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DIVISION 03 - CONCRETE

SECTION 03 30 00

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CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(2010; R 2015) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 301	(2020) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(2017) Guide to Placing Concrete by Pumping Methods
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 308.1	(2023) Specification for Curing Concrete
ACI MNL-2	(2019; 11th Edition) ACI Manual of Concrete Inspection
ACI MNL-15	(2020) Field Reference Manual: Specifications for Concrete Construction ACI 301-20 with Selected ACI References

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard
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AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M	(2018) Structural Welding Code - Reinforcing Steel
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ASTM INTERNATIONAL (ASTM)

ASTM A184/A184M	(2019) Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615/A615M	(2022) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A706/A706M	(2022a) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A934/A934M	(2022) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996/A996M	(2016) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1022/A1022M	(2016b) Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement
ASTM A1044/A1044M	(2016a; Errata 1) Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete
ASTM A1064/A1064M	(2024) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31/C31M	(2024b) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2023) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2024) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78/C78M	(2022) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2024d) Standard Specification for Ready-Mixed Concrete
ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2022) Standard Specification for Portland Cement
ASTM C157/C157M	(2024; E 2024) Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2024) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2024) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete

ASTM C311/C311M	(2024) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2019; E 2022) Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	(2023) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2023; E 2023) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C803/C803M	(2023) Standard Test Method for Penetration Resistance of Hardened Concrete
ASTM C873/C873M	(2015) Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds
ASTM C900	(2015) Standard Test Method for Pullout Strength of Hardened Concrete
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C989/C989M	(2024) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1074	(2019; E 2021) Standard Practice for Estimating Concrete Strength by the Maturity Method
ASTM C1077	(2024) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1157/C1157M	(2023) Standard Performance Specification for Hydraulic Cement
ASTM C1218/C1218M	(2020c) Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1260	(2023) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1567	(2023) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2022) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete

ASTM C1778	(2023) Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete
ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D471	(2016a) Standard Test Method for Rubber Property - Effect of Liquids
ASTM D1751	(2018) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2628	(1991; R 2016) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2835	(1989; R 2017) Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2021) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96/E96M	(2024) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E329	(2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E1155	(2020) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E1643	(2018a) Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E1745	(2017; R 2023) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
CONCRETE REINFORCING STEEL INSTITUTE (CRSI)	
CRSI 10MSP	(2018; Errata 2019) Manual of Standard Practice
CRSI RB4.1	(2016) Supports for Reinforcement Used in Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1 (2009) DOC Voluntary Product Standard PS 1-07,
Structural Plywood

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 104 (1980) Method of Calculation of the Fineness Modulus of
Aggregate

COE CRD-C 513 (1974) Corps of Engineers Specifications for Rubber
Waterstops

COE CRD-C 572 (1974) Corps of Engineers Specifications for
Polyvinylchloride Waterstops

1.2 DEFINITIONS

- a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, and slag cement.
- b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.
- c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.
- d. "Supplementary cementing materials" (SCM) include coal fly ash, slag cement, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.
- e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.
- f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.
- g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.
- h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.
- i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having

a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Curing Plan

Quality Control Program; G

Quality Control Personnel Certifications; G

Quality Control Organizational Chart

Laboratory Accreditation; GMaturity Method Data

SD-02 Shop Drawings

Formwork

Reinforcing Steel; G, DO

SD-03 Product Data

Joint Sealants; G

Joint Filler; G

Formwork Materials

Cementitious Materials; G

Vapor Retarder

Concrete Curing Materials

Reinforcement; G

Liquid Chemical Floor Hardeners and Sealers

Admixtures

Mechanical Reinforcing Bar Connectors

Waterstops

Local/Regional Materials; S

Biodegradable Form Release Agent

Pumping Concrete

Nonshrink Grout

SD-04 Samples

Slab Finish Sample

SD-05 Design Data

Concrete Mix Design; G, DO

SD-06 Test Reports

Concrete Mix Design; G, DO

Fly Ash

Pozzolan

Slag Cement

Aggregates

Tolerance Report Compressive Strength Tests; G, DO
Air Content

Slump Tests

Water

SD-07 Certificates

Reinforcing Bars

Welder Qualifications

VOC Content for Form Release Agents, Curing Compounds, and Concrete Penetrating Sealers

