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- 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
- 3. Moisture Vapor Transmission: ASTM E 96; 0.02 perm.
- 4. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Tie Wire: Annealed steel, 16 gage.

2.3 GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. Knauf Insulation.
 - 2. Johns Manville Corporation.
 - 3. Owens Corning Corp.
 - 4. CertainTeed Corporation.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
 - 1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum service temperature: 450 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent.
 - 4. Maximum Moisture Absorption: 0.20 percent by volume.
 - 5. Maximum Density: 8.0 lb/cu ft.
 - 6. Density: 3.0 lb/cu ft.
- C. Vapor Barrier Jacket:

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- 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
- 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
- 3. Moisture vapor transmission: ASTM E 96; 0.04 perm.
- 4. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.4 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
 - 1. Lagging Adhesive:
 - a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M).
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Embossed.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.5 DUCT LINER

A. Manufacturers:

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- 1. Knauf Insulation.
- 2. Johns Manville Corporation.
- 3. Owens Corning Corp.
- 4. CertainTeed Corporation.
- B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; semi-rigid duct liner; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
 - 1. Fungi Resistance: ASTM G21.
 - 2. Substitutions: See Section 23 01 00 General HVAC Provisions.
 - 3. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 - 4. Service Temperature: Up to 250 degrees F.
 - 5. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 - 6. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.30.
 - b. 1 inch Thickness: 0.45.
 - c. 1-1/2 inches Thickness: 0.60.
 - d. 2 inch Thickness: 0.70.
- C. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- D. Liner Fasteners: Galvanized steel, welded with press-on head.

2.6 MATERIALS

- A. External Insulation
 - 1. Exterior Exposed Rectangular Ducts: Rigid glass fiber insulation, minimum installed R-value of R-8, with factory applied reinforced aluminum foil vapor barrier for systems conveying air at less than room temperature with aluminum jacket.
 - 2. Exposed Round And Rectangular Ducts: 1 1/2-inch expanded closed cell elastomeric insulation equal to Armstrong Armaflex, "K" valve at 75° F, 0.27

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Btu/in/sq. ft./°F/hr.

- 3. Concealed Round Ducts: Flexible glass fiber insulation, minimum installed R-value of R-6, with factory applied reinforced aluminum foil vapor barrier for systems conveying air at less than room temperature.
- B. Internal Insulation
 - 1. Rectangular Ducts and Plenums: Internal duct insulation shall be semi-rigid duct liner board manufactured from glass fibers bonded with a thermosetting resin. Insulation shall be coated on one side with a fire resistant black coating and shall have a minimum installed R-value of R-6. Duct liner shall be installed by cutting side pieces of insulation to lap both top and bottom sections for maximum support. Install side pieces first. Side pieces and bottom piece shall be attached with 4" strips of adhesive at one foot intervals. Top section of insulation shall be attached with Stick-Klip fasteners secured by Miracle adhesive spaced one fastener per two square feet of insulation. Edges of insulation shall be butted with adhesive to insure a tight joint and provide a smooth surface.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.
- C. Finish with system at ambient conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

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- D. Insulated ducts conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces : Finish with canvas jacket sized for finish painting.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket finished, see Section _____.
- G. Slope exterior ductwork to shed water.
- H. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- I. Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 100 percent coverage.
 - Secure insulation with welded mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible and NAIMA Fibrous Glass Duct Liner Standards (latest edition) for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

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3.3 SCHEDULES

- A. Exhaust Ducts: Externally wrap.
- B. Outside Air Intake Ducts:
 - 1. Round: Externally insulate with 2-inch thick insulation, minimum installed R-value of R-6.
 - 2. Rectangular: Internally insulate with 1-inch thick semi-rigid duct liner with adhesive and welded mechanical fasteners, minimum installed R-value of R-6.
- C. Concealed Supply Ducts:
 - 1. Round Duct: Externally insulate with 2-inch thick insulation, minimum installed R-value of R-6.
 - 2. Rectangular: Internally insulate with 1-inch thick, semi-rigid duct liner, minimum installed R-value of R-6, with adhesive and welded mechanical fasteners.
- D. Concealed Return Air Ducts and Plenums:
 - 1. Round: Externally insulate with 2-inch thick insulation, minimum installed R-value of R-6.
 - 2. Rectangular: Internally insulate with 1-inch thick, minimum installed R-value of R-6, semi-rigid duct liner with adhesive and welded mechanical fasteners.
- E. Ducts Exposed to Outdoors:
 - 1. Internally line all rectangular duct, seal and weatherproof all joints and seams. Minimum installed R-value of R-8.

END OF SECTION

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SECTION 23 09 23

DDC CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building Automation System (BAS), utilizing direct digital controls.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Products Supplied But Not Installed Under This Section (where required by project specific plans):
 - 1. Control valves.
 - 2. Flow switches and flow meters.
 - 3. Wells, sockets and other inline hardware for water sensors (temperature, pressure, flow).
 - 4. Airflow measuring stations (where not supplied with factory equipment).
 - 5. Variable frequency drives. (This does not include VFDs integral to equipment such as chillers or packaged DX units).
- B. Products Not Furnished or Installed But Integrated with the Work of This Section (where required by project specific plans):
 - 1. Chiller control systems.
 - 2. Boiler control systems.
 - 3. Fire alarm relays for system shutdown
 - 4. Smoke detectors (through alarm relay contacts).
 - 5. Occupancy sensors (used for lighting spare contacts for use by DDC)
 - 6. Terminal unit 24V transformers
 - 7. VAV terminal unit control enclosures
- C. Work Required Under Other Divisions Related to This Section (where required by project specific plans):

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- 1. Installation of VFD's.
- 2. Installation of thermostat/zone sensor conduits between sensor zone location and the sensor's associated HVAC unit.
- 3. Power wiring to line side of motor starters, disconnects or variable frequency drives.
- 4. Power wiring to all controller enclosures.
- 5. Provision and wiring of smoke detectors and other devices relating to fire alarm system.
- 6. Campus LAN (Ethernet) connection to BAS system network controller.

1.3 SYSTEM DESCRIPTION

- A. Scope: Furnish all labor, materials and equipment necessary for a complete and operating Building Automation System (BAS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer bus over the BACnet protocol. The BAS shall be an open Niagara based system. Proprietary systems are not acceptable.
 - 1. System architecture shall fully support third party systems via integration utilizing protocols including BACnet, LonTalk, and MODBUS.
 - 2. System architecture shall provide secure Web-based access using any of the current versions of Microsoft Internet Explorer, Mozilla Firefox, or Google Chrome browsers from any computer on the owner's LAN.
 - 3. The BAS server or system network controller shall host all graphic files for the control system.
 - 4. Owner shall receive all Administrator level login and passwords for engineering toolset at first training session. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the BAS.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

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- B. Submit in electronic format. Submittals shall be representative of the entire control system and shall consist of a complete list of equipment and materials, including manufacturers' catalog data sheets. Provide BACnet Protocol Implementation Conformance (PICS) documentation for all DDC controllers upon Engineer request.
- C. Product Data: Submit manufacturer's data sheets on each product to be used.
- D. Control Drawings: Drawings shall contain complete wiring and schematic diagrams, sequences of operation, control system bus layout, material lists, and any other details required to demonstrate that the system has been coordinated and will properly function as a system.
- E. Upon completion of the work, provide electronic 'as-built' drawings and other project-specific documentation.
- F. Any deviations from these specifications or the work indicated on the drawings must be approved by the engineer and shall be clearly identified in the submittals and asbuilt documents.

1.5 QUALITY ASSURANCE

- A. The Control System Contractor shall have a full service DDC office within 100 miles of the job site. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment.
- B. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized building automation systems similar in size and complexity to the system specified.
- C. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.
- D. Factory Authorization: The Control System Contractor shall be a direct distributor and authorized agent of the primary controls line being installed (system network controllers, programmable equipment controllers, digital sensors, etc.)

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1.6 DELIVERY, STORAGE AND HANDLING

 Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. KMC Controls by Harrison Energy Partners.
- B. Substitutions: None or Engineer Approved Equal

2.2 GENERAL

- A. The Building Automation System (BAS) shall be based on the Niagara Framework. Proprietary systems are strictly prohibited.
- B. The BAS shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.
- C. The installed system shall provide secure password access to all features, functions and data contained in the overall BAS.

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing open protocols in one open, interoperable system.
- B. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins.

2.4 BAS SUPERVISOR SERVER HARDWARE

A. The BAS shall include a Supervisory Server device as required to meet the design intention for BAS performance including proper alarm management, trending performance and long term storage, backup data base storage, reasonable system performance speeds, etc. If a BAS Supervisor is not provided, the Control System Contractor shall provide sufficient performance documentation to the Engineer of Record for review and approval before acceptance. This performance documentation must prove that the provided System Network Controller (SNC) utilized in lieu of the Supervisor Server meets the Minimum Computer Hardware Configuration

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requirements specified herein.

- B. Minimum Computer Hardware Configuration
 - 1. Processor: Intel Pentium N4200 1.1 GHz CPU
 - 2. Memory: 4 GB LPDDR4 RAM
 - 3. Operating System: Windows 10 IoT version (must be able to disable automatic updates)
 - 4. Hard Drive: 64 GB Solid State Storage minimum, more recommended depending on archiving requirements. Minimum of 1 year of data storage.
 - 5. Network Support: Dual Gb LAN ports
 - 6. Connectivity: Full-time high-speed ISP connection shall be provided by the owner. Controls System Contractor shall offer remote connectivity via cellular service at an additional cost to the owner if needed.
- C. Standard Client: The thin-client Web Browser BAS graphical user interface shall be Google Chrome or browser equivalent. No special software shall be required to be installed on the PCs used to access the BAS via a web browser.

2.5 SYSTEM NETWORK CONTROLLER (SNC)

- A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC), and integrated BACnet devices which are connected to its communications trunks. For sites utilizing a supervisory server, the SNC shall directly communicate with the BAS supervisor server. The SNC is also responsible to perform control and operating strategies for the system based on information from any controller connected to the BAS. The basis of design SNC shall be the Niagara JACE 8000 controller.
- B. The controllers shall be capable of peer-to-peer communications with other SNC's and with any Operator Workstation (OWS) connected to the BAS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.
- C. The SNC shall be capable of routing all BACnet ms/tp communications traffic. However, BACnet routers shall be installed to manage the ms/tp communications traffic. This requirement is enforced in order to minimize the workload of the SNC to ensure proper performance of the BAS.
- D. The SNC shall be capable of executing application control programs to provide:

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- 1. Calendar functions.
- 2. Scheduling.
- 3. Trending.
- 4. Alarm monitoring and routing.
- 5. Time synchronization.
- 6. Integration BACnet controller data.
- 7. Integration of LonWorks and MODBUS controller data via the use of additional drivers when required.
- 8. Network management functions for all SNC, PEC and ASC based devices.
- E. The SNC shall provide the following hardware features as a minimum:
 - 1. Two 10/100 Mbps Ethernet ports.
 - 2. Two Isolated RS-485 ports with biasing switches.
 - 3. 1 GB RAM
 - 4. 4 GB Flash Total Storage / 2 GB User Storage
 - 5. Wi-Fi (Client or WAP)
 - 6. USB Flash Drive
 - 7. High Speed Field Bus Expansion
 - 8. Integrated 24 VAC/DC Global Power Supply
 - 9. MicroSD Memory Card Employing Encrypted Safe Boot Technology
- F. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
- G. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.
- H. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.

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- 1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
 - a. Alarm.
 - b. Return to normal.
 - c. To default.
- 2. Alarms shall be annunciated in any of the following manners as defined by the user:
 - a. Screen message text.
 - b. Email of complete alarm message to multiple recipients.
 - c. Graphics with flashing alarm object(s).
- I. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.
- J. The SNC shall support the following security functions.
 - 1. Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.
 - 2. Role-Based Access Control (RBAC) for managing user roles and permissions.
 - 3. Require users to use strong credentials.
 - 4. Data in Motion and Sensitive Data at Rest be encrypted.
 - 5. LDAP and Kerberos integration of access management.
- K. The SNC shall be provided with a minimum 1 Year Software Maintenance license for system upgrades during the warranty period. Additional Software Maintenance licenses shall be provided as needed to include system upgrades throughout the entire first year of system use. Labor to implement not included.

2.6 PROGRAMMABLE EQUIPMENT CONTROLLERS (PEC)

A. General: Controllers shall be responsible for monitoring and controlling directly connected HVAC equipment such as Chilled Water Systems, Cooling Towers, Hot Water Systems, Pump Systems, Geothermal Loop Systems, Domestic Water Systems, AHU's, RTU's, Split Systems, Heat Pumps, VAV Terminals, Fan Coil Units, Chilled Beams, Unit Ventilators, Exhaust Fans, Lighting Systems, and/or other building

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mechanical systems as required. Each controller shall be classified as a "native" BACnet device, supporting the BACnet Advanced Application Controllers (B-AAC) profile. Controllers that support a lesser profile such as B-ASC are not acceptable without written permission from the Engineer of Record. Controllers shall conform to the BACnet Advanced Application Controller (B-AAC) profile.

- B. Software Specifications
 - 1. General: The controller shall contain non-volatile memory to store both the resident operating system and application programming. Any program may affect the operation of any other program. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, extraction of the program for storage, routing communications, etc.
 - 2. Automatic Restart after Power Failure: Upon restoration of power after an outage, the controller shall automatically and without human intervention update all monitored functions; resume operation based on current synchronized time and status, and implement special start-up strategies as required.
 - 3. User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and set points. Controllers shall be capable of utilizing both line code based programming and Graphical Function Block programming interfaces.
 - a. Programs shall be generated by an English-language based (line) editor or a Graphical Function Block interface.
 - b. The language shall be structured to allow for the easy configuration of control programs and mathematical calculations.
 - c. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.
 - d. Controllers that use non-editable factory programming only methods will not be accepted without written permission from the Engineer of Record.
 - 4. Control Algorithms: The controller shall have the ability to perform the following control algorithms:
 - a. Proportional, Integral plus Derivative Control (PID)
 - b. Two Position Control

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- c. Digital Filter
- d. Ratio Calculator
- e. Equipment Cycling Protection
- 5. Mathematical Functions: Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, trigonometric functions, Boolean logic statements, or combinations of all. The controllers shall be capable of performing complex logical statements including operators such as ???, ???, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators.
- 6. Energy Management Applications: The controller shall have the ability to perform any or all of the following energy management routines where required by the sequence of operations or controls design:
 - a. Time of Day Scheduling
 - b. Calendar Based Scheduling
 - c. Holiday Scheduling
 - d. Exception Scheduling
 - e. Temporary Schedule Overrides
 - f. Optimal Start
 - g. Optimal Stop
 - h. Night Setback Control
 - i. Enthalpy Switchover (Economizer)
 - j. Peak Demand Limiting, Load Shed
 - k. Temperature Compensated Duty Cycling
 - 1. CFM Tracking
 - m. Heating/Cooling Interlock
 - n. Hot/Cold Deck Reset
 - o. Free Cooling

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- p. Hot Water Reset
- q. Chilled Water Reset
- r. Condenser Water Reset
- s. Chiller Sequencing
- t. Demand Ventilation
- C. History Logging: Each controller shall be capable of locally logging any input, output, calculated value, etc. over user defined time intervals (1 second minimum time). Up to 128 values shall be stored in each log. Logged data shall be downloadable to the Supervisory Server or SNC for long term archiving based upon user-defined time intervals, COV notification or manual command.
- D. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the controller. When communications return, the alarm will be transmitted to the Supervisory Server or SNC.
- E. Communications: The controllers shall be a native BACnet communications, available as EIA-485 (MS/TP) or Ethernet/IP physical connections as required. The controllers shall meet or exceed the specifications in the ANSI/ASHRAE BACnet Standard 135-2010 for BACnet Advanced Application.
 - 1. MS/TP Devices: For devices with MS/TP connectivity, baud rates between 9600 and 115.2k baud shall be selectable. Segmentation shall be supported. Auto-baud functionality shall be supported.
- F. Firmware Upgrades: The controller firmware shall be upgradeable for updates as future enhancements and expanded functionality. Firmware updates shall be supported via BACnet communications (over-the-network).
- G. Hardware Platform Features:
 - 1. Processor: The controller shall employ at minimum a 32-bit microprocessor.
 - 2. Memory: The operating system and the application programs for the controller shall be stored in non-volatile FLASH memory. The controller shall support up to 8 MB Flash memory and up to 2 MB of RAM. The controller shall include an on-board capacitor to back up the controller's RAM memory for a period of at least

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six hours. In the case of a power failure, the controller shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the controller shall restart itself from its application program stored in its FLASH memory.

- 3. Inputs: The controller shall have on-board universal inputs. Each universal input shall have over-voltage protection. Manually set, hardware configuration jumpers shall not be necessary.
- 4. Outputs: The controller shall have on-board universal outputs. Each universal outputs shall be software selectable as analog or binary.
- 5. Terminal Block Connectors: The controller shall have removable screw terminal blocks that can accommodate wire sizes 14-22 AWG.
- 6. Power Supply: The power supply for the controller shall be 24VAC power (20 VAC minimum/30 VAC maximum). Voltage below the operating range of the system shall be considered an outage.
- H. VAV Controller Specific Features:
 - 1. Integrated Actuator: The controller shall have an integrated actuator with the following features:
 - a. The actuator shall be rated at a minimum of 35 inch-lbs.
 - b. Connection to the damper shall be with a v-bolt clamp, accepting 3/8" to 5/8" damper shaft sizes.
 - c. The actuator shall have an integrated gear disengagement mechanism.
 - 2. Integrated Pressure Sensor: The controller shall have an integrated pressure sensor for airflow measurement. The sensor shall have a range of 0-2"wc, accurate to 5% of reading.
 - 3. Inputs: The controller shall have the following inputs:
 - a. Inputs for room temperature and room setpoint from wall sensor.
 - b. Additional universal inputs, software configurable as analog or binary.
 - 4. Outputs: The controller shall have the following outputs:
 - a. Damper Actuator, Clockwise and Counter-clockwise

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- b. Additional universal outputs, software configurable as analog or binary. Each output channel shall be capable of being manipulated individually, exclusive to any other output.
- 5. VAV Balancing: The VAV controller shall be capable of being balanced from the Digital Room Sensor without any specific pc-based software.
- I. General Purpose Controller Specific Features:
 - 1. Mounting: The controller shall be able to be mounted on standard DIN rail or to a panel using integrated mounting holes on 1" centers.
 - 2. Modular Expandability: The controller shall allow expansion of the device Input and Output capacity via Expansion Modules, making it possible to add I/O as desired to meet the requirements for individual control applications.

2.7 DIGITAL ROOM SENSOR

- A. General: The Digital Room Sensor shall provide the following types of functions and be field programmable:
 - 1. Space condition measurements and indications, including temperature, humidity, local motion/occupancy, and CO2 as required by specific application.
 - 2. User setpoint adjustments
 - 3. Equipment status and mode indication
- B. Integrated Sensors: The Digital Room Sensor shall have integrated sensors for temperature, humidity, motion/occupancy, and CO2 as required for the application. The intent of this requirement is to minimize the number of physical devices installed in the zone. The Controls Contractor shall inform the Engineer or Record if multiple zone sensor devices will be required for zone sensing of temperature, humidity, motion/occupancy, and CO2. The Engineer of Record will coordinate with the Architect for review/approval of the multiple zone sensors.
- C. User Set points: User/Occupant set points may be manipulated via the Digital Room Sensor. Single and/or multiple set points shall be supported and field configurable. Unique set point sequences shall be configurable and presented to the user based on a mode condition. Setpoint adjustment shall be capable of being locked out at the Digital Room Sensor. Setpoints shall be adjustable at the BAS when locked out locally.

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2.8 BACNET ROUTER

- A. General: The BACnet router shall router BACnet traffic between BACnet networks, virtual and/or physical. The router shall be designed for both permanent installations as well as temporary use for BACnet device configuration and BACnet network troubleshooting.
- B. Connections:
 - 1. Power: The router shall be powered wither from 24VAC AC (-15%, +20%) or from USB. The 24VAC connections shall be a removable terminal block accepting 12 to 22 AWG wire.
 - 2. Network Communication Ports: The controller shall have an on-board, 10/100bT Ethernet port and an EIA-485 port. The EIA-485 port shall be optically isolated and have integrated end-of-line (EOL) terminations. The EIA-485 port shall be a removable terminal block accepting 12 to 22 AWG wire.
- C. Mounting: The router shall be capable of being flush mounted via mounting holes on 1" centers, or DIN rail, without the use of additional mounting accessories.
- D. Communications: The router shall be a native BACnet device, available as EIA-485 (MS/TP) or Ethernet/IP physical connections as required.
 - 1. MSTP: MSTP network baud rates between shall be selectable between 9600 and 115.2k baud. Segmentation shall be supported.
 - 2. Ethernet/IP: The following BACnet For devices enabled with Ethernet/IP connectivity, the user shall be able to select BACnet 8802-3, BACnet IP, BACnet BBMD, or BACnet Foreign Device. Segmentation shall be supported.
- E. Routing: The router shall support: one BACnet MSTP network, one BACnet 8802-3 network, and two BACnet IP networks, the IP networks selected able as IP, foreign devices or BBMD. The BBMD Foreign Devices table shall support up to 128 entries.
- F. Diagnostics
 - Device Status: The router shall report the status of each MSTP device that is detected on the MSTP network. MSTP MAC address status shall be indicated with the following color coded categories: no devices detected (white), offline (grey), router MAC (blue), active device (green), errors or duplicate (red). Metrics shall indicate the total device count online, average token cycle time, and the average token time per device.

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- 2. Token Use: The router shall report state of the MSTP token. The status of the token as it is passed between MSTP devices shall be indicated with the following color-coded categories: passed in less than 100ms (normal, green), passed in more than 100 ms but less than the APDU timeout (slow, yellow), passed in longer than the APDU timeout (red). Poll for Master (PFM) shall be indicated in light blue.
- 3. Route Status: The router shall report all the known BACnet networks, both directly connected and remote connected. The status of each BACnet network should be identified, indicating the following network states: active, busy, down/gone, or duplicated network, duplicated MSTP MAC, sole MSTP master, BBMD: Unknown, BBMD: Multiple, Foreign Devices NAK.
- 4. MSTP Metrics: The following MSTP network metrics shall be indicated: Tx Frame Count, Tx Data Count, TX Error Count, Rx Frame Count, Rx Unexpected Frame Count, Wait for Reply Error Count, Duplicate MAC Count, Token Retry Count, Token Timeout Count, Rx Token Count, Token Error Count, Rx PRM Count, PFM Error Count, Rx Discard Count, Rx FB Reparse Count.
- G. Time Master: The router shall be a BACnet time sync master, capable of syncing BACnet network time to either local (PC) or a SNTP Time server. Both UTC and local time shall be supported.
- H. Firmware Upgrades: The router firmware shall be upgradeable for updates as future enhancements and expanded functionality. Firmware updates shall be supported via BACnet communications (over-the-network) and through the integrated configuration webpages.

2.9 DIRECT DIGITAL CONTROL SYSTEM HARDWARE

- A. Control damper actuators shall be furnished by the Control System Contractor. Twoposition or proportional electric actuators shall be direct-mount type sized to provide a minimum of 7 inch-lb torque per square foot of damper area. Damper actuators shall be capacitor-driven or spring-driven fail-safe with switch-selectable direction providing consistent torque in both powered and fail-safe modes. Damper actuators shall have gear disengagement button, and adjustable mechanical end stop. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators.
- B. Control Valves: Control valves shall be 2-way or 3-way pattern as shown and constructed for tight shutoff at the pump shut-off head or steam relief valve pressure.

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Control valves shall operate satisfactorily against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 4.0 psi at rated flow (unless otherwise noted or scheduled on the drawings). Valves with sizes up to and including 2.5 inches shall be "screwed" configuration and 3 inches and larger valves shall be "flanged" configuration. Electrically-actuated control valves shall include capacitor-driven or spring-driven fail-safe actuators with switch-selectable direction providing consistent torque in both powered and fail-safe modes sized for tight shut-off against system pressures (as specified above) and, when specified, shall be furnished with integral switches or positive feedback for indication of valve position.

- C. Control Valve Actuators: Actuators for cooling and heating coil control valves shall be "proportional" type. All actuators shall have inherent current limiting motor protection. Valve actuators shall be 24-volt, electronic type, modulating or twoposition as required for the correct operating sequence. Actuators on valves needing 'fail-safe' operation shall have capacitor-driven or spring-driven fail-safe actuators with switch-selectable direction.
- D. Only VAV terminal unit control valves and fan coil unit control valves shall allow for fail-in-place control valve actuators. All other hot water control valves shall be Normally-Open arrangement. Chilled water control valves shall be Normally-Closed arrangement.
- E. Sensor Only Wall Mount Room Temperature sensors: Where shown on plans as sensor only, provide stainless steel flat plate temperature sensors. Flat Plate Sensors shall have an accuracy of -/+ 0.5 Degrees F.
- F. Duct-mounted and Outside Air Temperature Sensors: Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size. The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air, preheat air, and other locations where air stratification might affect temperature readings, install bendable averaging duct sensors. Sensor element length shall be selected for sufficient coverage equal to one foot of sensor length for every two square feet or coverage area. These devices shall have accuracy of -/+ 0.5 degrees Fahrenheit over the entire range.
- G. Humidity sensors shall have accuracy to -/+ 2% over the 10 to 90% RH. Operating range shall be 0 to 100% RH and 40 to 120 degrees Fahrenheit. Sensors shall be selected for wall, duct or outdoor type installation as appropriate for the application.

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- H. Carbon Dioxide Sensors (CO2): Sensor default range shall be 0 2000 PPM.
 Accuracy shall be plus or minus 75 PPM. Sensor shall be wall or duct mounted type, as appropriate for the application.
- I. Current Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point.
 Current switch to include an integral LED for indication of trip condition and a current level below trip set point.
- J. Differential Static Pressure Transmitters: Provide a pressure transmitter with switchselectable pressure ranges (inches water column). Accuracy shall be plus or minus 1% of full scale range. Provide push button auto zero capability. Device shall have integral static pickup tube.
- K. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips or compression fittings.
- L. Water Flow Switches: Provide a SPST type contact switch with bronze paddle blade, sized for the actual pipe size at the location. If installed outdoors, provide a NEMA-4 enclosure. Flow switch shall be UL listed.
- M. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Indoor panels not subject to water damage shall be NEMA-1. Provide NEMA 3R panels for outdoor use or where subject to falling dirt, rain, sleet, snow, or external ice. In all cases where controls may be subject to windblown dust, splashing water, and hose-directed water, use NEMA-4 panels.
- N. Low Air Temperature Sensors: Switch shall be provided with at least two contacts.
 Switch shall have a range of 35 to 80 degrees Fahrenheit. Switch shall be manual reset type.
- O. Variable Frequency Drives: The variable frequency drive (VFD) shall be designed specifically for use in Heating, Ventilation, and Air Conditioning (HVAC) applications in which speed control of the motor can be applied. The VFD, including all factory installed options, shall have UL & CSA approval. VFD's shall include communications capability with DDC BAS via built-in interface card (BACnet) for information purposes. All control signals from VFD shall be controlled through direct, hardwired control signals (AO, BO, AI, BI).

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- P. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall have indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.
- Q. Emergency Stop Switches: Provide toggle-type switch with normally-closed contact. Switch shall be labeled "EMERGENCY SHUTOFF".
- R. Natural Gas Shutoff Valves: Provide 2-way normally closed operation Gas Shutoff Valve. Valve shall be 120V model with watertight enclosure. Size valve for line size installation. Basis of design is ASCO Series 8214.
- S. Transducers: Differential pressure transducers shall be electronic with three output ranges: 4 to 20 mA, 0 to 5 VDC, and 0 to 10 VDC. Device shall have the following: push-button and remote zeroing terminal, uni-directional or bi-directional pressure-range selection switch, high/low port swap switch to solve incorrect plumbing for differential, normal or slow-surge damping switch to prevent false alarms and reduce noise and output polarity reverse switch so in reverse mode the analog output is maximum when the pressure differential is zero and decreases as pressure increases. Unit shall be designed to operate in the pressure ranges involved.
- T. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 VA minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation.
- U. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

2.10 BAS SYSTEM WEB BROWSER GUI - SYSTEM OVERVIEW

- A. The BAS Contractor shall provide system software based on thin-client architecture, designed around the open standards of web technology. The BAS Supervisory Server or SNC shall communicate using Ethernet and TCP. BAS shall be accessed using a web browser over Owner intranet and remotely over the Internet.
- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the BAS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will

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support HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet.

- C. The web browser GUI shall provide a completely interactive user interface and shall provide a HTML5 experience that supports the following features as a minimum:
 - 1. Real time 'live' Graphic Programs.
 - 2. Trending.
 - 3. Scheduling.
 - 4. Parameter change of properties.
 - 5. Set point adjustments.
 - 6. Consolidated system reports
 - 7. Alarm / event information.
 - 8. Configuration of operators.
 - 9. Execution of global commands.
- D. Secure Socket Layers: Communication between the Web Browser GUI and BAS server shall offer encryption using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).
- E. Software Components: All software shall be the most current version. All software components of the BAS system software shall be provided and installed as part of this project. BAS software components shall include:
 - 1. Server/SNC Software, Database and Web Browser Graphical User Interface.
 - 2. 1 Year Software Maintenance license. Labor to implement not included.
 - 3. Embedded System Configuration Utilities for future modifications to the system and controllers.
 - 4. Embedded Graphical Programming Tools.
 - 5. Embedded Direct Digital Control software.

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6. Embedded Application Software.

2.11 GRAPHICAL USER INTERFACE

- A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic set point controls, configuration menus for operator access, reports and reporting actions for events.
- B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and strong password. Navigation in the system shall be dependent on the operator's role-based application control privileges.
- C. Navigation: Navigation through the GUI shall be accomplished by selecting dynamic links to system graphics.
- D. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic view to communicate information related to set points and comfort. Animated .gifs or .jpg, vector scalable, active set point graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall be non-proprietary and conform to the following basic criteria:
 - 1. Display Size: The GUI workstation software shall graphically display in a minimum of 1024 by 768 pixels 24 bit True Color.
 - 2. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
 - 3. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, as selected by Owner. Provide a visual display of temperature relative to their respective set points. The colors shall be updated dynamically as a zone's actual comfort condition changes.
 - 4. Mechanical Systems: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to

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enhance usability.

- 5. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
 - a. Each building.
 - b. Each floor and zone controlled.
 - c. Each piece of equipment monitored or controlled including each terminal unit.
- E. Hierarchical Schedules: An operator (with proper access credentials) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
 - 1. Schedules: Schedules shall comply with BACnet standards and shall allow events to be scheduled based on:
 - a. Types of schedule shall be Normal, Holiday or Override.
 - b. A specific date.
 - c. A range of dates.
 - 2. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
- F. Alarms: Alarms associated with a specific system or area shall be displayed in the 'Alarms' view. Alarms, and reporting actions shall have the following capabilities:
 - 1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report and a URL link to the associated graphic for the selected system or area.
 - 2. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.

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- 3. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance.
- 4. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
- G. Trends: As system is engineered, all critical points shall be enabled to trend. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously.
 - 1. Viewing Trends: The operator shall have the ability to view trends by using the BAS GUI. The system shall be able to simultaneously graphically display multiple trends per graph.
 - 2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server or SNC. Trend data, including run time hours and start time date shall be retained in non-volatile module memory.
 - 3. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval.
 - 4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
- H. Security Access: Systems that Security access from the web browser GUI to BAS server or SNC shall require a Login Name and Strong Password. Access to different areas of the BAS system shall be defined in terms of Role-Based Access Control privileges as specified:
 - 1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of ' easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.
 - a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
 - b. Edit Privileges shall comprise: Set point, Tuning and Logic, Manual Override, and Point Assignment Parameters.

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- c. Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.
- 2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

PART 3 EXECUTION

3.1 GENERAL

- A. Install system and materials in accordance with manufacturer's instructions and as detailed on the project drawing set.
- B. Low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.
- C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.
- D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.2 WIRING

- A. All low voltage electrical control wiring to the control panels shall be the responsibility of the Control System Contractor unless noted otherwise on plans.
- B. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes.
- C. Use manufacturer-specified wire for all network connections.
- D. Wiring installed outside or exposed is to be installed in EMT conduit.
- E. Wiring above accessible ceiling can be installed without raceway. Wiring should be installed neatly and suspended with j-hooks.

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3.3 ACCEPTANCE TESTING

- A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative or Engineer of Record. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.4 OPERATOR TRAINING

A. The Control System Contractor shall provide one day of comprehensive training for the Owner's representative to enable proficient operation of the system. Training shall be provided after final commissioning of the project.

3.5 TEST AND BALANCE ASSISTANCE

A. The Control System Contractor shall provide up to 4 hours of training to the test and balance contractor on the use of test and balancing tool – provided by the Control System Contractor for adjusting of system setpoints needed to balance the system. If no tool is available, the Control System Contractor shall provide up to 24 hours of assistance to the test and balance contractor.

3.6 COMMISSIONING AGENT ASSISTANCE

- A. The Control System Contractor shall provide up to 40 hours of assistance to the Commissioning Agent during final commissioning inspection. If additional hours are necessary, the Control System Contractor shall provide an hourly labor rate to the Commissioning Agent for the purchase of additional assistance labor hours as necessary for the completion of the commissioning process.
- B. The Control System Contractor shall not make changes to the final control system design or sequence of operations without written approval from the Engineer of Record. Any proposed changes to the control system design shall be prepared and submitted in writing by the Commissioning Agent.

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3.7 WARRANTY PERIOD SERVICES

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance. Within this period, upon notice by the Owner, any defects in the BAS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.

3.8 WARRANTY ACCESS

A. The Owner shall grant to the Control System Contractor reasonable access to the BAS during the warranty period. Remote access to the BAS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) will be allowed.

3.9 OPERATION & MAINTENANCE MANUALS

- A. See Division 1 for requirements. O&M manuals shall include the following elements, as a minimum:
 - 1. As-built control drawings.
 - 2. General description and specifications for all components.

END OF SECTION

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SECTION 23 23 00

REFRIGERANT PIPING AND SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Pressure regulators.
- H. Filter-driers.
- I. Solenoid valves.
- J. Expansion valves.

1.2 RELATED REQUIREMENTS

- A. Section 23 81 26 Small Capacity Split System Air Conditioner
- B. Section 23 54 00 Furnaces.
- C. Section 23 63 13 Air Cooled Refrigerant Condensers.
- D. Division 26 Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 710 Performance Rating of Liquid-Line Driers; 2009.
- B. AHRI 750 Thermostatic Refrigerant Expansion Valves; 2007.
- C. AHRI 760 Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.

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- D. ASHRAE Std 15 Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- E. ASHRAE Std 34 Designation and Safety Classification of Refrigerants; 2022, with Errata (2024).
- F. ASME BPVC-VIII-1 Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.
- G. ASME BPVC-IX Boiler and Pressure Vessel Code, Section IX Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- H. ASME B16.26 Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
- I. ASME B31.5 Refrigeration Piping and Heat Transfer Components; 2022.
- J. ASME B31.9 Building Services Piping; 2020.
- K. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- L. AWS A5.8M/A5.8 Specification for Filler Metals for Brazing and Braze Welding; 2019.
- M. MSS SP-58 Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.4 SYSTEM DESCRIPTION

- Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.

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D. Valves:

- 1. Use service valves on suction and discharge of compressors.
- 2. Use gage taps at compressor inlet and outlet.
- 3. Use gage taps at hot gas bypass regulators, inlet and outlet.
- 4. Use check valves on compressor discharge.
- 5. Use check valves on condenser liquid lines on multiple condenser systems.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shutoff valve and expansion valve.
- F. Strainers:
 - 1. Use line size strainer upstream of each automatic valve.
 - 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
 - 3. On steel piping systems, use strainer in suction line.
 - 4. Use shut-off valve on each side of strainer.
- G. Solenoid Valves:
 - 1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
 - 2. Use in liquid line of single or multiple evaporator systems.
 - 3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

1.5 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

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- D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Test Reports: Indicate results of leak test, acid test.
- F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- G. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.
- B. Design piping system under direct supervision of a licensed hvac company experienced in design of this type of work and licensed in the state where the Project is located.

1.7 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME (BPV IX).
- C. Welders Certification: In accordance with ASME (BPV IX).
- D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.
- 1.8 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver and store piping and specialties in shipping containers with labeling in place.
 - B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
 - C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

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PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.
- D. Valves:
 - 1. Use service valves on suction and discharge of compressors.
 - 2. Use gauge taps at compressor inlet and outlet.
 - 3. Use check valves on condenser liquid lines on multiple condenser systems.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shutoff valve and expansion valve.
- F. Strainers:
 - 1. Use line size strainer upstream of each automatic valve.
 - 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
 - 3. On steel piping systems, use strainer in suction line.
 - 4. Use shut-off valve on each side of strainer.
- G. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

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- 2. Use a filter-drier on suction line just ahead of compressor.
- 3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
- 4. Use sealed filter-driers in low temperature systems.
- 5. Use sealed filter-driers in systems utilizing hermetic compressors.
- 6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
- 7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
- 8. Use filter-driers for each solenoid valve.
- H. Solenoid Valves:
 - 1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
 - 2. Use in liquid line of single or multiple evaporator systems.
- I. Receivers:
 - 1. Use on systems ______ tons and larger, sized to accommodate pump down charge.
 - 2. Use on systems with long piping runs.
- J. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

2.2 REGULATORY REQUIREMENTS

- A. Welders Certification: In accordance with ASME BPVC-IX.
- B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.
- 2.3 PIPING
 - A. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
 - 1. Joints: Flared.
 - B. Pipe Supports and Anchors:
 - 1. Conform to ASME B31.5.

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- 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel adjustable swivel, split ring.
- 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- 7. Vertical Support: Steel riser clamp.
- 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- 10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- 11. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
- B. Refrigerant: As defined in ASHRAE Std 34.
 - 1. R-32.
 - 2. R-454B.

2.5 MOISTURE AND LIQUID INDICATORS

- A. Manufacturers:
 - 1. Henry Technologies.
 - 2. Parker Hannifin/Refrigeration and Air Conditioning.

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- 3. Sporlan Valve Company.
- 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 460 psi.

2.6 VALVES

- A. Manufacturers:
 - 1. Hansen Technologies Corporation.
 - 2. Henry Technologies.
 - 3. Danfoss Automatic Controls.
 - 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Diaphragm Packless Valves:
 - 1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- C. Packed Angle Valves:
 - 1. Forged brass , forged brass seal caps with copper gasket, rising stem and seat , molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- D. Ball Valves:
 - Two piece forged brass body with teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 325 degrees F.
- E. Service Valves:
 - 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

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2.7 STRAINERS

- A. Straight Line or Angle Line Type:
 - 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.
- B. Straight Line, Non-Cleanable Type:
 - 1. Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of 500 psi.

2.8 CHECK VALVES

- A. Manufacturers:
 - 1. Hansen Technologies Corporation.
 - 2. Parker Hannifin/Refrigeration and Air Conditioning.
 - 3. Sporlan Valve Company.
 - 4. Substitutions: See Section 01 60 00 Product Requirements.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Globe Type:
 - Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.
- C. Straight Through Type:
 - Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 250 degrees F.

2.9 FILTER-DRIERS

- A. Manufacturers:
 - 1. Flow Controls Division Emerson Electric Co.

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- 2. Parker Hannifin/Refrigeration and Air Conditioning.
- 3. Sporlan Valve Company.
- 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Performance:
 - 1. Flow Capacity Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.
 - 2. Flow Capacity Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730 (I-P).
 - 3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
 - 4. Design Working Pressure: 500 psi, minimum.
- C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, and filtration to 40 microns; of construction that will not pass into refrigerant lines.
- D. Construction: UL listed.
 - 1. Replaceable Core Type: Steel shell with removable cap.
 - 2. Sealed Type: Copper shell.
 - 3. Connections: As specified for applicable pipe type.

2.10 SOLENOID VALVES

- A. Manufacturers:
 - 1. Flow Controls Division of Emerson Electric.
 - 2. Parker Hannifin/Refrigeration and Air Conditioning.
 - 3. Sporlan Valve Company.
 - 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Valve: AHRI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum

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working pressure of 500 psi.

C. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.

2.11 EXPANSION VALVES

- A. Manufacturers:
 - 1. Flow Controls Division of Emerson Electric.
 - 2. Parker Hannifin/Refrigeration and Air Conditioning.
 - 3. Sporlan Valve Company.
 - 4. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, mechanical pressure limit (maximum operating pressure MOP feature), adjustable superheat setting, replaceable inlet strainer, with replaceable capillary tube and remote sensing bulb.
- C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.

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- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- G. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.5.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Provide copper plated hangers and supports for copper piping.
- H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- I. Provide clearance for installation of insulation and access to valves and fittings.

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- J. Provide access to concealed valves and fittings.
- K. Flood piping system with nitrogen when brazing.
- L. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- M. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.
- N. Insulate piping and equipment; refer to Section and Section 23 07 16.
- O. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- P. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- Q. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- R. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- S. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- T. Fully charge completed system with refrigerant after testing.
- U. Provide electrical connection to solenoid valves. Refer to Division 26.

3.3 FIELD QUALITY CONTROL

A. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using electronic leak detector. Test to no leakage.

3.4 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

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- 5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
- 6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.
- 7. 3-1/8 inch OD: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- 8. 3-5/8 inch OD: Maximum span, 11 feet; minimum rod size, 1/2 inch.
- 9. 4-1/8 inch OD: Maximum span, 12 feet; minimum rod size, 1/2 inch.

END OF SECTION

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SECTION 23 31 00

DUCTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonmetal ducts.
- B. Metal ductwork.
- C. Duct cleaning.

1.2 RELATED REQUIREMENTS

- A. Section 23 07 13 Duct Insulation: External insulation and duct liner.
- B. Section 23 33 00 Duct Accessories.
- C. Section 23 33 30 Air Duct Sealants.
- D. Section 23 37 00 Air Outlets and Inlets.
- E. Section 23 05 93 Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCE STANDARDS

- A. ASHRAE (FUND) ASHRAE Handbook Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A240/A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2015b.
- D. ASTM A480/A480M Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2015.
- E. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- F. ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with

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Improved Formability, and Ultra-High Strength; 2023.

- G. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- H. ASTM B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- I. ASTM C14M Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric); 2020.
- J. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- K. ICC-ES AC01 Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- L. ICC-ES AC106 Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- M. ICC-ES AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- N. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- O. NFPA 90B Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- P. NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- Q. SMACNA (LEAK) HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- R. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2020.
- 1.4 **DEFINITIONS**
 - A. Duct Sizes: Duct sizes indicated on drawings are inside clear dimensions.
 - B. Low Pressure: Static pressure in duct less than 1" WG and velocities less than 2000 fpm (10 meters/second).

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C. Medium Pressure: Static pressure between 1 and 6 inches WG and velocities between 1500 and 3000 fpm.

1.5 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide data for duct materials, duct liner, and duct connections.
- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems.
- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) HVAC Air Duct Leakage Test Manual.
- E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.
- F. Confirm ductwork has been fabricated and installed in accordance with recommendations and SMACNA standards.
- 1.6 QUALITY ASSURANCE
 - A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
 - B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.

1.7 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96, standards.

1.8 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

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PART 2 PRODUCTS

2.1 MATERIALS

- Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 316.
- D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 250 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
 - 4. For Use With Flexible Ducts: UL labeled.
 - 5. Products:
 - a. Seal all joints and seams on sheet metal supply, return, makeup air and exhaust ductwork with "Hardcast" type DT sealing tape and type FTA adhesive or "Hardcast" iron grip 601 duct sealant installed in strict accordance with manufacturer's instructions. Clean all dirt, oil, moisture, etc., before applying adhesive. Duct tape, UL listed or not, is not acceptable.
 - b. Substitutions: See Section 23 01 00 General HVAC Provisions.
- E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- F. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

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- 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
- 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
- 5. Other Types: As required.

2.2 DUCT ASSEMBLIES

- A. All Ducts: Galvanized steel, unless otherwise indicated.
- B. Low Pressure Supply (Heating Systems): 1 inch w.g. pressure class, galvanized steel.
- C. Return and Relief: 1 inch w.g. pressure class, galvanized steel.
- D. General Exhaust: 1 inch w.g. pressure class, galvanized steel.
- E. Outside Air Intake: 1 inch w.g. pressure class, galvanized steel.
- F. Combustion Air: 1 inch w.g. pressure class, galvanized steel.

2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Provide air foil turning vanes when rectangular elbows must be used.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Fabricate continuously welded round duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

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- H. Lap metal duct in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
- I. Size round ducts installed in place of rectangular ducts from ASHRAE Table of Equivalent Rectangular and Round Ducts. No variation of duct configuration or sizes permitted except by written permission.
- J. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with aluminized fiberglass scrim vapor barrier film.
 - 2. Pressure Rating: 6 inches WG positive and 1.0 inches WG negative.
 - 3. Maximum Velocity: 5000 fpm.
 - 4. Temperature Range: -10 degrees F to 160 degrees F.
 - 5. R-6.0 Formaldehyde free insulation.
 - 6. UL -181 (UL listed).
 - 7. Manufacturers:
 - a. Hart & Cooley.
 - b. Flex Master.
 - c. Substitutions: See Section 23 01 00 General HVAC Provisions.

2.5 NONMETAL DUCTWORK

- A. Fabric: Air diffusers shall be constructed of air permeable woven fire retardant antimicrobial fabric complying with the following physical characteristics:
 - 1. Fabric construction: 100% fire resistant polyester twill.
 - 2. Coating: Air permeable coating.
 - 3. Weight: 6.75 oz./square yard per ASTM D3776-96.

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- 4. Color: To be selected by Owner.
- 5. Air permeability: 2 cfm/square foot at 0.5 in. WG.
- 6. Temperature range: 0 degrees F to 180 degrees F.
- 7. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the flame spread/smoke development requirements of NFPA 90-A.
- B. Systems Fabrication Requirements:
 - 1. Dispersion orifice sizing: All fabric duct above 15 feet from finished floor to be provided with high throw orifice. All fabric duct below 15 feet shall be furnished with comfort throw orifice.
 - 2. Size, quantity and location of orifices to be specified by manufacturer and approved by the Engineer.
 - 3. Inlet connection includes zipper for easy removal/maintenence.
 - 4. Inlet connection includes cinch and loop attachment supplied by manufacturer.
 - 5. Lengths to include required zippers as specified by manufacturer.
 - 6. Fabric system shall include connectors to attach to suspension system as designated in this Specification Section.
 - 7. End cap includes zipper for easy maintenance.
 - 8. Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90 degree elbows are five gores and the radius of the elbow is 1.5 times the diameter of the duct sock.
 - 9. Provide adjustable Air Flow Control (AFO) as required by the manufacture's design and where indicated.
- C. Design Parameters:
 - 1. Fabric air diffusers shall be designed from 0.25 inch water gage minimum to 3.1 inch maximum, with 0.5 inch as the standard.
 - 2. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
 - 3. Design cfm, static pressure and diffuser length shall be designed or approved by the manufacturer.

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- 4. Do not use fabric diffusers in concealed locations.
- 5. Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.
- D. Suspension Hardware:
 - 1. Fabric duct 3 x 1 suspension system shall include single tension cable, powder coated aluminum hangers, D-clasp connectors to connect fabric duct to hangers and snap clips to connect cable between hangers.
 - a. Cable: Standard galvanized steel cable.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with draw bands.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- I. Use double nuts and lock washers on threaded rod supports.

23 31 00-8

- J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- K. Connect flexible ducts to metal ducts per manufacturer's recommendations.
- L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- M. Fire Partitions: Provide firestopping sealing as indicated within Section 07 84 00.
- N. Install chosen fabric suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.
- O. All round and rectangular duct installed in exposed areas shall be paint lock duct.