Safety Data Sheets

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Liquid Chemical Floor Hardeners and Sealers

Joint Sealants; S

Curing Compound

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow [ACI 301](#), [ACI 304R](#) and [ASTM A934/A934M](#) requirements and recommendations. Do not deliver concrete until vapor retarder, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit all documentation required in **ACI 301** Section 4 and as specified in this section. Submit a complete list of materials including type; brand; source and amount of cement, supplementary cementitious materials, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. Required average strength can be documented by field experience if field strength test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using materials and conditions similar to those expected for work, and encompassing a period of not less than 45 days. The average of field strength tests shall equal or exceed f_{cr} . Changes in materials, conditions, and proportions within the test record shall not have been more closely restricted than those for the proposed work. Test records shall not be more than 24 months old. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Shop Drawings

1.6.2.1 Formwork

Drawings showing details of formwork including, but not limited to; joints, supports, studding and shoring, and sequence of form and shoring removal. Indicate placement schedule, construction, location and method of forming control joints. Include locations of inserts, conduit, sleeves and other embedded items. Reproductions of contract drawings are unacceptable.

Design, fabricate, erect, support, brace, and maintain formwork so that it is able to support, without failure, all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

1.6.2.2 Reinforcing Steel

Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Reproductions of contract drawings are unacceptable.

1.6.3 Control Submittals

1.6.3.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with **ACI 308.1**.

1.6.3.2 Pumping Concrete

Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.6.3.3 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.6.3.4 Safety Data Sheets

Submit Safety Data Sheets (SDS) for all materials that are regulated for hazardous health effects. SDS must be readily accessible during each work shift to employees when they are at the construction site.

1.6.4 Test Reports

1.6.4.1 Fly Ash and Pozzolan

Submit test results in accordance with **ASTM C618** for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.6.4.2 Slag Cement

Submit test results in accordance with **ASTM C989/C989M** for slag cement. Submit test results performed within 6 months of submittal date.

1.6.4.3 Aggregates

Submit test results in accordance with **ASTM C33/C33M**, or **ASTM C330/C330M** for lightweight aggregate, and **ASTM C1293** or **ASTM C1567** as required in the paragraph titled ALKALI-AGGREGATE REACTION.

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~~1.6.5.1 Slab Finish Sample~~

~~Install minimum of 10 foot by 10 foot slab. Slab finish sample must not be part of the final project. Finish as required by specification.~~

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1.6.5 Quality Control Program

Develop and submit for approval a concrete quality control program in accordance with the guidelines of **ACI 121R** and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of **ACI MNL-15** and **CRSI 10MSP** at project site.

1.6.6 Quality Control Personnel Certifications

The Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a **quality control organizational chart** defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel shall have the qualifications listed below or shall have written evidence of having completed similar qualification programs. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

- a. CQC personnel responsible for inspection of concrete operations: ACI Concrete Construction Inspector, Level II.
- b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.
- c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I: ACI Concrete Flatwork Associate of ACI Concrete Flatwork Finisher

1.6.6.1 Quality Manager Qualifications

The quality manager must hold a current license as a professional engineer in a U.S. state or territory with experience on at least five similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.6.6.2 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

- a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with [ACI MNL-2](#) or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in [ACI MNL-2](#).
- b. Testing agencies that perform testing services on reinforcing steel must meet the requirements of [ASTM E329](#).
- c. Testing agencies that perform testing services on concrete materials must meet the requirements of [ASTM C1077](#).