3.2 CLEANING

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.
- B. If determined by the Architect and/or Engineer, that during construction the duct systems were not adequately protected and dirt/debris was allowed to enter the installed ductwork, then it will be required by the HVAC contractor for the duct system to be cleaned. If required, clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

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SECTION 23 33 00

DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers metal.
- C. Backdraft dampers fabric.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connections.
- H. Volume control dampers.

1.2 RELATED REQUIREMENTS

- A. Section 23 31 00 Ducts.
- B. Division 26 Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- B. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2020.
- C. UL 33 Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- D. UL 555 Standard for Fire Dampers; Current Edition, Including All Revisions.
- 1.4 SUBMITTALS
 - A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.

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- B. Project Record Drawings: Record actual locations of access doors, volume dampers, test holes, and fire dampers.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Fusible Links: Two of each type and size.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:
 - 1. Krueger.
 - 2. PCI Industries, Inc; Pottorff Brand.
 - 3. Ruskin Company.
 - 4. Titus.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
- C. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with worm drive mechanism with removable key operator.

2.2 BACKDRAFT DAMPERS - METAL

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc.

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- 2. Nailor Industries Inc.
- 3. PCI Industries, Inc; Pottorff Brand.
- 4. Ruskin Company.
- 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 BACKDRAFT DAMPERS - FABRIC

- A. Fabric Backdraft Dampers: Factory-fabricated.
 - 1. Blades: Neoprene coated fabric material.
 - 2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
 - 3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.4 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Nailor Industries Inc.
 - 2. Ruskin Company.
 - 3. Greenheck Fan Corporation.
 - 4. SEMCO Incorporated.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation

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with sheet metal cover.

- 1. Less Than 12 inches Square: Secure with sash locks.
- 2. Up to 18 inches Square: Provide two hinges and two sash locks.
- 3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
- 4. Larger Sizes: Provide an additional hinge.
- D. Access doors with sheet metal screw fasteners are not acceptable.
- 2.5 DUCT TEST HOLES
 - A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
 - B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 FIRE DAMPERS

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc.
 - 2. Nailor Industries Inc.
 - 3. Ruskin Company.
 - 4. Greenheck Fan Corporation.
 - 5. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
- D. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- E. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated

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steel concealed linkage, stainless steel closure spring, blade stops, and lock.

- F. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide dynamic style dampers with stainless steel closure springs and latches for closure under air flow conditions. Configure with blades out of air stream.
- G. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- C. Connector: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - a. Net Fabric Width: Approximately 3 inches wide.
 - 2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.8 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc.
 - 2. Nailor Industries Inc.
 - 3. Ruskin Company.
 - 4. Greenheck Fan Company.
 - 5. Jer-Air Manufacturing.
 - 6. United Enertech.
 - 7. Substitutions: See Section 23 01 00 General HVAC Provisions.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

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- 1. Fabricate for duct sizes up to 6 x 30 inch.
- 2. Blade: 24 gage, minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1. Blade: 18 gage, minimum.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on minimum 2-inch stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.9 MISCELLANEOUS PRODUCTS

- A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
 - 1. Thickness: 2 mils.
 - 2. High tack water based adhesive.
 - 3. UV stable light blue color.
 - 4. Elongation Before Break: 325 percent, minimum.

2.10 LOW VOLTAGE ELECTRO-BALANCE DAMPER

- A. Dampers provided by others shall meet the following requirements.
 - 1. Standoff bracket with minimum mounting surface of 3-1/2 inch x 4 inch for the drive unit.
 - 2. 90 degree open-close motion.
 - 3. Maximum torque to open/close 5 inch-lbs.

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4. Standoff bracket mounting holes located to ensure that the worm gear axis is concentric with damper shaft axis.

2.11 REMOTE CONTROLLED VOLUME DAMPERS

- A. Manufacturers
 - 1. Roto Twist.
 - 2. Young Regulator Company.
 - 3. United Enertech.
 - 4. Substitutions: Refer to Section 23 01 00 General HVAC Provisions.
- B. Furnish cable operated remote controlled volume dampers in branch ducts located in inaccessible ceilings and where indicated on the plans.
- C. Provide ceiling cups for damper control adjustment flush with ceiling.
- D. Damper shall be worm gear actuated via rotary cable.
- E. Furnish additional factory cable retainer supports as required by the cable length. Mechanical Contractor shall be responsible for providing required cable lengths based upon actual field dimensions.
- F. Ceiling cup, rotary cable and worm gear shall be furnished as one piece for installation with no linkage adjustment.

PART 3 EXECUTION

- 3.1 PREPARATION
 - A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access,

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size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Demonstrate re-setting of fire dampers to Owner's representative.
- G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- I. Use splitter dampers only where indicated.
- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

23 33 00-8

SECTION 23 33 30

AIR DUCT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air duct sealants for permanently sealing fabricated joints and seams of HVAC air ducts and thermal insulation.
- B. Reinforcing membrane for sealants.

1.2 RELATED SECTIONS

- A. Section 23 07 13 Duct Insulation.
- B. Section 23 31 00 HVAC Ducts and Casings.
- C. Section 23 33 00 Duct Accessories.

1.3 REFERENCES

- A. ASTM D 1668 Standard Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing; 1995.
- B. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.
- C. ASTM E 96/E 96M Standard Test Methods for Water Vapor Transmission of Materials; 2005.
- D. UL 181A Closure Systems for Use with Rigid Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 2005.
- E. UL 181B Closure Systems for Use with Flexible Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 2005.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Manufacturer's product data, including physical properties and application instructions.

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1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- B. Store materials in accordance with manufacturer's instructions. Protect from freezing.
 - 1. Storage Temperature: 40 to 100 degrees F.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply below 35 degrees F. or above 120 degrees F.
- B. Avoid high humidity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Hardcast, Inc.
 - 2. RCD Corporation.
- B. Substitutions: See Section 23 01 00 General HVAC Provisions.
- C. Supply all products specified in this section from a single manufacturer.

2.2 AIR DUCT SEALANTS

- A. Low to High Velocity Air Duct Sealant: Non-toxic, water-based, fiber-reinforced adhesive-sealant; for permanently sealing fabricated joints and seams of sheet metal air ducts, UL 181 listed rigid fiberglass air ducts, UL 181 listed flexible air ducts, and thermal insulation; for repairing damaged and leaking air ducts; for sealing conditioned spaces from air infiltration.
 - 1. Type: Elastomeric terpolymer emulsion.
 - 2. Underwriters Laboratories Listed: UL 181A-M and UL 181B-M.
 - 3. Solids by Weight: 67 percent, plus or minus 2 percent.
 - 4. Weight per Gallon: 10.5 pounds, plus or minus 0.20 pounds.
 - 5. Wet Film Coverage: 100 linear feet per gallon at 1/16 inch thick by 3 inches wide.

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- 6. Consistency: Thixotropic, non-sagging.
- 7. Adhesive Cure: 72 hours at 50 percent humidity and 70 degrees F.
- 8. Service Temperature Limits: Minus 10 degrees to 180 degrees F.
- 9. Water Vapor Transmission Rate: 0.6157 perms in accordance with ASTM E 96.
- 10. Flame Spread Index: Not greater than 5, when tested in accordance with ASTM E 84.
- 11. Smoke Developed Index: Zero, when tested in accordance with ASTM E 84.
- B. Low to High Velocity Air Duct Sealant: Hardcast Iron Grip 601 non-toxic, waterbased, adhesive-sealant; for permanently sealing fabricated joints and seams of sheet metal air ducts, UL 181 listed rigid fiberglass air ducts, UL 181 listed flexible air ducts, and thermal insulation; for repairing damaged and leaking air ducts; for sealing conditioned spaces from air infiltration.
 - 1. Type: Elastomeric terpolymer emulsion.
 - 2. Underwriters Laboratories Listed: UL 181A-M and UL 181B-M.
 - 3. Solids by Weight: 70 percent, plus or minus 2 percent.
 - 4. Wet Film Coverage: 320 linear feet per gallon at 20 mil thick by 3 inches wide.
 - 5. Consistency: Thixotropic, non-sagging.
 - 6. Adhesive Cure: 48 hours at 50 percent humidity and 70 degrees F.
 - 7. Flame Spread Index: Not greater than 5, when tested in accordance with UL-723.
 - 8. Smoke Developed Index: Zero, when tested in accordance with UL-723.
- C. Reinforcing Membrane: RCD "Glasscoat" inorganic woven fiberglass reinforcing membrane; conforming to irregular surfaces for sealing and coating thermal insulation, air ducts, return air plenums, equipment, vessels, pipes, and fittings.
 - 1. ASTM D 1668, Type III.
 - 2. Nominal Dry Weight: 1.2 to 2.0 ounces per square yard.
 - 3. Saturated Weight: 1.6 to 2.6 ounces per square yard.
 - 4. Nominal Thread Count: 10 by 20.

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5. Breaking Strength, Saturated: 75 warp, 75 fill minimum.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive air duct sealants.
- B. Notify Architect of conditions that would adversely affect application of sealants. Do not proceed with application until unsatisfactory conditions are corrected.

3.2 SURFACE PREPARATION

- A. Prepare surfaces in accordance with manufacturer's instructions.
- B. Remove water, dirt, oil, grease, and corrosion from surfaces to receive air duct sealants.

3.3 APPLICATION

- A. Apply air duct sealants in accordance with manufacturer's instructions.
- B. Apply to sheet metal air ducts, UL 181 listed rigid fiberglass air ducts, UL 181 listed flexible air ducts, thermal insulation, and other surfaces where indicated.
- C. Do not thin or mix.
- D. Apply tack coat at rate of 2 gallons per 100 square feet.
- E. Embed reinforcing membrane into tack coat.
- F. Apply finish coat at rate of 2 gallons per 100 square feet.
- G. Allow drying time as follows:
 - 1. Minimum 6 hours when used outdoors if wet weather is imminent.
 - 2. Minimum 24 hours before using air duct system.
 - 3. Additional time as required by air temperature and humidity conditions.

END OF SECTION

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SECTION 23 34 23

POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceiling exhaust fans.

1.2 RELATED REQUIREMENTS

- A. Section 23 31 00 HVAC Ducts and Casings.
- B. Section 23 33 00 Duct Accessories: Backdraft dampers.
- C. Division 26 Electrical: Equipment Wiring.

1.3 REFERENCE STANDARDS

- A. AMCA 210 Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).
- B. AMCA 261 Directory of Products Licensed to Use the AMCA Certified Ratings Seal; Air Movement and Control Association International, Inc.; http://www.amca.org/licenses/search.aspx.
- C. AMCA 300 Reverberation Room Methods of Sound Testing of Fans; 2024.
- D. AMCA 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.
- E. NEMA MG 1 Motors and Generators; 2014.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

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1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Equivalent fan selections shall not increase or decrease motor horsepower, increase top speed by more than 10%, or increase inlet air velocity by more than 20% from that specified.
- C. Provide fans capable of accommodating static pressure variations of plus or minus 10%.
- D. Provide balanced variable for motors 15 horsepower and under.
- E. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of the building.
- F. Provide belt guards on belt driven fans.
- G. Provide safety screen where inlet or outlet is exposed.
- H. Prime coat fan wheels and housing factory inside and outside. Prime coating on aluminum parts is not required.

1.6 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acme.
- B. Captive Aire.
- C. Greenheck.
- D. Loren Cook Company.
- E. Twin Cities Blower.
- F. Substitutions: See Section 23 01 00 General HVAC Provisions.

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2.2 POWER VENTILATORS - GENERAL

- A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.3 CEILING EXHAUST FANS

- A. Performance Ratings:
 - 1. Refer to fan schedule on plan sheet for fan performance.
- B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and factory mounted solid state speed controller.
- D. Grille: Molded white plastic.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Hung Cabinet Fans:
 - 1. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

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- C. Provide sheaves required for final air balance.
- D. Provide backdraft dampers on outlet from ceiling exhauster fans and as indicated.

3.2 SCHEDULES

- A. Drawing Code: See plan Schedule.
- B. Air Flow Capacity: See plan Schedule.
- C. Static Pressure: See plan Schedule.
- D. Motor hp:
 - 1. Electrical Characteristics: See plan Schedule.

E. Accessories:

1. See plan Schedule.

END OF SECTION

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SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sqaure ceiling diffusers.
- B. Registers/grilles.
 - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.
 - 2. Wall-mounted, exhaust and return register/grilles.
- C. Louvers:

1.2 REFERENCE STANDARDS

- A. AMCA 500-L Laboratory Methods of Testing Louvers for Rating; 2023.
- B. ASHRAE Std 70 Method of Testing the Performance of Air Outlets and Air Inlets; 2023.
- C. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- D. NFPA 90B Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- 1.3 SUBMITTALS
 - A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
 - B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
 - C. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

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1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Air Devices, Inc.
- B. Carnes Company HVAC.
- C. Krueger.
- D. Nailor.
- E. Price Industries.
- F. Ruskin.
- G. Titus.
- H. Tuttle-Bailey.
- I. Substitutions: See Section 23 01 00 General HVAC Provisions.

2.2 SQAURE CEILING DIFFUSERS

- A. Type: Provide high performance 3-cone diffuser diffuser to discharge air in 360 degree pattern .
- B. Frame: Surface mount, inverted T-Bar type. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Steel or aluminum as indicated on drawings with baked enamel finish.
- D. Color: As shown on drawings.
- E. See Air Distribution Schedule on drawings for details and accessories.

2.3 CEILING RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 1/2 inch minimum depth, 1/2 inch maximum spacing, with blades set at 45 degrees, horizontal face.

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- B. Frame: Surface mount, inverted T-Bar type. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Steel or aluminum as indicated on drawings with baked enamel finish.
- D. Color: As shown on the drawings.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans, where indicated on plans.
- F. See Air Distribution Schedule on drawings for details and accessories.

2.4 WALL RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 1/2 inch minimum depth, 1/2 inch maximum spacing, with spring or other device to set blades, horizontal face.
- B. Frame: 1-1/4 inch margin with gasket.
- C. Fabrication: Steel or aluminum as indicated on drawings with factory baked enamel finish.
- D. Color: As shown on the drawings.
- E. See Air Distribution Schedule for details and accessories.
- F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face, where indicated on plans.

2.5 LOUVERS

- A. Type: 6 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/4 inch square mesh screen over exhaust and 1/4 inch square mesh screen over intake.
- B. Color: As shown on the drawings.
- C. Fabrication: 12 gage thick extruded aluminum, welded assembly, with finish as indicated on Air Distribution Schedule.
- D. Mounting: Furnish with standard frame and extended sill for installation.

23 37 00-3

2.6 COUNTER BALANCED BACKDRAFT DAMPERS

- A. Frame shall be 0.90 inch minimum wall thickness extruded aluminum with 12 gage galvanized steel structural brace at each corner.
- B. Blades shall be 0.025 inch minimum roll-formed aluminum with extruded vinyl blade edge seals mechanically locked into the blades.
- C. Blades shall include field adjustable, zinc plated steel counter balance weights to allow pressure relief at less than .05 inches water gage.
- D. Bearings shall be corrosive resistant, long life synthetic type for quiet operation.
- E. Linkage shall be 1/2 inch wide tiebar concealed in the frame.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.
- F. Provide minimum 6" deep plenum box on back of all return and exhaust grilles.

3.2 SCHEDULES

- A. Air Outlet and Inlet Schedule
 - 1. Drawing Code: Refer to plan schedule.
 - 2. Manufacturer: As scheduled on drawings.
 - 3. Model: As scheduled on drawings.
 - 4. Description: As scheduled on drawings.
 - 5. Finish: As scheduled on drawings.

23 37 00-4

- 6. Service: As scheduled on drawings.
- 7. Mounting: As scheduled on drawings.
- 8. Accessories: As scheduled on drawings.

END OF SECTION

23 37 00-5

SECTION 23 40 00

AIR CLEANING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disposable, extended area panel filters.

1.2 RELATED REQUIREMENTS

A. Division 26 - Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 850 (I-P) Performance Rating of Commercial and Industrial Air Filter Equipment; 2013 (Reaffirmed 2023).
- B. ASHRAE Std 52.1 Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.[CHOICE TEXT]
- C. ASHRAE Std 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to Section 7.4.
 - 1. Dust Spot Efficiency: Plus or minus 5 percent.

1.5 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions and connection requirements.
- C. Shop Drawings: Indicate filter assembly and filter frames, dimensions and connection requirements.
- D. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

23 40 00-1

- E. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Filters: One additional set of each type and size of disposable panel filters to be installed at the time the building is conveyed to the Owner.

1.6 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

- 2.1 FILTER MANUFACTURERS
 - A. American Filtration Inc.
 - B. AAF International/American Air Filter.
 - C. Camfil Farr Company.
 - D. Substitutions: See Section 23 01 00 General HVAC Provisions.

2.2 DISPOSABLE, EXTENDED AREA PANEL FILTERS

- A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton and synthetic fabric; supported and bonded to welded wire grid by corrugated aluminum separators.
 - 1. Frame: Cardboard.
 - 2. Nominal size: to match equipment filter size requirements.
 - 3. Nominal thickness: 2 inches.
- B. Rating, per ASHRAE Std 52.1:
 - 1. Dust spot efficiency: MERV 8.
 - 2. Initial resistance at 500 FPM face velocity: 0.30 inch WG.
 - 3. Recommended final resistance: 0.9 inch WG.

23 40 00-2

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

3.2 SCHEDULES

- A. Air Filter Schedule
 - 1. Refer to plan Equipment Schedule.

END OF SECTION

23 40 00-3

SECTION 23 51 23

BREECHINGS, CHIMNEY, AND STACKS FOR CONDENSING APPLIANCES

PART 1- GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Venting for the removal of products of combustion for Category II, III, IV gas burning appliances

1.2 **REFERENCES**

- A. Underwriters Laboratories (UL):
 - 1. UL1738
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 54 National Fuel Gas Code

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 54
- B. Must install duct in accordance to manufacturer's listings and installation instructions.
- C. Components coming in contact with the products of combustion shall carry the appropriate UL or cUL listing, mark or label.

1.4 WARRANTY

A. Condensing Appliance vent listed to UL1738 shall have a limited lifetime warranty to begin at the date of installation. Any portion of the vent repaired or replaced under warranty shall be warranted for the remainder of the original warranty period.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Metal Fab, Inc.
- B. Substitutions: See Section 23 01 00 General HVAC Provisions.

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2.2 LISTED VENTING FOR CONDENSING APPLIANCES

- A. The condensing appliance vent shall be double-wall for use with Category II natural draft appliances and Category III or IV positive pressure appliances.
- B. Maximum temperature shall not exceed 550° F (288° C).
- C. Vent shall be listed for an internal static pressure of 6" w.g. and tested to 15" w.g. for diameters 6-36 inches and 10" w.g. for diameters 3-5.
- D. Vent shall be constructed of a material tested to UL1738, .015 thickness for 3"-12" diameters, .024 thickness for 14" to 24" diameters, and .035 thickness for 26" to 36" diameters.
- E. Outer casing shall be constructed of aluminized steel of .018 thickness for 3"to 12" diameters, .024 thickness for 14" to 24" diameters, and .035 thickness for 26" to 36" diameters.
- F. Condensing appliances may be vented with schedule 40 PVC if approved by equipment manufacturer.

PART 3-EXECUTION

- 3.1 STORAGE AND CONSTRUCTION
 - A. Protect materials from accidental damage.
 - B. All supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be included.
 - C. Joint assembly utilizes flanged mating surfaces with a factory supplied gaskets for diameters 6" through 24", for diameters 26" to 36" P070 sealant will be used on the flange surface. Flanges are joined with a vee band secured by tightening draw bolts. Diameters 3-5 inch utilize a snap-lock, gasketed connection.
 - D. Where exposed to weather, the outer closure band shall be sealed to prevent moisture from entering the space between the walls.
 - E. All parts exposed to the weather shall be protected by one (1) coat of corrosion and heat resistant base primer and one (1) coat of heat resistant paint unless constructed of 430, 304 or 316 stainless steel.
 - F. Vent shall terminate in accordance with installation instructions and local codes.
 - G. Installation shall conform to manufacturers installation instructions.

23 51 23-2

END OF SECTION

23 51 23-3

SECTION 23 54 00

FURNACES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Forced air furnaces.
- B. Controls.

1.2 RELATED REQUIREMENTS

- A. Section 23 01 00 General HVAC Provisions.
- B. Section 23 07 13 Duct Insulation: Duct Liner.
- C. Section 23 51 23 Breechings, Chimneys, and Stacks for Condensing Appliances.
- D. Section 23 62 13 Air Cooled Condensing Units.
- E. Section 23 31 00 Ducts.
- F. Division 26 Electrical.

1.3 REFERENCE STANDARDS

- A. NFPA 54 National Fuel Gas Code; 2024.
- B. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Project Record Documents: Record actual locations of components and connections.

23 54 00-1

- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 WARRANTY

- A. Provide five year manufacturers warranty for solid state ignition modules.
- B. Provide ten year manufacturers warranty for heat exchangers.
- C. Provide one year manufacturers parts warranty for entire unit.
- D. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

- 2.1 MANUFACTURERS
 - A. Trane Inc.
 - B. Daikin.
 - C. York
 - D. Substitutions: See Section 23 01 00- General HVAC Provisions.

2.2 GAS FIRED FURNACES

A. Annual Fuel Utilization Efficiency (AFUE): 0.96 ("condensing").

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- B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, and accessories; wired for single power connection with control transformer.
 - 1. Safety certified by CSA in accordance with ANSI Z 21.47.
 - 2. Venting System: Direct.
 - 3. Combustion: Sealed
 - 4. Air Flow Configuration: Refer to drawings.
 - 5. Heating: Natural gas fired.
 - 6. Accessories:
 - a. See schedule on drawings for required accessories.
- C. Performance:
 - 1. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.
- D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- E. Primary Heat Exchanger:
 - 1. Material: Hot-rolled steel
 - 2. Shape: Tubular type.
 - 3. Shape: _____
- F. Gas Burner:
 - 1. Atmospheric type with adjustable combustion air supply,
 - 2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - 3. Electronic pilot ignition, with hot surface igniter.
 - 4. Non-corrosive combustion air blower with permanently lubricated motor.
- G. Gas Burner Safety Controls:

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- 1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
- 2. Flame rollout switch: Installed on burner box and prevents operation.
- 3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
- 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- H. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
- I. Motor: 1750 rpm single speed, permanently lubricated, hinge mounted.
- J. Air Filters: 2 inch thick glass fiber, disposable type arranged for easy replacement.
- K. Operating Controls
 - 1. Room Thermostat: Cycles burner to maintain room temperature setting.
 - 2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.

2.3 THERMOSTATS

- A. Manufacturers:
 - 1. Trane.
 - 2. Daikin.
 - 3. York.
 - 4. Substitutions: See Section: See Section 23 01 00 General HVAC Provisions. .
- B. Room Thermostat: Low voltage, electric solid state microcomputer based room thermostat with remote sensor:
 - 1. System selector switch (heat-off) and fan control switch (auto-on).
 - 2. Preferential rate control to minimize overshoot and deviation from setpoint.
 - 3. Set-up for four separate temperatures per day.

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- 4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
- 5. Short cycle protection.
- 6. Programming based on every day of the week.
- 7. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
- 8. Battery replacement without program loss.
- 9. Thermostat Display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System Mode Indication: Heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and located correctly.
- C. Verify that proper fuel supply and pressure are available for connection.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.
- B. Install furnace on insulated furnace stand.

23 54 00-5
- C. Install in accordance with NFPA 90A.
- D. Install gas fired furnaces in accordance with NFPA 54.
- E. Provide vent connections in accordance with NFPA 211.
- F. Pipe drain from humidifier to nearest drain.
- G. Mount air cooled condenser on 4 inch thick concrete pad. Allow minimum 6 inches on all sides of equipment.

3.3 SCHEDULES

- A. Furnaces:
 - 1. See Schedule on drawings.

END OF SECTION

23 54 00-6

SECTION 23 55 33

ELECTRIC WALL HEATERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Note: Equipment in this section shall be provided by Owner through a purchasing agreement. Contractor shall be responsible for installation and all accessories necessary to provide a complete and working system.
- B. Electric unit heaters.

1.2 RELATED REQUIREMENTS

A. Division 26 - Electrical.

1.3 REFERENCE STANDARDS

- A. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2002.
- B. NFPA 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2006.
- C. UL Underwriters Laboratories Inc.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

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1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 WARRANTY

A. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

- 2.1 UNIT HEATER MANUFACTURERS
 - A. Modine Manufacturing Company.
 - B. Sterling HVAC/Mestek Technology, Inc.
 - C. Reznor/Thomas & Betts Corporation.
 - D. Markel.
 - E. Substitutions: See Section 23 01 00 General HVAC Provisions.

2.2 ELECTRIC UNIT HEATERS

- A. Contractor shall supply and install heavy duty wall mounted forced air electric heaters of the wattage, voltage and phase as specified on the drawings. The heater shall so be designed to provide an even distribution of heated air to the space to be heated by drawing return air in the peripheral area of the heater across and through the element which shall then be discharged from the center section of the heater by means of an electric motor and axial flow fan blade
- B. Heaters shall be surface mounted to extend no more than 5 3/4" from the finished wall.
- C. Heater front shall withstand 10.8 ft. lbs. (324 poundals) impact and 400 lbs. static force applied to an 8 sq. in. area at center grille location with less than 1/16" permanent distortion. The combination return and supply grille assembly shall be constructed of 1/16" x 3/8" rounded edge horizontal steel louvers which shall be spaced for maximum opening of 1/4". Louvers shall be welded at every intersection to

23 55 33-2

three evenly spaced 1/16" diameter vertical members and completely framed in a heavy gauge natural anodized Aluminum extrusion. Front assembly shall be attached to the chassis by hidden tamper-resistant (Allen-head) machine screws. All other parts shall be 16 Gauge steel Zinc coated, both sides finished in a high gloss or bronze colored baked powder coat finish.

- D. Motor shall be a permanently lubricated unit bearing, totally enclosed shaded pole type with impedance protection. Motors shall operate at no more than 1400 RPM and shall be same voltage as the heater. A protective shield shall surround the motor to separate return air from heated air.
- E. Heater shall have a rating as indicated on the drawings.
- F. Element assemblies shall consist of two or three corrosion resistant steel sheathed type elements mechanically bonded to common corrosion resistant steel fins. Each sheathed element shall consist of helically coiled Nickel Chromium alloy resistant wire completely embedded in and surrounded by Magnesium Oxide, enclosed and wedged into corrosion resistant steel sheaths. Elements shall have 2" cold conductor pins extending into the sheath and shall have a density of no more than 60 Watts per inch.
- G. Heaters shall be equipped with a "manual reset" thermal overload which disconnects elements and motor in the event normal operating temperatures are exceeded. For safety, if opened due to abnormal temperature, thermal overload shall remain open until manually reset. Automatic reset thermal overloads which allow the element to continue to cycle under abnormal conditions will not be accepted.
- H. Heaters shall be ETL Listed.

2.3 ROOM THERMOSTATS

- A. Manufacturers:
 - 1. Honeywell.
 - 2. Johnson Controls, Inc.
 - 3. Siemens Building Technologies, Inc.
 - 4. Substitutions: See Section 23 01 00 General hvsProvisions.
- B. Adjustable Room Thermostat: Low voltage, to control heater stages in sequence with delay between stages, and supply fan to maintain temperature setting.

23 55 33-3

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available.
- 3.2 INSTALLATION
 - A. Install in accordance with NFPA 90A and NFPA 90B.
 - B. Provide connection to electrical power systems.

3.3 SCHEDULES

- A. Electrical Unit Heaters
 - 1. Refer to plan Schedule.

END OF SECTION

23 55 33-4

SECTION 23 62 13

AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Condensing unit package.
- B. Charge of refrigerant and oil.
- C. Controls and control connections.
- D. Refrigerant piping connections.
- E. Motor starters.
- F. Electrical power connections.

1.2 RELATED REQUIREMENTS

- A. Section 23 23 00 Refrigerant Piping and Specialties.
- B. Section 23 54 00 Furnaces.
- C. Section 23 82 16 Air Coils.
- D. Division 26 Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 210/240 Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.
- B. AHRI 365 (I-P) Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units; 2009.
- C. ASHRAE Std 15 Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- D. ASHRAE Std 23.1 Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- E. ASHRAE Std 90.1 I-P Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.

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F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

- A. Condenser:
 - 1. Refer to plan Schedule.
- B. Electrical Characteristics:
 - 1. Refer to plan Schedule.

1.5 SUBMITTALS

- A. Section 23 01 00 General HVAC Provisions: Procedures for submittals.
- B. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Make submission with air handling units with coils to ensure capacities are complementary.
- C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.
- D. Design Data: Indicate pipe and equipment sizing.
- E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
- F. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, controls, and accessories.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

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1.8 WARRANTY

- A. Provide one year parts warranty for entire unit.
- B. Provide five year compressor warranty.
- C. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

- 2.1 MANUFACTURERS
 - A. Trane Inc.
 - B. York.
 - C. Daikin.
 - D. Substitutions: See Section 23 01 00 General HVAC Provisions.

2.2 MANUFACTURED UNITS

- A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, wind deflector, and screens.
- B. Construction and Ratings: In accordance with AHRI 210/240. Test in accordance with ASHRAE Std 23.
- C. Construction and Ratings: In accordance with ARI 210/240, ARI 365, and UL 207. Testing shall be in accordance with ASHRAE Std 23.
- D. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.3 CASING

- A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.
- B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.
- C. Provide removable access doors or panels with quick fasteners and piano hinges.

23 62 13-3

2.4 CONDENSER COILS

- A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide subcooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of refrigerant.
- B. Coil Guard: Hail Guard.

2.5 FANS AND MOTORS

- A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.
- B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in current and thermal overload protection.

2.6 COMPRESSORS

- A. Compressor: Hermetic reciprocating type or hermetic scroll type.
- B. Mounting: Statically and dynamically balance rotating parts and mount on rubber-inshear vibration isolators. Internally isolate hermetic units on springs.
- C. Motor: Constant speed 1800 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting. Furnish with starter.

2.7 REFRIGERANT CIRCUIT

A. Provide each unit with one refrigerant circuit or two independent refrigerant circuits, factory supplied and piped. Refer to Section 23 23 00.

2.8 CONTROLS

- A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, molded case disconnect switch, factory wired with single point power connection. Factory mount disconnect switch on unit under provisions of Section 26 05 83.
- B. For each compressor, provide across-the-line or part winding starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.

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- C. Provide safety controls arranged so any one will shut down machine:
 - 1. High discharge pressure switch (manual reset) for each compressor.
- D. Provide the following operating controls:
 - 1. Five minute off timer prevents compressor from short cycling.
 - 2. Low ambient temperature controls to 0 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Provide for connection to electrical service.
- C. Install units on concrete base as indicated.
- D. Provide connection to refrigeration piping system and evaporators. Refer to Section 23 23 00. Comply with ASHRAE Std 15.
- 3.2 SYSTEM STARTUP
 - A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.
 - B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.
 - C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

3.3 SCHEDULES

- A. Air Cooled Condensing Units
 - 1. As scheduled on drawings.

END OF SECTION

23 62 13-5

SECTION 23 74 13

PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof Top Air Conditioning Units.

1.2 REFERENCE STANDARDS

- A. AMCA 511 Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).
- B. ANSI Z21.47 American National Standard for Gas-Fired Central Furnaces; 2021.
- C. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- D. ISO 9001 Quality Management Systems Requirements; 2015, with Amendment (2024).
- E. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. UL 1995 Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
- B. Product Data:
 - 1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, and electrical characteristics and connection requirements.
 - 2. Provide computer generated fan curves with specified operating point clearly plotted.
 - 3. Manufacturer's Installation Instructions.

1.4 OPERATION AND MAINTANENCE DATA

A. Maintenance Data: Provide instructions for installation, maintenance and service.

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1.5 QUALIFICAITONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
- B. Startup must be done by trained personnel experienced with rooftop equipment.
- C. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters and remote controls are in place, bearings lubricated, and manufacturers' installation instructions have been followed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Accept products on site and inspect for damage.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.7 WARRANTY

- A. Units feature a 5-year parts and compressor warranty. Gas heat exchangers in gas/electric units include a 20-year warranty.
- B. Complete warranty details are available from your local dealer/contractor or at www.daikinac.com.

PART 2 PRODUCTS

- 2.1 MANUFACTURERS
 - A. Trane.
 - B. Daikin.
 - C. York.
 - D. Substitutions: See Section 23 01 00- General HVAC Provisions.
- 2.2 CABINET
 - A. Unit cabinets are made with galvanized steel as follows, top panel 0.046" ~19-gauge, access doors 0.034" ~21-gauge, side rails 0.058" 16 gauge with a powder-paint finish on all the external surfaces. Service panels provide access to refrigeration, heating,

23 74 13-2

blower, controls, and filter sections.

- B. Interior surfaces in the indoor air section are single wall insulated with a minimum 1/2-in. thick, minimum 1-1/2 lb./ft3 density, flexible fiberglass insulation bonded with a phenolic binder, Aluminum foil-faced on the air side.
- C. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240 minimum exterior sweat criteria.
- D. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- E. Cabinet finish panel is tested for 500 hours in a salt spray test in accordance with ASTM B117 standard for salt spray resistance.
- F. Base rails are a minimum 3-1/2" tall and include holes to allow for overhead rigging and lifting with forklifts.
- G. Unit includes a condensate drain pan with both vertical and horizontal drain connections.
- H. Unit must have ³/₄"-14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.
- I. Shall be a sloped condensate drain pan made of a corrosion resistant material.
- J. Unit must comply with ASHRAE Standard 62.1
- K. Unit shall be field convertible from vertical to horizontal airflow on all models. No special kit required.
- L. Base of unit shall have a thru-the-base gas (3-6 tons only) and electrical connections (factory installed or field installed), standard.

2.3 ACCESS PANELS

A. All Cabinet panels are designed to be easily removable for servicing Unit, and shall have one factory installed, tool-less, removable, filter access panel up to 12-½ tons. Option for hinged access panel for controls and blower section shall be available from the factory, hinges shall be of stainless-steel material for corrosion resistance.

2.4 CONTROLS

A. Units are factory-wired with color-coded wires with low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer

23 74 13-3

shall have 75VA capability.

- B. Units have single-point power entry either with the unit or with the electrical heat kits on a central control terminal board to provide connection points conveniently and safely for essential control functions such as: smoke detectors, phase monitor, economizer, thermostat, DDC control options, and low- and high-pressure switches.
- C. Unit to be provided with a terminal block for connection and control wiring.
- D. Units come with a grounding lug as standard.
- E. Units come standard with 5kA SCCR.
- F. Optional DDC controls BACnet native with LonWorks connectivity addition available. Integrate into BMS or operate as standalone digital system.

2.5 COMPRESSORS

- A. Compressors are hermetically sealed scroll compressors and are factory mounted on rubber grommets. On units with two refrigeration circuits $(71/2 12 \frac{1}{2} 10)$, one scroll compressor is used on each circuit.
- B. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
- C. Compressors shall be internally protected from high discharge pressure through internal pressure relief valve and externally protected via pressure switch in the discharge line.

2.6 REFRIGERNAT DETECTION SYSTEM:

A. RDS Function The mitigation system is a stationary device that detects the presence of R-32 refrigerant above 25% LFL using refrigerant sensors and then initiates mitigation actions. The mitigation system's primary function is to reduce the concentration of leaked R-32 refrigerant to prevent serious safety hazards. The mitigation actions are accomplished by halting HVAC operation and continuing indoor blower operation to provide airflow. Once refrigerant concentration reaches below a safe threshold, the unit will remain in mitigation mode for five minutes to evacuate any remaining R-32 refrigerant within the unit. Upon completion, the unit will resume its normal operation. RDS Operation The mitigation system is controlled by a refrigerant sensor(s), which is secured to a designated location(s) for active monitoring. If a leak is detected, HVAC operation is disabled and the indoor blower fan is activated, providing airflow at or above minimum required airflow to evacuate excess concentration. If a Zone Control

23 74 13-4

system is installed in the ductwork attached to this system, the Zone controller must be powered through a Daikin Zoning/ Accessory PCB to ensure that the Zoning Dampers open during mitigation mode to provide ventilation throughout all ducting. If the unit is installed with a communicating thermostat, the thermostat will display relevant alerts/ information concerning mitigation mode. Once sensors read concentration levels below a safe threshold, a fiveminute timer will initiate. Once the time is over, the unit will resume back to its normal operation. If the sensors detect another concentration excess, the unit will go back into mitigation mode and will repeat the same process. Refrigeration System Checks This unit is equipped with thermal expansion valves. Ensure the hold-down bolts on the compressor are secure and have not vibrated loose during shipment. Check that the vibration grommets have been installed and visually check all piping for damage and leaks and repair if necessary. The entire system has been factory charged and tested, making it unnecessary to field charge. Factory refrigerant charge is shown on the unit's nameplate. To confirm charge levels or, if a leak occurs and charge needs to be added to the system, it is recommended to evacuate the system and recharge refrigerant to the unit's nameplate specifications. This unit has been rated in the cooling mode at the AHRI rated conditions of: indoor (80°F db/67°F wb) and outdoor (95°F db). While operating at this condition, the superheat should range from 9°F to 11°F for each refrigeration circuit measured at the suction service port located near the compressor.

2.7 DRAIN PAN

- A. Unit includes a sloped condensate drain pan made of a non-corrosive material compliant with ASHRAE Standard 62.1. Shall use a 3/4" -14 NPT drain connection, possible either through the bottom or end of the drain pan.
- B. Connection shall be made per manufacturer's recommendations. No base pan penetration, other than those authorized by the manufacturer, is permitted.

2.8 FILTRATION

- A. Unit includes a factory-installed throwaway filter 2" thick, with dimensions selected based on commercial availability and low face velocity.
- B. Option to include higher filtration rating MERV8 or MERV13 filters.
- C. Filters are accessible through a tool-less access panel for fast and easy removal and maintenance.
- D. Filters shall be held in place by a pivoting filter tray, facilitating easy removal and installation.

23 74 13-5

2.9 COILS

- Coils are made of internally finned copper tube mechanically bonded to aluminum plate fins and are pressure tested at the factory to ensure pressure and leak integrity. The evaporator coil and condenser coil are leak-tested to 575 psig and pressure-tested to 450 psig.
- B. $71/2 12\frac{1}{2}$ -ton units have two refrigerant circuits. 3 6-ton units have a single refrigerant circuit.
- 2.10 ON ALL 3 12 ½ -TON AC, GAS ELECTRIC, AND HEAT PUMP (ONLY UP TO 6 TONS) UNITS, EACH REFRIGERANT CIRCUIT HAS A TXV METERING DEVICE FOR INDOOR AND OUTDOOR COILS.
 - A. Evaporator and condenser coils are qualified to UL 1995 burst test. Units include high- and low-pressure switches, service ports, and factory-installed filter driers. All heat pump units (DRH units) use a refrigerant accumulator.

2.11 HEATING SECTION

- A. Gas/Electric units (DRG units) include a corrosion-resistant, indirect fire, aluminized tubular steel heat exchanger with formed wrinkle bends at the inner diameter of each radius.
- B. Type 409 stainless steel heat exchangers are available as a factory-installed option.
- C. The gas heating section uses an induced draft combustion blower and a direct spark ignition system. Units are suitable for use with natural gas or propane with a field-installed kit.
- D. The unit heating section must include the following, high temperature limit switches, induced draft motor speed sensors, flame out rollout switch and flame proving controls.
- E. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
- F. Low NOx reduction shall be provided as an option to reduce nitrous oxide emissions to meet California's Air Quality Management District (SCAQMD and SJVAPCD) low-NOx emissions requirement of 14ng/J or less.
- G. Primary tubes and vestibule plates on low NOx units shall be 409 stainless steel. Other components shall be aluminized steel.

23 74 13-6

2.12 HEAT PUMP HEATING

A. Heat Pump units (DRH units). Evaporator coil, condenser coil, compressors and refrigerant circuit are designed for heat pump operation. The refrigerant circuit contains a 4-way reversing valve to provide heat. Hybrid heating option is provided for auxiliary heating.

2.13 FANS

- A. Fans in 3-phase and 1-phase equipment are available with ECM direct-drive, multispeed motors. All motors are thermally protected with permanently lubricated bearings.
- B. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required. Motor to include inherent automatic-reset thermal overload protection or circuit breaker and permanent lubricated bearings.
- C. Evaporator blowers for sizes $3 12\frac{1}{2}$ -ton consist of single width, single inlet (SWSI) type, Class II construction supply fan with aluminum fan and blades.
- D. Shall have slow ramp up to speed capabilities.
- E. Outdoor condenser fans are direct-drive, permanently lubricated, and contain overload protection.
- F. The cooling operating range is between 35°F and 115°F outdoor ambient temperature for $7\frac{1}{2} 12\frac{1}{2}$ -ton units and between 60°F and 115°F outdoor ambient temperature for 3 6-ton units as standard from the factory.
- 2.14 STORAGE AND HANDLING

2.15 UNIT TO BE STORED AND HANDLED PER MANUFACTURER'S RECOMMENDATIONS.

- A. Unit to be lifted by crane using spread bars.
- B. Unit to be stored in the upright position.
- 2.16 ACCESSORIES AND OPTIONS NOT ALL ACCESSORIES AND OPTIONS ARE AVAILABLE FOR ALL UNITS.
 - A. FACTORY-INSTALLED OPTIONS
 - 1. Non-Powered Convenience Outlet: A 120V, 15A, GFCI outlet can be installed in the unit making it easy for technicians to service other units once an electrician

23 74 13-7

runs power to the outlet. Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle. Transformer not included for this option. Outlet shall include a field-installed "Wet in Use" cover.

- 2. Stainless-Steel Heat Exchanger (DRG units only): A tubular heat exchanger made of 409-type stainless steel can be installed in the unit.
- 3. Disconnect Switch (non-fused): A disconnect switch can be installed in the unit with factory wiring complete from the switch to the unit. Please note that for air conditioners (DRC units) and heat pumps (DRH units), the appropriate electric heat kit must be ordered along with the disconnect switch (non-fused) to be factory-installed. For models with a powered convenience outlet option and a disconnect switch (non-fused) option, the power to the powered convenience outlet will be shut off when the disconnect switch (non-fused) is in the "off" position. National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff. Disconnect shall be accessible from outside of the unit and provide local shutdown and lockout capability.
- 4. Hinged Access Panels: Allows access to unit's major components. Combined with latches for easy access to control box and blower motor.
- 5. Through-the-base electrical connection: Allows an easy and fast field installation through the unit base pan.
- 6. Single Point Power Connection for Power Exhaust: Factory-installed, single-point power connection for field installed power exhaust.
- 7. DDC Controller: DDC communicating controller, available for 3 12.5-ton DR series models with on-board BACnet[™] communication interface.

B. FIELD-INSTALLED OPTIONS

- 1. Roof curbs: Full perimeter roof curb. Two different heights 14" and 24", allows proper installation and structure stability. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
- 2. Filtration: 2" MERV8 filters
- 3. FACTORY- OR FIELD-INSTALLED OPTIONS
- 4. Downflow Economizer: Fully modulating between 0 and 100%, contains seals that meet ASHRAE 90.1 requirements. Includes controls, motor, dampers, minimum position settings, a preset linkage, a wiring harness with plug, a mixed

23 74 13-8

air temperature sensor, enthalpy or dry bulb control, and a barometric relief damper. An optional return enthalpy sensor is available to provide comparative or differential enthalpy control. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable. The economizer damper type has been tested using the AMCA 511 guidelines under Section 14 "Volume Control Damper". The dampers used on these economizers are MicroMetl NS1 series and have tested and are listed by AMCA as Class 1A dampers. Class 1A dampers have a leakage rate of no more than 3 cfm per square foot at 1" static pressure. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor. Economizer controller shall accept a 2-10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

- C. Phase Monitor: Phase monitor (3-phase only), available for 3 12-1/2-ton DR series models. Phase monitor shall provide protection for motors and compressors against problems caused by phase loss, phase reversal and phase unbalance. Phase monitor is equipped with an LED that provides an ON or FAULT indicator.
 - 1. Drain pan overflow switch: Allows the controls to detect and send an alarm when there is an overflow on the drain pan.
 - Condenser Hail Guards: Louvered metal guards help protect the condenser coil from hail and debris; available as a field-installed or factory-installed options on 3 - 12-1/2-ton units.

PART 3

3.1 EXAMINATION

- A. Contractor shall verify that roof is ready to receive work and opening dimensions are as per manufacturer's recommendations.
- B. Contractor shall verify that proper power supply is available.

3.2 INSTALLATION

- A. Contractor shall install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

23 74 13-9

3.3 MANUFACTURER'S FIELD SERVICES

A. The contractor shall furnish manufacturer complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

END OF SECTION

23 74 13-10

SECTION 23 81 26

SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Indoor ductless fan & coil units.
- B. Controls.

1.2 RELATED REQUIREMENTS

- A. Section 23 23 00 Refrigerant Piping and Specialties.
- B. Division 26 Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 210/240 Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.
- B. ASHRAE Std 15 Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- C. ASHRAE Std 23.1 Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- D. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
 - 1. Design Data: Indicate refrigerant pipe sizing.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

23 81 26-1

- E. Project Record Documents: Record actual locations of components and connections.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 Product Requirements, for additional provisions.
 - 2. Extra Filters: Two filters for each indoor unit.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience and approved by manufacturer.
- C. Provide five year manufacturers warranty for compressors.
- D. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

1.6 MANUFACTURERS

- A. Daikin.
- B. Mitsubishi.
- C. LG.
- D. Substitutions: See Section 23 01 00 General HVAC Provisions.

1.7 INDOOR UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
 - 1. Capacity: Refer to drawings.

23 81 26-2

- 2. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.
- B. Remote Actuators:

1.8 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Refrigerant: R-32 or R-454B.
 - 2. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
- B. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
 - 1. Provide heat pump reversing valves.
- D. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.
- E. Mounting Pad: Roof curb, minimum 20 inches high, sized to match unit.

1.9 ACCESSORY EQUIPMENT

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
 - 1. System selector switch (heat-off-cool) and fan control switch (auto-on).
 - 2. Set-up for four separate temperatures per day.
 - 3. Instant override of setpoint for continuous or timed period from one hour to 31 days.
 - 4. Short cycle protection.

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- 5. Programming based on every day of the week.
- 6. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
- 7. Battery replacement without program loss.
- 8. Manufacturers:
 - a. Provided by Control Contractor.

PART 3 EXECUTION

2.1 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

2.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.
- D. Pipe drain from cooling coils to nearest drain.

2.3 SCHEDULE

A. Refer to plan Schedule.

23 81 26-4

SECTION 23 82 16

AIR COILS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refrigerant coils.

1.2 RELATED REQUIREMENTS

- A. Section 23 23 00 Refrigerant Piping and Specialties.
- B. Section 23 31 00 Ducts: Installation of duct coils.
- C. Division 26 Electrical. Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 410 Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).
- B. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2020.

1.4 SUBMITTALS

- A. See Section 23 01 00 General HVAC Provisions.
- B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- C. Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- D. Certificates: Certify that coils are tested and rated in accordance with ARI 410.
- E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

23 82 16-1

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.
- B. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.7 WARRANTY

- A. Provide five year manufacturer warranty for coils.
- B. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Same as equipment supplier.
- B. Substitutions: See Section 23 01 00 General HVAC Provisions.

2.2 REFRIGERANT COILS

- A. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.
- B. Fins: Aluminum or copper continuous plate type with full fin collars. Solder coat copper fin coils.
- C. Casing: Die formed channel frame of 16 gage galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.
- D. Headers: Seamless copper or brass tubes with silver brazed joints.
- E. Liquid Distributors: Brass or copper venturi type distributor with seamless copper distributor tubes, 5/16 inch outside diameter; maximum 12 circuits per distributor.
- F. Testing: Air test under water at 300 psi for working pressure of 250 psi; clean, dehydrate, and seal with dry nitrogen charge.
- G. Configuration: Down feed with bottom suction to prevent trapping of oil.

23 82 16-2

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturers written instructions.
- B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
 - 1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
 - 2. Provide frames for maximum three coil sections.
 - 3. Arrange supports to avoid piercing drain pans.
 - 4. Provide airtight seal between coil and duct or casing.
 - 5. Refer to Section 23 31 00.
- C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- D. Install coils level. Install cleanable tube coils with 1:50 pitch.
- E. Make connections to coils with unions and flanges.
- F. Insulate headers located outside air flow as specified for piping. Refer to Section 23 07 19.

3.2 SCHEDULES

A. Heating and Cooling Coils: Same as equipment manufacturer.

END OF SECTION

23 82 16-3

SECTION 26 00 10

GENERAL ELECTRICAL PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Furnish and install all electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Specifications and drawings are complimentary except that, in case of conflict, the most stringent will govern.
- B. Judgment shall be exercised to install electrical work in a practical manner to function properly, simplify future maintenance, and to fit building construction and finish. Items not shown or specified which are required to produce a complete, operative and finished system shall be provided.
- C. The electrical plans are a guide to the Contractor to show general arrangement of conduit and wiring and equipment required. If any error omissions or obscurities appear therein, which are questionable, do not conform to good practice, or appear contrary to the purpose and intent of the work, the Contractor shall promptly notify the Architect and Engineer and apply for directions before construction. The exact location of conduit runs and lengths shall be determined by the Contractor in the field.
- D. The drawings may be superseded by later revised or detailed drawings or specification addenda prepared by the Architect. The Contractor shall conform to all reasonable change without extra cost to the Owner. All items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation, shall be included.
- E. Examine the premises in accordance with Division 1 and Division 2 of the specifications.
- F. The Owner may furnish some equipment. Electrical Contractor is responsible to check the drawings and specifications for equipment that will be furnished by the Owner. Furnish the electrical connections, etc., on all Owner furnished equipment.
- G. Should the particular equipment which any bidder proposes to install, require other space conditions than those indicated on the drawings, arrange for such space with the Engineer before submitting a bid. Should changes become necessary because of failure to comply with this clause, install the changes without additional expense.

26 00 10-1

- H. Where electrical equipment is installed that causes electrical noise interference with other electrical systems installed under this contract, equip the offending equipment with isolating transformers, filters, shielding or any other means as required for the satisfactory suppression of the interference as determined by the Engineer.
- I. Comply with National Electric Code, NFPA, appropriate Building Code, and all local, state, and national ordinances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions and Supplementary General Conditions of the contract are an integral part of Division 26 of the Specifications. Carefully note its contents in performance of the work.
- B. The General Requirements as included in Division 1 of the Specifications are an integral part of Division 26. Carefully note its contents in performance of the work.
- C. Examine all of the contract drawings and specifications, field verify existing conditions, or otherwise determine the extent of related work in other divisions before submitting a quotation for the work in this division. Coordinate the work in this division with work in other divisions through the Electrical Contractor. No extra payment will be made for additional work required by failure to coordinate the work. Should drastic changes from original drawings be necessary, the Contractor shall notify the Architect and secure written approval and agreement from the Architect on necessary adjustments.
- D. The architectural, mechanical and structural plans and specifications, including Information to Bidders and other pertinent documents issued by the Architect or Engineer are a part of this Specification and the accompanying electrical plans. Comply with them in every respect. Examine all the above carefully.
 - 1. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, mechanical and structural details from the electrical drawings.
- E. Related work in other divisions requiring cooperation and coordination with this division includes, but is not limited to, the following:
 - 1. Power arranged under Division 1.
 - 2. Perform all cutting and patching as required under Division 1.

26 00 10-2

- 3. Furnish all sleeves, inserts, anchors and supports required by this work to be installed in concrete or masonry and coordinate with the respective trades under Division 3 and 4 for proper locations and installation.
- 4. Flash and seal roof penetrations in accordance with Division 7. Furnish locations and sizes and coordinate the installation with the respective trade.
- 5. Perform painting of electrical equipment and materials in finished areas as required under Division 9. Touch up or prime any surfaces required in this division in accordance with Division 9. Provide factory finishes as specified in other sections of this division.
- 6. Install branch circuits and make final connections to any equipment requiring electric power that is furnished and installed by the Contractor or by the Owner. Perform the electrical work according to approved shop drawings.
- 7. Install empty raceways and outlet boxes or branch circuits for equipment to be furnished by others and installed after completion of the contract.
- 8. Install and connect motor starters furnished under Division 23 where starters are not an integral part of the equipment. Insure that starters generally conform to the requirements of this division.
- 9. 120 volt control wiring is furnished and installed by the Electrical Contractor in accordance with the requirements of Division 23.
- 10. Mechanical equipment control conduit system furnished and installed by the Mechanical Contractor.
- 11. Motors are furnished and installed generally as an integral part of equipment specified under Division 23 and must conform to the requirements of this division.

1.3 FEES, PERMITS AND INSPECTIONS

- A. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith to include fees by the utility companies.
- B. Under this section of work the Contractor shall, upon completion of the work, furnish a certificate of final inspection to the Architect from the inspection department having jurisdiction.

26 00 10-3

1.4 CODES AND STANDARDS

- A. All work shall be done in a good workmanlike manner. Materials and workmanship shall comply with all applicable local state and federal codes including, but not limited to, the following:
 - 1. National Electrical Code, Latest Edition (NEC).
 - 2. Underwriters' Laboratories, Inc. (UL).
 - 3. Institute of Electrical and Electronic Engineers (IEEE).
 - 4. Insulated Power Cable Engineers' Association (IPCEA).
 - 5. National Electrical Manufacturers' Association (NEMA).
 - 6. American Standards Association (ASA).
 - 7. American Society for Testing Materials (ASTM).
 - 8. State Fire Prevention Code.
 - 9. Occupational Safety and Health Act (OSHA).
 - 10. National Fire Protection Association (NFPA).
 - 11. International Building Code (IBC).
- B. Comply with all State and Federal ADA Accessible Guidelines in regard to accessible or handicapped features.
- C. The latest specifications and standards available shall be used for the above.
- D. In case of discrepancy between the applicable codes, plans and specifications, the most stringent shall govern.
- E. Should the Contractor perform any work that does not comply with requirements of the applicable authorities, he shall bear all cost arising in correcting the deficiencies.
- F. Equipment and materials which are not covered by UL standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory.

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PART 2 PRODUCTS

2.1 QUALIFICATION (PRODUCTS AND SERVICES)

- A. Approvals are required of products or services of proposed manufacturers, suppliers and installers and will be based upon submission by Contractor of certification.
- B. Manufacturer's Qualifications, provide submittal information with the following: Manufacturer regularly and presently manufactures as one of the manufacturer's principal products the following items and has manufactured these items for at least five (5) years.
 - 1. Wire and Cable all types.
 - 2. Light Fixtures.
 - 3. Lighting Switches and Receptacles.
 - 4. Dimmers.
 - 5. Molded Case Circuit Breakers.
 - 6. Fuses.
 - 7. Conduit.
 - 8. Wiring Devices.
 - 9. Low Voltage Fusible and Non-Fusible Switches.
 - 10. Fire Alarm Systems and Equipment.
 - 11. Conduit Supports and Fittings.
 - 12. Panelboards.
 - 13. Transformers.
 - 14. Generator and Automatic Transfer Switch.
 - 15. Structured Telecommunication Cabling.
 - 16. Access Control.
 - 17. Video Surveillance.
 - 18. Fire Sealant.

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- C. Manufacturer's product submitted must have been in satisfactory operation on three (3) installations similar to this project for approximately five (5) years.
- D. There must be a permanent service organization maintained or trained by manufacturer which will render satisfactory service to this installation within eight (8) hours of receipt of notification that service is needed.
- E. Installer must have the technical qualifications, experiences, trained personnel and facilities to install specified items including at least three (3) years of successful installation of electrical work similar to that required on this project. Approval will not be given where the experience record is one of unsatisfactory performance.
- F. The lighting wholesale supplier shall have an office and a stocking warehouse within 100 miles of the project site. The distributor/manufacturer's representative shall have an office within 100 miles of the project site, and shall have on staff a full time lighting designer as well as personnel who are available to service the project after completion.

2.2 MANUFACTURED PRODUCTS

- A. Insure that materials and equipment furnished is of current production by manufacturers regularly engaged in the manufacture of such items for which replacement parts should be available.
 - 1. Items not meeting this requirement but which otherwise meet technical specifications and merits of which can be established through reliable test reports or physical examination of representative samples will be considered.
- B. Provide products of a single manufacturer when more than one (1) unit of the same product is needed.
- C. Equipment Assemblies and Components:
 - 1. All components of an assembled unit need not be products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies which include components made by others must assume complete responsibility for the final assembled unit.
 - 3. Components must be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar must be the product of a single manufacturer.

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- 5. Moving parts of any element of equipment of the units normally requiring lubrication must have means provided for such lubrication and must be adequately lubricated at factory prior to delivery.
- D. Identify all factory wiring on the equipment being furnished and on all wiring diagrams.
- E. Equipment and materials shall be new and shall bear the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material.
- F. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
- G. Dimensions: It shall be the responsibility of the Contractor to insure that items furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications. Dimensions are to be taken from the architectural drawings.
- H. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of equipment and materials. Notify the Architect of any conflict between any requirement of the contract documents and the manufacturer's directions and obtain the Architect's written instruction before preceding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the Architect, he shall bear all costs arising in correcting the deficiencies.
- I. The Contractor shall provide and install all accessories, and incidental items to complete the work, ready to use and fully operational.

2.3 EQUIPMENT RATINGS AND APPROVAL OF "EQUAL" EQUIPMENT

- A. Equipment voltage ratings must be in accordance with the requirements indicated on the drawings or as specified.
- B. Obtain written approval for any equipment which differs from the requirements of the drawings and specifications.
 - 1. Furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required.

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- 2. Approval by the Engineer of the equal equipment does not relieve the Contractor of the responsibility of furnishing and installing the equipment at no additional cost.
- 3. Furnish and install any other items required for the satisfactory installation of the equal equipment at no additional cost. This includes, but is not limited to, changes in branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels, and correlation with other work, subject to the jurisdiction and approval of the Engineer.
- C. Equipment and materials specified herein are named to establish a standard of quality. Other material of equal quality may be substituted per Section 01 60 00 and with approval by the Architect.
- D. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The contractor shall be responsible for any changes required in mechanical, electrical or structural systems resulting from equipment substitutions and shall bear all costs for those changes whether the substitute equipment is named by Architect for "equal" consideration or not. All changes shall be accomplished in a manner acceptable to the Architect at no additional cost to the Owner.
- E. In order to obtain prior approval on equipment or material not specified in Division 26, 27 and 28 Specifications or Equipment Schedules, Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.

2.4 EQUIPMENT PROTECTION

A. Store all materials and equipment to be installed in the work so as to insure the preservation of their quality, workability, and fitness for the work intended. Provide storage provisions for protection from the elements, rust and physical damage. Place stored materials on clean, hard surfaces above ground and keep covered at all times to insure protection from paint, plaster, dust, water and other construction debris or operations. Install heaters under the protective cover where the equipment may be damaged due to moisture and weather conditions. Keep conduit ends plugged or capped and all covers closed on boxes, panels, switches, fixtures, etc., until installation of each item. Store all plastic conduit or duct out of direct sunlight in shaded areas. Located stored materials and equipment to facilitate prompt inspection. All boxes and packaging must remain intact.

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- B. Protect during installation, all equipment, controls, controllers, circuit protective devices, etc., against entry of foreign matter on the inside and be vacuum clean both inside and outside before testing, operating and painting.
- C. Replace damaged equipment, as determined by the Engineer, in first class operating condition or return to source of supply for repair or replacement.
- D. Protect painted surfaces with removable heavy Kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.
- E. Repair damaged paint on equipment and materials. Finish with same quality of paint and workmanship as used by manufacturer so repaired areas are not obvious.
- F. All lighting fixtures are to be stored on the project in their original factory cartons.

2.5 EQUIPMENT ACCESSORIES

- A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.
- B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and specifications.
- C. Support, plumb, rigid and true to line all work and equipment included. Study thoroughly all general, structural, electrical and mechanical drawings, shop drawings and catalog data to determine how equipment is to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.

PART 3 EXECUTION

3.1 WORK PERFORMANCE

- A. Furnish and install a temporary electrical distribution system of adequate feeder sizes to prevent excessive voltage drop. Install all temporary work in a neat and safe manner. Provide temporary lighting as necessary to furnish 2.5 footcandles on all work surfaces.
- B. Field coordinate with other trades in ample time to build all chases and openings, set all sleeves, inserts and concealed materials, and provide clearances that may be required to accommodate materials and equipment. Lay out electrical work so that in

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case of interference with other items the layout may be altered to suit conditions encountered.

- C. Cutting and Patching:
 - 1. The Electrical Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any structural element, beam or column without the written approval of the Engineer.
 - 2. Pipes, conduits, cables, wires, wire ducts and similar equipment that pass through fire or smoke barriers shall be protected in accordance with NFPA 101.
- D. Wall Penetrations: When conduit, wireways, bus duct and other electrical raceways pass through fire partitions, fire walls, or walls and floors, install a firestop that provides an effective barrier against the spread of fire, smoke and gases. Firestop material must be packed tight and completely fill clearances between raceways and openings. Use firestop material conforming to the following:
 - 1. All wall penetrations shall be caulked and sealed. Provide fire barrier pillows to protect the interior of conduits/sleeves passing through fire rated walls.
 - 2. The Contractor shall furnish and install all necessary sleeves and chases for all work passing through and attaching to walls, ceilings or the roof.
 - 3. Provide UL listed, fire rated poke through devices for floor penetrations as required by the Standard Building Code, National Fire Code and Life Safety Code.
 - 4. Provide UL approved fire rated chases and fire sealing as required to maintain fire rating for all penetrations in fire rated walls.
 - 5. Firestopping material must be of the latest type as supplied by leading manufacturers such as "3M".
 - 6. Floor, exterior wall and roof seals must be watertight. Sleeve walls and floors which are cored for installation of conduit with steel tubing, grouted and the space between the conduit and sleeve filled as specified herein. Where conduits pierce the roof, refer to architectural specifications and drawings for details. Provide pourable sealant as specified by the Roofing Contractor.
- E. Do not use electrical hangers and other supports for other than electrical equipment and materials. Provide not less than a safety factor of five (5) and conform with any

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specific requirements as shown on the drawings or in the specifications.

- F. Do not deviate from the plans and specifications without the full knowledge and consent of the Engineer. Should, at any time during the progress of the work, a new or existing condition be found which makes desirable a modification of the requirements of any particular item, report such item promptly to the Engineer for his decision and instruction.
- G. Notify all other contractors of any deviations or special conditions. Resolve interferences between the work of the various contractors prior to installation. Remove, if necessary, work installed which is not in compliance with the plans and specifications as specified above, and properly reinstall without additional cost to the Owner.
- H. This Contractor shall furnish all necessary scaffolding, cranes, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

3.2 EQUIPMENT INSTALLATION AND EQUIPMENT

- A. Installation:
 - 1. "Provide" and "Install" as used on the drawings and in the specifications means furnish, install, connect, adjust and test except where otherwise specified.
 - 2. Install coordinated electrical systems, equipment and materials complete with auxiliaries and accessories installed.
- B. Equipment Location: As close as practical to locations shown on drawings.
- C. Working Spaces: Not less than specified in the National Electrical Code for all voltages specified.
- D. Inaccessible Equipment:
 - 1. Where the Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, remove and reinstall equipment as directed at no additional cost.
 - 2. "Conveniently Accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and ductwork.
- E. Equipment and Materials:

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- 1. Install new equipment and materials unless otherwise specified.
- 2. Insure that equipment and materials are designed to provide satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements applied to the installation and other code requirements apply to the installation in areas requiring special protection such as explosion proof, vapor-proof, water tight and weather-proof construction.

3.3 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the National Electrical Code, install identification signage which will clearly indicate information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, time clocks, contactors, separately enclosed circuit breakers, individual breakers, and controllers in switchgear and motor control assemblies, control devices and other significant equipment.

3.4 DRAWINGS AND SPECIFICATIONS

A. The drawings and specifications indicate the requirements for the systems, equipment, materials, operation and quality. They are not to be construed to mean limitation of competition to the products of specific manufacturers.

3.5 SYSTEM VOLTAGES

- A. System voltages are as follows:
 - 1. High Voltage: 480/277 volts, three phase, four-wire.
 - 2. Low Voltage: 208/120 volts, three phase, four-wire.

3.6 SUBMITTALS

- A. Obtain the Engineer's approval for all equipment and materials before purchasing or delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval is not permitted at the job site. Only equipment and material which have been approved by submittals may be used on this project. Refer to Section 26 00 10, Paragraph 2.3.E for substitutions.
- B. Include in all submittals adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval must be legible and clearly identify equipment being submitted.

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- C. Submit to the Engineer within (30) days after the awarding of the Contract, a complete set of brochures of shop drawings and descriptive data of all material and equipment proposed for the installation. All information shall be submitted electronically in "pdf" format, and shall be separated into electronic "pdf" files in three groups, lighting, switchgear and all others.
- D. The submittals must include the following:
 - 1. Information which confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
 - 2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring must be identified on wiring diagrams.
 - 3. Parts list which must include those replacement parts recommended by the equipment manufacturer.
 - 4. Approvals will be based on complete submission only.
- E. Furnish shop drawings for the work involved in sufficient time so that no delay or changes will be caused. Thermofax copies are not acceptable only permanent type prints are allowed.
- F. Verify that shop drawings comply in all respects with the item originally specified. It is the Contractor's responsibility to procure the proper sizes, quantities, rearrangements, structural modifications or other modifications in order for the substituted item to comply with the established requirements.
- G. Any shop drawings prepared to illustrate how equipment, conduit, fixtures, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified all the conditions. Obtaining approval thereon does not relieve the Contractor of responsibility in the event the material cannot be installed as shown on the drawings.
- H. Shop drawings need not cover detailed installation drawings prepared for the Contractor's own use, but be limited, as in the case of raceways, to necessary departures from the plans as prepared by the Engineer.
- I. Submit working scale drawings of apparatus and equipment which in any way varies from these specifications and plans, to be reviewed by the Engineer before the work is started. Correct interferences with the structural conditions before the work proceeds.

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- J. Submit all shop drawings at the same time in a loose-leaf binder with double index as follows:
 - 1. List the products by designated letter or number as indicated on plan sheets.
 - 2. List the name and manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the name and addresses of the local sales representative.
 - 3. Provide indexes with sheet numbers and quantities of the products listed.

3.7 TESTS AND DEMONSTRATION

- A. As equipment and materials are being installed and connected, test the installation for the following:
 - 1. Short circuits and ground faults.
 - 2. Insulation resistance at 500 volts DC.
 - 3. Grounding continuity.
 - 4. Breaker Coordination Study.
- B. After tests are completed and necessary corrections are made, put each system into operation and demonstrate its performance to the satisfaction of the Owner's authorized representative.
- C. Provide written documentation of tests and performance as requested by the Owner's authorized representative. The results are to be made part of the Closeout Documents.
- D. Furnish all instruments, test equipment and personnel that are required for the particular test. Certify that equipment and gauges are in good working order. Remove equipment subject to damage during test from line before test is applied.
- E. After installation is complete the Contractor shall conduct operating test of all electrical systems for approval by the Architect. Test shall include verification of direction of rotation for all motors. The equipment shall be demonstrated to operate in accordance with the requirements of the plans and specifications. The test shall be performed in the presence of the Architect or Engineer.
- F. Provide certified test of the grounding electrode system. It shall test to 5 ohms or less.
- G. Provide a breaker coordination study for all breakers to include short circuit coordination and arc flash study with factory labels (Electrical Contractor to install).

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The costs involved are to be included in this contract. Provide written documentation.

3.8 COMPLETION AND ACCEPTANCE

- A. Upon completion of the work and before final acceptance, perform the duties and provide the documents as follows in accordance with the General Conditions, Supplementary Conditions and Division 1 of Contract.
- B. Remove all rubbish, tools and surplus materials accumulated during the execution of the work in this Division.
- C. Touch up any equipment or finishes damaged during delivery or installation from the work in this Division.
- D. Provide a written one-year guarantee of materials and work except for items that are specified to have a longer warranty. Items that have a published or normal life expectancy of less than one year, such as incandescent lamps are to be covered by the manufacturer's guarantee.
- E. Provide systems and equipment installation, operating and maintenance instructions and catalog data for transmittal to the Owner. Place the data in a loose-leaf binder which contains an index of the products listed alphabetically by name and a separate index listing the manufacturers alphabetically by name and including the manufacturer's address and the name and address of their local representative.
- F. Instruct the Owner's representative in the proper operation and maintenance of the systems and their elements as required or directed to familiarize the Owner in the operation and maintenance of the systems.

3.9 RECORD DRAWINGS

- A. The Contractor shall keep a neat and accurate record of field changes made during construction. Changes shall be penciled in on a separate set of drawings used only for recording changes. At completion of the project the Contractor shall deliver this set to the Architect for preparation of record drawings.
- B. Record drawings shall include corrected panel schedules and riser diagram as well as all plan sheets.

3.10 FINALLY

A. It is the intention that this specifications shall provide a complete installation. All accessories and apparatus necessary for complete operational systems shall be included. The omission of specific reference to any part of the work necessary for

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such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

26 00 10-16

WIRES AND CABLES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Wires and cables.

1.2 RELATED WORK

A. Section 26 05 53: Identification.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Wire and cable shall be new, shall have size, grade of insulation, voltage and manufacturer name, permanently marked on outer covering at regular intervals.
- B. Building Wiring: 95% conductivity, soft drawn conforming to requirements of the NEC and relevant ASTM specifications, copper, 600 volt insulation, dual rated THHN-THWN.
- C. Branch Circuit Wiring: Conductors smaller than No. 12 AWG not permitted; No. 8 AWG and larger, stranded construction; smaller than No. 8, either solid or stranded.
- D. Fire Alarm System Wiring: UL Listed plenum-rated cable for conductors installed in plenum rated spaces. Coordinate with Authority Having Jurisdiction.
- E. Exterior Wiring: Bare stranded for ground, THWN-THHN for all other.
- F. Use pre-insulated pressure connectors such as Scotchlock on stranded conductors No. 10 and smaller. Use approved high-pressure crimp sleeve connectors on No. 8 and larger conductors.
- G. Where allowed by local inspecting authorities, type "MC" cable shall be allowed for fixture whips. It shall be installed using proper fittings and installation tools per NEC.
- H. Low voltage cable is to be installed in conduit in areas with no ceiling or inaccessible hard ceiling.

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PART 3 EXECUTION

3.1 INSTALLATION

- A. Make conductor length for parallel feeders identical.
- B. Lace or clip groups of conductors at panelboards, pull boxes and wireways.
- C. Provide copper grounding conductors and straps.
- D. Install wire and cable in code conforming raceway.
- E. Use wire pulling lubricant for pulling No. 4 AWG and larger wire.
- F. Install wire in conduit runs after concrete and masonry work is complete and after moisture is swabbed from conduits.
- G. Splice only in accessible junction or outlet boxes. Install splices and taps which have mechanical strength and insulation rating equivalent-or-better than conductor and are compatible with conductor material.
- H. Color code conductors to designate neutral conductor and phase as follows: 120/208V (phases) black, red, blue, (neutral) white, (ground) green; 277/480V (phases) orange, brown, yellow, (neutral) white with color stripe, (ground) green.
- I. All 20 amp circuits are 2-#12, 1-#12 ground unless noted. Use #10 AWG conductors on 20 amp branch circuits which exceed 75 feet to the first outlet.
- J. Install home runs as indicated on the panel schedules. Circuits may be grouped into 3-Phase home runs but in no case are more than 3 phase conductors allowed.
- K. Sharing of neutrals is not allowed, to include lighting and power circuits.
- L. Where conduit and wire are installed on the roof, refer to NEC Section 310.15.(B.)(2)(C) for derating/correcting factors for the distance installed from the roof.
- M. No low-voltage wiring is to be visible in open ceiling areas; install in conduit.

3.2 MARKING

- A. Identify circuits using wire markers at the following locations:
 - 1. All power and lighting branch circuits and feeders at pull boxes, fixtures, outlets, motors, etc., indicating panel and circuit number at which each circuit or feeder originates.

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- 2. All branch circuits in the panelboard gutters indicating corresponding branch circuit numbers.
- 3. All signal and control wires at all termination points such as cabinets, terminal boxes, equipment racks, control panels, consoles, etc. Install in accordance with approved schedules prepared by the equipment manufacturer or by the Contractor.
- 4. Mark both ends of all pull wires with tag reading "PULL WIRE" and numbered to refer to the same pull wire.

END OF SECTION

26 05 19-3

GROUNDING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Power system grounding.
- B. Communication system grounding.
- C. Building ground system.

1.2 RELATED WORK

- A. Section 26 05 19: Wires and Cables.
- B. Section 26 05 34: Conduit.

1.3 REGULATORY REQUIREMENTS

A. Install complete grounding system for the building(s) and all electrical equipment in accordance with National Electrical Code, Section 250.

PART 2 PRODUCTS

2.1 GROUNDING

A. Provide copper grounding conductors for grounding connections sized according to NEC.

PART 3 EXECUTION

3.1 POWER SYSTEM GROUNDING

- A. Install NEC sized ground conductor, #12 AWG minimum, in all branch circuit and equipment conduits.
- B. Bonding Jumpers: Provide green insulated wire, size correlated with over-current device protecting the wire. Connect to neutral only at service neutral bar.
- C. Bonding Wires: Install bonding wire in flexible conduit connected at each end to a grounding bushing.
- D. No strap type grounding clamps shall be used. All connections shall be made only after surfaces have been cleaned or ground to exposed metal.

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- E. The building structural steel shall be grounded as follows:
 - 1. All locations noted on the plans or if not shown, at approximately 75 foot intervals where structural columns are located.
 - 2. All grounding locations are to be made with 1/0 bare copper wire with exothermic welds or Burndy "HyGround" to the column, to in-footing rebar, and to a 3/4" x 8' copper ground rod. Include "Eupher" grounds at all locations shown with grounding symbol.
- F. Provide one 1-1/0 bare copper ground wire from the electrical service, and from nearest branch panel, grounding electrode, in 1 1/4" conduit, to the location of each telephone terminal board and Data Room. Provide "Intersystem Bonding Termination" bars at these locations and at the electrical meter where applicable. Termination bars in data or telephone rooms are to be equal to Chatsworth Products, Inc; Model 40153-020. Ground all equipment and metal parts using #6 bare copper ground from this terminal bar.
- G. Bond the neutral (grounded conductor) to ground at one location only once per building at the building's main service disconnect. Bond per NEC Article 250.
- H. Ground cable trays per N.E.C.

END OF SECTION

26 05 26-2

SUPPORTING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Conduit supports.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Single Runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips. All "Caddy" and "B-Line" hangers are approved.
- B. Multiple conduits running horizontally at the same grade and elevation may be supported by trapezes of channels suspended on rods. All support components shall be adequate size for loaded weights being supported. Provide conduit racks with 25% spare capacity.
- C. Perforated strap iron or wire shall not be used for supporting conduits or equipment.
- D. Where large conduits are supported beneath bar joist, hanger rods shall be secured to angle irons of adequate size. Each angle shall span two or more joist to distribute the weight properly.
- E. Supports shall be installed within three (3) feet of each coupling or connector.
- F. Vertical Runs: Channel support with conduit fittings, clamp type supports where conduits penetrate floors.

2.2 ANCHOR METHODS

- A. Hollow Masonry: Toggle bolts or spider type expansion anchors.
- B. Solid Masonry: Lead expansion anchors or preset inserts.
- C. Metal Surfaces: Machine screws, bolts or welded studs.
- D. Wood Surfaces: Wood screws.
- E. Concrete Surfaces: Self drilling anchors or power driven studs.

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2.3 METAL FRAMING SYSTEMS

A. Provide metal framing systems for electrical equipment and conduits as required for proper support spacing and approved for the purpose. Powerstrut, Unistrut, Kindorf or equal.

2.4 CABLE SUPPORTING SYSTEMS

A. Along each corridor on one side of the corridor, install cable supports, above the ceiling, supported by the wall studs. They shall be four tier, two-inch galvanized steel, equal to B-Line # BCH 32-4S. Install at eight-foot intervals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.
- B. Install horizontal supports at eight feet (8') on centers, at fittings and corners, and as required for proper support.
- C. Provide a complete installation with all channels, accessories, screws, nuts, washers, inserts, springs, clamps, hangers, clips, fittings, brackets framing fittings, post bases and brackets to provide a structural rigid support or mounting system.
- D. On the roof, provide B-Line DB series roof top support bases. Provide two supports per 10' length of conduit. Conduit to be 24" off the roof, minimum. Provide 1/2" rubber pads under the B-Line support blocks. Coordinate to be higher than other trades' piping on the roof. Install conduit in the ceiling space below where possible.

END OF SECTION

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CONDUIT

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Conduit and couplings.
- B. Flexible conduit.

1.2 RELATED WORK

A. Section 26 05 53: Identification.

PART 2 PRODUCTS

2.1 MATERIALS

- Conduit/Elbows: Rigid steel threaded ANSI C80.1; electrical metallic tubing ANSI C80.3, Schedule 40 PVC.
- B. Couplings/Connectors: Threaded; liquid-tight; compression gland. Set screw type products are not allowed.
- C. Flexible Conduit: Aluminum or steel armor, plastic jacketed type with liquid-tight connectors used only at motor/equipment terminations. Connectors are to be metal.
- D. Metal Clad Cable: Type "MC" cable may be used where allowed by local codes for fixture whips only.
- E. PVC or High Density Polyethylene Conduit: HDPE or PVC conduit is acceptable for underground and innerduct applications.

2.2 TYPE

- A. Utilize rigid steel conduit (3/4" minimum) in the following locations:
 - 1. In concrete.
 - 2. In exterior locations.
 - 3. Areas subject mechanical abuse.
- B. Utilize electrical metallic tubing in other locations, 3/4" minimum. Only E.M.T. is allowed in walls. E.M.T. may be Steel or Aluminum.

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- Make connections to motors and equipment with PVC jacketed flexible conduit and liquid-tight connectors. Minimum size 1/2" for motor connections. Use 3/8" Greenfield flexible conduit only for fixture wiring. Provide sufficient length of flexible conduit to avoid transmission of vibration. Install straps per NEC.
- D. PVC conduit may be used for underground service entrance conduits and all low voltage under-slab applications. It is not to be installed exposed. Elbows for service conduits and panel feeders are to be galvanized rigid.
- E. Flexible conduit is not allowed within walls.
- F. Conduit on the roof is rigid aluminum.

2.3 MARKING

- A. All empty conduit shall be left with a pull string for future use, and shall be permanently marked on each end with like numbers.
- B. Mark the conduits and boxes mentioned in this Section paragraph 2.2F as to circuits included and on the record drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- All wiring systems shall be installed in raceways consisting of galvanized steel tubing, PVC conduit, HDPE conduit, rigid galvanized steel, flexible steel conduit or neoprene covered flexible steel conduit.
- B. Water tight junction boxes, fittings, expansion joints, compression fittings (for use with all electrical tubing), conduit hubs, etc., shall be provided, for all electrical systems wherever construction dictates, including, but not limited to, outdoor locations.
- C. Flexible conduit used in outdoor locations or indoor locations where exposed to continuous or intermittent moisture shall be liquid tight, neoprene covered and UL listed. All fittings for such applications shall be liquid tight, nylon insulated throat type as manufactured by Thomas and Betts, Series 5331, or approved equal.
- D. Sufficient slack shall be provided in all flexible conduit connections to reduce the effects of vibration.
- E. Insulated bushings shall be used where rigid conduit is installed in any enclosure or junction box. In addition, insulated bushings shall be used on all conduits 1 1/4-inch

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and larger.

- F. All conduit bends shall have a radius greater than or equal to that stipulated by the NEC.
- G. Install conduit concealed in all areas excluding mechanical and electrical rooms and conduit to fixtures in rooms without ceilings.
- H. For exposed runs, attach surface mounted conduit with clamps.
- I. Coordinate installation of conduit in masonry work.
- J. Install conduit free from dents and bruises. Plug ends to prevent entry of dirt or moisture.
- K. All conduit systems shall be installed complete and shall be cleaned out before installation of conductors.
- L. Alter conduit routing to avoid structural obstructions, minimizing crossovers.
- M. Seal conduit with glass fiber where conduits leave heated area and enter unheated area.
- N. Provide flashing and pitch pockets making watertight joints where conduits pass through roof or waterproofing membranes. Provide pourable sealant as approved by the Roofing Contractor.
- O. Install UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints (review architectural and structural drawings and coordinate with General Contractor to determine expansion joint locations). Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings.
- P. Avoid routing conduit through public spaces with exposed structure where possible.
- Q. Route all exposed conduits parallel or perpendicular to building lines. Coordinate all exposed conduit locations with the Architect prior to rough-in.
- R. In exposed ceiling areas stub conduits feeding devices in walls out of the wall as high as possible at bottom of structure or bond beam, whichever is higher.
- S. Allow minimum of 6-inch clearance at flues, steam pipes and heat sources. Allow 12inch clearance at telephone conduits. Where possible, install horizontal raceway runs above water and steam piping.

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- T. Install conduit system from cabinets to boxes, boxes to outlet and outlet to outlet in such a manner as to be electrically continuous throughout.
- U. Make bends or offsets with approved bender or hickey.
- V. Where conduits are stubbed up for low voltage cabling or future use, do so neatly; furnish with nylon pull string, conduit caps and labeling on each end.
- W. Securely support conduits from the structure using approved type clamps, hangers and assemblies. Space supports according to manufacturer's recommendations and accepted practice. Do not support conduits from ceiling suspension system. In no case exceed support spacing per NEC maximum.
- X. Avoid installing conduit on the roof. Where necessary, support conduits via B-Line type DB supports and the appropriate strut straps. Support twice per 10' length of conduit. Use supports which hold conduit 24 inches above roof. Conduit on the roof is rigid aluminum. Provide 1/2" rubber pads under the conduit supports.
- Y. Leave a nylon pull string in all empty conduits. Terminate empty conduit stubouts with bushing manufactured for that purpose.
- Z. Install properly sized grounding conductor in all conduit.
- AA. Elbows for service and panel feeders are to be galvanized rigid conduit.
- BB. No conduit may be installed in slab. Conduit for stub-ups and panel feeders are to be installed with the top of the conduit at a minimum of four inches under the slab. Bed with one-half inch washed rock. Conduit for floor boxes is to be installed coming out of the bottom of the floor box and installed under slab.
- CC. Provide conduit for all low voltage cable installed in areas which have no ceiling or hard ceilings.
- DD. All data/telephone conduits are to be "home-run" to an area above an accessible ceiling. No "Daisy Chaining" allowed.
- EE. No "Daisy Chaining" of fixtures is allowed.
- FF. Seal conduits where they transition from underground distribution system to the interior of a building or structure, refer to N.E.C. 225.27.

END OF SECTION

26 05 34-4

OUTLET AND PULL BOXES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Outlet boxes.
- B. Pull and junction boxes.

1.2 RELATED WORK

- A. Section 26 05 53: Identification.
- B. Section 26 27 26: Wall Switches, Receptacles and Plate Covers.
- C. Section 27 10 05: Conduit for Telephone/Data and TV Raceway System.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Boxes: Hot dip galvanized, 1.25 oz/sq.ft. or cadmium plated, conforming to UL requirements.
- B. Interior Boxes: Pressed sheet steel blanked for conduit.
- C. Exterior Boxes: Corrosion-resistant cast, deep type, with face plate gasket and corrosion-resistant fasteners.
- D. For Ceiling: 4" square boxes for receiving three or less 3/4" conduits.
- E. For Flush Mounting in Walls: 4" square boxes with matching plaster cover for single or two gang outlets. For larger boxes, use solid type or special units, with flush plates.
- F. Surface Mounted: 4" square.
- G. Pull Boxes and Junction Boxes: Metal construction, conforming to National Electrical Code, with screw-on or hinged cover.
- H. Flush Mounted Pull Boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.
- I. For floor boxes, refer to the electrical legend on the plans.

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PART 3 EXECUTION

3.1 INSTALLATION

- A. Mount outlet boxes flush in areas other than mechanical rooms, electrical rooms, above removable ceilings, and on exposed structure in rooms without ceilings.
- B. Do not install boxes back-to-back in same wall, allow 6" minimum horizontal spacing between boxes.
- C. Do not use sectional or handy boxes unless specifically requested.
- D. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.
- E. For outlets mounted above counters, benches and splashbacks, coordinate location and mounting heights with built-in units. Adjust outlet mounting height to agree with required location for equipment served.
- F. Securely mount each outlet box to metal studs with outlet box mounting supports. Secure to at least two studs or install box stabilizers as manufactured by "B-Line" and "Caddy".
- G. Do not install more than three 3/4" conduits into one 4" outlet box. Do not use more than one extension ring on a box.
- H. For heights of outlets above the finished floor in permanent partitions, use the following unless otherwise noted: To Center of Device:
 - 1. Convenience Receptacles: 18" or as directed.
 - 2. Brackets: As directed.
 - 3. Switches: 46" or as directed.
 - 4. Telephone Outlets: 18" or as directed.
 - 5. Other Outlets: As directed or indicated.
 - 6. Over Counters: 6" above countertop, horizontal at windows or where indicated.
 - 7. Fire Alarm Pull stations: Minimum 42" and Max 48" measured vertically, from the floor level to activating handle or lever.
 - 8. Fire Alarm Audio Visual Device: 80" to top of box

26 05 37-2

- I. Locate pull boxes and junction boxes above removable ceiling or in electrical rooms, utility rooms or storage areas.
- J. Install pull boxes of the proper size and depth to accommodate the required conduits and wires.
- K. When installing outlet boxes in fire rated walls, provide fire blocking material on the back side of the boxes.
- L. Coordinate box mounting height with brick courses, where applicable.
- M. Study all devices and light fixtures, providing and installing applicable outlet and back boxes as necessary.
- N. Boxes for fire alarm systems are to be painted red.

END OF SECTION

26 05 37-3

IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide and install identification markers.

1.2 RELATED WORK

- A. Section 26 05 19: Wires and Cables.
- B. Section 26 05 34: Conduit.
- C. Section 26 05 37: Outlet and Pull Boxes.
- D. Section 26 24 16: Panelboards.
- E. Section 26 28 18: Motor and Circuit Disconnects.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide nameplates of laminated phenolic plastic with engraved letters 3/16" high at push-button stations, thermal overload switches, receptacles, wall switches and similar devices where the nameplate is attached to the device plate. At all other locations, make lettering 1/4" high, unless otherwise detailed on the drawings. Securely fasten nameplates to the equipment. Motor nameplates may be non-ferrous metal not less than 0.03" thick, die stamped.
- B. Pre-marked, self adhesive, wrap around type markers, manufacturers: Brady, T&B, E-Z Code.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Equip the following items with nameplates:
 - 1. All motors, motor starters, motor control center, push-button stations, control panels, time switches.

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- 2. Disconnect switches, fused or unfused, switchboards and panelboards, circuit breakers, contactors or relays in separate enclosure.
- 3. Power receptacles where the nominal voltage between any pair of contacts is greater than 150 volts.
- 4. Wall switches controlling outlets for lighting fixtures or equipment where the outlets are not located within sight of the controlling switch.
- 5. Special electrical systems at junction and pull boxes terminal cabinets and equipment racks.
- B. Adequately describe the function of or use of the particular equipment involved. Where nameplates are detailed on the drawings, use inscription and size of letters as shown. Include on nameplates for panelboards and switchboards the panel designation, voltage and phase of the supply. The name of the machine or the motor nameplates for a particular machine must be the same as the one used on all motor starter, disconnect and push button station nameplates for that machine.
- C. The Contractor shall provide typed panel schedules for all electrical panels. Schedules shall reflect actual wiring incorporating all field changes. Copies of Panel Schedules from the construction drawings are not acceptable.
 - 1. Panel Schedules shall reflect room numbers as depicted by the Owner as well as construction numbers.
- D. Label all junction boxes with a black permanent marker indicating circuit number and distribution panel or motor control center feeding the circuits contained therein.
- E. At each panel, provide a phenolic plastic plate with 1/4-inch high engraved letters, stating the voltages in the panel, the color code of the wires in the panel, power supply origination, the arc flash hazard, and the date of the installation. Attach to the panel cover with stainless steel bolts, locknuts and nuts or locking nuts. At the main disconnect, provide a label noting the available fault current and date of installation.
- F. All breakers within each panel are to be labeled.
- G. All underground conduits are to be labeled as to each end.

END OF SECTION

26 05 53-2

OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Fuses.
- B. Molded-case circuit breakers.

1.2 RELATED WORK

- A. Section 26 24 16: Panelboards.
- B. Section 26 28 18: Motor and Circuit Disconnects.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Fuses:
 - 1. Bussman.
 - 2. Littlefuse.
- B. Breakers and Relays:
 - 1. Eaton.
 - 2. General Electric.
 - 3. Siemens.
 - 4. Square D.

2.2 CIRCUIT BREAKERS

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components and construction in accordance with published product information and as required for a complete installation.

26 05 73-1

- B. Molded-Case Circuit Breakers: Provide factory assembled molded-case circuit breakers of frame assembled molded-case circuit breakers of frame size voltage and interrupting ratings as indicated on the drawings. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole and ampere ratings and indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick break action and positive handle indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 Deg. C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.
- C. Any overcurrent protection device rated 1200A or higher shall be furnished with an enegy-reducing maintenance switching feature with local status indication. This feature shall be furnished with the overcurrent device by the manufacturer.
- D. Tandem circuit breakers are not acceptable.

2.3 FUSES

- A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings and average time-current and peak let through current characteristics indicated, which comply with manufacturers' standard design, materials and construction in accordance with published product information and with industry standards and configurations.
- B. Class RK1 and Class J Current Limiting Fuses: Provide UL Class RK1 and Class J current limiting fuses rated 200,000 RMS symmetrical interrupting current for protecting motors and equipment, equal to Buss LPN-RK or LPS-RK.

PART 3 EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

- A. Install overcurrent protective devices as indicated in accordance with the manufacturer's written instructions and with recognized industry practices to insure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work as necessary to interface installation of overcurrent protective devices.
- C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports or cabling.

26 05 73-2

3.2 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short circuits. Correct malfunctioning units and then demonstrate compliance with requirements.

END OF SECTION

26 05 73-3

SHORT-CIRCUIT/COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS

GENERAL

- 1.1 SCOPE
 - A. The contractor shall furnish short-circuit and protective device coordination studies which shall be prepared by the equipment manufacturer.
 - B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE 141 Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
 - 2. IEEE 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
 - 3. IEEE 399 Recommended Practice for Industrial and Commercial Power System Analysis
 - 4. IEEE 241 Recommended Practice for Electric Power Systems in Commercial Buildings
 - 5. IEEE 1015 Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
 - 6. IEEE 1584 Guide for Performing Arc-Flash Hazard Calculations
- B. American National Standards Institute (ANSI):
 - 1. ANSI C57.12.00 Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
 - 2. ANSI C37.13 Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

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- 3. ANSI C37.010 Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
- 4. ANSI C 37.41 Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories
- 5. ANSI C37.5 Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents
- C. The National Fire Protection Association (NFPA)
 - 1. NFPA 70 National Electrical Code, latest edition
 - 2. NFPA 70E Standard for Electrical Safety in the Workplace

1.3 SUBMITTALS FOR REVIEW/APPROVAL

A. The short-circuit and protective device coordination studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

1.4 SUBMITTALS FOR CONSTRUCTION

- A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies, where required, shall be provided on CD in PDF format.
- B. The report shall include the following sections:
 - 1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations
 - 2. Descriptions, purpose, basis and scope of the study

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- 3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings
- 4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings
- 5. Multi-function relay setting file printouts including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.
- 6. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout
- 7. Incident energy and flash protection boundary calculations
- 8. Comments and recommendations for system improvements, where needed
- 9. Executive Summary including source of information and assumptions made

1.5 QUALIFICATIONS

 A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

PART 2 PRODUCT

2.1 STUDIES

A. Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer. By using the equipment manufacturer the study allows coordination of proper breakers, fuses, and current transformers. The coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and include the largest feeder circuit breaker and motor starter in the 480 Volt motor control centers and power distribution panelboards. The study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators

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associated paralleling equipment and distribution switchgear.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

2.2 DATA COLLECTION

- A. Contractor shall furnish all field data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source combination may include present and future utility supplies, motors, and generators.
- C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.
- D. Include fault contribution of existing motors in the study, with motors < 50 hp grouped together. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

- A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standards 141, latest edition.
- B. Transformer design impedances and standard X/R ratios shall be used when test values are not available.
- C. Provide the following:
 - 1. Calculation methods and assumptions
 - 2. Selected base per unit quantities
 - 3. One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted
 - 4. Source impedance data, including electric utility system and motor fault contribution characteristics

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- 5. Typical calculations
- 6. Tabulations of calculated quantities
- 7. Results, conclusions, and recommendations
- D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
 - 1. Electric utility's supply termination point
 - 2. Incoming switchgear
 - 3. Unit substation primary and secondary terminals
 - 4. Low voltage switchgear
 - 5. Motor control centers
 - 6. Standby generators and automatic transfer switches
 - 7. Branch circuit panelboards
 - 8. Other significant locations throughout the system
- E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- F. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short circuit ratings
 - 2. Adequacy of switchgear, motor control centers, and panelboard bus bracing to withstand short-circuit stresses
 - 3. Adequacy of transformer windings to withstand short-circuit stresses
 - 4. Cable and busway sizes for ability to withstand short-circuit heating
 - 5. Notify Engineer in writing, of existing, circuit protective devices improperly rated for the calculated available fault current

2.4 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.

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- B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
- D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the curve sheets, where applicable:
 - 1. Electric utility's protective device
 - 2. Medium voltage equipment relays
 - 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 - 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
 - 5. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters
 - 6. Conductor damage curves
 - 7. Ground fault protective devices, as applicable
 - 8. Pertinent motor starting characteristics and motor damage points
 - 9. Pertinent generator short-circuit decrement curve and generator damage point
 - 10. Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center
- F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.
- G. Select each primary protective device required for a delta-wye connected transformer so that the characteristics or operating band is within the transformer parameters which includes a parameter equivalent to 58% of the ANSI withstand point to afford protection for secondary line-to-ground faults.
- H. Separate low voltage power circuit breakers from each other and the associated primary protective device by a 16% current margin for coordination and protection in

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the event of secondary line-to-line faults.

I. Engineer shall provide settings file printouts for all multifunction relays supplied under this contract including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.