1.6.7 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of [ASTM C1077](#) and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.8 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with [ASTM C1077](#), including [ASTM C78/C78M](#) and [ASTM C1260](#). The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

- a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.
- b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by [ASTM C31/C31M](#).
- c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to material manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing period or for 72 hours after installation:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.7.1 Submittals for Environmental Performance

- a. Provide data indicating the percentage of post-industrial pozzolan (fly ash, slag cement) cement substitution as a percentage of the full product composite by weight.
- b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.
- c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.
- d. Provide product data stating the location where all products were manufactured
- e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.
- f. For projects using reusable formwork, provide data showing how formwork is reused.
- g. Provide SDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.
- h. Provide SDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.8 SUSTAINABLE DESIGN REQUIREMENTS

1.8.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources.

1.9 QUALIFICATIONS FOR WELDING WORK

Welding procedures must be in accordance with AWS D1.4/D1.4M.

Verify that Welder qualifications are in accordance with AWS D1.4/D1.4M for welding of reinforcement or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

- a. Form-facing material in contact with concrete must be lumber, plywood, tempered concrete-form-grade hardboard, metal, plastic, or treated paper that creates specified

appearance and texture of concrete surface. Submit product information on proposed form-facing materials if different from that specified herein.

- b. Design formwork, shores, reshores, and backshores to support loads transmitted to them and to comply with applicable building code requirements.
- c. Design formwork and shoring for load redistribution resulting from stressing of post-tensioned reinforcement. Ensure that formwork allows movement resulting from application of prestressing force.
- d. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.
- e. Design formwork to accommodate waterstop materials in joints at locations indicated in Contract Documents.
- f. Provide temporary openings in formwork if needed to facilitate cleaning and inspection.
- g. Design formwork joints to inhibit leakage of mortar.
- h. Limit deflection of facing materials for concrete surfaces exposed to view to 1/240 of center-to-center spacing of facing supports.
- i. Do not use earth cuts as forms for vertical or sloping surfaces.
- j. Submit product information on proposed form-facing materials if different from that specified herein.
- k. Submit manufacturer's product data on form liner proposed for use with each formed surface.

2.1.1 Wood Forms

Use lumber as specified in Section 06 10 00 ROUGH CARPENTRY and as follows. Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Plastic Forms

Plastic lumber as specified in Section 06 10 00 ROUGH CARPENTRY. Provide plastic forms that contain a minimum of 50 percent post-consumer recycled content, or a minimum of 50 percent post-industrial recycled content.

2.1.3 Carton Forms

Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set. Provide carton forms that contain a minimum of 10 percent post-consumer recycled content, or a minimum of 40 percent post-industrial recycled content.

2.1.4 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORMWORK ACCESSORIES

- a. Use commercially manufactured formwork accessories, including ties and hangers.
- b. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Form Ties

- a. Use form ties with ends or end fasteners that can be removed without damage to concrete.
- b. Where indicated in Contract Documents, use form ties with integral water barrier plates or other acceptable positive water barriers in walls.
- c. The breakback distance for ferrous ties must be at least $\frac{3}{4}$ in. for Surface Finish-2.0 or Surface Finish-3.0, as defined in [ACI 301](#).
- d. Submit manufacturer's data sheet on form ties.

2.2.2 Waterstops

Submit manufacturer's data sheet on waterstop materials and splices.

2.2.2.1 PVC Waterstop

Polyvinylchloride waterstops must conform to [COE CRD-C 572](#).

2.2.2.2 Rubber Waterstop

Rubber waterstops must conform to [COE CRD-C 513](#).

2.2.2.3 Thermoplastic Elastomeric Rubber Waterstop

Thermoplastic elastomeric rubber waterstops must conform to [ASTM D471](#).

2.2.2.4 Hydrophilic Waterstop

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water must conform to the following requirements when tested in accordance to [ASTM D412](#): Tensile strength 350 psi minimum; ultimate elongation 600 percent minimum. Hardness must be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F must be 3 to 1 minimum.