2.5 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2012, Informative Annex D.
- B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.
- C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- D. The Arc-Flash Hazard Analysis shall include all MV, 575v, & 480v locations and significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.
- E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.
- F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
- G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
- H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.
- 2.6 REPORT SECTIONS
 - A. Input Data:

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- 1. Utility three-phase and line-to-ground available contribution with associated X/R ratios
- 2. Short-circuit reactance of rotating machines with associated X/R ratios
- 3. Cable type, construction, size, # per phase, length, impedance and conduit type
- 4. Bus duct type, size, length, and impedance
- 5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio
- 6. Reactor inductance and continuous ampere rating
- 7. Aerial line type, construction, conductor spacing, size, # per phase, and length
- B. Short-Circuit Data:
 - 1. Source fault impedance and generator contributions
 - 2. X to R ratios
 - 3. Asymmetry factors
 - 4. Motor contributions
 - 5. Short circuit kVA
 - 6. Symmetrical and asymmetrical fault currents
- C. Recommended Protective Device Settings:
 - 1. Phase and Ground Relays:
 - a. Current transformer ratio.
 - b. Current setting.
 - c. Time setting.
 - d. Instantaneous setting.
 - e. Specialty non-overcurrent device settings.
 - f. Recommendations on improved relaying systems, if applicable.
 - 2. Circuit Breakers:

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- a. Adjustable pickups and time delays (long time, short time, ground).
- b. Adjustable time-current characteristic.
- c. Adjustable instantaneous pickup.
- d. Recommendations on improved trip systems, if applicable.
- D. Incident energy and arc flash boundary calculations.
 - 1. Arcing fault magnitude
 - 2. Device clearing time
 - 3. Duration of arc
 - 4. Arc flash boundary
 - 5. Working distance
 - 6. Incident energy
 - 7. Recommendations for arc flash energy reduction

PART 3 EXECUTION

3.1 FIELD ADJUSTMENT

- A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- B. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.
- C. Notify Engineer in writing of any required major equipment modifications.
- D. Following completion of all studies, acceptance testing and startup by the field engineering service division of the equipment manufacturer, a 2-year warranty shall be provided on all components manufactured by the engineering service parent manufacturing company.

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3.2 ARC FLASH WARNING LABELS

- A. The vendor shall provide a 4 in. x 4 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. The label shall have an orange header with the wording, "WARNING, SHOCK & ARC FLASH HAZARD", and shall include the following information:
 - 1. Location designation
 - 2. Nominal voltage
 - 3. Arc flash boundary
 - 4. Incident energy
 - 5. Working distance
 - 6. Shock Boundaries
 - 7. Engineering report number, revision number and issue date
- C. Labels shall be machine printed, with no field markings
- D. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
 - 1. For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc flash label shall be provided
 - 2. For each motor control center, one arc flash label shall be provided
 - 3. For each low voltage switchboard, one arc flash label shall be provided
 - 4. For each switchgear, one flash label shall be provided
 - 5. For medium voltage switches one arc flash label shall be provided
- E. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

3.3 ARC FLASH TRAINING

A. The equipment vendor shall train and use personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard For Electrical

26 05 76-10
Safety Requirements For Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

END OF SECTION

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SECTION 26 09 24

LIGHTING CONTROLS - LUTRON VIVE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single space wireless lighting control systems and associated components:
 - 1. Wireless occupancy/vacancy sensors.
 - 2. Wired load control modules with wireless communication inputs.
 - 3. Wireless control stations.
- B. Wireless hub(s) for centralized control, monitoring, and system integration.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 53 Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 27 26 Wiring Devices:
 - 1. Finish requirements for wall controls specified in this section.
- C. Section 26 51 00 Interior Lighting.

1.3 REFERENCE STANDARDS

- A. 47 CFR 15 Radio Frequency Devices; current edition.
- B. ASTM D4674 Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2019.
- C. CAL TITLE 24 P6 California Code of Regulations, Title 24, Part 6 (California Energy Code); 2022, with Supplement (2024).
- D. IEC 60929 AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2011, with Amendment (2015).
- E. IEC 61000-4-2 Electromagnetic Compatibility (EMC) Part 4-2: Testing and Measurement Techniques Electrostatic Discharge Immunity Test; 2008.
- F. ISO 9001 Quality Management Systems Requirements; 2015, with Amendment (2024).

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- G. NECA 1 Standard for Good Workmanship in Electrical Construction; 2023.
- H. NECA 130 Standard for Installing and Maintaining Wiring Devices; 2016.
- I. NEMA 410 Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.
- J. NEMA WD 1 General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- K. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 2043 Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall controls with actual installed door swings.
 - 3. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
 - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Pre-Wire Meeting; Lutron LSC-PREWIRE: Include as part of the base bid additional costs for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:
- C. Sequencing:
 - 1. Do not install sensors and wall controls until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

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- B. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.
- C. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed locations and settings for lighting control system components.
- F. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- G. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under "WARRANTY". Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications:
 - 1. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
 - 2. Registered to ISO 9001, including in-house engineering for product design activities.
 - 3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.

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4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.7 WARRANTY

- A. See Section 01 78 00 Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Standard Warranty, Without Manufacturer Full-Scope Start-Up:
 - 1. Manufacturer Lighting Control System Components, Except Wireless Sensors, Drivers and Load Control Modules: One year 100 percent parts coverage, no manufacturer labor coverage.
 - 2. Wireless Sensors: Five years 100 percent parts coverage, no manufacturer labor coverage.
 - 3. Drivers and Load Control Modules: Three years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Vive; www.lutron.com/#sle.

2.2 LIGHTING CONTROLS - GENERAL REQUIREMENTS

- A. Sensor Layout and Tuning: Include as part of the base bid additional costs for Lighting Control Manufacturer's Sensor Layout and Tuning service; Lutron LSC-SENS-LT:
- B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
- C. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- D. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F to 104 degrees F and 90 percent non-condensing relative humidity.
- E. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

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- F. Power Failure Recovery: When power is interrupted for periods up to 10 years and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
- G. Wireless Devices:
 - 1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
 - 2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).
 - 3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).
 - 4. System does not require a factory technician to set up or program the system.
 - 5. Capable of diagnosing system communications.
 - 6. Capable of having addresses automatically assigned to them.
 - 7. Receives signals from other wireless devices and provides feedback to user.
 - 8. Capable of determining which devices have been addressed.
 - 9. RF Range: 60 feet line-of-sight or 30 feet through typical construction materials between RF transmitting devices and compatible RF receiving devices.
 - 10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
- H. Wireless Network:
 - 1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
 - a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
 - b. Wireless devices operate in an uncongested frequency band providing reliable operation.

- c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).
- 2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
- 3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
 - a. Reliability of system performance.
 - b. Fast response time to events in the space (e.g. button presses or sensor signals).
 - c. Independent operation in the event of the wireless hub being removed or damaged.
- I. Device Finishes:
 - 1. Wall Controls: Match finishes for Wiring Devices in Section 26 27 26 Wiring Devices, unless otherwise indicated.
 - 2. Standard Colors: Comply with NEMA WD 1 where applicable.
 - 3. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
 - 4. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

2.3 WIRELESS SENSORS

- A. General Requirements:
 - 1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
 - 2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
 - 3. Does not require external power packs, power wiring, or communication wiring.

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- 4. Capable of being placed in test mode to verify correct operation from the face of the unit.
- B. Wireless Occupancy/Vacancy Sensors:
 - 1. General Requirements:
 - a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
 - b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
 - d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.
 - e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
 - f. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
 - g. Color: White.
 - h. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
 - i. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
 - j. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.

- k. Ceiling-Mounted Sensors:
 - 1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
- 1. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.

2.4 LOAD CONTROL MODULES

- A. Provide wireless load control modules as indicated or as required to control the loads as indicated.
- B. Junction Box-Mounted Modules:
 - 1. Plenum rated.
 - 2. 0-10 V Dimming Modules:
 - a. Product(s):
 - 8 A dimming module with 0-10V control, without emergency mode; Lutron PowPak Dimming Module Model RMJS-8T-DV-B.
 - b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - c. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
 - d. Selectable minimum light level.
 - e. Configurable high- and low-end trim.
 - f. Relay: Rated for 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
 - 3. Relay Modules:
 - a. Product(s):
 - 1) 16 A relay module, without emergency mode, with contact closure output; Lutron PowPak Relay Module Model RMJS-16RCCO1-DV-B.

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- b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
- c. Relay:
 - 1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
 - 2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
 - 3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.
- d. Contact Closure Output:
 - Single contact closure output with normally open and normally closed dry maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
 - 2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
 - 3) Controlled by associated occupancy/vacancy sensors and wall controls.

2.5 WIRELESS CONTROL STATIONS

- A. General Requirements:
 - 1. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
 - 2. Allows for easy reprogramming without replacing unit.
 - 3. Button Programming:
 - a. Single action.
 - b. Toggle action.
 - 4. Includes LED to indicate button press or programming mode status.
 - 5. Faceplates: Provide concealed mounting hardware.
 - 6. Finish: As specified for wall controls in "Device Finishes" under LIGHTING CONTROLS GENERAL REQUIREMENTS article above.

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- B. Battery-Powered Wireless Control Stations:
 - 1. Quantity: As indicated on the drawings.
 - 2. Does not require external power packs, power or communication wiring.
 - 3. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).
 - 4. Mounting:
 - a. Capable of being mounted with a table stand or directly to a wall under a faceplate.
 - 5. Product(s):
 - a. Type _____ 2-Button Control; Lutron Pico Wireless Control Model PJ2-2B.
 - 1) Button Marking: Light (icons).
 - b. Type _____ 2-Button with Raise/Lower Control; Lutron Pico Wireless Control Model PJ2-2BRL.
 - 1) Button Marking: Light (icons).

2.6 WIRELESS HUBS

- A. Product(s):
 - 1. Wireless hub without BACnet; Lutron Vive Hub.
 - a. Flush-mount wireless hub; Model HJS-0-FM; supports up to 70 total paired devices.
- B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.
- C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.
- D. Utilizes Ethernet connection for:
 - 1. Networking up to 64 hubs together to create a larger system.
 - 2. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).

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- E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.
- F. Communicates directly to compatible Lutron Vive RF devices through use of Lutron Clear Connect radio frequency communications link; does not require communication wiring; RF range of 71 feet through walls to cover an area of 15836 square feet (device and hub must be on the same floor).
- G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi. 2.4 GHz 802.11b/g; wireless range of 71 feet through walls (device and hub must be on the same floor).
 - 1. Does not require Wi-Fi router for connecting to the hub.
- H. Allows for system setup, control, and monitoring from mobile device or computer using Vive web-based software:
 - 1. Supports paired devices up to maximum number indicated including compatible wireless sensors, wireless control stations, and wireless load devices.
 - 2. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).
 - a. Timeclock is integrated into the unit and does not require a constant internet connection.
 - b. Retains time and programming information after a power loss.
 - c. 365-day schedulable timeclock allows for:
 - 1) Scheduling of events years in advance.
 - 2) Setting of recurring events with exceptions on holidays.
 - d. Timeclock events can be scheduled to:
 - 1) Send lights to a desired level and select the fade rate desired to reach that level.
 - 2) Adjust level lights go to when occupied.
 - 3) Adjust level lights go to when unoccupied.
 - 4) Enable/disable occupancy.

- 5) Adjust timeout of sensors (requires Lutron Model FC-SENSOR wired fixture sensor or Lutron Model DFCSJ-OEM-OCC wireless fixture control dongle with integral sensing capabilities).
- 3. Daylighting:
 - a. Daylighting can be enabled/disabled. Can be used to override the control currently taking place in the space.
 - b. Daylight set point can be adjusted with the software to increase or decrease the electric light level in the room based on the same amount of natural light.
- 4. Allows for control, monitoring, and adjustment from anywhere in the world (Lutron Vive wireless hub internet connection required).
- 5. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
 - a. Association and setup does not require a factory technician to perform.
- 6. System using Lutron Vive wireless hub(s) can operate with or without connection to the internet.
- 7. Supports energy reporting.
 - a. Reports measured energy data for PowPak fixture control modules at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
 - b. Reports calculated energy data for PowPak junction box mounted modules at accuracy of 10 percent.
- 8. Supports automatic demand response for load shedding via:
 - a. Local contact closure without need for separate interface.
 - b. OpenADR® 2.0b compliant utility command.
- 9. Support automatic generation of alerts in Lutron Vive web-based application for designated events/triggers, including:
 - a. Low-battery condition in battery-operated sensors and controls; alert cleared when battery is replaced.
 - b. Missing device (e.g., control or sensor); alert cleared when device is detected.

- 10. Wireless hub can be firmware upgraded to provide new software features and system updates.
 - a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.
- I. Lutron Vive Web-Based Application:
 - 1. Accessibility and Platform Support:
 - a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
 - b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
 - c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
 - d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
 - e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
 - f. WPA2 security for Wi-Fi communication with wireless hub.
 - 2. System Navigation and Status Reporting:
 - a. Area Tree View: Easy navigation by area name to view status and make programming adjustments through the software.
 - b. Area and device names can be changed in real time.
 - 3. Setup app available for iOS and Android that allows for:
 - a. Job registration to extend product warranty.
 - b. Management of setup for multiple projects in different locations.
 - c. Creation of handoff documents that are sent directly to a facility manager via email once setup is complete.
 - d. Backup of Vive wireless hub database to Lutron cloud for hub replacement.

- e. Access to native help and instructions to assist user with Vive system setup.
- J. API Integration:
 - 1. Support communication, without requiring interface, between lighting control system and third-party system via RESTful API.
 - 2. Requires one network connection per wireless hub.
 - 3. API Integration Capabilities:
 - a. Control all zones or subset of zones.
 - 1) Set zones in designated area to specific level.
 - 2) Raise/lower dimmable lights in designated area.
 - b. Control individual zones.
 - c. Subscribe to and Monitor:
 - 1) Area status changes (e.g, occupancy, light level, and instantaneous power).
 - 2) Individual zone changes in light level.
 - 3) Alerts (e.g., missing device and low battery).
- K. Scenes:
 - 1. Support programmable scenes to control individual devices, areas, or groups of areas on demand.
 - 2. Scenes may be activated via:
 - a. Contact closure input.
 - b. API integration.
 - c. Manual activation in app.
- L. Emergency Mode:
 - 1. Support emergency mode to, when triggered, send lights to defined levels and lock out controls for PowPak load control modules equipped with emergency mode.

- 2. Emergency mode may be activated via:
 - a. Contact closure input.
 - b. API integration.
 - c. Manual activation in app.
- M. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.
- N. Rated for use in air-handling spaces as defined in UL 2043.
- O. Meets CAL TITLE 24 P6 requirements.
- P. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer's instructions; do not exceed manufacturer's required maximum wiring segment lengths.

PART 3 EXECUTION

- 3.1 EXAMINATION
 - A. Verify that field measurements are as shown on the drawings.
 - B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
 - C. Verify that mounting surfaces are ready to receive system components.
 - D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, except for mounting heights specified in those standards.
- B. Install products in accordance with manufacturer's instructions.
- C. Sensor Locations:
 - Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by

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Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.

- 2. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.
- D. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- E. Identify system components in accordance with Section 26 05 53.

3.3 ADJUSTING

A. Sensor Fine-Tuning: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration. Where Lighting Control Manufacturer Sensor Layout and Tuning is not specified, Contractor to provide fine-tuning of sensor calibration.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

- A. Training:
 - 1. Include services of manufacturer's certified service representative to perform onsite training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.

3.6 **PROTECTION**

A. Protect installed products from subsequent construction operations.

END OF SECTION

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SECTION 26 21 02

UNDERGROUND DISTRIBUTION

PART 1 GENERAL

1.1 DESCRIPTION

- A. Work in contract: As indicated on plans.
- B. Work not in contract:
 - 1. Service transformer(s): Provided by serving utility.
 - 2. Primary conductors: Provided by serving utility.

1.2 SUBMITTALS

- A. Shop drawings:
 - 1. Pull Boxes.
- B. Product data:
 - 1. Specification comparison.
 - 2. Duct bank conduit separation.
- C. Project information:
 - 1. Test reports.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store conduit to avoid warping or deterioration.
- B. Store plastic conduit on flat surface protected from direct rays of sun.

1.4 JOB CONDITIONS

- A. Protect existing utilities and structures as indicated in Section 26 00 10.
- B. Avoid overloading. Keep surcharge sufficient distance back from edge of excavation to prevent slides or caving. Maintain and trim excavated materials in such a manner to be as little inconvenience as possible to public and adjoining property owners.

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C. Provide full access to public and private premises, to fire hydrants, at street crossings, sidewalks and other points as designated by Engineer to prevent serious interruption of travel.

PART 2 PRODUCTS

2.1 DUCT SYSTEM

- A. Primary duct system: Multiple (or single) 4-inch single, round-bore PVC conduits, coordinate with the local utility company.
 - 1. Rigid PVC conduit: As specified in Section 26 05 34.
 - 2. Separators: Concrete, plastic or other non-metallic, non-decaying material.
- B. Pull wire: 1/4-inch heavy nylon cord or 1/4-inch pull tape, free of kinks and splices.

2.2 PULL BOXES

- A. Conduit pull boxes equal to Quazite # PC1324 BB12/00, cover # PC1324CA-17. Modify size to match quantity of conduits used. Space per NEC.
- B. Provide gravel bed with drainage and install per manufacturer's instructions.

2.3 BACKFILL MATERIAL

- A. Backfill material:
 - 1. 1/2 inch washed rock.

PART 3 EXECUTION

- 3.1 EXCAVATING AND TRENCHING GENERAL
 - A. Remove and dispose of materials determined by Civil Engineer to be unsuitable.
 - B. Trench, backfill and compact for all underground utilities.

3.2 TRENCH EXCAVATION

- A. Excavate trenches by open cut method to depth necessary to accommodate the work.
 - 1. Permission may be granted for tunnel work for crossing under crosswalks, driveways or existing utility lines.
- B. Open no more than 300 LF of trench at one time, or less, as required by Engineer.
 Failure to comply may necessitate shutdown of entire project until backfilling is

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performed.

- C. Carry rock excavations minimum of 12 inches below indicated grades.
- D. Avoid over-excavating below indicated grades unless required to remove unsuitable material.
- E. Back-fill over-excavations with 1/2 inch rock.
- F. Trench size: Excavate only sufficient width to accommodate free working space.
 - 1. Cut trench walls vertically from bottom of trench to top of conduit.
- G. Keep trenches free of water.

3.3 EXISTING UTILITIES

- A. Protect all existing utilities.
- B. Pay fees for all new services.

3.4 INSTALLATION OF PRIMARY AND SECONDARY DUCT SYSTEM

- A. Install duct lines so that top of conduit is not less than 30 inches for secondary ducts and 48 inches for primary ducts below finished grade or finished paving at any point.
- B. Accomplish changes in direction of runs exceeding total of 10 degrees, either vertical or horizontal, by long sweep elbows.
 - 1. Manufactured bends: Minimum radius of 48 inches for primary ducts of 4 inches in diameter and larger, 24 inches for secondary ducts.
- C. Thoroughly clean conduit before using or laying.
- D. Lay no conduit in water or in unsuitable weather or trench conditions.
- E. During construction and after duct line is completed, plug ends of conduits to prevent water washing into conduit or manholes.
 - 1. Take particular care to keep conduits clear of concrete, dirt, and any other substance during course of construction.
- F. After duct line has been completed, pull standard flexible mandrel not less than 12 inches long, with diameter approximately 1/4 inch less than inside diameter of conduit, through each conduit. Then pull brush with stiff bristles through each conduit to make certain that no particles of earth, sand, or gravel have been left in line.

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- G. Pneumatic rodding may be used.
- H. Install nylon pull string in all unused new ducts.
 - 1. Extend minimum of 3 feet into each manhole or above pads beyond ends of ducts.
- I. Encase each secondary conduit completely in concrete not less that 3 inches beyond any surface of conduit.
 - 1. Do not place concrete until conduits have been inspected by Architect/Engineer.
- J. Provide uniform spacing between conduits: Not less that 3.5 inches.
 - 1. Place separators on maximum 4 feet centers.
 - 2. Securely anchor ducts to prevent movement during placement of concrete.
- K. Make conduit joints in accordance with manufacturer's recommendations for conduit and coupling selected.
 - 1. Make plastic conduit joints by brushing plastic solvent cement on inside of plastic coupling fitting and outside of conduit ends.
 - 2. Slip conduit and fitting together with quick one-quarter-turn twist to set joint tightly.
- L. Coordinate service conduits entering the building with the Structural Engineer.

3.5 BACKFILLING

- A. Do not backfill until all tests are performed on system, and system complies with specified requirements.
- B. Hand or pneumatic tamp backfill around and over pipe in lifts not exceeding 8 inches loose thickness.
- C. Compact to density specified, so pipe will not be injured.
- D. Exercise care in backfilling operations to avoid displacing pipe joints either horizontally or vertically and to avoid breaking pipe.
- E. Do not water flush for consolidation.

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3.6 COMPACTION

- A. Compact all trench backfill in areas under paved roads, parking areas, sidewalks and other structures as directed by Civil Engineer to at least 95 percent of maximum dry density.
- B. In locations where trench will not be under paved areas, compact backfill to minimum 90 percent of maximum dry density.
- C. Remove materials which cannot be compacted as specified.
- D. Backfill with 1/2 inch washed rock.

END OF SECTION

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SECTION 26 22 00

TRANSFORMERS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Extent of transformer work is indicated by drawings and schedules.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data on power/distribution transformers, including certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no-load and full-load losses in watts.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. HEVI-DUTY.
 - 2. Acme.
 - 3. Square "D".
 - 4. Eaton.
 - 5. General Electric.

2.2 POWER/DISTRIBUTION TRANSFORMERS

A. General: Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer. Ground step-down transformer secondaries as indicated on the drawings. Do not ground to water pipes.

2.3 DRY-TYPE DISTRIBUTION TRANSFORMERS

A. Transformers 225 KVA or less: Provide factory assembled, general purpose, air cooled, dry type distribution transformers where shown, of sizes, characteristics and rated capacities indicated; three phase, 60 Hz, 4.5% impedance with 480 volts primary and 208Y120 volts secondary. Provide primary winding with 6 taps, 2 above and 4

26 22 00-1

below full rated voltage for a de-energized tap-changing operation. Insulation to be in accordance with NEMA ST20 Standards for a 220 degree C UL Component Insulation System and rate for continuous operation at rated KVA. Transformers are to be rated at 150 degrees C temperature rise at standard sound levels. They shall comply with TP1/TP2 Standards.

B. Provide wiring connectors suitable for copper wiring. Mount transformers on ribbed neoprene vibration isolation pad. Electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap. Provide transformers with fully enclosed sheet steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for floor mounting, unless noted otherwise.

PART 3 EXECUTION

3.1 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA and IEEE standards and in accordance with recognized industry practices and insure that products fulfill requirements.
- B. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.
- C. Install units on vibration mounts; comply with manufacturer's indicated installation method. Connect transformer with flexible conduit for both primary and secondary feeders.
- D. Connect transformer units to electrical wiring system. Comply with requirements of other Division 26 sections. Wiring connections to be in strict conformity with NEC.
- E. Provide all disconnects necessary per NEC.

3.2 GROUNDING

 Provide tightly fastened equipment grounding and bonding connections for transformers as indicated. Ground secondary windings to building steel, as per NEC 250.

3.3 TESTING

A. Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers including, but not limited to, audible sound levels, to demonstrate capability and compliance with

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requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

END OF SECTION

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SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Branch circuit panelboards.

1.2 REGULATORY REQUIREMENTS

A. Construct panelboards to UL standards and provide UL labels.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Eaton.
- B. General Electric.
- C. Siemens.
- D. Square D.

2.2 ENCLOSURES

- A. Panels: Surface (or flush) mounted complete with hinged trim with outer door lock and metal directory frame.
- B. Panel Can: Galvanized, painted to match trim.
- C. Keys: Provide two keys for each panel. Make keys interchangeable for panels on this project.

2.3 120/208 AND 277/480 VOLT PANELBOARDS

- A. Panelboards: Three phase, 4-wire, solid neutral design with sequence style bussing, full capacity neutral and bare uninsulated grounding bar bolted to enclosure, composed of an assembly of bolt-in-place molded case automatic air circuit breakers with thermal and magnetic trip and trip free position separate from either "ON" or "OFF".
- B. Furnish and install power and distribution panelboards, equipped with thermal magnetic molded case circuit breakers of frame, trip ratings and interrupting

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capacities, as shown on the panelboard schedule, manufactured in accordance with the latest NEMA standards, listed by Underwriters' Laboratories, Inc. and bearing the UL label.

- C. Panelboard Main Bus, Main Lugs and/or Main Breaker: Copper only with current ratings as shown on the panelboard schedule. Current density in accordance with Underwriters' Laboratories requirements. Bus mounting for circuit breakers of the bolted connection type and accommodating any combination of circuit breaker units without further modification, wiring lugs suitable for copper conductors.
- D. Circuit Breakers: Quick make and quick break trip free on overload or short circuit; multi-pole breakers with common trip, wiring terminals suitable for the type conductor specified, bolt-on connections to the bus.
- E. Steel Box: As specified by Underwriters' Laboratories standards, end walls removable, size of wiring gutters in accordance with Underwriters' Laboratories standards, trim of code-gauge steel with primer and durable enamel finish, trim doors equipped with spring latch and cylinder lock keyed alike. Each individual circuit to be clearly numbered on the face of the panelboard and a directory for circuit identification provided.
- F. Where noted on the plans, provide "SPD" units.
 - 1. On main service equipment provide units equal or better than 125 kA per mode, minimum.
 - 2. On sub panels provide units equal to 80 kA per mode, where called for.
 - 3. All units to be built in to the panels called for. Provide with phase indicating lights and disconnecting means.
- G. The panelboard wholesale supplier shall have an office and a stocking warehouse within 100 miles of the project site. The distributor/manufacturer's representative shall have an office within 100 miles of the project site, and shall have on staff a full time designer as well as personnel who are available to service the project after completion.

PART 3 EXECUTION

- 3.1 INSTALLATION
 - A. Provide mounting brackets, busbar drillings and filler pieces for unused spaces.

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- B. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit. Label with construction and permanent room numbers.
- C. Provide 4-inch housekeeping concrete pads for all floor mounted units which are located inside the building or outdoors.
- D. At each panel, provide a phenolic plastic plate with 1/4-inch high engraved letters, stating the voltages in the panel and the color code of the wires in the panel and the available fault current and date of installation. Attach to the panel cover with stainless steel bolts, locknuts and nuts or locking nuts.

END OF SECTION

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SECTION 26 27 26

WALL SWITCHES, RECEPTACLES, AND PLATE COVERS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Wall switches.
- B. Receptacles.
- C. Plate covers.
- 1.2 RELATED WORK
 - A. Section 26 05 26: Grounding.
 - B. Section 26 05 37: Outlet and Pull Boxes.
 - C. Section 26 05 53: Identification.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Arrow Hart.
- B. Bryant.
- C. Eagle.
- D. General Electric.
- E. Hubbell.
- F. Leviton.
- G. P&S.
- H. Substitutions: See Section 26 00 10 General Electrical Provisions.

2.2 WALL SWITCHES

- A. Acceptable Devices
 - 1. Single Pole Switch: Type 1221, or equal.

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- 2. Double Pole Switch: Type 1222, or equal.
- 3. Three-way Switch: Type 1223, or equal.
- 4. Four-way Switch: Type 1224, or equal.
- 5. Dimmers: Lutron "NOVA" Series or equal; size as required per the circuit wattage, 600 watt minimum. Provide type for the fixtures being dimmed.
- 6. Two-pole switches used to control two loads, like lights and exhaust fans in restrooms, must be "rated" for that duty.
- 7. Keyed Switches: Provide four keys per switch.
- B. Materials
 - 1. 120/277 Volt Switches: Quite slow make, slow break design, toggle handle with totally enclosed case, rated 20 ampere, specification grade. Provide matching two pole, three-way and four-way switches.
 - 2. Color: Coordinate with the Architect.
 - 3. Dimmers: Electronic switching type with toroid filter coil to eliminate RF interference.
 - 4. Two-pole switches used to control two loads, like lights and exhaust fans in restrooms, must be "rated" for that duty.
 - 5. Provide metal barrier between gangs in boxes, where adjacent switches have a potential in excess of 300V between conductors.

2.3 RECEPTACLES

- A. Device: Receptacles In General Use Areas of Project: All receptacles shall be commercial grade and shall be "Tamper Resistant."
 - 1. Duplex Receptacle: Type BR20TR, or equal.
 - 2. Duplex Receptacle, GFCI: Type GFTR20, or equal.
 - 3. Single Receptacle: Type 5361, or equal.
 - 4. Special Outlets: See Plans.
 - 5. Isolated Ground Receptacle: Type 5362IG, or equal.

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- B. Devices
 - 1. Standard Duplex Receptacle: Nema 5-20R. Full gang size, polarized, duplex, parallel blade, U grounding slot, rated at 20 amperes, 125 volts, designed for split feed service.
 - 2. Nameplates: Provide engraved or embossed plastic for receptacles other than standard duplex and standard single receptacles indicating voltage, phase and amperes.
 - 3. Isolated ground outlets to be orange, emergency circuit devices to be red, all other device colors to be coordinated with the Architect.
 - 4. Exterior receptacles are to be "GFI" and rated as "weather resistant".

2.4 PLATE COVERS

- A. Materials
 - 1. Stainless Steel: Type 302 or 304, No. 4 finish, 0.040 inches thick, accurately die cut, protected with release paper.
 - 2. Cast Metal: Die cast profile, ribbed or strength, flash removed, primed with grey enamel, furnished complete with four mounting screws.
 - 3. Gaskets: Resilient rubber or closed cell foam urethane.
 - 4. Nylon: High-performance, molded nylon.
 - 5. Stamped Metal: For use on 4" square boxes.
- B. Device
 - 1. Flush Mounting Plates: Beveled type with smooth rolled outer edge.
 - 2. Surface Box Plates: Beveled, steel, pressure formed for smooth edge to fit box.
 - 3. Weatherproof Plates: CAST METAL, gasketed; for receptacles, provide the weatherproof "while in use" type.
 - 4. Where two-gang boxes are required for single gang devices, provide special plates with device opening in one gang and second gang blank.

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PART 3 EXECUTION

3.1 INSTALLATION

- A. Coordinate switch mounting location with architectural detail and heights as noted on plans.
- B. Run separate neutral for each lighting circuit.
- C. Install switches at 46" to center above finished floor, coordinate with brick layers where applicable.
- D. Mount receptacles at mounting heights specified on the plans, 18" to center of the box unless noted otherwise.
- E. Connect all devices using pigtails. Do not through-wire on device terminals.
- F. Mount outlets for electric water coolers and other similar permanently installed plug connected equipment behind equipment according to approved installation drawing, coordinate with the equipment installer.
- G. Install coverplates on wiring devices level and with all four edges in contact with finished surface.
- H. Use stainless steel plates in all interior areas unless noted. Use steel plates in mechanical and utility type areas.

END OF SECTION

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SECTION 26 28 18

MOTOR AND CIRCUIT DISCONNECTS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide and install motor and circuit disconnects.

1.2 REGULATORY REQUIREMENTS

A. Conform to National Electrical Code and to applicable inspection authority.

1.3 REFERENCES

- A. Underwriters' Labs, Inc. Annual Product Directories.
- B. Classification of Standard Types of Non-ventilated Enclosures for Electric Controllers, National Electrical Manufacturers Association.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Eaton.
- B. General Electric.
- C. Hubbell.
- D. Leviton.
- E. Square D.

2.2 EQUIPMENT

- A. Provide motor and circuit disconnects with UL label.
- B. Single Phase 120 Volt Disconnect Switches: Double pole toggle switch, Leviton MS302.
- C. Provide with lockable covers.
- D. Three-Phase Motor Disconnect Switches and Single Phase 240 Volt Disconnect
 Switches: 2 or 3 pole heavy duty fusible or non-fusible as shown, 250 or 480 volt as required in NEMA Type 1 or 3 enclosures. Provide with lugs for suitable wire range,

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with ground lug, copper current carrying parts, silver-tungsten contacts, reinforced fuse clips for type R rejection fuses.

E. Provide NEMA "4/4X" type disconnects within the kitchen area.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install motor and circuit disconnect as recommended by manufacturer and as required by Code.
- B. Where required by local authorities, install disconnects for all roof mounted equipment separate from that equipment. Furnish (galvanized) "Unistrut" or angle iron mounting stands with B-Line DB series roof top support base. Coordinate with the equipment supplier and Roofing Contractor.

END OF SECTION

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SECTION 26 32 15

GENERATOR AND AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 SCOPE OF WORK - GENERATOR

- A. It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
- B. Any and all exceptions to the published specifications shall be subject to the approval of the engineer.
- C. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
- D. The equipment shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
- E. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
- F. Gillette Generator or approved equal by Kohler, Generac, or MTU Onsite Energy

1.2 SCOPE OF WORK – TRANSFER SWITCH

A. Furnish and install automatic transfer switches system(s) with 3 Pole, 100 amps, 208 Volt-60Hz. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

1.3 GENERAL REQUIREMENTS

A. It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein.

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The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.

- B. All equipment shall be new and of current production by a national firm that manufactures the generator sets and controls, transfer switches, and switchgear, and assembles the generator sets as a complete and coordinated system. There will be one-source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.
- C. Transfer switch shall be furnished with a field programmable delayed transition operation with a in-phase monitoring feature (enable/disable and phase angle) to allow residual voltages in the load circuits to decay.

1.4 SUBMITTAL

A. The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

1.5 CODES AND STANDARDS – GENERATOR

- A. The generator set shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.
- B. The generator set shall be IBC Certified meeting the required maximum seismic design acceleration level per the International Building Code 2000/2003 or 2006 for the specific job site. The generator set shall be analyzed or shake tested by a third party, accompanied by a Certificate of Compliance, and include a seismic label on the generator set (per section 1702 of the IBC Code.) Seismic-certified generators shall be installed per the specific seismic instructions provided by the manufacturer.
- C. The generator set shall conform to the requirements of the following codes and standards:
 - 1. CSA C22.2, No. 14-M91 Industrial Control Equipment.
 - 2. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
 - 3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

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- 4. IEC8528 part 4, Control Systems for Generator Sets.
- 5. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
- 6. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
- 7. Mil Std 461D-1993, Military Standard, Electromagnetic Interference Characteristics.
- 8. Mil Std 462D-1993, Military Standard, Measurement of Electromagnetic Interference Characteristics.
- NFPA 70, National Electrical Code, National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements: Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
- 10. NFPA 99, Essential Electrical Systems for Health Care Facilities.
- 11. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

1.6 CODES AND STANDARDS – TRANSFER SWITCHES

- A. The automatic transfer switches and controls shall conform to the requirements of:
 - 1. UL 1008 Standard for Transfer Switch Equipment.
 - 2. IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment.
 - NFPA 70 National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 4. NFPA 99 Essential Electrical Systems for Health Care Facilities.
 - 5. NFPA 110 Emergency and Standby Power Systems.
 - 6. IEEE Standard 446 IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

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- 7. NEMA Standard ICS10-1993 (formerly ICS2-447) AC Automatic Transfer Switches.
- 8. UL 508 Industrial Control Equipment.
- 9. CSA C22.2 No. 178 certification.

1.7 TESTING

- A. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
- B. Design Prototype Tests: Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
 - 1. Maximum power (kW).
 - 2. Maximum motor starting (kVA) at 35% instantaneous voltage dip.
 - 3. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
 - 4. Governor speed regulation under steady-state and transient conditions.
 - 5. Voltage regulation and generator transient response.
 - 6. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
 - 7. Three-phase short circuit tests.
 - 8. Alternator cooling air flow.
 - 9. Torsional analysis to verify that the generator set is free of harmful torsional stresses.
 - 10. Endurance testing.
- C. Final Production Tests. Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
 - 1. Single-step load pickup.
 - 2. Transient and steady-state governing.

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- 3. Safety shutdown device testing.
- 4. Voltage regulation.
- 5. Rated Power @ 0.8 PF.
- 6. Maximum power.
- 7. Upon request, a witness test, or a certified test record sent prior to shipment.
- D. Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test shall be performed by the manufacturer's local representative. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 - 1. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
 - 2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
 - 3. Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
 - 4. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

1.8 WARRANTY AND MAINTENANCE

- A. The generator set shall include a two year comprehensive extended warranty to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of startup. Optional warranties shall be available upon request.
- B. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that

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specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and function tests performed on all systems.

PART 2 PRODUCTS

2.1 GENERATOR

- A. Equipment
 - 1. The generator set shall be a Gillette Generator model SP-250. It shall provide 25kW/31kVA when operating at 120/208 volts, 60 Hz, .8 power factor. The generator set shall be capable of a Standby 130°C rating while operating in an ambient condition of less than or equal to 104°F and a maximum elevation of 656 feet above sea level.
 - 2. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 72 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 30%, as measured by a digital RMS transient recorder in accordance with IEEE standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip i.e. engine, alternator, voltage regulator and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.
 - 3. Vibration isolators shall be provided between the engine-alternator and heavyduty steel base.
- B. Engine
 - 1. The 143.5-cubic-inch displacement engine shall deliver a minimum of 42 HP at a governed speed of 1800 rpm. The engine shall be equipped with the following:
 - a. Electronic isochronous governor capable of 0.5% steady-state frequency regulation.
 - b. 12-volt positive-engagement solenoid shift-starting motor.

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- c. 70-ampere automatic battery charging alternator with solid-state voltage regulation.
- d. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
- e. Dry-type replaceable air cleaner elements for normal applications.
- f. Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel.
- 2. The naturally aspirated engine shall be fueled by Natural Gas.
- 3. The engine shall have a minimum of 4 cylinders and be liquid-cooled by Unit Mounted Radiator 122°F/50°C.
- 4. The engine shall be EPA certified from the factory.
- C. Alternator
 - The alternator shall be salient-pole, brushless, 2/3-pitch, 12 lead, self-ventilated with drip-proof construction and amortisseur rotor windings and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to Standby 130°C. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within ±2.0% at any constant load from 0% to 100% of rating. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.
 - 2. The alternator shall have a single maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
 - 3. The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
- D. Controller

- 1. DSE7420 Generator Set Controller
 - a. The generator set controller shall be a microprocessor based control system that will provide automatic starting, system monitoring, and protection. The controller system shall also provide local monitoring and remote monitoring. The control system shall be capable of PC based updating of all necessary parameters, firmware, and software.
 - b. The controller shall be mounted on the generator set and shall have integral vibration isolation. the controller shall be prototype and reliability tested to ensure operation in the conditions encounstered.
- 2. Codes and Standards
 - a. The generator set controller shall meet NFPA 110 Level 1 requirments and shall include an integral alarm horn as required by NFPA.
 - b. The controller shall meet NFPA 99 and NEC requirements.
 - c. The controller shall be UL 508 listed.
- 3. Applicability
 - a. The controller shall be a standard offering in the manufacturer's controller product line.
 - b. The controller shall support 12-volt and 24-volt starting systems.
 - c. The controller's environmental spcification shall be: -40C to 70Coperating temperature range and 5-95% humidity, non-condensing.
 - d. The controller shall mount on the genrator or remotely within 40 feet with viewable access.
- 4. Controller Buttons, Display and Components
- 5. The generator set controller shall include the following features and functions:
 - a. Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:
 - 1) Run Mode: When in the run mode the generator set shall start as directed by the operator.

- 2) Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.
- 3) Auto Mode: When in Auto the mode the generator set shall be ready to accept a signal from a remote device.
- b. Emergency Stop Switch. The remote stop switch shall be red in color with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.
- c. Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.
- d. Digital Display. The digital display shall be alphanumeric, with 2 lines of data and approximately 24 charters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running, the display shall scroll all-important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts or the rotary dial is depressed.
- e. Fault Light. The controller shall have an annunciator fault light that glows red for faults and yellow for warnings. These faults and warnings shall be displayed in the digital display. The fault light will also glow yellow when not in AUTO.
- f. Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
- g. Alarm Silence/Lamp Test Button. When this button is depressed, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not AUTO.
- h. USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set

parameters, fault diagnostics and viewing of all controller information via use a laptop computer.

- i. Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2-wire star for transfer switch and auxiliary shutdown.
- j. The controller shall have auto resettable circuit protection integral on the circuit board.
- 6. System Controller Monitoring and Status Features and Functions
 - a. The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller:
 - 1) Overview menu
 - (a) Active shutdowns and warnings shall be displayed if present and without the need of operator interface
 - (b) Engine runtime with total hours
 - (c) Average line to line voltage
 - (d) Coolant temperature
 - (e) Fuel level or pressure
 - (f) Oil pressure
 - (g) Battery voltage
 - (h) Software version
 - (i) Frequency
 - (j) Average current
 - 2) Engine metering menu.
 - (a) Engine speed
 - (b) Oil pressure
 - (c) Coolant temperature

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- (d) Battery voltage
- 3) Generator metering menu.
 - (a) Total power in VA
 - (b) Total power in W
 - (c) Rated power % used
 - (d) Voltage L-L and L-N for all phases
 - (e) Current L1, L2, L3
 - (f) Frequency
- 4) Generator set information.
 - (a) Generator set model number
 - (b) Generator set serial number
 - (c) Controller set number
- 5) Generator set run time.
 - (a) Engine run time total hours
 - (b) Engine loaded total hours
 - (c) Number of engine starts
 - (d) Total energy in kW
- 6) Generator set system
 - (a) System voltage
 - (b) System frequency 50/60Hz
 - (c) System phase, single/three phase
 - (d) Power rating kW
 - (e) Amperage rating
 - (f) Power type standby/prime

- (g) Measurement units, metric/English units adjustable
- (h) Alarm silence, always or auto only
- 7) Generator set calibration, the following are adjustable at the controller.
 - (a) Voltage L-L and L-N all phases
 - (b) Current L1, L2, L3
 - (c) Reset all calibrations
- 8) Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller.
 - (a) Voltage Adjustable +/- 10%
- 9) Digital and Analog Inputs and outputs
 - (a) Displays settings and status
- 10) Event Log
 - (a) Stores event history, up to 1000 events
- 7. Controller Engine control features and functions
 - a. Automatic restart the controller has automatic restart feature that initiates the start routine and re-crank after a failed start attempt.
 - b. Cyclic cranking the controller shall have programmable cyclic cranking
 - c. Engine starting aid the controller shall have the capability of providing control for an optional engine starting aid.
 - d. The control system shall include time delays for engine start and cool down.
 - e. The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
 - f. The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring
- 8. Controller Alternator control features and functions

- a. Integrated hybrid voltage regulator. The system shall have integral microprocessor based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
- AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
- c. Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
- d. Power metering. The controller digitally displays power metering of kW and kVA.
- 9. Other control features and functions
 - a. Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
 - b. Historical data logging. The controller total number of generator set successful start shall be recorded and displayed.
 - c. Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for analysis.
- 10. Generator Set Warning, Shutdown Alarm and Status
 - a. The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:

- 1) Engine functions
 - (a) Critical high fuel level (alarm)
 - (b) ECM communication loss (shutdown)
 - (c) ECM diagnostics (alarm & shutdown)
 - (d) Engine overspeed (shutdown)
 - (e) Engine start aid active
 - (f) Engine under speed (shutdown)
 - (g) Fuel tank leak (alarm & shutdown)
 - (h) High DC battery voltage (alarm)
 - (i) High coolant temperature (alarm & shutdown)
 - (j) High fuel level (alarm)
 - (k) Low DC battery voltage (alarm)
 - (l) Low coolant level (shutdown)
 - (m) Low coolant temperature (alarm)
 - (n) Low cranking voltage (alarm)
 - (o) Low engine oil level (alarm & shutdown)
 - (p) Low fuel level (alarm & shutdown)
 - (q) Low fuel pressure (alarm)
 - (r) Low oil pressure (alarm & shutdown)
 - (s) No coolant temperature signal (shutdown)
 - (t) No oil pressure signal (shutdown)
 - (u) Overcrank (shutdown)
 - (v) Speed sensor fault (alarm)
- 2) Generator functions

- (a) AC sensing loss over & under current (alarm & shutdown)
- (b) Alternator protection (shutdown)
- (c) Ground fault input (alarm)
- (d) kW overload (shutdown)
- (e) Locked rotor (shutdown)
- (f) Over-frequency (shutdown)
- (g) Over AC voltage (shutdown)
- (h) Under-frequency (shutdown)
- (i) Under AC voltage (shutdown)
- (j) Emergency stop (shutdown)
- 3) Other General functions
 - (a) Battery charger fault (alarm)
 - (b) Common fault (shutdown)
 - (c) Common warning (alarm)
 - (d) Master switch not in auto (alarm)
 - (e) Generator running
 - (f) Input/Output fault (alarm)
- 4) The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements that include several of the above along with; EPS supplying load, Master switch "not in auto", and contacts for local and remote common alarm.
- 11. Communications
 - a. The controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards
 - b. A RBUS shall be able to monitor and alter parameters, and start or stop a generator.

- c. The controller shall have the capability to communicate to a personal computer (IBM or compatible) and appropriate application software
- d. A variety of connections shall be available based on requirements:
 - 1) A single control connection to a PC via USB
 - 2) Internet connection via Ethernet
- e. Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same communication network.
- E. Accessories
 - 1. Air Restriction Indicator: The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.
 - 2. Battery Charger: A 6-ampere automatic float to equalize battery charger with the following features:
 - a. 12 VDC output.
 - b. 1% steady-state voltage regulation from no load to full load over 10% AC input line voltage variation.
 - c. LED lamps for charge state indication.
 - d. Temperature compensated for ambient temperatures for -40°C to 70°C.
 - e. Potting for durability.
 - f. Short-circuit and reverse polarity protection.
 - g. UL 1236 listed.
 - 3. Battery Rack and Cables: Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.
 - 4. Block Heater: The block heater shall be thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.
 - 5. Circuit Breaker: A UL 1077 listed, 80% rated line circuit breaker of 100 amperes, molded-case type, LSI electronic trip, generator-mounted with load side lugs.

- 6. Critical Silencer: The engine exhaust silencer shall be temperature and rust resistant, and rated for critical applications. The silencer will reduce total engine exhaust noise by 25-35 db(A).
- 7. Dry Contact Kits: The 1 Dry Contact Kit shall provide normally open and normally closed, gold-plated contacts in a form C configuration to activate warning devices and other customer-provided accessories allowing remote monitoring of the generator set. Typically, lamps, audible alarms, or other devices signal faults or status conditions.
- 8. Failure Relay:
 - a. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
 - b. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
 - c. Once energized the relay shall remain latched until the system is reset by the main controller switch.
- 9. Flex Exhaust Tube: The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows with threaded NPT connection.
- 10. Flexible Fuel Lines: The flexible fuel line shall have a fitting for the engine inlet and a threaded pipe fitting for connection to the stationary piping.
- Prealarm Senders: The generator prealarm senders shall provide signals for local and/or remote annunciation for engine conditions approaching critical/shutdown parameters required in NFPA 110. Prealarms warn of low water (engine) temperature, approaching low oil pressure, and approaching high engine temperature.
- 12. Rodent Guards: Generator rodent guards shall prevent intrusion and protect internal components.
- 13. Spring Vibration Isolators: A minimum of 4 spring vibration isolators shall be supplied for installation between the engine-generator and concrete housekeeping pad. Each isolator shall include an external level adjustment via a single electrozinc plated bolt and lock nut. The isolators shall include fully adjustable snubber inserts of oil resistant synthetic rubber for lateral stability. The isolator housing shall be rugged enable coated cast iron per ASTMA 48 with 0.52" to 1.58" static

deflection, 1/4" thick waffle embossed non-skid elastomer sound pads shall be included for noise absorption. The springs shall be carbon steel with a corrosive resistant powder coated finish.

- 14. Run Relay: The run relay shall provide a three-pole, double-throw relay with 10amp/250 VAC contacts to indicate that the generator is running. The relay provides three sets of dry contacts for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)
- 15. Safeguard Breaker: A resettable line current breaker with inverse-time shall be furnished to protect the generator from damage due to its own high current capability. This breaker shall have a time delay up to 10 seconds to allow selective tripping of downstream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of voltage if maintenance is being preformed.
- 16. Standard Air Cleaner: The air cleaner shall provide an engine filter service for typical operating conditions with minimal cost.
- 17. Enclosure
 - a. The Generator shall be furnished in a NEMA 3R enclosure.
- 18. Sound Attenuated Enclosure
 - a. The enclosure shall be constructed from aluminum. Enclosures manufactured from steel do not meet the requirements of this specification and will not be considered as equal. The enclosure shall attenuate the sound level to a maximum of 75 dBA when measured from any point around the gerator at a distance of 7 meters (23 feet) and the generator set operating at 100% rated load.
 - b. The enclosure shall be finish coated with powder baked paint for superior finish, durability and appearance. Enclosures will be finished in the manufacturer's standard color.
 - c. The enclosure shall allow the generator set to operate at full load in an ambient of 45 degree C with no additional derating of the electrical output.
 - d. The enclosure shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirments are two doors per side. When the generator set controller faces the rear of the generator set, an additonal rear facing door is

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required. Access to the controller and main line circuit breaker must meet the requirements of the NEC.

- e. Doors must be hinged with stainless steel hinges and hardware and be removable.
- f. Doors shall be equipped with lockable latches. Locks must be keyed alike.
- g. A duct between the radiator and air outlet shall be provided to prevent recirculation of hot air.
- h. The complete exhaust sytem shall be internal to the enclosure.
- i. All accoustical insulation shall be fixed to the mounting surface with pressure sensitive adhesive or mechanically fastened. In addition, all acoustical insulation mounted on a horizontal plane shall be mechanically fastened. The accoustical insulation shall be flame retardant.
- j. The enclosure shall include an exhaust scoop to direct the cooling air in a vertical direction.
- 19. Remote Annunciator. The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source position, loaded test, and retransfer. The panel shall have the capability to be either flush-mounted or surface-mounted. The annunciator shall meet UL508 requirements.

2.2 TRANSFER SWITCH

- A. Acceptable Manufacturers
 - 1. ASCO
 - 2. Generac
 - 3. Kohler
- B. Mechanically Held Transfer Switch
 - 1. The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism. Main operators shall include overcurrent disconnect devices; linear motors or gears shall not be acceptable.

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- 2. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
- 3. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- 4. All main contacts shall be silver composition.
- 5. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
- 6. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
- 7. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.
- C. Enclosure
 - 1. The ATS shall be furnished in a NEMA 1 (A) enclosure.
 - 2. All standard door mounted switches and long life super bright type indicating LEDs described in section 3 shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing & replacement. The panel shall be capable of having manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.
- D. Controller Display and Keypad
 - 1. A four line, 20 character LCD display and dynamic 4 button keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the communications interface port. The following parameters shall only be adjustable via a password protected programming on the controller (dip switches shall not be acceptable):

- a. Nominal line voltage and frequency.
- b. Single or three phase sensing.
- c. Operating parameter protection.
- d. Transfer operating mode configuration (Open transition, Closed transition, or Delayed transition).
- 2. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.
- E. Voltage, Frequency and Phase Rotation Sensing
 - 1. Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Dropout/Trip	Pickup/Reset
Under voltage	75 to 98%	85 to 100%
Over voltage	105 to 135%	95 to 100% of trip
Under frequency	85 to 99%	95 to 99%
Over frequency	105 to 120%	101 to 105%
Voltage unbalance	5 to 20%	3 to 18%

- a. Repetitive accuracy of all settings shall be within $\pm 0.5\%$ over an operating temperature range of -20°C to 70°C.
- b. An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
- c. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via the communications interface port.
- d. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the LCD; the service required LED and the annunciation through communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being defeated, if required.

- e. The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition shall be considered a failed source.
- f. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.
- F. Time Delays
 - 1. An adjustable time delay of 0 to 10 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
 - 2. A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
 - 3. A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
 - 4. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
 - 5. A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal. The controller shall also include the following built-in time delays for the following operations:
 - a. 0 to 60 minute time delay on failure to acquire the acceptable electrical parameters from the emergency source
 - b. 0 to 60 minute time delay for a failure to synchronize on an in-phase operation.
 - c. 60 minute time delay for the load disconnect position for delayed transition operation.

- 6. All time delays shall be adjustable in 1 second increments.
- 7. All time delays shall be adjustable by using the display and keypad or with a remote device connected to the communications interface port through a security-password system.
- 8. All time delays shall be adjustable by using the display and keypad or with a remote device connected to the communications interface port through a security-password system.
- 9. Each time delay shall be identified and a dynamic countdown shall be shown on the display.
- G. Additional Features
 - 1. The controller shall have 3 levels of security. Level 1 shall allow monitoring of settings and parameters only. The Level 1 shall be capable of restricted with the use of a lockable cover. Level 2 shall allow test functions to be performed and Level 3 shall allow setting of all parameters.
 - 2. Membrane-type switches shall be provided for the test functions and be maintained until the end test function is activated. The test function shall be allowed through password security. It shall be possible to defeat the password requirement by way of a circuit board mounted dip switch setting. The test function shall be load, no load or auto test. The auto test function shall request an elapsed time for test. At the completion of this time delay the test shall be automatically ended and a retransfer sequence shall commence. All loaded tests shall be immediately ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.
 - 3. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
 - 4. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.
 - 5. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

- 6. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources (red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.
- 7. A membrane switch shall be provided on the membrane panel to test all indicating lights and display when pressed.
- 8. Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- 9. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which closes to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or the communications interface port. A "not-in-auto" LED shall indicate anytime the controller is inhibiting transfer from occurring.
- 10. An in-phase monitor shall be a standard feature in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in-phase monitor shall be specifically designed for and be the product of the ATS manufacturer. The in-phase monitor shall be capable of being enabled or disabled from the user interface.
- 11. The controller shall be capable of accepting two separate external normally open contacts that will allow the functions described in the "input" section 5.02.B. In addition, the controller shall have two separate "C" form contacts that will function as described in the "output" section 5.02.A. The controller shall be capable of expanding the number of inputs and outputs with additional modules.
- 12. Engine Exerciser: The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on a calendar mode. For each routine, the user shall be able to:
 - a. Enable or disable the routine.
 - b. Enable or disable transfer of the load during routine.
 - c. Set the start time.
 - d. Set the time of day.

- e. Set the day of week.
- f. Set the week of month (1st, 2nd, 3rd, 4th, alternate or every).
- g. Set the duration of the run.
- h. At the end of the specified loaded exercise duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible of ending the exercise event with a single button push.
- i. Date and time: The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight saving and standard times.
- j. System Status:
 - 1) The controller shall have a default display the following on:
 - (a) System status.
 - (b) Date, time and type of the next exercise event.
 - (c) Average voltage of the preferred and standby sources.
 - 2) Scrolling through the displays shall indicate the following:
 - (a) Line to line and line to neutral voltages for both sources.
 - (b) Frequency of each source.
 - (c) Load current for each phase.
 - (d) Single or three phase operation.
 - (e) Type of transition.
 - (f) Preferred source.
 - (g) Commit or no commit modes of operation.
 - (h) Source/source mode (Utility/Gen; Gen/Gen; Utility/Utility).

- (i) In phase monitor enable/disable.
- (j) Phase rotation.
- (k) Date and time.
- k. Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.
- 1. Self Diagnostics: The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- m. Communications Interface: The controller shall be capable of interfacing, through a standard communications with a network of transfer switches and generators. It shall be able to be connected via an RS-485 serial communication (up to 4000 ft. direct connect or multi-drop configuration), an Ethernet connectivity (over standard 10baseT Ethernet networks utilizing a RJ-45 port or remotely utilizing a dial-up modem). This module shall allow for seamless integration of existing or new communication transfer devices and generators. Monitoring software shall allow for the viewing, control and setup of parameters of the genset and transfer switch network through a standard personal computer utilizing current Microsoft operating systems. Separate and specific transfer switch software interfaces shall not be acceptable.
- n. The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU and Modbus TCP/IP open standard protocols utilizing Modbus register maps. Proprietary protocols shall not be acceptable.
- o. The controller shall contain a USB port for downloading the controller's parameters and settings; exercise event schedules; maintenance records and event history. The file designator shall be the unique serial number of the transfer switch.
- p. Data Logging: The controller shall have the ability to log data and to maintain the last 2000 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a nonvolatile memory. The controller shall be able to display up to the last 99 events. The remaining events shall be downloadable to be displayed on a

computer.

- 1) Event Logging
 - (a) Data, date and time indication of any event.
 - (b) Statistical Data: *The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
 - (1) Total number of transfers.*
 - (2) Total number of fail to transfers.*
 - (3) Total number of transfers due to preferred source failure.*
 - (4) Total number of minutes of operation.*
 - (5) Total number of minutes in the standby source.*
 - (6) Total number of minutes not in the preferred source.*
 - (7) Normal to emergency transfer time.
 - (8) Emergency to normal transfer time.
 - (9) System start date.
 - (10) Last maintenance date.
- q. External DC Power Supply: An optional provision shall be available to connect up to two external 12/24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead for extended periods of time. This module shall contain reverse battery connection indication and circuit protection.
- 13. Surge Protection Device (SPD)
 - a. A SPD shall be provided for protection of the normal source supply. The SPD shall be provided with replaceable cartridges to allow replacement of components without disconnecting the normal source supply. A 90dB audible alarm shall be provided as standard. A terminal block for remote contacts shall be provide. The SDP shall provide L-L, L-N, L-G, and N-G lines protection. LED status indicators shall be available on the face of the device to indicate operational state. The SPD device shall be listed to UL 1449,

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Editon 3.

- H. Tests and Certification
 - 1. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
 - 2. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, and installation and servicing in accordance with ISO 9001.
- I. Service Representation
 - 1. The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
 - 2. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 26 51 00

INTERIOR BUILDING LIGHTING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Installation of luminaires, supports and accessories.
- B. Emergency lighting units.
- C. Exit signs.
- D. Lamps.
- E. Ballasts, drivers, and accessories.

1.2 RELATED WORK

- A. Section 26 05 19: Wires and Cables.
- B. Section 26 05 29: Supporting Devices.

1.3 REFERENCES

 NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

- A. Submit shop drawings and product data in accordance with General Conditions including pertinent physical characteristics and complete photometric data reports from independent testing laboratory.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

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E. Operation and Maintenance Data: Instructions for each product. Installation manuals are required.

1.5 COORDINATION

- A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the Engineer/Architect and defer ordering until clarified.
- B. Supply plaster frames, trim rings and backboxes to other trades.
- C. Coordinate with Division 23 to avoid conflicts between luminaires, supports, fittings and mechanical equipment.
- D. Conform to requirements of NFPA 70.
- E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- F. Products: Listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.
- G. The lighting wholesale supplier shall have an office and a stocking warehouse within 100 miles of the project site. The distributor/manufacturer's representative shall have an office within 100 miles of the project site, and shall have on staff a full time lighting designer as well as personnel who are available to service the project after completion.
- H. Any substitutions to the light fixture schedule shall be proven, by the manufacturer at the discretion of the Engineer, to be of equal or superior quality, material, and performance than the specified light fixtures. All requests for substitutions shall be submitted along with fixture specification sheets, photometric calculations and electronic ies files 10 days prior to bid opening date for review. Substitutions shall be requested in writing only, accompanied by the above listed electronic ies files. Substitutions will not be considered if they are indicated or implied in shop drawing submission without previous formal request. Substitutions will not be considered if they require substantial revision of the contract documents. The Contractor shall be responsible for any and all additional costs required by modifications to architectural, structural, mechanical or electrical facilities, devices, systems, etc. resulting from the approved substitution.

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I. Light fixtures and ballasts are to comply with the fixture schedule and the Specifications.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Acceptable Manufacturers
 - 1. Provide products of manufacturers as listed in the lighting fixture schedule or equal, subject to compliance with requirements.
 - 2. Fixtures are to be supplied in manufacturer's standard cartons.
 - 3. Substitutions: See Section 26 00 10 General Electrical Provisions.

B. Lensed Luminaires

- Pre-treat housing and finish in high reflectance baked white powder paint on exposed and reflective surfaces giving reflectance of 90% minimum average. Paint shall be applied after fabrication.
- 2. Reflective end plates may be 20 gauge metal.
- 3. Provide full 22 gauge steel housing.
- 4. Provide hinged frames with fully enclosed spring loaded cam latches and T-type hinges, removable for cleaning without tools. Support lay-in lenses on four sides with flip ends on short dimension.
- 5. Provide gasketing, stops and barriers to form light traps and prevent light leaks.
- 6. Design luminaire to dissipate ballast and lamp heat.
- 7. Use formed or ribbed backplates, endplates, reinforcing channels.
- 8. Provide virgin acrylic diffusers, 0.125" thick nominal, number 12 pattern, 7.8 oz. weight per square foot.
- 9. Furnish products as indicated in Fixture Schedule, or equal.
- C. Recessed Luminaires
 - 1. Supply recessed luminaire complete with trim type required for ceiling system installed. Before ordering, confirm ceiling construction details and architectural finish for each area. Supply with "IC" type housing or gyp board hat over the

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fixture, where insulation will cover.

- 2. Fixtures shall be delivered to the job site in factory provided individual cartons.
- 3. All damaged fixtures are to be replaced

2.2 LAMPS

- A. Acceptable Manufacturers
 - 1. General Electric.
 - 2. Osram/Sylvania.
 - 3. Philips.

B. LED Lamps

- 1. LED Lamps: Manufacturers must have Energy Star/DLC rating or shall offer LM-80 and TM-21 test reports to the public online.
- 2. LED estimated useful life: Minimum of 50,000 hours at 70% lumen maintenance, calculated based on LM-80 test data.
- 3. LED fixtures shall be modular and allow for separate replacement of LED lamps and drivers.User serviceable LED lamps and drivers shall be accessible and replaceable from the room side.
- 4. Light fixture provider shall provide all low voltage control wiring for dimmable fixture.
- 5. Note lamp color specifications on the fixture schedule, minimum CRI shall be 80.
- 6. All light fixtures shall be provided with a 5 year warranty on the LED and driver system.

2.3 BALLASTS AND DRIVERS

- A. Provide ballasts that meet standards of an electrical testing laboratory and the Certified Ballasts Manufacturers' Association.
- B. Acceptable Manufacturers:
 - 1. Universal.
 - 2. Philips/Advance.

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- 3. Osram/Sylvania.
- C. LED Drivers
 - 1. LED drivers shall be electic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 " Electronic Drivers for LED Devices, Arrays, or System". LED drivers shall have a sound rating of "A", have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.
 - 2. Dimmable LED drivers shall be 0-10V type unless otherwise noted on the schedule. Dimmable LED drivers shall be capable of dimming without LED strobling or flicker across their full drimming range.
 - 3. Emergency LED drivers shall be manufactured by a company with a minimum of five (5) years service. They shall be factory installed and tested, to include red pilot lights. They shall be manufactured by Bodine Mfg. and be rated at 1100 lumens, minimum.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install lamps in accordance with manufacturer's instructions.
- B. Provide spare lamps in the amount of 5% of the total count, or 5 each type, whichever is the greater number.
- C. All incandescent lamps shall be replaced at the Date of Substantial Completion.
- D. Provide ballasts of compatible design to lamps specified.
- E. No "Daisy Chaining" of fixtures is allowed.
- F. Install fixtures securely, in a neat and workmanlike manner.
- G. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- H. Support all luminaires independent of ceiling framing, directly from building structure by rod hangers and inserts or suspension wire, two per fixture.
- I. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

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- J. Install recessed luminaires to permit removal from below.
- K. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- L. Install clips to secure recessed grid-supported luminaires in place.
- M. Install wall mounted luminaires, emergency lighting units, and exit signs at height as scheduled.
- N. Manufactured wiring systems are approved. Provide submittals per Specifications.

3.2 RECESSED LUMINAIRES

- A. Perform field inspection, testing, and adjusting in accordance with Section 26 00 10.
- B. Install recessed luminaires to permit removal from below to gain access to outlet or pre-wired fixture box.
- C. Install an accessible junction box not less than two feet away from the fixture and connect to it by not less than four feet nor more than six feet of flexible conduit, using type of fixture wire approved for this purpose.
- D. Mount in suspended ceiling with exposed tee bar grid system, support directly from the building structure by a minimum of two support wires.
- E. Hold insulation back from all fixtures by three (3) inches and clear on top.
- F. A disconnecting means is required for all ballasted luminaires with double ended lamps. Install per NEC 410.130(G).
- 3.3 ALIGNMENT
 - A. Aim and adjust luminaires.
 - B. Align luminaires, clean diffusers and replace burned out lamps prior to final acceptance.

3.4 FIRE RATED CEILINGS

A. Where recessed fixtures will penetrate either fire-rated ceilings or fire rated gypsum board located above suspended ceilings, the fire-rated ceiling or gypsum board shall be continuous over and around the fixture housing and outlet box. Coordinate the ceiling and fixture installations to insure a continuous fire rated ceiling.

26 51 00-6

3.5 FINALLY

- A. Remove dirt and debris from enclosures.
- B. Clean photometric control surfaces as recommended by manufacturer.
- C. Clean finishes and touch up damage.
- D. Relamp luminaires that have failed lamps at Substantial Completion and all lamps that have been energized during construction for more than 500 hours.

END OF SECTION

26 51 00-7

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Installation of luminaires, supports and accessories.

1.2 RELATED WORK

- A. Section 26 05 19: Wires and Cables.
- B. Section 26 51 00: Interior Building Lighting.

1.3 REFERENCES

 NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

- A. Submit shop drawings and product data in accordance with General Conditions including pertinent physical characteristics and complete photometric data reports from independent testing laboratory.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: Instructions for each product.

1.5 COORDINATION

A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the Engineer/Architect and defer ordering until clarified.

26 56 00-1

- B. Supply plaster frames, trim rings and backboxes to other trades.
- C. Conform to requirements of NFPA 70.
- D. Products: Listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide products of manufacturers as listed in the lighting fixture schedule, or equal.
- B. LED Lamps
 - 1. LED Lamps: manufacturers must have Energy Star/DLC rating or shall offer LM-80 and TM-21 test reports to the public online.
 - 2. LED estimated useful life: Minimum of 50,000 hours at 70% lumen maintenance, calculated based on LM-80 test data.
 - 3. LED fixtures shall be modular and allow for separate replacment of LED lamps and drivers.
 - 4. Light fixture provider shall provide all low voltage control wiring for dimmable fixture.
 - 5. All light fixtures shall be provided with a 5 year warranty on the LED and driver system.
 - 6. Note lamp color specifications on the fixture schedule, minimum CRI shall be 80.
 - 7. All exterior light fixtures shall be, at a minimum, IP64 rated.

2.2 RECESSED LUMINAIRES

A. Supply recessed luminaire complete with trim type required for ceiling system installed. Before ordering, confirm ceiling construction details and architectural finish for each area. Supply with "IC" type housing or gyp board hat over the fixture, where insulation will cover.

26 56 00-2

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fixtures securely on poles and pole bases as shown on the plans.
- B. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- C. Install recessed luminaires to permit removal from below.
- D. Install clips to secure recessed grid-supported luminaires in place.

3.2 ALIGNMENT

A. Aim and adjust luminaires.

3.3 FINALLY

- A. Remove dirt and debris from enclosures.
- B. Clean photometric control surfaces as recommended by manufacturer.
- C. Clean finishes and touch up damage.

END OF SECTION

26 56 00-3
SECTION 27 10 05

CONDUIT FOR TELEPHONE/DATA AND TV RACEWAY SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

A. Telephone/Data and TV raceway system.

1.2 RELATED WORK

- A. Section 26 05 19: Wires and Cable.
- B. Section 26 05 34: Conduit.
- C. Section 26 05 37: Outlet and Pull Boxes.
- D. Section 26 05 53: Identification.

1.3 SYSTEM DESCRIPTION

- A. At TV locations, provide a 4" outlet box and plaster ring with 3/4" raceway to above a drop ceiling in an accessible area. Leave a pull string in each raceway. End each stub up with a 90-degree elbow. Mount as shown on the plans.
- B. At all telephone/data locations, provide a 4" outlet box and plaster ring with 1" raceway to an accessible area above a ceiling. Leave a pull string in each raceway. End each stub-up with a 90-degree elbow.

PART 2 PRODUCTS

- 2.1 MATERIALS
 - A. Conduit: Refer to Section 26 05 34.
 - B. Outlet and Pull Boxes: Refer to Section 26 05 37.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide an insulated throat connector or plastic bushing where raceways are stubbed out above the ceiling, including a 90-degree elbow on the end of the conduit.
- B. Provide a stainless steel blank cover plate for any outlet location which is not to be used. Allow for this quantity to be 50% of total data outlets.

27 10 05-1

- C. Provide conduit for all low voltage wiring which is installed in areas which have no ceiling or hard ceiling and shall be painted blue.
- D. All device plates are to be stainless steel.

END OF SECTION

27 10 05-2

SECTION 27 10 11

STRUCTURED TELECOMMUNICATIONS CABLING AND ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cabling and pathways inside the building.
- B. Distribution frames, cross-connection equipment, enclosures, and outlets.
- C. Grounding and bonding the telecommunications distribution system.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods.
- B. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations.
- C. Manufacturer Qualifications.
- D. Installer Qualifications.
- E. Project Record Documents:
 - 1. Record actual locations of distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on contract drawings.
- F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

27 10 11-1

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least 5 years experience manufacturing products of the type specified.
- B. Installer is to be hired directly by the owner as a vendor contractor. Electrical contractor is to coordinate with this vendor contractor.
- C. Installer Qualifications: A company having at least 5 years experience in the installation and testing of the type of system specified, and:
 - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD) or Registered Professional Engineer. Contracted services not allowed.
 - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
 - 3. Employing experienced technicians for all work; show at least 3 years experience in the installation of the type of system specified, with evidence from at least 2 projects that have been in use for at least 18 months; submit project name, address, and written certification by user.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

1.5 WARRANTY

- A. See Section 01 77 00 Contract Closeout, for additional warranty requirements.
- B. Correct defective Work within a 1 year period after Date of Substantial Completion.
- C. The Contractor shall facilitate a 20 year performance warranty between the manufacturer and the Owner. An extended component warranty shall be provided which warrants functionality of all components used in the system for 20 years from the date of acceptance. The performance warranty shall warrant the installed 250 MHz MHz horizontal copper, and both the horizontal and backbone optical fiber portions of the cabling system. Copper links shall be warranted against the links performance minimum expected results defined in TIA/EIA-568-B.1. Fiber optic links shall be warranted against the link and segment performance minimum expected results defined in the TIA/EIA-568-B-1.

27 10 11-2

D. The Contractor shall furnish an hourly rate with the proposal submittal which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system. These occurrences shall not void the contractor's or manufacturer's warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cable: Belden, Corning, AT&T, Berk-Tek, Siemons, Mohawk.
- B. Racks: Ortronics, Leviton, Black Box, B-Line/Cooper, Hubbell.
- C. Patch Panels: Ortronics, Leviton, Hubbell, APC, Siemons.
- D. Modular Jacks: Amp, Leviton, Panduit, APC, Hubbell, Siemons.
- E. Substitution: See Section 26 00 10 General Electrical Provisions.

2.2 SYSTEM DESIGN

- A. Provide a complete permanent structured cabling building system composed of cables and pathways supporting both computers and VoIP telephone stations, including cables, support structures, enclosures and cabinets, and computer modular outlets.
 - 1. Comply with TIA/EIA-568 and TIA/EIA-569, latest editions.
 - 2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
- B. Capacity:
 - 1. Provide optical fiber backbone cabling between data communication rooms, with copper backbone cabling within the building. Refer to the Plan Sheets.
 - 2. Horizontal Cabling: Copper.
 - 3. Provide one data outlet at each location shown on the plans. On the plan sheet, the number next to the outlet symbol denotes the number of cables to be installed. No number shown is minimum of two cables.
 - 4. Provide one telephone cable to each location shown on the plans.
 - 5. Provide two telephone cables to the fire alarm panel. These lines to be dedicated outside lines.

27 10 11-3

- 6. Provide one data cable and one coax cable to each TV location. Stainless Steel plate is by this Contractor.
- C. Main Distribution Frame (MDF): Centrally located support structure for terminating backbone cables, functioning as point of presence to external service provider.
 - 1. Locate main distribution frames as indicated on the drawings.
 - 2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
- D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
 - 1. Locate intermediate distribution frames in secondary data closets.
- E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
- F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".
- G. Owner shall purchase and install the telephone switch, computer system, telephone equipment, rack mounted UPS system, switches, and all items past the patch panel/cords.

2.3 PATHWAYS

- A. Conduits are supplied by the Electrical Contractor. No cable is to be installed in the open unless above accessible ceilings.
- B. All low voltage system conduits shall be painted blue.
- C. Provide all J-hooks and supports necessary, mounted at four-foot intervals.

2.4 COPPER CABLE AND TERMINATIONS

- A. Incoming cable is provided and coordinated by this Contractor.
- B. Structured VoIP Copper Horizontal Data Cable: TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 4 individually twisted pairs; covered with blue jacket, coordinate colors with owners system, and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.

27 10 11-4

- 1. Provide NFPA 70 type CMP plenum-rated cable, where required by plenum spaces.
- 2. Cable jacketing shall be lead free.
- 3. Individual conductors shall be 100% FEP insulated.
- 4. Cable shall be independently verified by ETL and shall exceed all TIA/EIA and ISO Enhanced Category 6/Class D requirements.
- 5. Cable performance shall be independently verified and characterized to 250 MHz.
- 6. Cable shall be independently verified for flammability by UL and listed under file number E138034.
- C. Copper Horizontal Voice Cable: TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 4 individually twisted pairs; covered with yellow jacket and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.
 - 1. Provide NFPA 70 type CMP plenum-rated cable, where required by plenum spaces.
- D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- E. Jacks and Connectors: RJ-45, non-keyed, terminated with 110-style insulation displacement connectors; high impact thermoplastic housing; complying with same standard as specified horizontal cable and UL 1863.
 - 1. Performance: 500 mating cycles.
 - 2. Voice and Data Jacks: 4-pair, pre-wired to T568B configuration, with color-coded indications for T568B configuration.
- F. Provide device plates to match color/type as called for in Section 26 27 26.
- G. Provide HDMI cabling as noted on drawing sheets. Cabling is to be high speed type cabling to provide a minum resolution of 4K on the screen.

2.5 FIBER OPTIC CABLE AND ADAPTORS

A. Fiber Optic Backbone Cable: 12-fiber, single mode, OS2, Indoor/Outdoor, Armored, complying with TIA-492AAAB; covered with cable jacket complying with relevant portions of and addenda to latest edition of TIA/EIA-568.

27 10 11-5

- 1. Provide NFPA 70 type OFNP nonconductive-plenum-rated cable.
- B. Fiber Optic Adapters and Connectors: Duplex ST, push-on-push-off type, multimode adaptors with zirconia ceramic alignment sleeves; complying with relevant parts and addenda to latest edition of TIA/EIA-568 and with maximum attenuation of 0.3 dB at 1300 nm with less than 0.2 dB change after 500 mating cycles when tested in accordance with TIA-455-21. Field verify existing connector type prior to ordering.
- C. Provide orange innerduct for fiber optic cable.

2.6 CROSS-CONNECTION EQUIPMENT

- A. Connector Blocks for Category 6 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
- B. Patch Panels for Category 6 Cabling: Modular Type; capacity sufficient for cables to be terminated, plus 25 percent spare.
- C. Patch Panels for Copper Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - 1. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per 2 RU high, standard width panel.
 - 2. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - 3. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
 - 4. Provide separate 48 port patch panels, as many as required, for each of the following systems:
 - a. Data/voice
 - b. Wifi
 - c. Security Cameras
- D. Patch Panels for Fiber Optic Cabling: Sized to fit EIA standard 19-inch wide equipment racks; 0.09 inch thick aluminum.
 - 1. Adaptors: As specified above under FIBER OPTIC CABLING; maximum of 24 duplex adaptors per standard panel width.

27 10 11-6

- 2. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
- 3. Provide incoming cable strain relief and routing guides on back of panel.
- 4. Provide rear cable management tray at least 8 inches deep with removable cover.
- 5. Provide dust covers for unused adaptors.

2.7 ENCLOSURES

- A. Equipment Racks and Cabinets: CEA-310 standard 19-inch wide component racks.
 - 1. Wall Mounted Racks: 8 gage aluminum brackets, hinged to allow access to back of installed components, lockable with circulation fan.
 - 2. Floor Mounted Racks: 16 gage steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
 - a. Floor mounted racks to be four post, open type.
 - 3. Provide Ladder Cable Tray from wall to wall across the room over the equipment racks.

PART 3 EXECUTION

- 3.1 INSTALLATION GENERAL
 - A. Comply with latest editions and addenda of TIA/EIA-568, TIA/EIA-569, ANSI/J-STD-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

3.2 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.
 - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

27 10 11-7

- 5. Do not overfill conduit or other raceways, refer to National Electrical Code.
- 6. Cables shall be continuous, no splices are allowed.
- 7. At no time shall cables rest on acoustic ceiling grids or panels. Cables shall be independently supported.
- 8. The maximum number of cables in a bundle is 40.
- 9. Attache cable to the structure above fire sprinkler and other systems.
- 10. Do not attach cable to lighting grid support wire.
- 11. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final accpetance at no cost to the Owner.
- 12. Pulling tension on 4 pair UTP cables shall not exceed 25 pounds for a single cable or cable bundle.
- 13. Backbone cable shall be installed separartely from horizontal distribution cables.
- 14. Where cables are installed in an air return plenum, the cable shall be installed in conduit, or plenum rated cable shall be installed in a plenum inner duct.
- 15. Where cabling is installed in/under floor slab, use only cabling rated for that installation.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 - 1. At Distribution Frames: 120 inches.
 - 2. At Outlets Copper: 12 inches.
 - 3. At Outlets Optical Fiber: 39 inches.
- C. Copper Cabling:
 - 1. Category 6: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
 - 2. Copper Cabling Not in Conduit: Use only type CMP plenum-rated cable as specified.
 - 3. The cable jacket shall be maintained as close as possible to the termination point.

27 10 11-8

- D. Fiber Optic Cabling:
 - 1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 - 2. Support vertical cable at intervals as recommended by manufacturer.
- E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
 - 1. All racks and enclosure shall be grounded to the telecommunications bus bar which is furnished by this Contractor and installed by licensed electrical contractor.
- F. Field-Installed Labels: Comply with TIA/EIA-606 using encoded identifiers.
 - 1. Cables: Install color coded labels on both ends.
 - 2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier. Jack numbering shall match the corresponding patch panel labeled A to Z and corresponding port numbered 1 to 48 in the data room.
 - 3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.
 - 4. Each cable shall be labeled at a location that can be viewed without removing the bundle support ties.
 - 5. Dust caps shall be installed on the connectors and couplings at all times unless physically connected.
 - 6. Each cable shall be clearly labeled at the entrance to the termination panel. Cables labeled within the bundle shall not be acceptable.
 - 7. Each outlet plate shall be labeled with permanent labeling and shall include the telecommunication room number.
 - 8. Labels are to be machine made; hand written labels are unacceptable.
- G. Coordinate the installation of all cable with the Electrical Contractor and other low voltage contractors on the project.
- H. Provide fire stop systems at all rated penetrations.

27 10 11-9

- I. Provide grounding per ANSI/J-STD-607. Provide a Telecommunications Bonding Backbone to be used to bond all telecomminications cable shields, equipment, racks, cabinets, raceways, basket/ladder tray, and other associated hardware that has the potential for acting as a current carrying conductor.
- J. The main entrance facility equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications closet shall be provided with a telecommunications ground bus bar (TGB). The TMGB shall be connected to the building electrical service entrance grounding electrode. This is to be accomplished by a licensed electrical contractor employed by this Contractor.
- K. All wires used for telecommunications grounding purposes shall be identified with green insulation. Non-insulated wires shall be indentified at each termination point with a wrap of green tape. All cables and bus bars are to be identified and labeled.
- L. The TBB shall adhere to the recommendations of the ANSI/J-STD-607-A standard and be designed or aproved by a qualified PE, licensed in the State of Arkanasas. All grounding is to be installed by a licensed electrical contractor who is an employee of this Contractor.

3.3 TESTING

- A. Comply with inspection and testing requirements of specified installation standards.
- B. Visual Inspection:
 - 1. Inspect cable jackets for certification markings.
 - 2. Inspect cable terminations for color coded labels of proper type.
 - 3. Inspect outlet plates and patch panels for complete labels.
- C. Testing Copper Cabling and Associated Equipment:
 - 1. Test backbone cables after termination but before cross-connection.
 - 2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
 - 3. Test operation of shorting bars in connection blocks.
 - Category 6 Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay. Test each pair for short circuit continuity, short to ground, 27 10 11-10

crosses, reversed polarity.

- 5. All cables and termination hardware shall be 100% tested for defects in installation and to verify cable performance under installed conditions.
- 6. Copper cables are to be tested using a Class 1 or Class 2 cable analyzer.
- 7. Each installed cable shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet, as appropriate. The cable length shall conform to the maximum distance set forrth in the TIA/EIA-568-B Standard.
- 8. Test results shall be automatically evaluated by the equipment, using the most upto-date criteria from the TIA/EIA Standard and the result shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equpment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved. A pass or fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.
- 9. The Owner reserves the right to witness any or all testing. The Contractor shall advise the Owner in writing when testing is scheduled at least one week in advance of actual testing.
- 10. All test results are to be documented and submitted as part of the construction close out documents. They shall be approved by the Owner Representative prior to substantial completion.
- D. Testing Fiber Optic Cabling:
 - 1. Backbone: Perform optical fiber end-to-end attenuation test and manufacturer's recommended test procedures; perform verification acceptance tests.
 - 2. The Owner reserves the right to witness any or all testing. The Contractor shall advise the Owner in writing when testing is scheduled at least one week in advance of actual testing.
 - 3. All test results are to be documented and submitted as part of the construction close out documents. They shall be approved by the Owner Representative prior to substantial completion.
- E. Finally:
 - 1. Provide labeling on both ends of each cable.

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- 2. Provide riser diagrams with all cables labeled.
- 3. Provide all patch cables and jumper cables necessary for a complete installation.
- 4. All server equipment is by the Owner.
- 5. All test results ae to be documented and submitted as part of the construction close out documents. The shall be approved by the Owner Repsresentative prior to substantial completion.
- 6. The Owner reserves the right to witness any or all testing. The Contractor shall advise the Owner in writing when testing is scheduled at least one week in advance of actual testing.
- 7. All cables shall be terminated in approved modular jacks or termination enclosures. No cables shall be left "free" unless so stated on the Drawings.
- 8. This Contractor is to provide complete system labeling, Accurate As-Built Drawings, complete system riser diagrams, and complete Test Documentation bound in a three ring binder(s) prior to acceptance by the Owner's Representative, and substantial completion.
- 9. The Contractor shall warrant the cabling system against defects in workmanship for a period of one year from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. This warranty shall be provided at no additional cost to the Owner.

END OF SECTION

27 10 11-12

SECTION 28 13 01

ACCESS CONTROL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Building Access Control System as shown on the drawings and as herein specified.
- B. The requirements of the conditions of the Contract, Supplementary Conditions and General Requirements apply to the work specified in this section.
- C. Additionally, the entire installed system and all integrated system operations shall be within the guidelines of International Building Code, National Electric Code, Fire Code, NFPA 72 and NFPA 101, and all local and national codes/ordinances.

1.2 SYSTEM OVERVIEW

A. The design of the Access Control System shall include devices and equipment to monitor and control access of cardholders to restricted areas, detect and deny unauthorized attempted entries within specific buildings or areas, annunciate alarms, and generate reports. The system shall also include devices and equipment to detect 'changes of state' for alarm points such as dry contacts. Once incorporated with the daily operations of the designated facility, the system shall detect and deny unauthorized entry into restricted areas, while granting entry to individuals who have proper access rights. The system is to be designed and configured to provide operational flexibility, reliable performance, and ease of use.

1.3 REQUIREMENTS

- A. The access control contractor shall be responsible for the desing and installation of all building access control devices.
- B. All work shall be in accordance with acknowledged industry and professional standards and practices, existing building conditions, and as specified in this document.
- C. Provide a complete working installation of all devices with all necessary equipment in proper operating condition. Documents do not purport to show or list every item to be provided. When an item not shown or listed is clearly necessary for proper installation

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and operation of the equipment and systems, provide, install and test/certify the item at no increase to the contract price.

- D. The Access Control Contractor shall provide all required cables, cable support materials, conduits, connectors, and mounting hardware (etc.) for a completely functional/operational system
- E. This Specification contains a combination of prescriptive and performance requirements. The access control contractor is responsible for fully implementing the functions described in the specifications. This will require the contractor to select system components, integrate system functions, and integrate the various security systems with each other.

1.4 QUALIFICATIONS

- A. Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.
 - 1. Contract maintenance office located within 100 miles (160 km) of project site.

1.5 SUBMITTALS

- A. Submit Manufacturer product data sheets for all proposed devices and equipment.
- B. Provide wiring diagrams, equipment ratings, dimensions, and finishes for all proposed devices and equipment.
- C. If submittals, upon review, are found not to conform with the requirements of these specifications; the Contractor shall be responsible for the Owner's extra expenses for the provision and installation as called for in this specification. Approval of the submittals by the Owner shall, in no case, relieve the Contractor of the responsibility to meet the requirements of the specification.

1.6 PROJECT RECORD (AS-BUILT) DRAWINGS

- A. The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawings.
- B. Record drawings shall include all device locations and types of hardware installed.

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- C. Upon completion of the work, and final acceptance by the local authority, the Contractor shall submit record drawings to the Owner and the Engineer.
- 1.7 OPERATION AND MAINTENANCE DATA
 - A. Submit Manufacturer data sheets for all equipment installed.
 - B. Include operating, installation, and routine maintenance instructions.
 - C. Include Manufacturer letter stating the date of installation on which the system is operational.

PART 2 PRODUCTS

- 2.1 MANUFACTURERS
 - A. Lenel installed by Convergint (Base Bid).
 - B. Verkada installed by Diamond State Technologies (Alternate Bid)
 - C. Substitutions: None.

2.2 PRODUCTS

- A. Controllers
 - 1. Lenel LNL-X2220 quantity as requried.
- B. Interface Module
 - 1. Lenel LNL-1320-S3 - quantity as requried.
- C. Power Supply.
 - 1. Lenel LSP-FPO1502502D8P202 quantity as required.
- D. Computer hardware as necessary.
- E. Controller cabinet as required.
- F. Low profile, vandal resistant proximity card readers. (See Door Hardware 08 71 00)
 - 1. HID Signo Reader 40 at wall mount locations.
 - 2. HID Signo Reader 20 at mullion mount locations.
- G. Proximity/Badge ID cards, initial stock of 200 blank cards.

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- H. Intercom St.
 - 1. 2N.com
 - a. IP Solo Surface mount intercom station with back plate. Provide one at exterior and one at interior inside Vestibule.
 - b. Indoor View Black 7 Indoor intercom desk station with desk stand.
 - c. DC Power Supply "PS-2420"
- I. Proximity Card Portable Reader, with download capabilities.
- J. Flush mounted door contact switch.

2.3 WIRE AND CABLE

A. All wire and cable shall be in strict compliance with local codes and the provisions of NEC Article 760 A and C for Power-limited Fire Protective Signaling Circuits. If required, the installation and control panel may be reclassified as Non Power-limited, per the provisions in NEC 760 Section C, providing all the requirements of NEC 760 A and B are met, and all identification of Power-limited circuits are removed from the control panel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with all other trades. Refer to architectural door hardware specifications for additional information.
- B. The Contractor shall clean all dirt and debris from the inside and the outside of the Access Control equipment after completion of the installation.
- C. Provide and install the system in accordance with the plans and specifications, all applicable codes and the Manufacturer's recommendations. All wiring shall be installed in accordance with all applicable codes and standards. Upon completion of installation, the Contractor shall so certify, in writing, to the Owner and the Engineer.
- D. Provide and install DITEK type "DTK-HW" surge protective devices on each power supply panel.

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3.2 FIELD QUALITY CONTROL

- A. The completed Access Control system shall be fully tested in accordance with the manufacturer's recommendations, by the Installer, in the presence of the Owner's representative. Upon completion of a successful test, the Installer shall so certify, in writing, to the Owner and Engineer.
- B. The Manufacturer shall provide on-site technical installation support.

3.3 MANUFACTURER'S FIELD SERVICES

A. Include on-site services of a certified technician to provide technical installation support for panel start up, program editing, troubleshooting of the access control system and assistance to the Installer for one complete final system checkout in accordance with the Field Quality Control section of the specifications. The Manufacturer shall also provide one training session, four hour minimum, with the Owner, or Owners Representative, upon completion of installation for instruction of system operation.

END OF SECTION

28 13 01-5

SECTION 28 23 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 26 Basic Materials and Methods section apply to work specified in this section.

1.2 DISCRIPTION OF WORK

- A. Contractor is responsible for the design and installation of the CCTV system. Locations and quantities shown on drawings are approximate only. Provide quantity of cameras required to cover the building.
- B. Extent of CCTV system work is to include a complete operating system consisting of, but not limited to, cameras, monitors, cables, NVR equipment, racks, and associated components required to provide a complete and operational system.
- C. The work of this section includes electrical raceways, boxes and fittings as specified in applicable Division 26 Basic Materials and Methods Sections, which are used to enclose CCTV cabling.

1.3 REFERENCES

- A. The following specifications and standards of issues listed below but referred to thereafter by basic designation only, form a part of these specifications:
 - 1. National Electrical Code, Latest Adopted Edition.
 - 2. National Fire Protection Associations Recommended Practices.
 - 3. Local, City and State Codes and Ordinances.
 - 4. National Electrical Safety Code, Latest Adopted Edition.
 - 5. Underwriter's Laboratories, Inc.

1.4 SUBMITTALS

A. Submit under provisions of Section 26 00 10.

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- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. The basic information for each item of equipment to be included is as follows:
 - 1. Index
 - 2. Installation and Operation Instructions
 - a. Individual tabbed sections
 - b. Manufacturer descriptive literature
 - c. Applicable control diagrams
 - d. Composite wiring diagrams
 - 3. Each submittal sheet shall be clearly marked with equipment Catalog Number and accessory items being submitted.

1.5 QUALITY ASSURANCE

- A. Installer: A firm or individual with not less than 5 years of successful experience in installation of CCTV systems similar to those required for this project. Provide documentation of a qualified service organization and parts inventory to support the supplied equipment. Response time shall be less than 3 hours for service calls.
- B. NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to CCTV system components.
- C. UL Compliance with Labeling: Comply with applicable portions of UL standards pertaining to Access Control System components; and provide products and components which have been UL-listed and labeled.
- D. NEC Compliance: Comply with NEC requirements as applicable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Axis installed by Convergint (Base Bid).
- B. Verkada installed by Diamond State Technologies (Alternate Bid)

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting and Wiring: Control and other panels shall be mounted with sufficient clearance for observation and testing. All communication junction boxes must be clearly marked for easy identification. All wiring shall be in conduit, EMT thin-wall or as indicated on project drawings. Flexible connectors shall be used for all devices mounted in suspended lay-in ceiling panels. All conduit, mounting boxes, junction boxes and panels shall be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system. No wiring other than that directly associated with the CCTV system or auxiliary functions shall be permitted in the CCTV system conduits. Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected. Transposing or changing color coding of wires shall not be permitted. Wire nut-type connections are not acceptable.
- B. All conductors in conduit containing more than one wire shall be labeled on each end with "E-Z markers" or an equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminal shall be numbered and coded. All controls, function switches, etc., shall be clearly labeled on equipment panels. All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.

3.2 ACCEPTANCE TESTING

- A. Operation and Maintenance Manuals: Prior to final acceptance, the Contractor shall provide complete operation and maintenance manuals (4 copies of each system) to the Owner's representative. All aspects of system operation and maintenance shall be detailed, including electrical schematics of all circuits, a written description of the system design, drawings illustrating control logic and equipment used in the system. Checklists and emergency procedures, troubleshooting techniques, and maintenance operations shall be included.
- B. System Checkout, Owner Training and Acceptance: Upon completion of the installation, a meeting shall be held at the site with Contractor and the Owner's representative. The Contractor shall familiarize the Owner's personnel with system components, system functions and recommended procedures. At this time, a functional test of the system will be performed. The Contractor shall provide the necessary personnel and instrumentation to conduct this test. The Contractor shall give 2 weeks written notice to the Owner prior to this test. The Contractor will provide the Owner with a system checklist, which the Owner can sign as acceptance of the system.

28 23 00-3

- C. Tests: After the system has been completely installed, (under direct supervision of the equipment manufacturer) functional tests shall be performed demonstrating to the satisfaction of the Owner and the Architect/Engineer that the installed system meets these specifications. Direct instruction of the Owner's operating personnel shall be provided to assure familiarity with all phases of the operation of the system.
- D. Drawings and Manuals: System drawings and manuals shall be provided as described below:
 - Record drawings shall be furnished to the Owner's representative within a 10 day period, after the construction is completed. The Contractor shall revise all drawings to agree with the construction as actually installed and have each drawing stamped "Record Drawing". Those drawings describing construction where no change was involved shall be stamped "Record Drawing, No Change". Drawings prepared by the Contractor shall have minimum dimensions of 24 inches by 36 inches and shall be furnished with one reproducible copy. Other drawing copies shall be furnished in quadruplicate included with, or separate from the system maintenance manuals.
 - 2. All equipment locations (Control Panels, Cameras, Power Supplies, Monitors, etc.) shall be shown in relation to the floor plans. All peripheral devices integrated into the system shall also be shown.

3.3 WARRANTY

- A. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.
- B. Warranty Period: 1 year from date of Substantial Completion.

END OF SECTION

28 23 00-4

SECTION 28 31 04

FIRE DETECTION AND VOICE EVACUATION SYSTEM

PART 1 GENERAL

1.1 SCOPE

- A. This specification describes a Fire Detection and Voice Evacuation system. The control panel, to be intelligent device addressable, analog detecting, low voltage and modular, with digital communication technology, in full compliance with all applicable codes and standards. This system shall operate as a stand-alone panel, with transponders or peer-to-peer operation. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.
- B. The system shall be in full compliance with National and Local Codes.
- C. The system shall include all required hardware, piping, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
- D. All equipment furnished shall be new and the latest state of the art products of a single manufacturer, engaged in the manufacturing and sale of fire detection devices for over ten years.
- E. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the Owner in an operational condition.

1.2 RELATED WORK

- A. Division 1 Bidding Requirements and Conditions Of The Contract.
- B. Section 26 00 10 General Electrical Provisions.

1.3 STANDARDS AND CODES

- A. The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.
- B. National Fire Protection Association (NFPA) Most current or approved Standard

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- 1. NFPA 70 National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- 2. NFPA 72 National Fire Alarm Code.
- C. Underwriters' Laboratories, Inc. (UL) Appropriate "UL" equipment standards.
 - 1. UL 864 Control Panels.
 - 2. UL 268 Smoke Detectors.
 - 3. UL 268A Smoke Detectors (HVAC).
 - 4. UL1480 Speakers for Fire Protection Signaling Systems.
 - 5. UL 1971, Standard for Visual Signaling Appliances.
- D. Building Codes
 - 1. International Building Code and the International Fire Code.
 - 2. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction.
 - 3. ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.

1.4 QUALIFICATIONS OF INSTALLERS

- A. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm and suppression systems of the same scope, type and design as specified.
- B. The Contractor shall submit copies of all required Licenses and Bonds as required in the state of Arkansas.
- C. The Contractor shall employ on staff a minimum of one NICET level III technician or a professional engineer, registered in the state of Arkansas.
- D. The Contractor shall be qualified by UL for certifying fire alarm systems. Upon completion of the installation the Contractor shall certify the final system meets UL ongoing maintenance.
- E. Fire alarm sales and installation shall be the primary function of this Contractor with minimum of five years experience.