2.2.3 Biodegradable Form Release Agent

- a. Provide form release agent that is colorless, biodegradable, and water-based, with a low (maximum of 55 grams/liter (g/l)) VOC content.
- b. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
- c. Provide form release agent that reduces formwork moisture absorption, and does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.

- d. Submit manufacturer's product data on formwork release agent for use on each form-facing material.

2.2.4 Chamfer Materials

Use lumber materials with dimensions of $3/4 \times 3/4$ in .

2.2.5 Construction and movement joints

- a. Submit details and locations of construction joints in accordance with the requirements herein.
- b. Locate construction joints within middle one-third of spans of slabs, beams, and girders. If a beam intersects a girder within the middle one-third of girder span, the distance between the construction joint in the girder and the edge of the beam must be at least twice the width of the larger member.
- c. Locate construction joints in walls and columns at underside of slabs, beams, or girders and at tops of footings or slabs.
- d. Make construction joints perpendicular to main reinforcement.
- e. Provide movement joints where indicated in Contract Documents or in accepted alternate locations.
- f. Submit location and detail of movement joints if different from those indicated in Contract Documents.
- g. Submit manufacturer's data sheet on expansion joint materials.
- h. Provide keyways where indicated in Contract Documents. Longitudinal keyways indicated in Contract Documents must be at least $1-1/2$ in. deep, measured perpendicular to the plane of the joint.

2.2.6 Other Embedded items

Use sleeves, inserts, anchors, and other embedded items of material and design indicated in Contract Documents.

2.3 CONCRETE MATERIALS

2.3.1 Cementitious Materials

2.3.1.1 Portland Cement

- a. Unless otherwise specified, provide cement that conforms to **ASTM C150/C150M** Type II .
- b. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.
- c. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.
- d. Cementitious materials must be stored and kept dry and free from contaminants.

2.3.1.2 Blended Cements

- a. Blended cements must conform to **ASTM C595/C595M** Type IL or **ASTM C1157/C1157M** Type GU. Provide limestone added to the Type IL blend that is interground with cement clinker. Include a written statement from the manufacturer that the amount of limestone in the finished cement does not vary more than plus or minus 2.5 mass percent of the finished cement from lot to lot or

within a lot. Limit the percent of slab, pozzolan, or limestone to a maximum of IL(15). The percentage and type of mineral admixture used in the blend is not allowed to change from that submitted for the aggregate evaluation and mixture proportioning.

2.3.1.3 Fly Ash

- a. **ASTM C618**, Class F , except that the maximum allowable loss on ignition must not exceed 3 percent.
- b. If fly ash is used it shall range from 15 to 20 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, it shall not be used. Report the chemical analysis of the fly ash in accordance with **ASTM C311/C311M**. Evaluate and classify fly ash in accordance with **ASTM D5759**.

2.3.1.4 Slag Cement

ASTM C989/C989M, Grade 120.

2.3.1.5 Other Supplementary Cementitious Materials

Natural pozzolan must be raw or calcined and conform to **ASTM C618**, Class N, including the optional requirement for uniformity.

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to **ASTM C618**, Class F or N, and the following additional requirements:

- a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.
- b. The average particle size must not exceed 6 microns.
- c. The sum of SiO₂ plus Al₂O₃ plus Fe₂O₃ must be greater than 77 percent.

2.3.2 Water

- a. Water or ice must comply with the requirements of **ASTM C1602/C1602M**.
- b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.
- c. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.
- d. Protect mixing water and ice from contamination during storage and delivery.
- e. Submit test report showing water complies with **ASTM C1602/C1602M**.

2.3.3 Aggregate

2.3.3.1 Normal-Weight Aggregate

- a. Aggregates must conform to **ASTM C33/C33M** .
- b. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.
- c. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to

drain freely. Do not use aggregates that contain frozen lumps.