28 31 04-2

F. Contractor's business shall be within 100 miles of this project site.

1.5 MANUFACTURER'S REPRESENTATIVE

- A. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State.
- B. Contractor shall maintain a factory trained service department with service personnel available on a 24 hour, 7-day per week basis. Provide a 24-hour emergency service number with a maximum telephone response time of 1 hour.
- C. Contractor shall maintain a spare parts inventory of critical function components.
- D. Contractor's personnel shall have a minimum of five years experience in service and maintenance of fire detection, and alarm systems.

1.6 SUBMITTAL

- A. The Contractor shall include the following information in the equipment submittal:
 - 1. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement.
 - 2. Supervisory power requirements for all equipment.
 - 3. Alarm power requirements for all equipment.
 - 4. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.
 - 5. Voltage drop calculations for wiring runs demonstrating worst-case condition.
 - 6. Complete manufacturers catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.
 - 7. Complete drawings covering the following shall be submitted by the Contractor for the proposed system:
 - a. Floor plans shall show all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.

28 31 04-3

- b. Provide a fire alarm system function matrix as referenced by NFPA 72. Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.
- c. Provide complete fire alarm installation plans which have been signed by the Authority Having Jurisdiction. Any required modifications to the issued documents shall be included in this contractor's bid.
- 8. Installation drawings shop drawings, and record drawings shall be prepared by an individual who is experienced with the work specified herein.
- 9. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.

1.7 SYSTEM REQUIREMENTS

- A. The system shall be a complete, electrically supervised fire detection and notification and voice paging system, microprocessor based operating system having the following; capabilities, features and capacities:
 - 1. Audible and visual notification alarm circuit zone control.
 - 2. Status indicators for sprinkling system water-flow and valve supervisory devices.
 - 3. Each intelligent addressable device on the system shall be displayed at the Control Panel Display.
 - 4. Remote annunciators shall have alphanumeric display with the same characteristic as the fire alarm control panel. The remote display shall be programmable to have complete system control or just as an annunciator.
 - 5. The Fire Alarm System is to be capable of paging and preforming emergency announcements. Coordinate with owner to program the required emergency announcements and paging.

1.8 SYSTEM OPERATION

- A. Activation of any system fire, supervisory, trouble, or status initiating device shall cause the following actions at the panel annunciator.
- B. Fire Alarm Condition:

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- 1. Sound an audible alarm and display a custom screen/message defining the building in alarm and the specific alarm point initiating the alarm in a graphic display.
- 2. Log to the system history archives all activity pertaining to the alarm condition.
- 3. Sound the ANSI 117-1 signal followed by a voice message with synchronized strobes.
- 4. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
- 5. A signal dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
- 6. Record within system history the initiating device and time of occurrence of the event.
- C. Supervisory Condition:
 - 1. Display the origin of the supervisory condition report at the fire alarm control panel.
 - 2. Activate supervisory audible and dedicated visual signal.
 - 3. Audible signals shall be silenced from the control panel by the supervisory acknowledge switch.
 - 4. Record within system history the initiating device and time of occurrence of the event.
- D. Trouble Condition:
 - 1. Display at the local fire alarm control panel, the origin of the trouble condition report.
 - 2. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
 - 3. Audible signals shall be silenced from the fire alarm control panel by a trouble acknowledge switch.
 - 4. Trouble reports for primary system power failure to the master control shall be automatically delayed for a period of time equal to 25% of the system standby

28 31 04-5

battery capacity to eliminate spurious reports as a result of power fluctuations.

5. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: The equipment and service described in this specification represent the base bid for the equipment. Manufacturers are required to have non-proprietary equipment that can be serviced by multiple local installers.
 - 1. Subject to compliance with requirements, preapproved manufacturers are by one of the following:
 - a. EST.
 - b. Notifier.
 - c. Fire Lite.
 - d. Silent Knight.
 - e. Gamewell-FCI.
- B. Being listed as an acceptable Manufacturer in no way relieves the Contractors obligation to provide all equipment and features in accordance with these specifications.

2.2 CONTROL PANEL

- A. The control panel and all system interface panels shall be modular in construction and shall include, but not limited to: the hardware, software and firmware required to perform the following major system functions:
 - 1. Steel, satin red, baked enamel cabinet with indicator viewing window, removable hinged outer door with cylinder lock and dead front construction with the outer door open. The inner dead front doors shall be hinged for ease of system operation by firefighters and access by technicians for testing and maintenance modes.
 - 2. System power supplies, including necessary transformers rectifiers, regulators, filters and surge protection required for system operation, with the capacity to power the system in a worst case condition with all devices in alarm and all local

28 31 04-6

indicating appliances active without exceeding the listed ratings. All system devices shall display normal and alarm conditions consistently whether operating from normal power or reserve (standby) power.

- 3. Surge protection shall be supplied at the power input to each cabinet. The surge suppression shall be of the phase to neutral (normal mode suppression). Phase to ground devices, MOV based devices and pure inductive devices shall not be considered acceptable. Protection shall also be furnished for SLC and NAC circuits where exiting and entering any structure, connected prior to any system devices within the structure.
- 4. Standby power source shall meet the requirements for standby capacity as detailed in paragraph 1-5.2.6, NFPA 72, i.e. supervisory for 24 hours with local systems, central station and proprietary systems and 60 hours for auxiliary and remote station systems. Additionally, the supply shall be capable, at the end of this period of operating the system with all evacuation appliances active for a period of five minutes using conventional signaling or fifteen minutes using voice evacuation.
- 5. Control panel and CIP power supply input and output voltages, battery charging currents and terminal voltages shall be displayed on the main control panel LCD display when requested via the panel service menu. It shall not be required to be at the cabinet being interrogated to measure service voltages.
- 6. System 16 bit core processor, with internal operating system to process incoming alarm signals and issue output commands required as a result of the alarm reception, by system programming or by manual commands. Total system response time shall not exceed 4 seconds on a system configured to the 2000 input address maximum capacity. All system processors shall be supervised by individual watchdog circuitry furnishing automatic restart after loss of activity.
- Digital communication capabilities supporting Style 4 (Class B) or Style 7 (Class A) communications using either DC digital or fiber optics technologies or combinations of both as required for the control panel to communicate with up to 63 local network nodes including CIP's, annunciators, and displaying local network information.
- 8. The dialer shall be an internally mounted internet dialer Digital Alarm Communication Transmitter (IP-DACT). It shall be a UL 864 listed network dialer capable of operating on a VoIP system. Router used for network transmission shall have battery backup. AND Provide dual path commercial fire communicator connected to the IP_DACT capable of providing three selectable 28 31 04-7

reporting paths which include: cellular only, IP only or IP primary/cellular backup.

- 9. Capability shall exist within the system to extend the network at any node. The system shall support a maximum of two network extension circuits in series on any system branch, extending the inherent distance limitations for network communications.
- 10. Communication protocol shall be of the CS/MACD (carrier sense, multiple access, collision detect) type, eliminating delays incorporated into other protocols. Communication techniques using token passing and requiring sensing of delays and re-generation of the token to re-establish network communications in the event of a fault shall not be acceptable.
- 11. Capability shall exist within the system to extend the network at any node. The system shall support a maximum of two network extension circuits in series on any system branch, extending the inherent distance limitations for network communications.
- 12. NFPA 72 Style 4 operation analog signaling circuit with isolation capability for circuit survival in a shorted circuit mode, as required to communicate with 120 points consisting of a maximum of sixty intelligent analog alarm initiating and sixty intelligent controllable output devices.
- 13. Analog loops shall be configured with loop isolators and wired in a manner that prevents a catastrophic wiring event in a smoke zone or on a floor from effecting the performance of other floors.
- 14. Limited energy output circuits as required for operation of direct current audible or visual indicating appliances, leased line or city tie, or extinguisher system release shall be provided by controllable signal modules.
- 15. Outputs shall be programmable as device coded, zone coded, march time coded, temporal code 3, or continuous sounding and shall be configured as required for Style Y (Class B) or Style Z (Class A).
- 16. Control of operations requiring switching functions, where required, shall be provided a software controllable relay module. Relay coils shall be supervised when in the standby state. Relay contacts shall be rated at 2 amperes minimum.
- 17. System display/keyboard shall be usable at any network node and shall have the following capabilities, capacities, indicators and controls:

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- a. An 80-character back lighted alphanumeric super twist LCD display readable at any angle.
- b. Thirty-two character user defined custom messages shall describe the location of the active device.
- c. Display shall indicate desired message in a sequence, including; English/Spanish, English/Portuguese, English/French and English. Either of the selected languages shall be selectable as the primary display.
- d. The local system display shall have the capability to display a minimum of 6,000 custom messages activated as a result of alarms originated at other local panels resident on the external network. Systems unable to perform to this level shall supply PC based terminals displaying the required messages.
- 18. The system shall be capable of programming to allow troubles occurring and restored in the system to be automatically removed from the display queue.
 - a. As a minimum, an LED display for "ALARM", "AUDIBLES SILENCED", "SUPERVISORY", "TROUBLE", "SECURITY", "POWER ON" and "PARTIAL SYSTEM DISABLED".
 - b. Touch activated, audible feed-back, membrane switches for "ALARM ACKNOWLEDGE", "AUDIBLE SILENCE", "SUPERVISORY ACKNOWLEDGE", "TROUBLE ACKNOWLEDGE", "SECURITY ACKNOWLEDGE", "RESET", "DISPLAY HOLD" and "DISPLAY NEXT".
 - c. Touch activated, audible feed-back, membrane switch functions, programmable to perform a minimum of twelve custom designed and programmed functions such as drill, disable, bypass automatic control commands or other special functions as required by the system user.
 - d. The membrane switches shall also be used for the entry of multiple key sequences to be used for passcode protection inputs into logic strings, preventing un-authorized command entry.
 - e. Ten-digit keypad for passcode entry to perform programming and maintenance functions.
- 19. The system shall support a minimum of three supervised remote alphanumeric annunciators as full function remote control points.

28 31 04-9

- 20. Each system display shall be programmable, as a software function at the Fire Alarm Control Panel to be full function or display only, with its own set of function commands, as described above. Selection in software shall also determine the display of either local only or global information.
- 21. Real time clock with lithium battery for the maintenance of time through a full system power down, assuring the accuracy of time labels in the historical events log.
- 22. Selective historical log, up to 800 events of all types, shall be stored in flash memory and displayed, printed or downloaded by classification for selective event reports.
 - a. The system shall allow selection of events to be logged, including inputs, as; alarms, troubles, supervisory, security, status changes, walk tests and device verification, outputs as; audible control and output activation, actions as; reset, set sensitivity, arm/disarm, override, password, set time and acknowledge.
 - b. Data format for downloading shall be adaptable to a data base management program allowing custom report generation to track alarms, troubles and maintenance.
 - c. Audible and visual indications shall be generated when memory is 80% and 90% full to allow downloading of data.
- 23. The system shall be configured paging as campus system.
- 24. Software and hardware shall be furnished to allow an authorized service provider the ability to communicate with the control panel via phone lines, running diagnostic reports, historical reports, recording system voltage levels and recording system sensitivity levels.
- 25. The local control shall have voice evacuation capabilities integrated into the software, hardware and operating system. The audio control modules supplied shall communicate with the fire alarm master via high-speed network communications lines.
- 26. The master microphone module shall be permanently mounted behind the locked access door, visible through the viewing window and provide firefighters with the means of issuing voice message instructions to specific audio zones, groups of zones or all zones. The microphone and the press-to-talk switches shall be supervised. This module shall contain a local speaker with volume control to

28 31 04-10

monitor selected audio channels.

- 27. A tone generator capable of providing a variety of tones for use in the system shall be included. Software configuration shall determine tone usage.
- 28. Coded or pulsed at:
 - a. 120 ppm.
 - b. 30 ppm.
 - c. Temporal code 3.
 - d. 4-4-4.
- 29. A backup tone card shall be furnished for the audio control module.
- 30. The integrated voice system shall utilize local or distributed amplification as required for optimum system performance and configuration.
- 31. The voice system amplifiers and speakers as required to optimize system performance shall be 25 vrms.
- 32. The integrated voice system shall be capable of operation of three voice channels simultaneously; Evacuation, Alert and Auxiliary. Systems using a dedicated paging channel shall not be considered equal.
- 33. The amplifiers shall be modular to meet the system requirements providing power as required to supply a minimum of 2.0 watts of power for each connected system speaker. Amplifiers shall automatically transfer to standby battery when commercial power fails or is disconnected. Provide the amplifier wattage of 100 watt.
- 34. Amplifiers shall be configured for:
 - a. Two channel.
- 35. All amplifiers shall be supervised and provide automatic switching to backup amplifier output in the event of amplifier failure.
- 36. The voice system shall be operable as a voice node on the external voice network composed of up to 63 self standing network panels, allowing paging to or from other external network nodes as selected in system programming.

28 31 04-11

- 37. The voice network shall be capable of configuration using conventional hardwired techniques or fiber optics transmission systems.
- 38. Furnish supervisory circuitry for amplifiers, speaker circuits and visual circuits in quantities as required by system design. All audible and visual notification circuits shall be power limited.
- 39. Furnish manual switch and annunciator modules on the face of the control panel in quantities required by the system. Manual switch modules shall be grouped and labeled in a color-coded configuration to indicate speaker circuit control, telephone circuit control, HVAC smoke control, and water flow and valve supervision. Each LED shall be capable of displaying status of the controlled zone via three different colors in either a steady or flashing state to denote the active status circuit and indicate trouble. All switch activation and LED status indications shall be software mapped to any system functions desired. Systems requiring the use of multiple switches to activate groups of zones or functions shall not be acceptable.
- 40. Furnish for the indication and control of all system speaker zone modules as follows:
 - a. Speakers shall be zoned in logical divisions of the building.
 - b. The remote annunciator shall be either a system display as indicated on the drawings. The remote annunciator shall have all the capabilities of the system annunciator. The remote annunciator shall have the ability to be programmed as an annunciator only or an annunciator with full system control.
 - c. An off-site dialer shall be provided. The dialer shall be listed with the system and shall be capable of transmitting Ademco Contact ID and SIA protocols. Ademco Contact ID shall be capable of transmitting up to 999 points. SIA protocol shall be capable of transmitting all 2040 MXL points. The dialer shall have a minimum of 5 inputs until system completion in which the dialer shall transmit individual point information.

2.3 POWER SUPPLY

A. System power supply, including necessary transformers rectifiers, regulators, filters and surge protection required for system operation, with the capacity to power the system in a worst case condition with all devices in alarm and all local indicating appliances active without exceeding the listed ratings. All system devices shall display normal and alarm conditions consistently whether operating from normal

28 31 04-12

power or reserve (standby) power.

- B. Standby power source shall meet the requirements for standby capacity as detailed in NFPA 72, i.e. supervisory for 24 hours and sufficient power to provide the required discharge, control and notification.
- C. Supply a 12 amp power supply model MPS-12.

2.4 SYSTEM ENCLOSURES

- A. Provide the enclosure needed to hold all the cards and modules as specified with at least spare capacity for two cards. The enclosures shall be red. The outer doors shall be capable of being a left hand open or a right hand open. The inner door shall have a left hand opening. System enclosure doors shall provide where required ventilation for the modules or cards in the enclosure.
- B. Enclosures housing amplifiers shall provide venting as per the manufacturers recommendation.
- C. Provide a "plan box" located at the fire alarm control panel to hold approved As-built plans.

2.5 SYSTEM PRINTER (CAPABILITY ONLY)

- A. Provide capability for system printer. Printer information below included for reference only.
 - 1. The system printer shall be operated from a Printer Modules (PIM-1 which mounts inside the enclosure and PIM-2, which outside the enclosure.
 - 2. The logging printer shall be "UL" listed with the system. This parallel printer shall be supervised for: On/Off line, out of paper, paper jam, power off, and connection the system. The printer shall be a; high speed, 24 dot matrix, wide carriage, and capable of using tractor or friction fed paper. Supervised network connection shall be either Style 4 or 7 as required by local requirements. The printer shall contain diagnostic LED's for ease in maintenance.

2.6 INITIATION DEVICES INTELLIGENT

- A. System intelligent alarm initiation devices shall be furnished and installed where indicated on the drawings.
 - 1. Detectors not listed for sensitivity testing from the control panel shall not be deemed acceptable due to the additional maintenance expense involved in the

28 31 04-13
required removal, calibrated smoke generation and testing as described by NFPA 72.

- 2. Sensitivity testing performed from the control panel shall be logged by the system printer or stored in system memory as specified, as a permanent record of the performance of code mandated testing.
- 3. Detectors shall be operational with addressable relay bases, addressable audible bases and remote indicating LED's, programmable by the control panel and controlled by the detector electronics. They shall be supplied and installed with one of these options where indicated on the drawings or required by the operational requirements of this specification.
- 4. Detector shall be readily disassembled without the requirement for special tools to gain access to the detection chamber for cleaning and maintenance.
- 5. Detectors shall be assigned a sensitivity level for alarm threshold by the central controller, if not programmed to respond to a specific fire occupancy profile, based on environment, time of day or other programmable functions as required by the system user and shall respond at that level whether in the on line mode or default mode.
- B. Fire Detectors, Application Specific
 - 1. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
 - 2. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.
 - 3. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
 - 4. Detectors shall be programmable as application specific, selected in software for a minimum of eleven specific environmental fire profiles unique to the installed location. These fire profiles shall eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring fire burn rates, ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.

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- 5. Detection technologies using time delays to verify the existence of an alarm condition shall not be considered acceptable.
- 6. Detector electronics shall utilize surface mounted techniques and be conformal coated with a substance rendering the electronics impervious to stray conduction caused by dust and moisture. The coating shall remain stable to 135 degrees F.
- 7. Detector shall be listed for duct smoke sampling when mounted in a compatible housing and shall be specifically programmable as a duct smoke detector in the software database. When used as a duct detector it shall support the use of a remote test switch and LED indicator.
- C. Heat Detectors, Intelligent, Electronic Thermistor Type shall be rated at 135 degrees and 15 degrees per minute rate of rise. Detectors shall be constructed to compensate for the thermal inertia inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135 degrees Fahrenheit.
 - 1. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.
 - The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet for use in environments as covered by Factory Mutual and "UL" (UQGS) and shall be installed according to the requirements of NFPA 72 for open area coverage.
- D. Detector bases shall be low profile twist lock type with screw clamp terminals and self wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box. Bases shall be supplied with the following features as required for performance to this specification.
 - 1. Detector relay base with software programmed addressable relay integral to the base.
- E. The manual pull station shall be addressable and semi flush mounted. Where surface mounted is required supply the manufacturers surface mount box.
 - 1. Furnish a double action pull station.
 - 2. Furnish with clear, tamper proof polycarbonate shield and frame that fits over the pull station. Provide with the optional horn.
- F. Smoke Detector/Carbon Monoxide (CO) Detector

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- Smoke Detector/Carbon Monoxide Detector shall be listed to UL 268 and UL 2075 for Carbon Monoxide Gas Detection.
- 2. The Detector shall be photoelectric smoke sensing and electrochemical CO sensing and equipped with a sounder capable of Temp 3 and Temp 4 audible signals.
- 3. The Detector shall have nominal sensitivity of 2.5% per foot as measured in the UL smoke box.
- 4. The Detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms.
- 5. The Detector's base shall be able to mount to a single-gang electrical box or direct (surface mount) to the wall or ceiling.
- 6. The Detector shall provide LED indication that blinks to indicate normal standby, smoke alram, smoke maintenacne, CO alarm, CO trouble/end-of-life. When the detector is in CO trouble conditon, it shall send a trouble signal to the panel.
- 7. The Detector shall provide a means to test CO gas entry into the CO sensing cell. The detector shall provide this with a test mode that accpets CO gas from a test agent and alarms immeditately upon sensing CO entry. The 2-wire model shall include a maintenance signal to indicate the need for maintenance at the alarm control panel and shall provide a loop testing capability to verify the circuit without testing each detector individually.
- 8. The Detector shall have a replaceable CO cell that can be replaced at end of cell life.

2.7 NOTIFICATION APPLIANCES

- A. The speaker/strobe or speaker appliance as indicated on the drawings shall be a multiple tap speaker. The S-LP series having taps for ¹/₄, ¹/₂, 1 and 2 watts. The S-HP series having taps for 1/16, 1/8, ¹/₄, ¹/₂, 1, 2, and 4 watts. The speaker/strobes shall have a synchronized strobe light with multiple candela taps to meet the intended application. The strobe light taps shall be adjustable for 15/75, 30/75, 75, and 110 candela. The appliance shall be red for wall mounting and white for ceiling mounted. Ceiling mounted appliances shall be rated for that application.
- B. The strobe only appliance as indicated on the drawings shall be a synchronized strobe light with multiple candela taps to meet the intended application. The strobe light taps shall be field adjustable for 15/75, 30/75, 75, and 110 candela. The appliance shall be

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red for wall mounting and white for ceiling mounted. Ceiling mounted appliances shall be rated for that application.

C. An alarm extender panel shall be provided where needed. The power supply shall be a minimum of 6 amps. The power supply shall contain four supervised notification circuits maximum of 3 amps each circuit. The power supply shall contain built-in synchronizing modules for strobes and audibles. There shall be a 3 amp filtered auxiliary power limited output. There shall be a minimum of 8 options as to the operations of the inputs and outputs. Locate away from any sources of heat.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Perform work in accordance with the requirements of NFPA 70, NFPA 72.
- B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.
- C. In the event that limited energy cable installation is allowed under Division 26, all cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 8 feet and shall be plenum rated.
- D. All necessary devices and wiring which are necessary for a complete, acceptable system shall be supplied regardless whether shown on the plans or not.
- E. Provide all wiring necessary to connect the control panel to a monitoring service. Coordinate connection with the Owner.
- F. Provide wire guards to protect all devices installed in gymnasiums and areas subject to physical abuse.

3.2 BOXES, ENCLOSURES AND WIRING DEVICES

- A. Boxes shall be installed plumb and firmly in position.
- B. Extension rings with blank covers shall be installed on junction boxes where required.
- C. Junction boxes served by concealed conduit shall be flush mounted.
- D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.

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- E. Provide all working necessary to connect the control panel to a monitoring service. Coordinate connection with the Owner.
- F. All low voltage systems conduit shall be painted blue.

3.3 CONDUCTORS

- A. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.
- B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer. All wiring is to be plenum rated.
- C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits; 18 AWG twisted shielded, speaker circuits; 18 AWG twisted, telephone circuit; 18 AWG twisted shielded.
- D. All splices shall be made using solderless connectors. All connectors shall be installed in conformance with the manufacturer recommendations.
- E. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.
- F. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.
- G. A consistent color code for fire alarm system conductors throughout the installation.
- H. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.4 DEVICES

- A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.
- B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.
- C. All devices and appliances shall be mounted to or in an approved electrical box.

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3.5 CERTIFICATE OF COMPLIANCE

A. Complete and submit to the Project Engineer in accordance with NFPA 72, most current edition adopted by the Authority Having Jurisdiction.

3.6 FIELD QUALITY CONTROL

- A. Testing, general
 - 1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
 - 2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
 - 3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
 - 4. Test reports shall be delivered to the acceptance inspector as completed.

3.7 ACCEPTANCE TESTING

- A. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.
- B. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.
- C. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
 - 1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, shorted and grounded signal line circuits.
 - b. Open, shorted and grounded notification, releasing circuits.

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- c. Primary power or battery disconnected.
- 2. System notification appliances shall be demonstrated as follows:
 - a. All alarm notification appliances actuate as programmed
 - b. Audibility and visibility at required levels.
 - c. Voice Intelligibility testing.
- 3. System indications shall be demonstrated as follows:
 - a. Correct message display for each alarm input at the control display.
 - b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
 - c. Correct history logging for all system activity.
- 4. System off-site reporting functions shall be demonstrated as follows:
 - a. Correct zone transmitted for each alarm input
 - b. Trouble signals received for disconnect
- 5. Secondary power capabilities shall be demonstrated as follows:
 - a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - b. System primary power shall be restored for forty-eight hours and systemcharging current shall be normal trickle charge for a fully charged battery bank.
 - c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.8 DOCUMENTATION

- A. System documentation shall be furnished to the Owner and Authority Having Jurisdiction and shall include, but not be limited to, the following:
 - 1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM with copies of the record drawings in PDF format.

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- 2. System operation, installation and maintenance manuals.
- 3. System matrix showing interaction of all input signals with output commands.
- 4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
- 5. System program showing system functions, controls and labeling of equipment and devices.
- 6. Documentation of voice evacuation intelligibility test, and demonstration.

3.9 SERVICES

- A. The Contractor shall warrant the entire system against mechanical and electrical defects for a period described in the contract general conditions. This period shall begin upon completed certification and test of the system or upon first beneficial use of the system, whichever is earlier.
- B. The fire alarm system subcontractor or manufacturer shall offer for the Owner's consideration at the time of system submittal a priced inspection, maintenance, testing and repair contract in full compliance with the requirements of NFPA 72.
- C. The Owner shall have the option of renewing at the price quoted for single or multiple years up to five years.
- D. The Contractor performing the contract services shall be qualified and listed to maintain ongoing certification of the completed system to the UL for specific installed system listing.
- E. The installation contractor shall furnish training as follows for a minimum of four employees of the system user:
 - 1. Training in the receipt, handling and acknowledgement of alarms.
 - 2. Training in the system operation including manual control of output functions from the system control panel.
 - 3. Training in the testing of the system including logging of detector sensitivity, field test of devices and response to common troubles.
 - 4. The total training requirement shall be a minimum of two hours, but shall be sufficient to cover all items specified.

END OF SECTION

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SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Protecting existing vegetation to remain.
- 2. Removing existing vegetation.
- 3. Clearing and grubbing.
- 4. Stripping and stockpiling topsoil.
- 5. Removing above- and below-grade site improvements.
- 6. Disconnecting, capping, or sealing site utilities.
- 7. Temporary erosion and sedimentation control.

1.2 RELATED SECTIONS

- A. 015639 TEMPORARY TREE AND PLANT PROTECTION
- B. 015713 TEMPORARY EROSION AND SEDIMENT CONTROL
- C. 312000- EARTH MOVING

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

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- 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentationcontrol and plant-protection measures are in place.
- E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 **PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and

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walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLAN PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.

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- 2. Use only hand methods or air spade for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip as necessary to remove topsoil, roots, and organic materials to a minimum depth of 6 inches from existing grade in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

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SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Excavating and filling for rough grading the Site.
- 2. Preparing subgrades for, slabs-on-grade, walks, pavements, turf, and grasses, and plants.
- 3. Excavating and backfilling for buildings and structures.
- 4. Drainage course for concrete slabs-on-grade.
- 5. Subbase course for concrete walks, pavements.
- 6. Subbase course and base course for asphalt paving.
- 7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

- 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hotmix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre-excavation conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material test reports.

1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- B. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
 - 1. Arkansas Highway and Transportation Department Class 7 Aggregate Base Course (ABC)
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 <u>ACCESSORIES</u>

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 **PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 - 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITIY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 321313 " Concrete Pavement."
- D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 321313 " Concrete Pavement."
- E. Initial Backfill: Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontals so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698/ASTM D 1557.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

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SECTION 31 21 16

TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavating trenches for piped utilities.

B. Related Sections:

1. Section 312000 – Earthwork: For backfilling and compaction of utility trenches.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

- 1. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- 2. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
- 3. ASTM D1556 Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
- 4. ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
- 5. ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- 6. ASTM D6938 10 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 013000 – Administrative Requirements: Requirements for submittals.

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B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable codes, and City of Bentonville Ordinances.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Arkansas.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
 - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with qualified operator to establish lines and grades.

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3.2 PREPARATION

- A. Call "One Call", the local utility information service at 811 not less than three (3) working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

- A. Excavate subsoil required for utilities to utility service.
- B. Remove lumped subsoil, boulders, and rock up of 1/6 of a cubic yard measured by volume. Remove larger material as specified in Section 312000 as rock excavation.
- C. Perform excavation within 24 inches of existing utility service and in accordance with utility's requirements.
- D. Do not advance open trench more than 200 feet ahead of installed pipe.
- E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
- F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.
- G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe utilities.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

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- J. When subsurface materials at bottom of trench are loose or soft, [excavate to greater depth as directed by notify Engineer, and request instructions.
- K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with satisfactory fill material as defined in Section 312000, Earthwork and compact to density equal to or greater than requirements for subsequent backfill material.
- L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- M. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with satisfactory fill as directed by Engineer.
- N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

- A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
- C. Design sheeting and shoring to be removed at completion of excavation work.
- D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- E. Repair damage to [new] [and] [existing] Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Refer to Drawings and Section 312000, Earthwork for backfill procedure and materials for various pipe types.
- D. Employ placement method that does not disturb or damage utilities in trench.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.

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- F. Do not leave more than 50 feet of trench open at end of working day.
- G. Protect open trench to prevent danger to the public.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.7 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Basis of acceptance shall include but not be limited to compacted density performed as specified herein.
 - 1. Perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method) or ASTM D 6938.
- B. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, Contractor shall perform additional compaction and testing, at his expense, until specified density is obtained.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes construction dewatering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide temporary grading to facilitate dewatering and control of surface water.
- B. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls," Section 311000 "Site Clearing," during dewatering operations.

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3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.
- C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION

31 23 19-2

SECTION 31 50 00

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.3 INFORMATIONAL SUBMITTALS

- A. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.4 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
 - 1. Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.

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PART 3 - EXECUTION

3.1 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to dpths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.2 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.
- B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.3 TIEBACKS

- A. Drill, install, grout, and tension tiebacks.
- B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.
 - 1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.
- C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

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3.4 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
 - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

3.6 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
 - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION

31 50 00-3

SECTION 32 05 23

CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Sections:1. 312000 EARTH MOVING

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material certificates.
- C. Material test reports.
- D. Floor surface flatness and levelness measurements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
 - 2. Manufacturer shall provide concrete mix designs stamped and sealed by a licensed professional Engineer licensed in the State of Arkansas.

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- B. Testing Agency Qualifications: An independent agency, approved by Owner and Engineer qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Testing Agency shall be managed by a licensed professional engineer licensed in the State of Arkansas.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code Reinforcing Steel."
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Concrete Testing Service: Engage and provide a qualified independent testing agency to perform material evaluation tests and to sample and test concrete mixtures.
- F. Preinstallation Conference: Conduct conference at Project site.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 - 1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class I or Class II, as approved, zinc coated after fabrication and bending.
 - 2. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

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- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.
- F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain or deformed steel, as approved.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or Type II gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
- C. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
- E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlappolyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

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- G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Concrete mixture designs shall be stamped and signed by a registered professional Engineer registered in the State of Arkansas.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures with approval from Engineer and according to manufacturer's written instructions.
 - 1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
- D. Proportion normal-weight concrete trail and pavement mixture as follows:
 - 1. Minimum Compressive Strength: 3500 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.


- E. Proportion normal-weight concrete bridge pier, abutment and structure mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.



3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Concrete shall not be placed on top of mud, standing water, ice, trash, debris or anything other than the specified subbase material.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

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- 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- D. Cold-Weather Placement: Comply with ACI 306.1.
- E. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 - 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

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- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

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- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project].
- 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- 3.11 FIELD QUALITY CONTROL
 - A. Testing and Inspecting: Engage and provide a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - B. Sample concrete materials for slump, temperature and strength testing as required by ACI 301.
 - C. Provide one (1) set of concrete tests for each 50 cubic yards of material or fraction thereof.
 - D. Concrete test samples shall include four concrete cylinders for strength testing; one to be tested at 7 day, two to be tested at 28 day, and one spare to be tested at 56 days as required.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course for Portland cement or asphalt concrete paving.

1.2 RELATED SECTIONS

- A. Section 312000: Earthwork
- B. Section 321216: Asphalt Pavement
- C. Section 321313: Concrete Pavement

1.3 REFERENCES

- A. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
- B. ASTM D1557 Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 10lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- C. ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- D. ASTM D6938 10 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Class 7 Base Course: Crushed stone base material with the following gradation:

SIEVE (mm)	Class 7
	Percent Passing
3" (75)	-
22.11.22.1	

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2" (50)	-
1½" (37.5)	100
1" (25.0)	60 - 100
³ ⁄ ₄ " (19.0)	50 - 90
3/8" (9.5)	-
#4 (4.75)	25 - 55
#10 (2.00)	-
#40 (0.425)	10 - 30
#200 (0.075)	3 - 10

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate to a maximum compacted thickness of 6 inches per lift.
- B. Level and contour surfaces to elevations and gradients indicated.
- C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

- A. Flatness: Maximum variation of ¹/₄ inch measured with 10 foot (3 m) straight edge.
- B. Scheduled Compacted Thickness: Within ¹/₄ inch.

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C. Variation From Design Elevation: Within ¹/₂ inch.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1557 and ASTM D6938, as indicated.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: One per lift per 2,500 square feet or as otherwise recommended by the Geotechnical Engineer.

END OF SECTION

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SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:1. Hot-mix asphalt paving.
- B. Related Sections:1. Section 321123 Aggregate Base Course, for aggregate subbase and base courses.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: For each job mix proposed for the Work.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material, from manufacturer.

1.4 QUALITY ASSURANCE

A. Allowable Tolerances:

- 1. Subgrade after fine grading:
 - a. Shall not vary more than 0.05 feet from plan elevation.
- 2. Aggregate base:
 - a. Shall not vary more than 0.05 feet from plan elevation.
- 3. Asphalt concrete hot mix binder course:
 - a. Shall not vary more than 0.04 feet from the plan elevation.
 - b. Shall not vary more than 0.04 feet from specified thickness.
- 4. Asphalt concrete hot mix wearing course:
 - a. Shall not vary more than 0.03 feet from the plan elevation.
 - b. Shall not vary more than 0.02 feet from specified thickness.
 - c. Shall not vary more than 0.015 feet from the edge of a 10 foot straight edge laid thereon parallel to or at right angles to the direction of paving.

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- 5. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
 - a. Test and Design Mix Criteria:
 - 1) Contractor, at his expense, shall employ the services of an independent testing laboratory to perform tests and design mixes. Materials and mix designs shall be approved at least 10 days before starting of construction.
 - a) Aggregate tests (Aggregate Base Course):
 - b) The material to be used for the aggregate base course shall conform to Section 321123, Aggregate Base Course.
 - c) Preliminary job mix formula (Asphalt Concrete Hot Mix Surfacing):
 - 1. A preliminary job mix formula shall be developed for the asphalt concrete hot mix surfacing material in accordance with AASHTO MP 2 or equal to AHTD requirements.
 - 2. Resubmit a new job mix formula for OWNER'S approval if it becomes necessary to change the source of aggregates or when unsatisfactory results or other conditions warrant a change in mixture requirements.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Tack Coat: Minimum surface temperature of 60 deg F
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Bitumen for Binder Course and Surface Course: AASHTO M 320, PG 76-22
- B. Bituminous Tack Coat: CSS-1, CSS-1h, RC-70, MC-250, or OWNER approved equal.

2.3 MIXES

A. Hot-Mix Asphalt: Each mix design shall be prepared by laboratory analysis. Each mix design will establish a mix gradation for the aggregates (based on the weight of material passing specified screen sizes), an optimum asphalt binder content (expressed as a percentage of the total mix weight), an optimum laboratory mixing temperature, and an optimum laboratory compaction temperature. Optimum laboratory mixing and compaction temperatures shall be established based on temperature-viscosity curves of the asphalt binder to be used in the mix. The optimum asphalt content is the asphalt binder to be used in the mix. The optimum asphalt content is the asphalt binder content at 4% Air Voids (AV) for PG 76-22 mixes and 4.5% Air Voids (AV) for PG 64-22 and PG 70-22 mixes. The mix design will be designed in accordance with the volumetric mix design procedures contained in AASHTO MP 2 and its referenced standards or equal to AHTD specified mix designs.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

- A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000.
- B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with granular fill as defined in Section 312000 and compact as specified in Section 312000.

3.2 AGGREGATE BASE

- A. Where required, construct the aggregate base as shown on Drawings on the prepared subgrade as soon as possible after final shaping and compaction of the subgrade is completed.
- B. Construction requirements shall be compacted to a density of at least 95 percent as defined by ASTM D1557 (Modified Proctor).
- C. Density tests shall be taken as specified in Section 312000 and no bituminous layer shall be applied on the aggregate base course until it is approved by OWNER.

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3.3 BITUMINOUS TACK COAT

A. Apply a bituminous tack coat to an existing bituminous surface if it has been dirtied by traffic or by other means just before constructing another bituminous course. The face of all concrete surfaces to which the bituminous surface will come in contact with shall be sprayed or painted with tack oil.

3.4 BITUMINOUS BINDER COURSE

A. Construct a plant mixed bituminous binder course as shown on Drawings using a mechanical paver.

3.5 BITUMINOUS WEARING COURSE

A. Construct a plant mixed bituminous wearing course as shown on Drawings using a mechanical paver.

3.6 FIELD QUALITY CONTROL

A. From time to time during progress of the work and/or upon completion of the work, OWNER may require that testing be performed to determine that materials provided for the work and its installation meets the specified requirements.

3.7 DEFECTIVE WORK

- A. When tests and inspections of the aggregate base and/or bituminous work indicate noncompliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance, the area is considered defective and Contractor shall:
 - 1. Remove and replace defective work at no cost to OWNER;
 - 2. Correct the work at no cost to OWNER in a manner acceptable to OWNER; or
 - 3. Give OWNER a credit towards the Contract Price if said credit is acceptable to OWNER.

3.8 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

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- 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
- 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.9 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Replace and compact hot-mix asphalt where core tests were taken.

END OF SECTION

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SECTION 32 13 13

CONCRETE PAVEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Furnish and construct all exterior portland cement concrete as shown on Drawings and herein specified.
 - 1. Work to be included under this Section shall consist of the following:
 - a. Driveways, fire access lanes, dumpster approach, sidewalks, and any concrete pavement specified on the drawings.
- B. Related Work Specified Elsewhere:
 - 1. Section 312000: Earthwork
 - 2. Section 321216: Asphalt Pavement

1.2 QUALITY ASSURANCE

- A. Qualifications of Installers:
 - 1. Provide at least 1 person at all times during execution of this portion of Work and who is thoroughly familiar with the type of materials being installed and is directly responsible for all Work performed under this Section.
- B. Requirements of Regulatory Agencies:
 - 1. It is Contractor's responsibility to comply with the requirements of the regulatory agencies, including the purchase of any permits at their own expense.
- C. Construction Tolerances:
 - 1. Vertical alignment shall not vary more than 1/8 inch from the edge of a 10-foot straight edge.
 - 2. Horizontal alignment shall not vary more than 1/2 inch from the plan alignment for pavement.
 - 3. Concrete thickness shall not be less than specified.
 - 4. Reinforcing bars shall be placed to the following tolerances:
 - a. Clear distance to formed surface, plus or minus ¹/₄ inch.
 - b. Sheared length, plus or minus 1 inch.
 - c. Concrete cover on top bars in slabs and beams 8 inches deep or less, 2 inches plus or minus 1/4 inch.
 - d. Concrete cover on top bars in members 8 inches to 24 inches deep, 2 inches plus or minus 1/2 inch.
 - e. Crosswise or lengthwise spacing, plus or minus 2 inches provided minimum spacing and cover requirements are not violated.

- D. Referenced Standards:
 - 1. The current editions of the following American Concrete Institute (ACI) publications shall govern all Work performed hereunder, unless otherwise specified:
 - a. Recommended Practice for Concrete Floor and Slab Construction ACI 302.
 - b. Recommended Practice for Hot Weather Concreting ACI 305.
 - c. Recommended Practice for Cold Weather Concreting ACI 306.
 - d. Recommended Practice for Construction of Concrete Pavements and Concrete Bases ACI 316.
 - e. Building Code Requirements for Reinforced Concrete ACI 318.
- E. Design Criteria:
 - 1. Contractor shall employ an approved independent materials testing laboratory and pay for the service of setting up the design mixes and to analyze the fine and coarse aggregate for the various uses of concrete utilized on the project. Design mixes shall be in accordance with the previously cited ACI 318 publication and in compliance with this Specification. The proposed mixes shall be submitted to OWNER for approval prior to placing of any concrete. The approved mixes established by the laboratory shall be used in the Work as long as the characteristics of the ingredients remain unchanged. If any significant change is made in the ingredients, new mixes shall be prepared and submitted to OWNER for approval.
 - 2. Concrete shall consist of a minimum 28 day compressive design strength of 4,000 psi using portland cement, aggregate, air entraining admixture, water and an air content ranging from 5 to 7 percent. Slump of concrete shall have a range of 2 to 4 inches.
 - a. If any of the conditions vary from those as described, Contractor shall submit a revised mix design prepared by the testing laboratory along with a written request for the variance desired to OWNER for their consideration and approval.
 - b. Concrete for portions of the structure required to be watertight, such as water storage, pumpstation wetwells and waste treatment tanks, shall be air-entrained and have a water-cement ratio not exceeding 0.48.
 - c. Admixtures shall be used only with the approval in writing by OWNER. All admixtures shall be used in accordance with the manufacturer's instructions and shall be added at the plant. Calcium chloride shall not be used as an admixture.
 - d. Mix designs shall be based on Type I cement. Type III (high early) cement or any other types of cement shall be used only when approved in writing by OWNER. When high-early cement is used, the 7-day strength test shall exceed the specified 28-day strength tests.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Prepare and submit product data for OWNER'S approval. Product data shall include manufacturer's recommended installation instructions.

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B. Samples:

1. If requested by OWNER, submit samples for approval of proposed materials.

- C. Certification:
 - 1. Submit 3 copies of certification of material compliance as requested by OWNER.
- D. Delivery Tickets:
 - 1. Submit a delivery ticket with each truck load of concrete delivered which indicates OWNER'S design mix, truck number, project number, Contractor, ready mix producer, time of batching and total yards of concrete.
- E. Test Reports and Design Mixes:
 - 1. Submit 3 copies of design mixes and material test reports to OWNER.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Form Material:

- 1. Form material shall be either sound lumber or steel, free of defects and variations in dimensions. The sides of all lumber shall be surfaced and matched to prevent mortar leakage. Metal forms shall be of standard manufacture and need not be new, but shall be free from rust and dirt. Metal forms shall be flat and true to line without punctures. All form material shall be sized and of strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal of same.
 - a. Rigid forms are to be utilized on tangent alignment and curves having a radius of 150 feet or greater.
 - b. Curved forms shall be utilized on the curved Work with a radius of 150 feet or less, and shall consist of flexible spring steel or laminated lumber.
- B. Reinforcement Materials:
 - 1. Reinforcing bars and dowels shall be of new billet steel conforming to ASTM A615, Grade 60 (60,000 psi yield). Sizes of bars shall be as indicated on Drawings or herein specified.
 - a. Dowel bars when used for contraction and expansion joints shall be smooth steel bars coated with a thin uniform coating of liquid asphalt (MC-250) or grease on 1/2 the length of the bar plus 2 inches. In addition, dowel bars for expansion joints shall be furnished with end caps designed with one end closed, a minimum length of 3 inches and be positioned to allow bar movement of not less than 1 inch.
 - b. Dowel bar assemblies may be permitted if fabricated to the width of the pavement section.
 - c. Tie bars for control, longitudinal and construction joints shall be deformed bars.

C. Concrete Materials:

- 1. Portland cement shall conform to ASTM C150.
 - a. Cement shall be a low alkali cement (Type I) containing not more than 0.6 percent by weight of tri-sodium silicate oxide.
- 2. Coarse aggregate shall conform to Size 57 grade requirements of Table 2 of ASTM C33 standard.
- 3. Fine aggregate shall conform to ASTM C33 with fineness modulus not to vary more than 0.20 from value assumed in design mix.
- 4. Water shall be potable, clean and free from deleterious amounts of acid, alkali or organic material.
- D. Admixtures:
 - 1. Air entraining agent shall conform to ASTM C260 and shall be added at the mixer.
 - 2. Water reducing agents, (such as super plasticizers), retarding agents, accelerating agents and all other admixtures, shall require approval by OWNER and if used, shall conform to ASTM C494. In no case shall admixtures be permitted as substitute for cement content specified, unless approved by OWNER.
- E. Expansion Joint Material:
 - 1. Joint filler material shall consist of a non-extruding standard bituminous bound type "Sealtight Asphalt Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois or OWNER approved equal.
 - a. Material shall conform to ASTM D994.
 - 2. Joint filler material shall consist of preformed non-extruded bituminous bound type "Sealtight-Fibre Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois; "Code 1390" as manufactured by W.R. Grace Company, Cambridge, Massachusetts or OWNER approved equal.
 - a. Material shall conform to ASTM D1751.
 - b. Material shall be 1/2 inch thick, unless otherwise noted, of widths equal to slab thickness less 1/2 inch or as otherwise indicated.
 - 3. Joint sealant shall be a single component, polyurethane type "Sikaflex-la" as manufactured by Sika Chemical Corporation, Lyndhurst, New Jersey or OWNER approved equal. Color as selected by OWNER.
- F. Curing Materials:
 - 1. Kraft paper shall be waterproof and nonstaining "Sisalkraft 5K-10" conforming to ASTM C171.
 - 2. Polyethylene film shall be white opaque sheet or roll material not less than 0.006 inch thick (6 mil) conforming to AASHTO-M171.
 - 3. Contractor may at their option use a liquid curing compound for surfaces that will not receive treating oil or waterproofing membrane. Liquid curing compound shall conform to ASTM C309 and shall consist of the following:
 - a. Type 1D, translucent with fugitive dye.
 - b. Type 2, white pigmented, Class B (vehicle solids restricted to all resin).

2.2 **PRODUCTION**

A. Concrete shall be ready-mixed, and shall be batched, mixed and transported in accordance with "Specification for Ready-Mixed Concrete" ASTM C94. The production plant equipment and facilities shall meet the requirements of the National Ready Mixed Concrete Association.

PART 3 – EXECUTION

3.1 JOB CONDITIONS

- A. Hot Weather Conditions:
 - 1. The following precautions shall be adhered to:
 - a. Reject concrete mixture having temperature of 85°F or greater.
 - b. Pre wet subgrade.
 - c. Crushed or flaked ice may be utilized in reducing temperature of mixture.
 - d. If necessary, reduce temperature of reinforcing steel with wet burlap.
 - e. Reduce mixing time (agitating time) in truck to 45 minutes.
 - f. During periods of high winds, shelter windward side with adequate wind breaks.
 - g. Apply no chemical retarder to finished surface unless permission is granted in writing by OWNER.
- B. Cold Weather Conditions:
 - 1. When ambient temperature is 40°F or less, the following precautions are to be adhered to:
 - a. Subbase shall not be frozen.
 - b. Concrete mixture delivered at Worksite shall be 55°F (minimum), 85°F (maximum).
 - c. No calcium chlorides, salts or other chemical accelerators shall be permitted, unless otherwise acceptable in writing by OWNER.
 - d. Concrete surface shall be maintained at a minimum of 50°F with appropriate thermal insulation for a period of 7 days (normal concrete), 3 days (high early-strength concrete).
 - e. Refer to previously cited ACI 306 for minimum thickness of thermal protection required.
 - f. Any concrete that has frozen or disintegrated as a result of freezing shall be removed and replaced at Contractor's expense.

3.2 SUBGRADE PREPARATION

A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000 of this Specification or as indicated on the Drawings.

B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with select fill material and compact as specified in Section 312000.