- d. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with [ASTM C33/C33M](#), and [ASTM C1293](#) expansion data not more than 18 months old.

2.3.4 Admixtures

- a. Chemical admixtures must conform to [ASTM C494/C494M](#). A high-range water-reducing (HRWR) admixture conforming to [ASTM C494/C494M](#) in concrete mix designs provided that slump does not exceed 8 inches.
- b. Air-entraining admixtures must conform to [ASTM C260/C260M](#) and must be used in concrete mix designs for the exterior surfaces exposed to cold weather.
- c. Do not use calcium chloride admixtures.
- d. Use a corrosion-inhibiting admixture for concrete classified under exposure category C1. Use an ASR-inhibiting admixture for concrete containing aggregate susceptible to ASR.
- e. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.
- f. Protect stored admixtures against contamination, evaporation, or damage.
- g. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.
- h. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Concrete Curing Materials

Provide concrete curing material in accordance with [ACI 301](#) Section 5 and [ACI 308.1](#) Section 2. Submit product data for concrete [curing compounds](#). Submit manufactures instructions for placement of curing compound.

2.4.2 Nonshrink Grout

Nonshrink grout in accordance with [ASTM C1107/C1107M](#).

2.4.3 Floor Finish Materials

2.4.3.1 Liquid Chemical Floor Hardeners and Sealers

- a. Hardener must be a colorless aqueous solution containing a blend of inorganic silicate or silicate material and proprietary components combined with a wetting agent; that penetrates, hardens, and densifies concrete surfaces. Submit manufactures instructions for placement of liquid chemical floor hardener.
- b. Use concrete penetrating sealers with a low (maximum 100 grams/liter, less water and less exempt compounds) VOC content. Submit manufactures instructions for placement of sealers.

2.4.4 Expansion/Contraction Joint Filler

[ASTM D1751](#) or [ASTM D1752](#) Type I or Type II. Material must be [1/2 inch](#) thick, unless otherwise

indicated.

2.4.5 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.5.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.5.2 Preformed Polychloroprene Elastomeric Type

ASTM D2628.

2.4.5.3 Lubricant for Preformed Compression Seals

ASTM D2835.

2.4.6 Vapor Retarder

ASTM E1745 Class A polyethylene sheeting, minimum 15 mil thickness or other equivalent material with a maximum permeance rating of 0.01 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.4.7 Dovetail Anchor Slot

Preformed metal slot approximately 1 inch by 1 inch of not less than 22 gage galvanized steel cast in concrete. Coordinate actual size and throat opening with dovetail anchors and provide with removable filler material.

2.5 CONCRETE MIX DESIGN

2.5.1 Properties and Requirements

- a. Use materials and material combinations listed in this section and the contract documents.
- b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.

The minimum cementitious material content for concrete used in floors must meet the following requirements:

Nominal maximum size of aggregate, in.	Minimum cementitious material content, pounds per cubic yard
1-1/2	470
1	520
3/4	540
3/8	610

- c. Selected target slump must meet the requirements this section, the contract documents, and must

not exceed 9 in. Concrete must not show visible signs of segregation.

- d. The target slump must be enforced for the duration of the project. Determine the slump by **ASTM C143/C143M**. Slump tolerances must meet the requirements of **ACI 117**.
- e. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must be in accordance with the requirements of the paragraph titled DURABILITY.
- f. Measure air content at the point of delivery in accordance with **ASTM C173/C173M** or **ASTM C231/C231M**.
- g. Concrete for slabs to receive a hard-troweled finish must not contain an air-entraining admixture or have a total air content greater than 3 percent.
- h. Concrete properties and requirements for each portion of the structure are specified in the table below. Refer to the paragraph titled DURABILITY for more details on exposure categories and their requirements.