3.3 GRANULAR BASE

- A. Construct the select fill and granular base as shown on Drawings on the prepared subgrade after the final shaping and compacting of the subgrade is completed.
- B. Compact as specified base in Section 312000 of this Specification.

3.4 FORM CONSTRUCTION

- A. Forms shall have the strength and rigidity, regardless of material, such that when they are set in place and braced, they will withstand weight of equipment and weight of concrete without settlement or lateral displacement.
- B. Keyway forms in the edge of pavement slabs and at construction joints shall be constructed to the dimensions shown on Drawings. Wood keyway forms, if used, shall be bolted or nailed to the side forms. Metal keyway forms shall be fixed or held rigidly in place by staking or other OWNER approved method.
- C. Forms shall be coated prior to the placement of concrete, with a nonstaining form release agent. Wooden form may be prewetted with water. No standing water, adjacent to forms, shall be permitted.

3.5 REMOVAL OF FORMS

- A. Forms for slabs on grade shall not be removed earlier than 12 hours after the placement of concrete has been completed. Within 24 hours of form removal backfill adjacent to the pavement shall be completed.
- B. Forms supporting the weight of concrete shall not be released until the concrete has reached its specified 28-day strength. Minimum time elapse after casting and before the false Work supports are released shall be 8 days for spans up to 96 inches center to center of supports, plus 1 additional day for each 12 inches of increase in span length over 84 inches up to 14 days for span of 14 feet and over. Such time period shall be exclusive of those time intervals during which the concrete surface temperature is below 40°F. If temperature remains below 40°F during the casting and curing period no forms shall be removed until approved field tests indicating adequate concrete strength have been provided.

3.6 REINFORCEMENT PLACEMENT

A. Tie bars, reinforcement bars and dowel bars shall be clean, free from rust and shall be

placed on adequate supports in locations as shown on Drawings. Provide the following minimum thickness of concrete cover:

- 1. Concrete deposited on ground: 3 inches
- 2. Formed surfaces against ground: 1-1/2 inches
- 3. Beams, girders and columns: 1-1/2 inches
- 4. Slabs, walls and joists: 1 inch
- 5. Clear distance between parallel bars: 1 inch or nominal bar distance
- 6. For No. 6 bars or larger: 2 inches
- 7. No broken brick, block or concrete shall be permitted as reinforcement supports.
- B. Welded steel wire fabric shall be placed free from rust, kinks and bends and shall be cut in such a way that the overlap measured between outermark cross wires of each fabric sheet is not less than 2 inches. The fabric shall be cut at contraction joints. It shall be supported by a layer of fresh concrete placed to the depth of the mesh shown on Drawings, followed by placement of the upper layer of concrete.

3.7 CONCRETE PLACEMENT

- A. Place concrete to required depth and width to form a continuous mass requiring a minimum of rehandling. Concrete adjacent to side forms and fixed structures shall be consolidated by means of portable vibrators or by mechanical means with the use of hand spading. Vibrators shall not be used to move concrete horizontally.
- B If it is necessary to place a construction joint prior to a contraction joint, the distance between the construction joint and the previous contraction joint shall not be less than 60 inches.
- C. Automatic machine may be used for curb and gutter placement at Contractor's option, if acceptable to OWNER. If machine placement is to be used, submit revised mix design and laboratory test results, which meet or exceed the minimum herein specified. Machine placement must produce curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.8 JOINTS

- A. General:
 - 1. Construct expansion, contraction and construction joints with face perpendicular to surface of concrete.
 - 2. Where joining existing structures, match existing contraction or expansion joints.
- B. Expansion Joints:
 - 1. All fixed objects, such as buildings and structures or pavement, sidewalks or curb intersections shall be separated by a 1/2 inch expansion joint placed at the full depth

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of the concrete thickness. Expansion joints, in addition to the above, shall be placed at 60 foot intervals in the following:

- a. Concrete curb and gutter
- b. Concrete walk
- 2. For pavement construction, place expansion joints as shown on Drawings.
- C. Contraction Joints:
 - 1. Contraction joints shall be placed at the following intervals and dimensions or as shown on Drawings:
 - a. Concrete curb and gutter -10 feet; 1/8 inch wide by $1 \frac{1}{2}$ inch depth.
 - b. Concrete walk -10 feet; 1/8 inch wide by 1/4 the depth of concrete.
 - 2. Cut plastic concrete with appropriate tool to specified depth. Finish edges with 1/4 inch radius tool.
 - 3. Saw-cut joints to specified width and depth on hardened concrete as soon as concrete has hardened sufficiently to prevent raveling or damage to the joint.
- D. Joint Sealer:
 - 1. Apply joint sealer to a clean and dry expansion or contraction joint if specified to a point approximately 1/4 inch below the top surface. Where oil treatment is specified, joint sealer shall be applied prior to application of the oil.

3.9 CONCRETE FINISH

- A. After initial strike-off and floating, and prior to finishing, test surface with 10-foot straightedge. Correct irregularities prior to final finishing operations.
- B. Apply the following surface finish after surface sheen or excess moisture has disappeared:
 - 1. Apply steel trowel finish followed by stiff-bristled broom drawn across concrete surfaces, perpendicular to line of traffic:
 - a. Sidewalk
 - b. Concrete pavement
 - c. Curb and gutter

3.10 CONCRETE CURING AND PROTECTION

- A. Cure concrete surfaces for 7 days (normal concrete) and for 3 days (high early-strength concrete), using appropriate means of protection as previously cited in ACI 305 and ACI 306.
- B. Curing methods shall consist of one of the following:
 - 1. Keep concrete surface continuously wet by ponding with water.
 - 2. Apply moisture proof fabric to entire area lapping joints and edges at least 3 inches. Tape interior joints and weight edges down with sand or other approved material.

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3. Apply liquid membrane curing compound to the finished surface in a 2 coat continuous operation with second application applied transversely to the direction of the first application, and in accordance with the manufacturer's directions. Replace damaged areas with equal applications of membrane using compound. Liquid membrane curing compound shall not be permitted where the surface will be subjected to an application of waterproof coatings, bonding agents, treating oil or paint.

3.11 TESTING AND EVALUATION

- A. Concrete materials and operations shall be tested and inspected as the Work progresses, by an independent testing laboratory. Contractor shall furnish any necessary labor who is familiar with methods of sampling and shall assist the testing agency in obtaining and handling samples, and for safe storage and proper curing of concrete test specimens on Worksite.
- B. Mold and cure three standard 6-inch diameter specimens from each sample in accordance with ASTM C31. Compressive strength test specimens shall be in accordance with ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. The acceptance test results shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded. When high-early strength concrete is used, the first specimen shall be tested at 3 days; the remaining two at 7 days.
- C. Make at least one strength test for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one day.
- D. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using standard slump cone as per ASTM C143.
- E. The testing laboratory shall report all test and inspection results to OWNER, OWNER'S Engineer, and Contractor immediately after they are performed. All concrete test reports shall include name of job, date of placement, date of test, batch mix design, slump and the exact location in the Work at which the batch represented by the test was deposited.
- F. All costs necessary to prepare concrete test cylinders, make tests and furnishing of written reports shall be borne by the Contractor.

3.12 DEFECTIVE WORK

A. When tests and inspections of the aggregate base and/or concrete Work indicate non-

compliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance the area is considered defective and Contractor shall:

- 1. Remove and replace defective Work at no cost to OWNER;
- 2. Correct the Work at no cost to OWNER in a manner acceptable to OWNER;
- 3. Give OWNER a credit towards the Contract Price if it is acceptable to OWNER;
- 4. If Work is found to be in noncompliance, Contractor shall pay for the defective area removal and replacement, and the tests and inspection costs; or
- 5. If Work is found to be in compliance, OWNER shall pay for tests and inspection costs.

END OF SECTION

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SECTION 32 13 73 CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Hot-applied joint sealants.
 - 3. Joint-sealant backer materials.
 - 4. Primers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each kind and color of joint sealant required.
- C. Paving-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

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PART 2 - PRODUCTS

1.5 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

1.6 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
- C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.
- D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
- E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

1.7 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.
- B. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I or Type II.
- C. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I, II, or III.
- D. D 6690, Type IV.

1.8 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

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- B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

1.9 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

1.10 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Cleaning of Joints: Clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
- C. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer.
- D. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- E. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- F. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact joint substrates.
 - 2. Completely fill recesses in each joint configuration.

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- 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 - 1. Remove excess joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- H. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.
- I. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

END OF SECTION

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SECTION 32 16 13

CONCRETE CURB AND GUTTER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - A. Cast in place concrete curb and gutter.
 - B. Cast in place ribbon curb.

1.2 RELATED SECTIONS

- A. 033000 CAST IN PLACE CONCRETE
- B. 312000 EARTH MOVING

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 QUALITY ASSURANCE

- A. Perform cast-in-place concrete in accordance with ACI 301 and Section 033000.Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 1. Standard Specifications for Highway construction, Edition of 2003, hereafter referred to as "AHTD Standard Specifications".

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ready Mixed concrete: ASTM C94 and Articles 2.01 through 2.11 of Section 033000.
- B. Curing Compound: ASTM C309
- C. Pre-formed expansion joint fillers: ASTM D1751.

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1. Thickness: One-half (1/2) inch.

PART 3 - EXECUTION

3.1 PREPARATION

A. Grade subgrade and compact in same manner and density as specified in Section 312000

3.2 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:

- 1. Ensure that excavation and formwork are completed and within the allowed tolerances.
- 2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
- 3. Check that reinforcement is secured in place.
- 4. Verify that insulation, anchors, and other embedded items are secured in position.
- C. Install concrete work in accordance with ACI 301-99 except as amended by this section.

3.3 INSTALLATION

- A. Retain this article if required. If retaining, Drawings should show tree- and plant-protection zones and protection-zone fencing.
- B. Cast in place concrete: Refer to Section 033000.
 - 1. See Detail Drawings for Curb and Gutter, Ribbon Curb, and for Handicap Ramp.
 - 2. Prepare subgrade in accordance with Section 312000.
 - 3. Set forms to line and grade.
 - 4. Install forms over full length of curb.
 - 5. Form contraction joints at maximum 10 feet spacing using steel templates, division plates or saw cuts.
 - 6. Remove templates or plates as soon as concrete has hardened sufficiently to retain its shape.
 - 7. Install preformed expansion joint fillers at maximum 60 feet spacing, at curb returns, and behind curb at abutment to sidewalks and other structures.
 - 8. Place top of expansion joint material ¹/₄ inch below curb surface.
 - 9. Place concrete in position without separation of concrete materials.
 - 10. Consolidate concrete with mechanical vibrators.

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- 11. Round face of curbs at top with finishing tool of correct radius.
- 12. Finish exposed surfaces with wood float followed by light brushing with broom.
- 13. Apply curing material and cure for seven days.
- 14. DO NOT rub concrete, patch before curing.
 - a. Repair of surface defects: Comply with requirements within Section 033000
 - b. Field Quality Control: Comply with requirements within Section 033000
 - c. Protection of Completed Work
 - 1. It is the contractor's responsibility to protect all work until Final Acceptance. Repair or replace all work deemed unacceptable by Engineer at Contractor's expense.

END OF SECTION

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. It is the intent of this Specification that a finished system is complete in every respect and shall be ready for operation satisfactory to the Landscape Architect and Owner. The design is to be delegated by the contractor and approved by the Landscape Architect.
- B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated in these Specifications, and as necessary to complete the contract.
- C. Section Includes:
 - 1. Pipe and fittings, valves, outlets, backflow preventer, and accessories.
 - 2. Connection to utilities and meter installation.
 - 3. Automatic control system.

1.02 REFERENCES, DEFINITIONS AND APPLICABLE STANDARDS

- A. ASTM D 1785 Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)
- B. ANSI/ASTM D 2564 Solvent Cement for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.
- C. Reference and comply with applicable plumbing codes, standards, or specifications by building code or governing utility authority for the project location.
- D. Rain Bird Irrigation Installation Details and Specifications.
- E. Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- F. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote control, signaling power-limited circuits.
- G. Notice of Completion: The date at the close of the Maintenance Period when the work has been completed, checked, accepted, and written approval of the work has been given by the Architect.
- H. Date of Acceptance: The date at the end of the warranty periods as specified herein, and written acceptance has been given by the Architect.
- I. Finish Grade: Elevation of finished surface of planting soil within 1/10th of an inch.

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

1.03 GENERAL DESIGN SYSTEM REQUIRMENTS

- A. Contractor's delegated design for an automatic 2-wire system, electric valve, irrigation system with 100 percent coverage and minimal over spray onto buildings and paved surfaces to meet the following design standards:
 - 1. Compliance with all applicable plumbing codes for the project location.
 - 2. Irrigation water meter and tap to be provided as part of the irrigation system. Meter size and location to be determined by contractor's system design and coordination with owner and general contractor.
 - 3. General Contractor to provide irrigation system sleeving under pavement crossings at the locations and sizes shown in the irrigation shop drawings. Coordinate with General Contractor to provide any additional sleeves that may be necessary.
 - 4. Provide backflow preventer assembly with insulated housing. Provide automatic controller, control wiring, and hardwired connections to power source. Coordinate controller location with owner, general contractor and electrical contractor.
 - 5. Provide wireless rain and heat sensor device to shut off, delay, and adjust watering cycle times.
 - 6. Pipe sizing must provide for a maximum velocity of 5 feet per second and must provide adequate pressure delivery at all heads for proper performance.
 - 7. Provide separate valve zones for turf and planted bed areas.
 - 8. Provide pop-up spray and/or rotor type outlets for turf areas.
 - 9. Space spray and/or rotor type outlets to provide near 100% overlapped coverage between each outlet.
 - 10. Provide drip irrigation for planted bed areas.
 - 11. Provide drip pop up indicators at all drip areas.
 - 12. Provide additional drip emitters for trees in drip zone areas.
 - 13. Coordinate the locations of controller and backflow preventers to minimize visibility and screen with landscape materials where possible.
 - 14. Piping to be located along back of curbs, pavement edges, and bed edges.
 - 15. Spray from perimeter of areas where feasible.
 - 16. Provide 100% coverage of all newly planted landscape areas on site and in adjacent street rights-of-way and/or other areas as indicated in the Landscape Plan.
 - 17. Provide manual drain valves and sumps, or piped connections to drainage system in sufficient locations to drain the entire system for winterizing.
 - 18. Provide valve boxes and covers at all locations described. Align all valve boxes parallel or perpendicular to adjacent hardscape where applicable.
 - 19. Minimize the number of outlets, trenching, and pipe installation where possible.

1.04 PRE-CONSTRUCTION SUBMITTALS

A. Contractor to provide a delegated design for a fully automated 2- wire irrigation system to be review and approved by the Landscape Architect through shop drawings.

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

- B. Product Data:
 - 1. Prior to ordering of any materials, and for each type of product indicated provide submittals for acceptance by the Landscape Architect. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. The submittals shall include the following information:
 - a. A title sheet with the job name, the Contractor's name, address and telephone number, submittal date and submittal number.
 - b. Shop Drawings with the following clearly indicated: Irrigation layout plan showing the sleeving locations, mainline routing, lateral line routing, controller location, meter location, backflow location and head or drip line locations.
 - c. An index sheet showing the item number (i.e. 1, 2, 3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Rain Bird); the item model number (i.e. 44DLRC); and the page(s) in the submittal set that contain the catalog cuts.
 - d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled or highlighted on the catalog cuts.
 - e. Submittals for equipment shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.
 - 3. Submittal format requirements:
 - a. Submittals shall be provided as one complete package for the project. Multiple or partial submittal packages will not be reviewed.
 - b. Submittal package shall be submitted as a single PDF file.

1.05 POST CONSTRUCTION SUBMITTALS

- A. Record Drawings
 - 1. Record accurately on one set of drawings all changes in the work constituting departures from the original approved Shop Drawings and the actual final installed locations of all required components as shown below.
 - 2. Record Drawings shall be prepared to the satisfaction of the Architect. Prior to final inspection of work, submit Record Drawings to the Architect.
 - 3. Show locations and depths of the following items:
 - a. Point of connection (including water POC, basket strainer, pressure regulator, master control valve, flow sensors, etc.)
 - b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing.)
 - c. Isolation valves.
 - d. Mainline air release valves.
 - e. Automatic remote-control valves (indicate station number and size.)

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

- f. Quick coupling valves.
- g. Routing of control wires where separate from irrigation mainline.
- h. Irrigation controllers
- i. Related equipment (as directed)

B. Controller Charts:

- 1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.
- 2. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness. The contractor is to provide a minimum of three (3) copies to the owner.

1.06 FIELD QUALITY CONTROL

- A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.
- B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the Specifications.
- C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out. Anything contained in these Specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these Specifications call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these Specifications shall take precedence.
- D. Materials supplied for this project shall be new and free from any defects. Defective materials shall be replaced immediately at no additional cost.
- E. Secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.
- F. Acquire certificate of compliance from local authority indicating approval of backflow preventer installation.

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

1.07 FIELD MEASUREMENTS

A. Verify that field conditions are as shown in the drawings. Revise design and record drawing as required.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.
- C. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.
- D. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and at no additional cost.

1.09 PROJECT CONDITIONS

- A. Verify and determine the locations, size and detail of points of connection provided as the source of water and electrical supply to the irrigation system.
- B. Irrigation design shall be based on the available water pressure. Verify the dynamic water required is available on the project prior to the start of construction. Should a lack of pressure exist to achieve the flow necessary to operate the system, notify the Landscape Architect prior to beginning construction.
- C. Prior to cutting into the soil, locate all cables, conduits, sewer septic tanks, and other utilities that are commonly encountered underground, and take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, promptly notify the Landscape Architect who will arrange for relocations. Proceed in the same manner if a rock layer or any other such conditions are encountered. Call in utility locates prior to all trenching or excavation.
- D. Protect all existing utilities and features to remain on and adjacent to the project site during construction. Repair, at Contractor's own cost; all damage resulting from Contractor's operations or negligence.
- E. Coordinate installation of required sleeving per approved Shop Drawings 32 84 00

LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

- F. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied, unless permitted under the following conditions and then only after arranging to provide temporary water service according to the requirements indicated:
 - 1. Notify Water Utility provider prior to Interruption.
 - 2. Notify Architect no fewer than two working days (48 hours) in advance of proposed interruption of water service.
 - 3. Do not proceed with interruption of water service without the Architect's written permission.

1.10 GUARANTEE

- A. The entire irrigation system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the approved final acceptance.
- B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Landscape Architect. When the nature of the repairs as determined by the Landscape Architect constitutes an emergency (i.e. broken mainline) the Landscape Architect may proceed to make repairs at the Contractor's expense. Damages to existing improvement resulting either from faulty materials or workmanship shall be repaired to the satisfaction of the Landscape Architect by the Contractor, all at no additional cost.
- C. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Rain Bird Corporation, Turf Division: For all irrigation system equipment and accessories.
- B. NDS: For valve boxes.
- C. Wilkins/Zurn: For backflow preventers

2.2 MATERIALS

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

A. Pipe:

- 1. PVC in accordance with ASTM D 1785: PVC Schedule 40 pipe for all sleeving, main lines, lateral lines, and fittings throughout system. Solvent-weld sockets.
- 2. Rigid copper pipe required from tap at public main through backflow preventer.
- B. Fittings: Type and style of connection to match pipe.
- C. Solvent Cement: ANSI/ASTM D 2564 for PVC pipe and fittings.
- D. Tracer Wire: 14 AWG solid copper wire with insulating cover, to be tagged as "Tracer wire" with metal tags. Color of insulating cover must be different from other wiring.

2.3 MATERIALS

A. Turf Outlets:

- 1. Spray Outlets: Pop-up spray bodies, 6 inch minimum to 12 inch riser heights as needed for adequate performance, with installed check valves and pressure regulating devices.
- 2. Stream Rotor Outlets: Pop-up stream rotor bodies, 6 inch and/or 12 inch riser heights as needed for adequate performance, with installed check valves and internal pressure regulating devices. Rotors without internal pressure regulation may be used if combined with a pressure regulating PVC pipe swing joint.

B. Drip System Outlets:

- 1. Drip Line: Pressure compensating surface type installation drip line with flexible tubing, 12 inch emitter spacing, and internal emitter check valves. Anchor line with galvanized wire anchors at 24"-30" spacing. Lines and connector fittings must be capable of operating at 50 PSI without supplementary clamps.
- 2. Drip Emitters: Pressure Compensating drip emitters for additional water to tree placements within drip zones; one drip emitter for each ornamental size tree and two drip emitters for each medium or large size tree. Provide diffuser caps for each emitter.

2.4 BACKFLOW PREVENTERS

- A. Control Valves: Electric solenoid operating valves with glass filled nylon body construction. Size valves for minimum pressure loss for designed flow rate. Provide and install pressure regulating devices for each valve placement.
- B. Backflow Preventer: Wilkins/Zurn: 975XL or 975XLSEU backflow preventer sized for maximum flow in system with a maximum pressure loss limited to 10% of available residual pressure.
- C. Backflow Preventer Housing: DekoRRa model 301/302, Class II, turf brown granite color, anchored to 4" minimum concrete base per manufacturer's details and specifications. Provide minimum size to cover with insulation bag. 32 84 00

LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

2.5 CONTROLS

- A. Controller: Automatic controller for electric valve operation sized for required number of stations, with grounding per manufacturer specifications and hardwired connections to power source.
- B. Controller Housing:
 - 1. Indoor Installations: Wall mount plastic housing with lockable access door. Indoor installations must be able to accommodate wiring or wireless system remote operation of rain and heat sensing device. Coordinate with electrician for power source
 - 2. Outdoor Installations:
 - a. Wall Mount: Stainless steel housing with lockable access door.
 - b. Ground Mount: Stainless steel housing and pedestal with lockable access door.
- C. Accessories: Include required fittings, galvanized metal electrical conduit, and accessories for installation.
- D. Control Wiring: Gauge of wire to be sized by contractor for adequate operation of valves. Use waterproof connectors for all connections. Use different color wire jackets for valve power wires and white jacket for common wire.
- E. System Grounding: Provide grounding at controller and throughout control wiring and valve layout to meet manufacturer's standards with grounding devices as recommended by manufacturer.
- F. Rain and Heat Sensor Device: Wireless automatic, adjustable, shutoff device to disable/delay operations during or after recent rainfall and adjust watering cycle times for local heat and rainfall conditions. Provide and install connection equipment necessary for operation at controller.

2.6 OTHER EQUIPMENT

- A. Swing Joints: Provide PVC pipe swing joints for all full circle rotor outlet placements.
- B. Pressure Regulating Swing Joints: Provide pressure regulating PVC pipe swing joints for all rotor outlet placements without internal pressure regulation.
- C. Valve Boxes and Covers: Valve boxes and covers required for all control valves, drip filters, drain valves, surge protector devices, wiring changes of direction, and wiring junctions.
- D. Drip Filters: Replaceable and/or cleanable sized to match zone flows, installed with valve in valve box.

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

E. Drain Valves: Manual, PVC valves on tees for low points in system.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify location of existing utilities. Repair utilities damaged as a result of this work at no increase in Contract Sum.
- C. Verify that required utilities are available in proper location and ready for use.
- D. Verify available water pressure at meter or backflow preventer locations.
- E. Verify sleeve locations.
- F. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

- A. Layout and stake locations of system components.
- B. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system. Notify Architect/Engineer for approval of field changes to system design.
- C. Coordinate location of controller, rain and heat sensor device, and connections to power source with Owner, General Contractor, and Electrical Contractor.

3.3 TRENCHING

- A. Minimum Trench Depth: Trench depth must provide a minimum of 18 inches of cover over all main lines and wiring and 12 inches of cover over all lateral lines.
- B. Trench to accommodate grade changes and slope to manual drain valves at low points in system.
- C. Maintain trenches free of rocks, obstructions, or other debris that may damage pipe or wiring.
- D. Repair or replace existing improvements damaged by work performed under this contract with equivalent materials or products.

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

3.4 INSTALLATION

- A. Install irrigation sleeving under all pavement crossings and buried at a minimum depth of 18 inches below finish grade. All sleeving trenches must match finish grade and be compacted to minimum subgrade requirements for paving.
- B. Install pipe, backflow preventer, valves, valve boxes, wiring, grounding, drains, controls, and outlets in accordance with all applicable plumbing codes, manufacturer's details, instructions, and minimum standards.
- C. Trenches for irrigation main and lateral lines must match finish grade and be compacted to the degree that no settlement will occur.
- D. Install cast concrete thrust blocking at all piping bends for 3 inch or larger pipe sizes.
- E. Install zone valves with pressure regulating devices in valve boxes per manufacturer specifications and details. Provide metal tag with zone number for each valve.
- F. After piping is installed but before sprinkler heads are installed and trenches backfilled, open valves and flush system with full head of water.
- G. Install spray and rotor outlets with fittings, flex pipe, swing joints, etc. Use threaded connections to lateral lines. Install in accordance with manufacturer's details, instructions and minimum standards.
- H. Install drip lines, emitters, filters, fittings, etc. in accordance with manufacturer's details, instructions and minimum standards. Anchor line with galvanized wire anchors at 3 feet on center, minimum spacing.
- I. Install manual drain valves at system piping low points and pipe connections from valves to site drainage system, or, provide 12" diameter by 24" deep, gravel filled drain sumps where piped connections are not feasible.
- J. Connect to water and electrical services.
- K. Set outlets and box covers at finish grade elevations.
- L. Install control wiring in trenches along with main lines to valves and provide 30-inch expansion coil at each valve and change of direction. Also provide 30-inch expansion coils at 100-foot intervals between valves.
- M. Tracer Wire: Install tracer wire from gate valve at backflow preventer along all main lines to each zone valve. Terminate at valve boxes with 24" wire coil and metal tags labeled as "Tracer Wire."

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LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

- N. Install automatic controller. Provide hardwired connection to power source, enclose wiring to system and power source in rigid metal conduit where exposed. Paint exposed conduit to match building exterior.
- O. Install rain and heat sensor device and wireless connection device to controller. Verify proper operation of device.
- P. Program remote irrigation controller and install connection equipment necessary for operation at controller. Verify proper operation of remote.
- Q. Repair or replace any other work or improvements damaged as a result of work related to system installation at no increase to the Contract Sum.

3.5 FIELD QUALITY CONTROL

A. Prior to backfilling and installation of outlets, cap or plug pipes and test system for leakage. Maintain maximum available pressure for one hour. Piping is acceptable if no leakage or loss of pressure occurs during test period.

3.6 ADJUSTING

- A. Adjust control system to achieve time cycles required for adequate watering at time of installation.
- B. Adjust heads and/or nozzles to achieve proper coverage and performance. Make nozzle or head changes as necessary for proper coverage.
- C. Adjust zone valves for proper operating pressures at valve zones.

3.7 EXTRA MATERIALS

- A. Furnish to Owner the following extra components:
 - 1. Two sprinkler heads of each type and size.
 - 2. Two nozzle inserts for each type and size.
 - 3. Two drip emitters of each type and size
 - 4. Two drip line basket filters of each type and size.
 - 5. Two keys each for valve boxes and controller (if locked boxes are used).
 - 6. Two of any required special tools for adjustment or replacement of each type of outlet, nozzle, valve, and other system equipment.

3.8 CLOSEOUT

A. Provide system demonstration to Owner and Architect/Engineer for review and final 32 84 00

LANDSCAPE IRRIGATION PREFORMANCE SPECIFICATION

acceptance of work. Coordinate demonstration of procedures for winterizing (draining system lines, backflow preventer, etc.) and spring start-up with Owner. Review system operation and components during service visit.

- B. Instruct Owner or representative in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.
- C. Deliver record drawing of system, required operation and maintenance information, extra materials and backflow preventer certificate to Owner at the instruction meeting.

3.9 WARRANTY

- A. Provide one-year materials and workmanship warranty on all system components and installation beginning on date of acceptance of the work.
- B. Replace failed components immediately upon notification by Owner or Architect/Engineer.

END OF SECTION

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SOIL PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete and thorough preparation of the planting soil, including soil amendment products, imported topsoil, as required, to make up deficiencies in quantity of soil available on site, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Agronomic Soil Fertility Testing and Soil Percolation Testing.
 - 2. Topsoil.
 - 3. Pre-Plant Weed Control.
 - 4. Soil Conditioners, Amendments and Fertilizers (Organic & Chemical).

C. Related Work

- 1. Section 31 2000: Earthwork
- 2. Section 32 9300: Exterior Plants
- 3. Section 32 8400: Irrigation Systems
- 4. Section 32 9200: Turf Grasses

1.02 DEFINITIONS AND APPLICABLE STANDARDS

A. References:

- 1. USDA United States Department of Agriculture.
- 2. ASTM American Society for Testing & Materials.
- B. Definitions:
 - Topsoil Shall be friable soil, providing sufficient structure in order to give good tilth and aeration to the soil. Topsoil shall be free of roots, clods, stones larger than one-inch (1") in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, brush and other litter. It shall not be infested with nematodes or other undesirable disease-causing organisms such as insects and plant pathogens.
 - Gradation Limits Soil shall be a sandy loam, loam, clay loam or clay. The definition of soil texture shall be per the USDA classification scheme. Gravel over ¹/₄-inch in diameter shall be less than 20% by weight.
 - 3. Permeability Rate Hydraulic conductivity rate shall be not less than one-inch (1") per hour, nor more than twenty-inches (20") per hour, when tested in accordance with the USDA

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Handbook Number 60, Method 34b, or other approved Methods.

4. Fertility - The range of the essential elemental concentration in soil shall be as follows: (cont. next page)

Ammonium Bicarbonate/			
DTPA Extraction (PPM)			
Element	Concentration	Concentration of	
	of elements for	Elements for Final	
	Soil Selection,	Acceptance	
	measured as	(amended and	
	mg/kilogram	conditioned soil)	
	dry weight	measured as	
	basis	mg/kilogram dry	
		weight basis	
Phosphorus	2 - 40	10 - 40	
Potassium	40 - 220	100 - 220	
Iron	2 - 35	24 - 35	
Manganese	0.3 - 6	0.6-6	
Zinc	0.6 - 8	1-8	
Copper	0.1 - 5	0.3 – 5	
Boron	0.2 - 1	0.2 - 1	
Magnesium	50 - 150	50 - 150	
Sodium	0 - 100	0-100	
Sulfur	25 - 500	25 - 500	
Molybdenum	0.1 - 2	0.1 - 2	

- 5. Acidity The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 7.9.
- 6. Salinity The salinity range measured in the saturation extract (Method 3a, USDA Hand Number 60) shall be 0.5 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milli-equivalents per liter in the saturation extract, the maximum salinity shall be 4.0 dS/m.
- 7. Chloride The maximum concentration of soluble chloride in the saturation extract (Medoth3a, USDA Handbook Number 60) shall be 150 mg/1 (parts per million).
- 8. Boron The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/1 (parts per million).
- 9. Sodium Adsorption Ratio (SAR) The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.
- 10. Aluminum Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 3.0 parts per million.
- 11. Soil Organic Matter Content Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter. The desirable range is 3% to 5%. The carbon:nitrogen ratio should be about 10. A high carbon:nitrogen ratio can indicate the presence of hydrocarbons or non-humified organic matter.

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- 12. Calcium Carbonate Content Free calcium carbonate (limestone) shall not be present in acid-loving plants.
- 13. Heavy Metals The maximum permissible elemental concentration in the soil shall not exceed the following concentrations: (cont. on next page)

Ammonium Bicarbonate/		
DTPA Extraction (PPM)		
Element	(mg/kilogram)	
	dry weight	
	basis	
Arsenic	1.0	
Cadmium	1.0	
Chromium	10.0	
Cobalt	2.0	
Lead	30.0	
Mercury	1.0	
Nickel	5.0	
Selenium	3.0	
Silver	0.5	
Vanadium	3.0	

- a) If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50% to the above values. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75% of the above values. No more than three (3) metals shall be present at 50% or more of the above values.
- Phytotoxic constituent, herbicides, hydrocarbons, etc. Germination and growth of plants shall not be restricted more than 10% compared to the reference soil. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Method No. 8020.
- 15. Sub Grade Soil level resulting from the rough grading work under another Section. Cultivation of sub grade areas prior to placement of Topsoil is included in this Section.
- 16. Stockpiled Topsoil Soil stockpiled for spreading over prepared sub-grade.
- 17. Stockpiled Native Topsoil Topsoil stripped from the site prior to rough grading Work (under another Section), to be spread and amended as Work under this Section.
- 18. Imported Topsoil Off-site Topsoil, imported and stockpiled under this Section, to be spread and amended as Work under this Section.
- C. Measurements:
 - 1. PPM: Measurement, in parts per million.

1.03 QUALITY ASSURANCE

A. Installer Qualifications for requirements indicated herein this Section

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- 1. Licensed Landscape Contractor, in the State of Arkansas.
 - a) Engage an experienced, licensed Contractor who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - b) Installer's Field Supervision: Contractor shall maintain an experienced, full-time landscape supervisor/superintendent at the Project Site during times that landscaping operations identified herein the Contract are in progress.
- B. Manufacturer's Directions: Follow Manufacturer's directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings or Contract Specifications.
- C. Permits, Fees, Bonds, Testing, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing, and inspections necessary to perform and complete his portion of the Work.
- D. Approved Testing Laboratory and Procedures for Agronomic Soil Fertility Analyses:
 - 1. Agronomic Soil Fertility Analyses shall be conducted by a reputable, certified, agronomic soils laboratory. Laboratory shall be a member of the Council on Soil Testing and Plant Analysis. The same laboratory shall be used throughout the duration of the Contract:
 - 2. Contractor shall verify and confirm the selected Testing Laboratory and specific location(s) of soil sample(s) with the Landscape Architect prior to commencing soil sampling operations.
 - 3. For each Soil type, submit the physical Soil Samples directly to the selected Laboratory for analysis, per the procedures outlined per Part III herein this Section.
 - a) In addition to the physical Soil Samples, Contractor shall also provide the Laboratory with a copy of the Soil Amendment and Fertilizer products indicated herein this Section.
 - 4. Along with the testing data results, the Agronomic Soil Fertility Analysis shall also include written recommendations authored by the Laboratory conducting the Analyses for amending, treating, and/or correcting the sampled soils. Laboratory shall utilize the organic-based Soil Amendments and Fertilizers described herein this Section to the greatest extent possible to produce satisfactory planting soil(s) suitable for sustaining healthy viable plant growth.
 - a) The Analyses shall also include Maintenance and Post-Maintenance fertilization programs for planted areas within the Contract.
 - 5. Agronomic Soil Fertility Analyses shall be performed on each Soil Type samples, and include testing results for the following:

pH:		
Electro-conductivity (salinity) measurement – saturated		
extract.		
Measurement of sodicity (Sodium Absorption Ratio);		
Estimate of soil texture and soil organic matter;		
Presence of lime;		
Nutrients/Toxic Elements measurement of DPTA extract		
Saturation extracts for nitrate, sulfate, sodium, calcium,		
magnesium, potassium, soluble phosphate, and boron;		
Parasitic nematodes;		

Herbicide contamination;

(For Lightweight Soil Mixes): Test for physical and chemical composition, and saturated weight per cu.ft.

- 6. Planting operations shall not commence until the results of the Agronomic Soil Fertility Analysis and Recommendations are reviewed accordingly by the Landscape Architect.
- 7. The quantity or type of amendments may be modified by the Landscape Architect within fourteen (14) days of receipt of the results. The Agronomic Soil Fertility Analysis and Recommendations shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.
- 8. The Agronomic Soil Fertility Report/Recommendation shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.

1.04 SUBMITTALS

- A. General:
 - 1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
 - 2. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.
- B. Digital Submittal Information:
 - 1. Product/Material Data: Submit available product/material literature supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.

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- a) Planting Soil (Imported/Amended Topsoil).
- b) Soil Amendments (for each type used, for Sand, Perlite, Peat Humus, Gypsum, Soil Sulfur, Iron, etc).
- c) Bulk Composted Organic Soil Amendment Material.
- d) Granular Soil Conditioning Material.
- e) Mycorrhizal Inoculum.
- f) Fertilizers (for each type used).
- 2. Agronomic Soil Fertility Analysis and Recommendations: Submit a minimum of fourteen (14) days prior to amending of the soil and ordering soil amendments. The locations of where each of the soil test samples were derived from the Project Site shall be keyed to the site plan and shall be included with the results.
- 3. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar installations.
- C. Material Samples: Submit four (4) sets of physical Material Samples for review of kind, color, pattern, size, and texture for a check of these characteristics with other elements, and for a comparison of these characteristics between Submittal and actual component as delivered and installed. Include the full range of exposed color and texture expected in the completed work. Provide Material Samples bound and individually wrapped in re-sealable labeled 1-gallon plastic bags (as applicable):
 - 1. Provide Material Sample sets for each item submitted under Product/Material Data.
- D. Submittals under this Article will be rejected without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.
- E. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver and install materials so as to not delay Work and install only after preparations for installation have been completed.
 - 1. Packaged Materials: Deliver packaged materials in original, unopened packages or containers, with manufacturer's labels intact and legible, showing weight, analysis, and name of manufacturer. Store and secure properly to prevent theft or damage.
 - a) Store packaged materials off ground and under cover, away from damp surfaces and inclement weather.
 - b) Protect during storage and construction against soilage or contamination from earth and other materials.
 - 2. Bulk Materials:
 - a) Deliver and store bulk materials so as not to impede Work of others.
 - b) Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas, or plants.
 - c) Protect during storage and construction against soilage or contamination from earth and other materials. Provide adequate separation between bulk materials so as not to cross-contaminate bulk materials.

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- d) Store under cover, away from inclement weather.
- e) Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water run-off, and airborne dust reaching adjacent properties, water conveyance systems, structures, or walkways.
- f) Accompany each delivery of bulk materials (fertilizers, amendments, topsoil, etc.) with appropriate certificates. Furnish original certificates to Landscape Architect upon request.

1.06 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Notify the Contractors performing Work related to installation of Work under this Section in ample time to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.
- B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- C. Excavation: When conditions detrimental to adequate Soil Preparation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.
- D. Installation: Perform Soil Preparation operations only when weather and soil conditions are suitable in accordance with locally accepted practices.
- E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site, all associated cost are to be paid by the contractor.

1.07 SITE CONDITIONS

- A. Project Site shall be free of weeds, native grasses, evasive grasses, (Bermuda Grass, Johnson Grass, Nut Grass, etc.) prior to Topsoil distribution or soil amendment placement.
- B. Excessive rock, dead or declining vegetation, trash, debris, or other items that has accumulated throughout the duration of the Project shall be removed from the Project Site by the Contractor, and as directed by the Landscape Architect.
- C. Grading and soil preparation Work shall be performed only during the period when beneficial and optimum horticultural results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure or cause compaction, spreading and

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grading operations shall be suspended until, in the opinion of the Landscape Architect, the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.

- 1. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect.
- 2. If the soil moisture level is found to be insufficient for planting, planting pits shall be filled with water and allowed to drain before commencing planting operations.
- D. Planting areas which become compacted in excess of 85% relative compaction due to construction activities shall be tilled and thoroughly cross-ripped to a minimum depth of twelve-inches (12") to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.

PART 2 - PRODUCTS

2.01 PLANTING SOIL (TOPSOIL)

- A. Topsoil: Meet ASTM D5268, pH range of 5.5 to 7, 4 percent organic material minimum.
 - 1. Topsoil Source: Reuse native surface soil stockpiled on the site. Verify suitability of native surface soil stockpiled on site to produce Topsoil meeting requirements; amend, as necessary. Supplement native surface soil stockpiled on site with imported Topsoil when quantities are insufficient.
 - a) Composition: Fertile, friable, well-drained soil, of uniform quality, free of stones over one-inch (1") diameter or larger in any dimension sticks, oils, chemicals, plaster, concrete, roots, plants, sod, and other deleterious or extraneous materials harmful to plant growth.
 - b) Obtain an Agronomic Soil Fertility Report/Recommendation of the stockpiled Topsoil from the approved Testing Laboratory indicated herein this Section.
 - c) Test Results: Request Testing Agency to send one (1) copy of test results direct to the Landscape Architect and one (1) copy to the Owner. Amend as required.
 - 2. Topsoil Source: Provide Imported Topsoil obtained from off-site sources, from naturally well-drained sites; do not obtain from bogs or marshes.
 - a) Quantity: Provide Imported Topsoil as soon as an insufficient quantity of native stockpiled surface soil is verified. Quantity of Imported Topsoil to complete the Work shall be calculated by Contractor.
 - b) Stockpiling: Stockpile on site as directed by Owner.
 - c) Composition: To match in quality, accepted native stockpiled Topsoil.
 - d) Analysis: Obtain an Agronomic Soil Fertility Report/Recommendation of the Imported Topsoil from the approved Testing Laboratory indicated herein this Section.
 - e) Review: Landscape Architect reserves the right to take samples of the Imported Topsoil delivered to the site for conformance to the Contract Specifications.
 - f) Rejected Imported Topsoil: Immediately remove rejected Imported Topsoil off site, at Contractor's expense.

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2.02 SOIL MIXES/BLENDS (BACKFILL/PLANTING MIX)

- A. Soil Conditioner Blend, for amending on-site native soil planting surfaces, stockpiled, plant back fill or imported topsoil: Furnish a thoroughly blended composition of Bulk Composted Organic Soil Amendment Material and Granular Soil Conditioning Material & Fertilizer. Any substitution for the "Soil Conditioner Blend" listed herein must be requested by the Contractor and approved, in writing, by the Landscape Architect at least thirty (30) days prior to installation.
 - 1. Bulk Composted Organic Soil Amendment Material:
 - a) Material Composition: Bulk Composted Organic Soil Amendment Material shall be thoroughly cured for a minimum of 100 days, and shall be free from any trash (glass, metal, plastic, etc.) deleterious materials, bio-solids, and/or toxic chemicals. The Material shall be non-hazardous, and conform to US Environmental Protection Agency 40 CFR503 criteria for "Class A" products. It shall also exceed standards and specifications for unrestricted application as a landscaping and agricultural soil amendment.
 - b) Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%. The organic matter content shall be at least 50% on a dry weight basis.
 - c) Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
 - d) Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
 - e) Sludge-based materials are not acceptable.
 - 1) Gradation/Screen Analysis: A minimum of 90% of the material by weight shall pass a ¹/₂" screen. Material passing the screen shall meet the following criteria:

Percent	Sieve Designation
Passing	
80 - 100%	6.35 mm (1/4")
50 - 80%	2.38 mm (No.8)
0 - 40%	500 micron
	(No.35)

- 2) Maturity: Physical characteristics suggestive of maturity include shall include:
 - a) Color: Dark brown to black.
 - b) Odor: Aerobic, without malodorous presence of decomposition products.
 - c) Particle characterization: Identifiable wood pieces are acceptable, but the balance of Material should be soil-like without recognizable grass or leaves.
 - d) Analytical Properties: Contractor shall submit proof of the Bulk Composted Organic Soil Amendment Material by providing a sample as identified herein this Section, and a lab analysis that has been performed within 30 days of the installation of the planting. Soil mix shall have (at a minimum) the following properties:

Material	Minimum Targeted Property/Range
Total Nitrogen (N%)	.50-1.0%

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Phosphorus (as P2O5)	2.0%
Potassium (as K2O)	0.2%
pH (units)	6.0 to 7.5, as determined in saturated
	paste.
Organic Content	Minimum 50% based on dry weight and
	determined by ash method. Minimum
	205 lbs. organic matter per cubic yard of
	compost.
ECe (millimho/cm)	<5.0; based on pre-leaching with equal
	volume of water.
Carbon-to-Nitrogen Ratio	<25-to-1, nitrogen stabilized.
Bulk Density	1,000 to 1,100 pounds/cubic yard.
Sodium Absorption Ratio	Under 20.0
(SAR)	1.50/ 2.00/
I Olal Iron Meisture Content	1.5% - 3.0%
Moisture Content	S5%-00%
Acid-soluable Asil content	
Salt Content	~ 10 millimbo/cm @ 25d C on a
San Content	saturated paste extract
Boron Content	<1.0 parts per million on a saturated
Doron Content	paste extract.
Silicon-Content	<50%
(acid-insoluable ash)	
Calcium Carbonate	No presence on alkaline soils.
Maximum Total Permissible	• Arsenic: 1.0
Pollutant Concentrations Parts	• Cadmium: 1.0
per million (mg/kg dry-weight	• Chromium: 10.0
basis)	• Cobalt: 2.0
	• Copper: 1.0
	• Lead: 30.0
	• Mercury: 1.0
	• Molybdenum: 2.0
	• Nickel: 5.0
	• Selenium: 1.0
	• Silver: 0.5
	• Vanadium: 3.0
	• Zinc: 2.0

- e) Application Rate: As indicated herein this Section under "Planting Soil Amendments Schedule".
- f) Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

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- 3) Provide submittal and sample to be approved by the Landscape Architect.
- 2. Granular Soil Conditioning Material & Fertilizer:
 - a) Material Composition and Analytical Properties: Granular Soil Conditioning Material & Fertilizer shall be a singular manufacturer-blended combination of soil conditioning material and fertilizer. It shall be granular in form, long-lasting, free flowing, and suitable for application with approved equipment. It shall not contain any sewage sludge or manure-based products, and shall contain the following guaranteed minimum available analysis range:

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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TURF GRASSES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide sodded lawns as shown and specified. The work includes:
 - 1. Soil preparation.
 - 2. Sodding lawns and other indicated areas.
 - 3. Maintenance.

1.02 QUALITY ASSURANCE

- A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.
- B. Provide and pay for materials testing. Testing agency shall be acceptable to the Architect. Provide the following data:
 - 1. Test representative materials samples proposed for use.
 - 2. Topsoil:
 - a. pH factor.
 - b. Mechanical analysis.
 - c. Percentage of organic content.
 - d. Recommendations of type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

1.03 SUBMITTALS

- A. Submit sod growers certification of grass species. Identify source location.
- B. Submit the following materials certification:1. Fertilizer(s) analysis.
- C. Submit materials test report.
- D. Upon sodded lawn acceptance, submit written maintenance instructions recommending procedures for maintenance of sodded lawns.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Cut, deliver, and install sod within a 24-hour period.

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- 1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
- 2. Protect sod from sun, wind, and dehydration prior to installation.
- 3. Do not tear, stretch, or drop sod during handling and installation.

1.05 PROJECT CONDITIONS

- A. Work notification: Notify Architect at least 7 working days prior to start of sodding operations.
- B. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.
- C. Perform sodding work only after planting and other work affecting ground surface has been completed.
- D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.
- E. Provide hoses and lawn watering equipment as required.

1.06 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until final acceptance. Re sod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Landscape Architect.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reference plan for turf material type.
- B. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.
- C. Fertilizer:
 - Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.
 a. 8-8-8.

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- b. 10-10-10.
- D. Water: Will be may not be available on site. Landscape contractor will provide necessary hoses and other watering equipment required to maintain and complete work. An auto-matic/drip irrigation system will be installed simultaneously with the landscape planting. The landscape contractor shall not anticipate the use of the irrigation system during installation of this contract.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Limit preparation to areas which will be immediately sodded.
- B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.
- C. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.
- D. Apply Type A fertilizer at the rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (220 lbs./acre). Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by disking or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil. Buffalo Grass Sod may not require fertilizer submit soil test for review by Landscape Architect.
- E. Dampen dry soil prior to sodding.
- F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.03 INSTALLATION

- A. Sodding:
 - Lay sod per plans to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. 32 93 00

Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.