	Minimum $f'c$ psi	Exposure Categories [^]	Miscellaneous Requirements
Grade Beams, Drilled Piers and Pier Caps	4500 at 28 days	S0 ; C0 ; W1 ; F2	Max. slump: 6 in. Nominal maximum aggregate size must be 3/4 in.
Slabs-on-grade	4000 at 28 days	S0 ; C0 ; W0 ; F1	Nominal maximum aggregate size must be 3/4 in.
Exterior Slab-on-grade	4500 at 28 days	S0 ; C0 ; W1 ; F2	Nominal maximum aggregate size must be 3/4 in.

2.5.2 Durability

2.5.2.1 Alkali-Aggregate Reaction

Do not use any aggregate susceptible to alkali-carbonate reaction (ACR). Use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction (ASR):

- a. For each aggregate used in concrete, the expansion result determined in accordance with **ASTM C1293** must not exceed 0.04 percent at one year.
- b. For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with **ASTM C1567** must not exceed 0.10 percent at an age of 16 days.
- c. Alkali content in concrete (LBA) must not exceed **4 pounds per cubic yard** for moderately reactive aggregate or **3 pounds per cubic yard** for highly reactive aggregate. Reactivity must be determined by testing in accordance with **ASTM C1293** and categorized in accordance with **ASTM C1778**. Alkali content is calculated as follows:
LBA = (cement content, **pounds per cubic yard**) × (equivalent alkali content of portland cement in percent/100 percent)

2.5.2.2 Freezing and Thawing Resistance

- a. Provide concrete meeting the following requirements based on exposure class assigned to members for freezing-and-thawing exposure in Contract Documents:

Exposure class	Maximum <i>w/cm</i> *	Minimum <i>f'c</i> , psi	Air content	Additional Requirements
F0	N/A	2500		N/A
F1	0.55	3500	Depends on aggregate size	N/A
F2	0.45	4500	Depends on aggregate size	See limits on maximum cementitious material by mass

*The maximum *w/cm* limits do not apply to lightweight concrete.

- b. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must meet the requirements of the following table:

Nominal maximum aggregate size, in.	Total air content, percent* ^A	
	Exposure Class F2 and F3	Exposure Class F1
3/8	7.5	6.0
1/2	7.0	5.5

Nominal maximum aggregate size, in.	Total air content, percent ^{*^}	
	Exposure Class F2 and F3	Exposure Class F1
3/4	6.0	5.0
1	6.0	4.5
1-1/2	5.5	4.5
2	5.0	4.0
3	5.5	3.5

*Tolerance on air content as delivered must be plus/minus 1.5 percent.

^For f_c greater than 5000 psi, reducing air content by 1.0 percentage point is acceptable.

- c. Submit documentation verifying compliance with specified requirements.

2.5.2.3 Corrosion and Chloride Content

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members requiring protection against reinforcement corrosion in Contract Documents.
- b. Submit documentation verifying compliance with specified requirements.
- c. Water-soluble chloride ion content contributed from constituents including water, aggregates, cementitious materials, and admixtures must be determined for the concrete mixture by **ASTM C1218/C1218M** at age between 28 and 42 days.
- d. The maximum water-soluble chloride ion (Cl⁻) content in concrete, percent by mass of cement is as follows:

Exposure class	Maximum w/cm*	Minimum f _c , psi	Maximum water-soluble chloride ion (CL ⁻) content in concrete, percent by mass of cement
Reinforced concrete			
C0	N/A	2500	1.00
C1	N/A	2500	0.30
C2	0.4	5000	0.15

*The maximum w/cm limits do not apply to lightweight concrete.

2.5.2.4 Sulfate Resistance

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members for sulfate exposure.

Exposure class	Maximum w/cm	Minimum f _c , psi	Required cementitious materials-types			Calcium chloride admixture
			ASTM C150/C150M	ASTM C595/C595M	ASTM C1157/C1157M	
S0	N/A	2500	N/A	N/A	N/A	No restrictions

2.5.2.5 Concrete Temperature

The temperature of concrete as delivered must not exceed 95°F .