- 2. Do not lay dormant sod or install sod on saturated or frozen soil.
- 3. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
- 4. Peg sod on slopes greater than 3 to 1 to prevent slippage at a rate of 2 stakes per yd. of sod.
- 5. Water sod thoroughly with a fine spray immediately after laying.
- 6. Roll with light lawn roller to ensure contact with sub-grade.
- B. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

3.04 MAINTENANCE

- A. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Architect at the completion and acceptance of the entire project.
 - 1. Water sod thoroughly every 2 to 3 days, or as required to establish proper rooting.
 - 2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
 - 3. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing.
 - 4. Apply Type B fertilizer to lawns approximately 30 days after sodding at a rate equal to 2.0 lbs. of actual nitrogen per 1,000 sq. ft. (140 lbs./acre). Apply with a mechanical rotary or drop type distributor. Thoroughly water into soil. *Only as required per soil test for Buffalo Sod
 - 5. Apply herbicides as required to control weed growth or undesirable grass species.
 - 6. Apply fungicides and insecticides as required to control diseases and insects

3.05 ACCEPTANCE

- A. Inspection to determine acceptance of sodded lawns will be made by the Architect, upon contractor's request at the completion of the entire project. Provide notification at least 10 working days before required inspection date.
 - 1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weeds, undesirable grass species, disease, and insects.
- B. Upon final acceptance, the Owner will assume lawn maintenance.

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3.06 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

END OF SECTION

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EXTERIOR PLANTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide trees, shrubs, ground covers, native perennials, native grasses and native wildflower and grass seed as shown and specified.
 - 1. Soil preparation.
 - 2. Trees, shrubs, groundcovers, native perennials and native grasses.
 - 3. Planting mixes.
 - 4. Mulch and planting accessories.
 - 5. Maintenance and Extended Management.
- B. Related work:
 - 1. Section 01 5713: Temporary Erosion and Sediment Control
 - 2. Section 32 8400: Planting Irrigation
 - 3. Section 32 9200: Turf Grasses
 - 4. Section 32 9400: Landscape Planting Accessories
 - 5. Section 31 2100: Finish Grading
 - 6. Section 32 9400: Soil Preparation
- C. Definitions:
 - 1. Plant Material(s) Refers to living plant species, inclusive of trees, shrubs, groundcovers, vines, ornamental grasses, cacti/succulents, espaliers, annuals, perennials, etc., as indicated in the Contract Drawings.
 - 2. Planting Area (PA) As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
 - 3. Plant Height Measurement of main body height, not measurement to branch tip.
 - 4. Plant Spread Measurement of main body diameter, not measurement from branch tip to branch tip.
 - 5. Amended Planting Backfill Mixture Refer to Section 32 91 13 Soil Preparation.
 - 6. Balled and Burlapped Stock Healthy, vigorous exterior plants with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
 - 7. Balled and Potted Stock Healthy, vigorous exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
 - 8. Bare-Root Stock Healthy, vigorous exterior plants grown with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
 - 10. Compacted Settling Layer Subgrade under where a plant is directly planted.

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EXTERIOR PLANTS

- 11. Container-Grown Stock Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
- 12. Fabric Bag-Grown Stock Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
- 13. Finish Grade Elevation of finished surface of planting soil.
- 14. Manufactured Topsoil Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- 15. Multi-Stem Where three (3) or more main stems arise from the ground from a single root crown or at a point right above the root crown.
- 16. Sub-grade Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- 17. Subsoil All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

1.02 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Requirement: Valid Arkansas Landscaping Contractor License.
 - 2. Engage an experienced Installer who has demonstrated completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 3. Installer's Field Supervision: Installer shall maintain an experienced full-time supervisor on the Project site during times that landscaping installations under this Section are in progress.
 - 4. Selections of Plant Material may be sourced and purchased by the Owner directly. Contractor to provide a line item installation cost and separate warranty identifying the schedule of values for each.
- B. Plant Material:
 - 1. Trees, Shrubs, Grasses and Seed: Provide quality, size, genus, species, and variety of Plant Material indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
 - a. At least one (1) plant of each Plant Material species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor that identifies the size and specific type of Plant Material upon delivery.

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- 1.) Incorrect Planting Materials:
 - a.) Replace, at no cost to Owner, Plant Material that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
 - b.) Provide replacements equal to the size and quality to match the planted materials at the time the untrue species is discovered.
- 2.) Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.
- 2. Native Wildflower and Grass seed: Provide quality seed and/or custom mix identified within the Construction Documents. Noxious weed seeds shall not exceed one-half (1/2) percent by weight of the total of pure live seed and other material in the mixture. Johnson Grass, nutgrass or other noxious weed seed will not be allowed.
 - a. At least one-half (1/2) pound of each seed/seed mix species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor to verify the species of seed upon delivery.
 - 1.)Incorrect Seed Materials:
 - a.) Replace, at no cost to Owner, Seed that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
 - b.) Provide replacement seed at the time the untrue species is discovered.

2.)Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.

- C. Observation: Landscape Architect may observe Plant Materials at their place of growth (nursery), at the site before or after planting, or both, for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect also retains right to observe Plant Material further for size and condition of root balls, trunks, branches, and crowns; insects; pests; disease; weeds; injuries, and latent defects. Landscape Architect reserves the right to reject unsatisfactory and/or defective Plant Material at any time during progress of Work. Contractor shall remove rejected Plant Material immediately from Project site.
- D. Regulatory Requirements:
 - 1. Contractor shall meet the requirements of applicable laws, codes, and regulations as required by the authorities having jurisdiction over the Work. Plant names indicated, comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

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EXTERIOR PLANTS

- E. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.
- F. Plant Material Review and Selection (Tagging):
 - 1. At the discretion of the Landscape Architect, Plant Material will be subject to review, photographed, and selected/tagged by the Landscape Architect at the nursery, or other place of growth, prior to delivery to the Project Site. Contractor shall verify with the Landscape Architect if tagging operations are required.
 - 2. Selecting/Tagging of Plant Materials at the nursery or place of growth does not cancel the right of the Landscape Architect to reject Plant Materials at the Project Site, if damaged or unacceptable conditions are found that were not detected at the nursery, place of growth, or in the submitted photographs.
- G. Plant Material Delivery: Plant Material shall be delivered with original Plant Material tagging materials set in place, as selected, and marked by the Landscape Architect at the nursery or place of growth. Seed, topdressing, and any fertilizer materials shall be delivered in original containers. Include materials showing weight, analysis, and names of growers. Store all seed material in a manner to prevent wetting, excessive heating, or other deterioration. Contractor shall notify Landscape Architect upon delivery of Plant Material for review of stock and tagging materials. Plant Materials delivered without original tagging materials, or with broken, damaged, or altered tagging materials, shall be subject to rejection by the Landscape Architect. Rejected Plant Material shall be removed immediately.
- H. Pre-installation Conference: Conduct conference at Project Site.
- I. Protection of Existing Plant Material:
 - 1. Refer to Requirements specified in Section 015639 Temporary Tree and Plant Protection.
 - 2. It is the intent of the Contract Documents that certain existing Plant Materials shall be retained. Prior to the removal of any Plant Materials, the Contractor shall confer with the Landscape Architect to determine which Plant Materials are to remain.
 - 3. All existing Plant Materials which are to remain in the project shall be tagged and identified by the Contractor prior to start of Work.
 - 4. Contractor shall be responsible for Plant Materials that are designated to remain. Damage to any Plant Materials which results in death or permanent disfiguration of said Materials shall result in compensation outlined in Section 01 56 39 Temporary Tree and Plant Protection. The Landscape Architect shall be the sole judge of the condition of the Plant Materials.
 - 5. Existing Plant Materials designated to remain shall be protected at all times from damage by construction activity (tools, materials, equipment, personnel, etc.). Damage by the Contractor to existing Plant Materials shall be repaired at the Contractor's expense to the satisfaction of the Owner, as directed by the Landscape Architect.
 - 6. Contractor shall insure that no foreign material and/or liquid, such as paint, concrete, cement, oil, turpentine, acid or the like, be deposited or allowed to be deposited on soil within the drip

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line (the outside edge of the foliage overhang) of any Plant Material. Do not store construction materials, debris, or excavated material within drip line of existing Plant Material. Should any such poisoning of the soil occur, the Contractor shall thoroughly remove said soil as directed by the Landscape Architect and replace with acceptable soil at no additional cost to the owner.

- 7. Excavation adjacent to existing Plant Materials: Where it is necessary to excavate in close proximity to the drip lines of existing Plant Materials, all possible caution shall be exercised to avoid injury to roots and trunk. Excavation close to Plant Materials shall be done by hand, with narrow-tine spading forks or other approved tools to comb soil to expose roots. Tunnel under roots two-inches (2") and larger in diameter. Cutting of roots two-inches (2") and larger shall be only on the approval of the Landscape Architect.
- 8. Replacement of Damaged Plant Material: Replace existing Plant Material to remain as required, hat are damaged by Contractor during construction with accepted Plant Material of the same species, size, and quantity as those damaged, at no additional cost to Owner. Owner shall be the sole judge as to the extent of the damage and the value of said damaged Plant Material.

1.03 SUBMITTALS

- A. General:
 - 1. Collect information into a single submittal.
 - 2. Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
 - 3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.
- B. Digital Submittal Information:
 - 1. Alphabetized List of Plant Material.
 - 2. submitted in the following format.
 - a. Project Name
 - b. Botanical Name
 - c. Common Name
 - d. Container Size
 - e. Overall Height
 - f. Caliper Size
 - g. Quantity
 - 3. The submittal shall not be construed as to acceptance of the plant material. All plant material shall be subject to review and approval by the Landscape Architect upon delivery to the project site.

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- C. No work shall proceed under this Section until submittal requirements indicated herein have been review accordingly by the Landscape Architect.
- D. Provide plant material record drawings:
 - 1. Legibly mark drawings to record actual construction.
 - 2. Indicate horizontal and vertical locations, referenced to permanent surface improvements.
 - 3. Identify field changes of dimension and detail and changes made by Change Order.
- E. Submit for the Landscape Architect's approval five samples of each container grown plant under the number 15 container size. The five approved samples shall be retained in a protected location on the project site at a location approved by the General Contractor. The Landscape Contractor shall maintain the sample plants until completion of the site planting. The sample plants may then be used in the site planting.

1.04 DELIVERY, STORAGE, AND HANDLING.

- A. General: Do not prune Plant Material before delivery, except as approved by the Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie Plant Material in such a manner as to destroy natural shape.
 - 1. Immediately after digging field-grown Plant Materials, pack root systems in wet straw, hay, burlap, or other suitable material to keep root system moist until final planting installation.
 - 2. Deliver freshly dug field-grown Plant Materials with firm, natural balls of earth of sufficient depth to include fibrous and feeding roots, meeting, or exceeding requirements of ANSI Z60.1 for root ball diameter.
 - 3. Sore all seed material in a manner to prevent wetting, excessive heat, or other deterioration.
- B. Handling Plant Materials:
 - 1. Handle balled and burlap Plant Material stock by the root ball.
 - 2. Handle container-grown Plant Materials only by their containers.
 - 3. DO NOT handle Plant Materials by their trunks or stems.
 - 4. DO NOT drop any Plant Materials.
 - 5. DO NOT bind or handle Plant Materials with wire or rope.
 - 6. Pad trunk and branches of Plant Materials whenever using hoisting cables, chains, or straps.
 - 7. Should the Contractor engage in handling any Plant Material(s) by any unacceptable method(s), the Landscape Architect shall reserve the right to reject any of the mishandled Plant Material(s). The Contractor shall replace rejected Plant Material(s) with approved Plant Material(s), at no additional cost to the Owner.
- C. Delivery: Provide protective covering during delivery. Deliver Plant Material only after preparations for planting have been completed and install immediately. If planting is delayed more than six (6)

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hours after delivery, set Plant Materials in shade, protect from weather and mechanical damage, and keep roots moist. Anchor plants to prevent damage from winds.

- 1. Heel-in bare-root Plant Material stock. Soak roots in water for two (2) hours prior to planting.
- 2. Set balled Plant Material stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
- 3. DO NOT remove container-grown Plant Material stock from containers before time of planting.
- 4. Water root systems of Plant Material stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.05 PROJECT CONDITIONS

A. Work notification: Notify Architect at least 7 working days prior to installation of plant material.

- B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.
- C. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.

1.06 WARRANTY

- A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of 1 year after completion and acceptance of entire project.
 - 1. A review of plants will be made by the Architect at Substantial Completion and Final Completion.
- B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes such as bark abrasions and misuse of chemicals, due to the Landscape Contractor's negligence. The cost of such replacement(s) is at Landscape Contractor's expense. Warrant all replacement plants for 1 year after installation.
- C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area, acts of vandalism or negligence on the part of the owner.
- D. Remove and immediately replace all plants, as determined by the Architect, to be unsatisfactory during the initial planting installation.

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PART 2 - PRODUCTS

2.01 MATERIALS

- A. Immediately upon award of Contract for Work in this Section, Contractor shall locate and purchase or hold for purchase plant material as required.
 - 1. Contractor shall verify with Landscape Architect of Plant Material that has been nursery "contract grown" by the Owner for use of Work under this Contract.
 - 2. Contractor shall review the condition of the Plant Material with Landscape Architect at the nursery maintaining the Plant Material prior to delivery, and when delivered to the Project Site.
- B. Quality: Plant Materials shall have a growth habit typical for each variety and species indicated in the Plant List (as detailed on the Contract Drawings).
 - 1. All Plant Materials specified shall be superior/premium-grade nursery stock, full, densely foliated, symmetrical, with tightly knit branching, so trained or favored in development and appearance in form, number of branches, compactness and symmetry, healthy, and vigorous in growth, as reviewed and determined by the Landscape Architect.
 - 2. Plant Materials shall be free from insect pests, eggs and larvae, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, windburn, salt burn, weeds, or other disfigurements or conditions, as reviewed and determined by the Landscape Architect.
 - 3. Plant Material shall be subject per the Arkansas State Department of Agriculture's Regulations for Nursery Inspections of Rules and Grading.
 - 4. Growing Conditions: Plant Materials shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project unless otherwise specifically authorized.
- C. Container Stock (excluding annuals) shall be grown in boxes or containers in which delivered for at least one (1) growing season, but not over two (2) years. Plant Material grown in boxes or containers shall be cultivated during this time to permit full rooting within the specified box or container to bind the planting soil, but not so long as to create a "root-bound" condition.
 - 1. Plant Material shall be completely free of circling, kinked or girdling trunk surface and center roots, and show no evidence of a pot-bound condition.
 - 2. No boxed nor container Plant Material shall be planted which have cracked or broken balls of earth when separated from their boxes or containers.
 - 3. No Plant Material shall be planted with damaged roots, broken root balls, or which are found to be "root-bound" when separated from their containers.

D. Pruning:

- 1. Do not prune Plant Materials unless directed by the Landscape Architect.
- 2. Pruning of Plant Material as grown at the nursery shall conform to ANSI A300 Standards.
- 3. Consult with Landscape Architect for pruning Plant Materials after delivery and installation.

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- E. Measurements: Measure Plant Material according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes.
 - 1. Take caliper measurement at a point on the trunk six-inches (6") above natural ground line for trees up to four-inches (4") in caliper (at a point twelve-inches (12") above the natural ground line for trees over four-inches (4") in caliper).
 - a. Measure foliage across mean foliage dimension when branches are in their normal upright position.
 - b. For trees to be supplied in "raised up" condition, foliage origin along main trunk shall be measured from soil line after installation.
 - c. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Properly trimmed plants shall measure the same in any direction. If a plant is unevenly grown, it shall be classified in the size category of the smallest dimension.
 - 2. Size Range: If a range of size is given, do not use Plant Materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plant Materials that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.
- F. Field Dug Stock: Prior to digging of field-grown Plant Materials, ensure that excess loose fill resulting from cultivation around trunks/stems and over roots be removed down to natural finish grade at crown of Plant Materials. During digging, verify that size of tree spade or other equipment is adequate to encompass the actively growing root zone of all Plant Materials. Plant Materials which, after digging, show mostly large fleshy roots and few fibrous roots, will be rejected.
- G. Condition of Root Systems: Plant Materials must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition. Upon inspection by Landscape Architect at the job site, if five-percent (5%) or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species shall be rejected.
- H. Unacceptable Trees: Trees that have damaged, broken, pruned, or crooked leaders will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused will be rejected.

2.02 TREES

- A. Shade and Flowering Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitation for container stock.
 - 1. Branching Height: 1/2 of tree height, unless otherwise indicated on Contract Drawings.

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- B. Small Trees: Small upright or spreading type, branched, or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitation for container stock.
 - 1. Form: As indicated on the Contract Drawings for individual selected species.
- C. Field Dug Specimen Trees:
 - 1. Form and Size: As specified on the Contract Documents for height, spread, and/or caliper, subject to review and acceptance by the Landscape Architect at the supplying nursery prior to delivery and installation. Provide superior quality, full, symmetrical, well-rooted, upright, spreading, with well-balanced crown.
 - 2. Throughout the duration of excavation, transport, delivery, storage, and installation, all Field Dug Specimen Trees shall have their root balls remain moist, firm and intact, with no damage. Provide metal cages, as required, to insure root ball stability. Any tree that exhibits a broken, damaged, or dry root ball at any time under the Contract shall be subject to immediate rejection by the Landscape Architect.

2.03 SHRUBS

- A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of Shrub, subject to review and acceptance by the Landscape Architect. Container-grown Shrubs will be acceptable in lieu of balled and burlapped.
 - 1. Container-grown Shrubs shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.04 CONIFEROUS EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, well-rooted, coniferous evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
 - 1. Boxed or container-grown coniferous evergreens will subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.05 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, well-rooted, broadleaf evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
 - 1. Container-grown broadleaf evergreens shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.
- 2.06 GROUNDCOVERS

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A. Provide ground covers full, established, and well-rooted in removable flats, containers, or integral peat pots, and with not less than the minimum number and length of runners required by ANSI Z60.1 for the container size indicated, and other requirements as indicated on the Contract Drawings, subject to review and acceptance by the Landscape Architect.

2.07 NATIVE GRASSES AND PLUGS

- A. Form and Size: High-quality, established, full, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
 - 1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.08 PERMANENT SEEDING

A. Quantity/Weight per plans. An approved combination of Wildflower Seeds and Native Grass seed shall be supplied as custom mixes identified within the Construction Documents. Procure local genotype seed when and if available. Seed must be collected by lawful means and must come from a similar geographic region.

2.08 ACCESSORIES

A. Reference – Section 32 94 00 Landscape Planting Accessories

2.09 PLANT LIST

A. The plant list including quantities is located on the plans and is for reference only. It is the responsibility of the contractor to determine total quantities in conformance with the plans. Height of plants specified and height of lowest branches of trees is above soil line.

PART 3 - EXECUTION

3.01 INSPECTION

- A. No work under this section shall commence until submittals under this section have been reviewed accordingly by the Landscape Architect.
- B. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. Installation practices of the Plant Materials shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practices, as judged by the Landscape Architect.
 - 1. Soil moisture levels prior to planting shall be no less than seventy-five-percent (75%) of field

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capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect, and their decision shall be final.

- a. If the soil moisture level is found to be insufficient for planting installation, planting pits shall be filled with water and allowed to drain before commencing planting operations.
- b. Any planting area that may become compacted in excess of eighty-five-percent (85%) relative compaction (due to construction operations or other activities during the Contract) shall be tilled and thoroughly cross-ripped to a minimum depth of nine-inches (9") to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.
- c. Do not commence planting installation prior to acceptance of Section 329113 –Soil Preparation.
- D. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.
- E. Preparation of Planting Installation: Lay out individual Plant Material locations and areas for multiple plantings. Stake locations, outline areas, and gain the Landscape Architect's acceptance prior to commencing physical planting installation.
- F. At the discretion of the Landscape Architect, Contractor shall make field adjustments to the planting layout, as required, per the direction of the Landscape Architect. Layout changes made accordingly shall be performed at no additional cost to the Owner.

G. No more Plant Materials shall be distributed in the planting area on any day than can be installed and watered on that day. Plant Materials shall be planted and watered immediately after the removal of their containers, as applicable.

H. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and Landscape Establishment Period.

- I. Finish Grades for planting areas shall have been established (per Section 31 22 19 Landscape Grading) prior to Work under this Section. Verify that grades are within one-inch plus or minus (1"+/-) of the required finish grade, and that all proper soil amendments and fertilizers have been furnished and installed accordingly as specified (per Section 329113 Soil Preparation).
- 1. Maintain positive surface drainage of all planted areas throughout the duration of the Contract.
- J. Pre-Planting: Where Plant Materials are to be pre-planted to permit site improvements to be installed around them, Contractor shall be responsible for the accurate layout and placement of those Plant Materials, as measured to their centerlines. Confirm designated pre-planting operations with Landscape Architect prior to commencing Work. Contractor shall also be responsible for the protection of pre-planted Plant Materials while other Work is taking place around them. Provide automated irrigation, as necessary, prior to installation and functioning of irrigation systems (per Section 32 84 00 – Irrigation Systems).

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3.02 EXCAVATION FOR PLANT MATERIAL

- A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 32 91 13 Soil Preparation, excavate planting hole(s) for Plant Material with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Excavate holes according to the spacing alignment (i.e. hedge spacing, grid spacing, triangular spacing, etc.) and the on-center (O.C.) spacing intervals (i.e. 24" O.C. etc.) indicated on the Contract Drawings. Loosen any hard subsoil in the bottom of the excavation where evident, and remove all rocks greater than one-half-inch (1/2") in diameter, trash, debris, etc. Retain the excavated soil for use as part of the Amended Planting Backfill Mixture (as indicated in Section 32 91 13 Soil Preparation).
- B. Planting areas that have not been excavated prior to planting.
 - 1. Plug Plant Material:
 - a. Excavate at least four-inches (1") wider than the perimeter of the plug, and deep enough to allow setting of the roots on a compacted layer of native planting soil, where the top of the plant's root collar is one half-inch (1/2") higher than finished grade or as further directed by the Landscape Architect
 - 2. Balled and Burlap Plant Material:
 - a. Excavate the planting hole to the width and depth indicated in the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is two-inch (2") higher than finished grade or as further directed by the Landscape Architect:
 - b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
 - 3. Container-Grown Plant Material:
 - a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is two-inch (2") higher than finished grade or as further directed by the Landscape Architect:
 - b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
 - 4. Field Grown/Specimen Trees:
 - a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is three-inch (3") higher than finished grade or as further directed by the Landscape Architect:
 - b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.

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- c. In areas where special subsurface drainage for planting is indicated, tie drainage pipes, as required, into the drain system.
- d. Excavate planting hole at 3x the diameter of the rootball.
- 5. Permanent Seeding
 - a. Treat seed area with an aquatic approved herbicide two (2) weeks prior to scarifying or applying topsoil.
 - b. Lightly scarify existing topsoil and place seed directly on existing soil.
 - c. When existing topsoil has been removed during grading operations, place a minimum of three-inches (3") of topsoil (Reference Section 32 91 13) to provide an acceptable seeding substrate.
- C. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.
 - 1. Hardpan Layer: If encountered, drill six-inch (6") diameter holes into free-draining strata or to a depth of ten-feet (10'), whichever is less, and backfill with free-draining material.
- D. Drainage: Notify the Landscape Architect if subsoil conditions show evidence of unexpected water seepage or retention in planting holes.
- E. Time of planting:
 - 1. Evergreen material: Plant evergreen materials between September 1 and November 1 or in spring before new growth begins. If project requirements require planting at times, other than winter months, plants shall be sprayed with anti-desiccant prior to planting operations.
 - 2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.

3.03 INSTALLATION

- A. Plug Plant Material: Set Plug Plant Material plumb and in center of the excavated hole, with top of root structure set properly at the adjacent finish grade as indicated. Set Plug Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
 - Thoroughly soak the roots in clean water for a minimum of two (2) hours but no more than four (4) hours to fully hydrate the root mass. Do not soak above the root crown.
 - 2. Carefully place the Plant Material stock on the specified setting layer of compacted native soil, with the top of root mass set approximately one half-inch (1/2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide an orientation of the Plant Material that is confirmed and acceptable by the Landscape Architect.
 - 3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:

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- a. ¹/₄ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 Soil Preparation).
- b. ¹/₂ pound of Granular Soil Conditioning Material & Fertilizer (per Section 329113–Soil Preparation).
- c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 329113 Soil Preparation), per the Manufacturer's latest printed instructions.
 - 1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
 - a.) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
- 4. Backfilling the excavated planting hole:
 - a. Place the Amended Planting Backfill Mixture around the Plant Material root mass in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
 - b. Maintain the Plant Material plumb while working the Mixture around the root mass. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
 - c. Add the Fertilizer Tablets and other amendments, (per Section 329113 Soil Preparation) as required, at the prescribed application rates (as indicated per Section 329113 Soil Preparation) or if not indicated, per the Manufacturer's latest printed instructions.
 - d. Place the final layers of the Amended Planting Backfill Mixture, tamping accordingly, to the top of the root mass.
 - e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole.
 - f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 –Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
- 5. Mulching: Apply mulch evenly at 1" at all plug installation locations. Refer to Section 32 94 00) Landscape Planting Accessories for type and requirements.
- B. Balled and Burlapped Plant Material: Set the Balled and Burlapped Plant Material plumb and in center of the excavated hole, with top of the root ball raised above adjacent finish grade as indicated. Set Balled and Burlapped Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

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- 1. Carefully place the Balled and Burlapped Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set two-inch (2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, handle the Plant Material by its root ball; avoid handling the Plant Material by its trunk.
- 2. Once orientation is accepted, carefully remove the burlap and wire baskets from the tops of the root ball and partially from the sides, but do not remove from under the root ball. Do not damage the root ball or any part of the plant. Plant Material shall be rejected if the root ball is cracked or broken before or during the planting operation.
- 3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
 - a. ¹/₄ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 Soil Preparation).
 - b. ¹/₂ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13– Soil Preparation).
 - c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 –Soil Preparation), per the Manufacturer's latest printed instructions.
- 4. Backfilling the excavated planting hole:
 - a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
 - b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
 - c. Add the Fertilizer Tablets and other amendments, (per Section 32 91 13 Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
 - d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball. Pull soil away and exposed root flare. Ensure root flare is planted above finished grade.
 - e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
 - f. Thoroughly mix water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 32 94 00–Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
- 5. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to

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Section 32 94 00 – Landscape Planting Accessories for type and requirements.

- 6. Wrapping:
 - a. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
 - b. Wrap trunks of all trees as directed spirally from bottom to top with specified tree wrap and secure in place.
 - c. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
 - d. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.
- 7. Staking/guying:
 - a. Stake/guy all trees immediately after each tree planting.
 - b. Stake all trees and all multi-trunk trees.
 - c. Flag or color all cables.
 - d. All work shall be acceptable to the Landscape Architect.
- C. Container-Grown and Ball and Burlap Plant Material: Set Plant Material plumb and in the center of the excavated planting hole, with top of the root ball raised above adjacent finish grade as indicated. Set Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
 - 1. For plastic container stock (4" pot, 1-gallon, 5-gallon, 15-gallon, etc.), carefully remove the plant container prior to setting the plant in the excavated hole so as not to damage root ball. Tip container to horizontal position and shake carefully to remove Plant Material. Support root ball during installation to prevent cracking or shedding of soil.
 - 2. Set the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the plant material, carefully handle the Plant Material by its container; avoid handling the Plant Material by its trunk.
 - a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.
 - 3. For Ball and Burlap stock, carefully set whole root ball of the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set two-inch (2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation, carefully handle the Plant Material by its basket; avoid handling the Plant Material by its trunk or branches. Once orientation is accepted, remove 1/3 of the wire basket so as not to damage the root ball or

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any part of the plant. Do not remove the bottom of the wire basket. Discard top 1/3, do not bend back or bury.

- a. Plant Material with a damaged root ball upon placing/planting, or if the root ball fails to thoroughly hold the soil as it is planted, or if the plant is mishandled or damaged during planting operations, shall be rejected.
- 4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
 - a. ¹/₄ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 Soil Preparation).
 - b. ¹/₂ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13– Soil Preparation).
 - c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 –Soil Preparation), per the Manufacturer's latest printed instructions.
 - 1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
 - a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
- 5. In areas where indicated on the Contract Drawings, install the Deep Watering Bubblers as part of the irrigation system.
- 6. Backfilling the excavated planting hole:
 - a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets. Foot tamp the backfill, as required.
 - b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
 - c. Add the Fertilizer Tablets and other amendments (per Section 32 91 13 Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
 - d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
 - e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.

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- 7. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 32 94 00 Landscape Planting Accessories for type and requirements.
- 8. Wrapping:
 - a. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
 - b. Wrap trunks of all trees as directed spirally from bottom to top with specified tree wrap and secure in place.
 - c. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
 - d. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.
- 9. Staking/guying:
 - a. Stake/guy all trees immediately after each tree planting.
 - b. Stake all trees and all multi-trunk trees.
 - c. Flag or color all cables.
 - d. All work shall be acceptable to the Landscape Architect.
- D. Native Wildflower and Grass Seed Material: Drill or hand apply seed per volumes specified within the Construction Documents. Apply native grass and wildflower seed after ground preparation is complete between September 15 and October 15 or February 15 and March 15. Landscape Architect shall be consulted prior to seeding to review preparation and installation.
 - 1. Seed as follow to ensure complete coverage as noted:
 - a. Treat all seed areas with an aquatic approved herbicide when vegetation is present, two (2) prior to all seeding.
 - b. Fine grade areas that receive seed eliminate low areas that may hold water.
 - c. Provide 2 parts masonry sand to 1 part pure live seed (PLS). Granule Mycorrhizal shall also be included and may substitute the masonry sand.
 - d. Herbicide reapplication shall be required prior to broadcasting seed if visible vegetation is present.
 - e. Broadcast half the Native Grass and/or Wildflower Seeds evenly over the entire area prior to placement of compost at the rates indicated within the Construction Documents. Sow remaining seed in a perpendicular direction to the initial sowing prior to placement of compost.
 - f. Placement of one-half inch (1/2") organic compost by Landscape Contractor
 - g. Wildflower seed to be broadcast similar to the above and seed shall be allows to rest on top of the compost without pressing into the substrate. Do not cover the seed more than 1/16".
 - h. Cover seed with a 100% wood fiber hydroseeding mulch.
 - 2. Jute netting or Biodegradable Erosion Control Blanket:
 - a. Install per plans and/or all areas that exceed 3:1 slopes using biodegradable stakes.

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3.04 PRUNING AND THINNING OF PLANT MATERIAL

- A. Pruning/Thinning of Tree Canopy
 - 1. At no time shall Plant Material be pruned, trimmed, thinned, shaped, or topped prior to delivery. Pruning, trimming, thinning, shaping, or topping of Plant Material shall be only conducted on the Project Site, and under the presence and direction of the Landscape Architect or approved Certified Arborist. Plant Material that has been pruned and delivered to the Project Site without prior approval by the Landscape Architect or an approved Certified Arborist will be rejected.
- B. When directed by the Landscape Architect or an approved Certified Arborist, Contractor shall prune, thin, and shape plant material, according to standard horticultural practice, to preserve the natural character of the Plant Material.
 - 1. Pruning and remedial work shall be done per ANSI A300.
 - 2. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from trees.
 - 3. Prune shrubs accordingly to retain natural character.
 - 4. Provide pruning, cabling and bracing, irrigation, pest and disease control and other remedial treatments as recommended to assure the long-term health of the trees and existing vegetation, and the safety of persons and property.
 - 5. Newly planted trees shall be pruned near the termination of the Landscape Establishment Period, per the direction of the Landscape Architect, as required.

3.05 CLEAN UP AND PROTECTION

- A. During installation operations, keep Work area in an orderly and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.
- B. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.
- C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, surplus soil and other items resulting from construction operations and legally dispose of it off the Owner's property.
- D. Scars, ruts, or other marks in the ground caused by the Contractor's Work shall be repaired.
- E. Remove equipment and implements of service and leave the entire Project Site area in a neat, clean, and Owner-approved condition.
- F. Labels: Remove all nursery-type labels, flags, and or identification markings from Plant Materials AS DIRECTED BY THE Landscape Architect.
- 3.06 MAINTENANCE

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- A. Maintain the trees, shrubs, groundcovers, perennials, native grasses until Final Completion of the entire project. Upon Final Completion, the Owner will assume maintenance as recommended by the written maintenance instructions submitted by the Landscape Contractor for Sodded areas only.
- B. Maintenance shall include pruning, cultivating, weeding, watering, and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
 - 1. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.
 - 2. Tighten and repair guy wires and stakes as required.
 - 3. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.
 - 4. Deep-water trees, plants, groundcover, perennial and native grass beds within the first 24 hours of initial planting, and thereafter as required for healthy growth until final acceptance.

3.07 SUBSTANTIAL COMPLETION

A. An inspection of the trees, shrubs, groundcovers, perennials and native grasses will be made by the Landscape Architect upon request for Application of Substantial Completion by the Landscape Contractor. Provide notification of at least five (5) working days before requested inspection date.

3.08 FINAL COMPLETION

A. An inspection of the trees, shrubs and ground covers will be made by the Landscape Architect upon request for Final Completion by the Landscape Contractor.

END OF SECTION

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SECTION 33 05 00

COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Piping joining materials.
 - 2. Dielectric fittings.
 - 3. Sleeves.
 - 4. Identification devices.
 - 5. Grout.
 - 6. Piping system common requirements.
 - 7. Equipment installation common requirements.
 - 8. Concrete bases.
 - 9. Metal supports and anchorages.

1.02 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.03 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Identification devices.

1.04 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- 1.05 QUALITY ASSURANCE
 - A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

- 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.01 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
 - a) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.02 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

- B. Dielectric Unions:
 - 1. Description: Factory fabricated, union, NPS 2 and smaller.
 - a) Pressure Rating: 250 psig at 180 deg F.
 - b) End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.
 - a) Pressure Rating: 300 psig.
 - b) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric Couplings:
 - 1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.
 - a) Pressure Rating: 300 psig at 225 deg F.
 - b) End Connections: Threaded.
- E. Dielectric Nipples:
 - 1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
 - a) Pressure Rating: 300 psig at 225 deg F.
 - b) End Connections: Threaded or grooved.
- 2.03 SLEEVES
 - A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
 - B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
 - C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
 - D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 - E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
 - F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
 - G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.04 IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.1. Data: Manufacturer, product name, model number, serial number, capacity, operating and

power characteristics, labels of tested compliances, and essential data.

- 2. Location: Accessible and visible.
- B. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.
- C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.
- D. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.
- E. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.
- F. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.
- G. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.
 - 1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
 - 2. Color: Comply with ASME A13.1, unless otherwise indicated.
- H. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.
 - 1. Material: 0.032-inch- thick, aluminum.
 - 2. Material: 0.0375-inch- thick stainless steel.
 - 3. Material: 3/32-inch- thick plastic laminate with 2 black surfaces and a white inner layer.
 - 4. Material: Valve manufacturer's standard solid plastic.
 - 5. Size: 1-1/2 inches in diameter, unless otherwise indicated.
 - 6. Shape: As indicated for each piping system.
- I. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.
- J. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 - 1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
 - 2. Thickness: 1/8 inch, unless otherwise indicated.
 - 3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
 - 4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

- K. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:
 - 1. Green: Cooling equipment and components.
 - 2. Yellow: Heating equipment and components.
 - 3. Brown: Energy reclamation equipment and components.
 - 4. Blue: Equipment and components that do not meet criteria above.
 - 5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
 - 6. Terminology: Match schedules as closely as possible. Include the following:
 - a) Name and plan number.
 - b) Equipment service.
 - c) Design capacity.
 - d) Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 - 7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.05 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.06 CLEANOUTS

- A. Cast-Iron Cleanouts for Main Lines:
 - 1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
 - 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. Cast-Iron Cleanouts for RV Stalls:
 - 1. Description: 4" RV Female Footloose Sewer Cap (White), Enviro Design Products or equal. Submit shop drawing.
 - 2. Sewer Pipe Fitting and Riser to Cleanout: Schedule 40 PVC

PART 3 - EXECUTION

3.01 DIELECTRIC FITTING APPLICATIONS

- A. Dry Piping Systems: Connect piping of dissimilar metals with the following:
 - 1. NPS 2 and Smaller: Dielectric unions.
 - 2. NPS 2-1/2 and Larger: Dielectric flanges.
- B. Wet Piping Systems: Connect piping of dissimilar metals with the following:
 - 1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.

2. NPS 2-1/2 and Larger: Dielectric nipples.

3.02 PIPING INSTALLATION

- A. Install piping according to the following requirements and utilities Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a) Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - a) PVC Pipe Sleeves: For pipes smaller than NPS 6.
 - b) Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.03 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
 - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.04 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Install dielectric fittings at connections of dissimilar metal pipes.

3.05 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.06 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
 - 2. Locate pipe markers on exposed piping according to the following:
 - a) Near each valve and control device.
 - b) Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c) Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
 - d) At manholes and similar access points that permit view of concealed piping.
 - e) Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 - 1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple

units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.07 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.08 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Section 055000 "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.09 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.

- G. Place grout around anchors.
- H. Cure placed grout.

3.10 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 - 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 - 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 - 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

END OF SECTION

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SECTION 33 05 13

MANHOLE AND STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section Includes:
 - 1. Modular precast concrete manhole and structures with tongue-and-groove joints with masonry transition to cover frame, covers, anchorage, and accessories for
 - 2. Bedding and cover materials.
- **B.** Related Sections:
 - 1. Section 312000 Earthwork
 - 2. Section 031000 Concrete Forms and Accessories.
 - 3. Section 032000- Concrete Reinforcement.
 - 4. Section 033000 Cast-in-Place Concrete:

1.02 REFERENCES

- A. City of Bentonville, Arkansas
 - 1. Standard Specifications for Design and Construction of Water Lines and Sewer lines. Current Edition.
- B. American Concrete Institute:
 - 1. ASTM A48/A48M Standard Specification for Gray Iron Castings.
 - 2. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A536 Standard Specification for Ductile Iron Castings.
 - 4. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. ASTM C55 Standard Specification for Concrete Brick.
 - 6. ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
 - 7. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - 8. ASTM C497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
 - 9. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures.
 - 10. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
 - 11. ASTM D3753 Standard Specification for Glass-Fiber-Reinforced Polyester

1.03 DESIGN REQUIREMENTS

- A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.
- B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

- C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.
- 1.04 SUBMITTALS
 - A. Section 013000 Administrative Requirements: Requirements for submittals.
 - B. Shop Drawings: Indicate manhole and structure locations, elevations, piping, and sizes and elevations of penetrations.
 - C. Product Data: Submit cover and frame construction, features, configuration, and dimensions.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with the City of Bentonville's applicable standards requirements.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Section 016000 Product Requirements: Product storage and handling requirements.
 - B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes and structures.
 - C. Store precast concrete manholes and structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
 - D. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements.
- B. Cold Weather Requirements: ACI 530.

PART 2 - PRODUCTS

2.01 MANHOLES AND STRUCTURES

- A. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923 or cast-in-place (submit shop drawings for cast-in-place reinforcement and dimensions)
- B. Mortar and Grout: As specified in Section 040511, Masonry Mortar and Grout. Type S.

C. Reinforcement: As specified in Section 032000, Concrete Reinforcement.

2.02 FRAMES AND COVERS

- A. Manufacturers:
 - 1. Refer to Drawings for frame, grates, and covers required for each manhole and structure.
 - 2. Substitutions: Section 016000 Product Requirements
- B. Product Description: Cast iron construction, machined flat bearing surface and as shown on the Drawings.

2.03 COMPONENTS

A. Manhole Steps: corrosion resistant, coated, and reinforced with steel per ASTM C-478. Steel reinforcing minimum 1/2" diameter. Formed integral with manhole and structure sections.

2.04 CONFIGURATION

- A. Shaft Construction: As indicated on the Drawings, lipped male/female joints; sleeved to receive pipe sections.
- B. Shape: As indicated on the Drawings
- C. Clear Inside Dimensions: As indicated on the Drawings.
- D. Design Depth: As indicated on Drawings.
- E. Clear Cover Opening: [As indicated on Drawings.]
- F. Pipe Entry: Furnish openings as indicated on Drawings.
- G. Steps: As required by code.

2.05 BEDDING AND COVER MATERIALS

A. Refer to Section 312116, Trenching.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 013000 Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.

D. Verify correct size of manhole and structure excavation.

3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
- C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.03 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for manholes and structures in accordance with Section 312000 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
 - 2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
 - 3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
- B. Place base pad, trowel top surface level.
- C. Place manhole [and structure] sections plumb and level, trim to correct elevations, anchor to base pad.
- D. Backfill excavations for manholes and structures in accordance with Section 312000.
- E. Form and place manhole and structures cylinder plumb and level, to correct dimensions and elevations.
- F. Cut and fit for pipe sections.
- G. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.
- H. Set cover frames and covers level without tipping, to correct elevations.
- I. Coordinate with other sections of Work to provide correct size, shape, and location.

3.04 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

- A. Lift precast components at lifting points designated by manufacturer.
- B. When lowering manholes and structures into excavations and joining pipe to units, take

precautions to ensure interior of pipeline and structure remains clean.

- C. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 312000 and 312116 or on other support system shown on Drawings.
- D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.
- E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly.
- F. Maintain alignment between sections by using guide devices affixed to lower section.
- G. Joint sealing materials may be installed on site or at manufacturer's plant.
- H. Verify manholes and structures installed satisfy required alignment and grade.
- I. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.
- J. Cut pipe to finish flush with interior of structure.
- K. Shape inverts through manhole and structures as shown on Drawings.

3.05 FRAME AND COVER INSTALLATION

A. Set frames using mortar and pre-cast concrete rings. Install precast reinforced concrete rings. Lay precast concrete rings in full bed of mortar and completely fill joints.

3.06 FIELD QUALITY CONTROL

- A. Section 014000 Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test cast-in-place concrete in accordance with Section 033000.
- C. Vertical Adjustment of Existing Manholes and Structures:
 - 1. Where required, adjust top elevation of existing manholes and structures to finished grades shown on Drawings.
 - 2. Reset existing frames, grates and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.
 - 3. Remove concrete without damaging existing vertical reinforcing bars when removal of existing concrete wall is required. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement, as indicated Drawings.
 - 4. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete in accordance with Section 033000.

END OF SECTION

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SECTION 33 41 11

STORM DRAINAGE

PART 1 - GENERAL

1.01 SUMMARY

A. WARRANTY

- 1. Section Includes:
 - a) Storm drainage piping.
 - b) Accessories.
 - c) Underground pipe markers.
 - d) Catch basins and plant area drains.
- 2. Related Sections:
 - a) Section 312000 Earthwork: Backfill and compaction for structures and storm piping.
 - b) Section 312116 Trenching: Execution requirements for trenching required by this section.
 - c) Section 330513 Manholes and Structures.
 - d) Section 033000 Cast-in-Place Concrete: Concrete type for catch basin base pad construction.

B. REFERENCES

- 1. American Association of State Highway and Transportation Officials:
 - a) AASHTO T180 Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- 2. ASTM International:
 - a) ASTM A74 Standard Specification for Cast Iron Soil Pipe and Fittings.
 - b) ASTM C14 Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
 - c) ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - d) ASTM C443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - e) ASTM C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - f) ASTM C924 Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
 - g) ASTM C969 Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 - h) ASTM C1103 Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 - i) ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600kN-m/m3)).
 - j) ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700kN-m/m3)).
 - k) ASTM D2235 Standard Specification for Solvent Cement for

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Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

- 1) ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- m) ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- n) ASTM D2729 Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- o) ASTM D2751 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- p) ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- q) ASTM D6938 10 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- r) ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- s) ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. SUBMITTALS

- 1. Section 013000 Administrative Requirements: Requirements for submittals.
- 2. Product Data: Submit data indicating pipe, pipe accessories, and appurtenances.
- 3. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

D. CLOSEOUT SUBMITTALS

- 1. Project Record Documents:
 - a) Accurately record actual locations of pipe runs, connections, catch basins, structures, and invert elevations.
 - b) Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

E. QUALITY ASSURANCE

- 1. Perform Work in accordance with the City of Bentonville's applicable standards requirements.
- F. COORDINATION
 - 1. Section 013000 Administrative Requirements: Coordination and project conditions.
 - 2. Coordinate the Work with termination of storm sewer connection outside building, trenching, and to the connection to municipal storm sewer utility service.

PART 2 - PRODUCTS

2.01 STORM DRAINAGE PIPING

- A. Polyethylene Pipe:
 - 1. Piping and fittings shall be ADS N-12 ST IB pipe as manufactured by Advanced Drainage

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Systems (ADS) of Hilliard, OH, or equal.

- 2. Piping and fittings shall have a smooth interior and annular exterior corrugations.
- 3. Pipe shall be manufactured in accordance with AASHTO M252, Type S or SP for 4-inch through 10-inch diameter, and AASHTO M294 or ASTM F2306 for 12-inch through 60-inch diameter.
- 4. Pipe shall be joined using a bell and spigot joint meeting AASHTO M252, AASHTO M294 or ASTM F2306. The joint shall be soil-tight and gaskets shall meet the requirements of ASTM F477.
- 5. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
- 6. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch diameters, or 435400C for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.
- B. Perforated Pipe for Underdrains:
 - 1. Piping and fittings shall be perforated ADS single wall corrugated HDPE pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.
 - 2. Perforations shall be Type B pattern as specified by ADS. Contractor shall obtain approval if perforation pattern other than Type B is to be used.
 - 3. Perforated pipe shall be wrapped in geotextile fabric. Fabric shall be 4-oz non-woven geotextile fabric, Mirafi 140N or equivalent.
- C. Reinforced Concrete Pipe:
 - 1. Reinforced concrete pipe and flared-end sections: ASTM C 76, Type III, tongue and groove joints or as indicated on the Drawings.
 - 2. Joint material: cold-applied preformed plastic gasket type sealant conforming to ASTM C 443.

2.02 ACCESSORIES

A. UNDERGROUND PIPE MARKERS

1. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Storm Sewer Service" in large letters.

B. CATCH BASINS

1. Cast-in-place concrete or as indicated on the Drawings.

C. BEDDING AND COVER MATERIALS

- 1. Bedding: As indicated on the Drawings.
- 2. Cover: As indicated on the Drawings.

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PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 013000 Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on [layout] drawings.

3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

- A. Excavate pipe trench in accordance with Section 312116 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with [ASTM D2321]. Seal joints watertight.
- B. Place pipe on bedding material as indicated on the Drawings.
- C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.
- D. Place bedding backfill around pipe as indicated on the Drawings.
- E. Install trace wire continuous over top of pipe buried 12 inches below finish grade, above pipe line.

3.05 INSTALLATION – CATCH BASINS AND STRUCTURES

A. Perform work in accordance with Drawings.

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B. Refer to Section 330513, Manholes and Structures.

3.06 FIELD QUALITY CONTROL

- A. Section 014000 Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.07 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
 - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
- B. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

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PROJECT IDENTIFICATION SIGN



NOTES: SIGN MATERIAL IS 4x8 SHEET OF 5/8" M.D.O. PLYWOOD OR EQUIVALENT A-C GRADE. PROVIDE DOUBLED 2x4 LEGS AT EACH END, SET INTO EARTH. ALTERNATE MOUNTING AND/OR LOCATION WILL BE DETERMINED IN THE FIELD BY THE ARCHITECT.

COLOR KEY

COLOR NO. ① = SHERWIN WILLIAMS 7006 "EXTRA WHITE" COLOR NO. ② = SHERWIN WILLIAMS 7669 "SUMMIT GRAY" COLOR NO. ③ = SHERWIN WILLIAMS 6866 "HEART THROB" COLOR NO. ④ = SHERWIN WILLIAMS 6258 "TRICORN BLACK"

TEXT KEY

TEXT (A) = 2 INCH CENTURY GOTHIC TEXT (B) = 2 INCH CENTURY GOTHIC BOLD TEXT (C) = 3 INCH CENTURY GOTHIC BOLD

APPENDIX "A'