2.5.2.6 Concrete Permeability

- a. Provide concrete meeting the requirements of the following table based on exposure class assigned to members requiring low permeability in the Contract Documents.

Exposure class	Maximum w/cm*	Minimum f _c , psi	Additional minimum requirements
W0	N/A	2500	None
W1	0.5	4000	None

*The maximum w/cm limits do not apply to lightweight concrete.

- b. Submit documentation verifying compliance with specified requirements.

2.5.3 Trial Mixtures

Trial mixtures must be in accordance to **ACI 301**.

2.5.4 Ready-Mix Concrete

Provide concrete that meets the requirements of **ASTM C94/C94M**.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by **ASTM C94/C94M**:

- a. Type and brand cement
- b. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete
- c. Maximum size of aggregate
- d. Amount and brand name of admixtures
- e. Total water content expressed by water cementitious material ratio
- f. Concrete drying shrinkage shall be determined for the approved concrete mixture per **ASTM C157/C157M** as modified by ACI.

2.6 REINFORCEMENT

Shop Fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

- a. Bend reinforcement cold. Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not permitted. Bending must be in accordance with the standard approved practice and by approved machine methods. Provide hooks and bends that are in accordance with the Contract Documents. Fabricate reinforcement in accordance with fabricating tolerances of [ACI 117](#).
- b. Submit manufacturer's certified test report for reinforcement.
- c. Submit placing drawings showing fabrication dimensions and placement locations of reinforcement and reinforcement supports. Placing drawings must indicate locations of splices, lengths of lap splices, and details of mechanical and welded splices.
- d. Submit request with locations and details of splices not indicated in Contract Documents.
- e. Submit request to place column dowels without using templates.
- f. Submit request for field cutting, including location and type of bar to be cut and reason field cutting is required.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

2.6.1 Reinforcing Bars

- a. Reinforcing bars must be deformed, except spirals, load-transfer dowels, and welded wire reinforcement, which may be plain.
- b. [ASTM A615/A615M](#) with the bars marked S, Grade 60; or [ASTM A996/A996M](#) with the bars marked R, Grade 60, or marked A, Grade 60. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total recycled content requirements.
- c. Reinforcing bars may contain post-consumer or post-industrial recycled content. Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.
- d. Submit mill certificates for reinforcing bars.

2.6.1.1 Bar Mats

- a. Bar mats must conform to [ASTM A184/A184M](#).

2.6.1.2 Headed Shear Stud Reinforcement

Headed studs and headed stud assemblies must conform to [ASTM A1044/A1044M](#).

2.6.2 Mechanical Reinforcing Bar Connectors

- a. Provide 125 percent minimum yield strength of the reinforcement bar.
- b. Submit data on mechanical splices demonstrating compliance with this paragraph.

2.6.3 Wire

- a. Plain or deformed steel wire must conform to [ASTM A1064/A1064M](#).
- b. Stainless steel wire must conform to [ASTM A1022/A1022M](#).

2.6.4 Welded wire reinforcement

- a. Use welded wire reinforcement specified in Contract Documents and conforming to one or more of the specifications given herein.
- b. Plain welded wire reinforcement must conform to [ASTM A1064/A1064M](#), with welded intersections spaced no greater than **12 in.** apart in direction of principal reinforcement.
- c. Deformed welded wire reinforcement must conform to [ASTM A1064/A1064M](#), with welded intersections spaced no greater than **16 in.** apart in direction of principal reinforcement.

2.6.5 Reinforcing Bar Supports

- a. Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports must conform to [CRSI RB4.1](#).
- b. Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.
- c. Minimum 10 percent post-consumer recycled content, or minimum 20 percent post-industrial recycled content. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total recycled content requirements. Plastic and steel may contain post-consumer or post-industrial recycled content.

2.6.6 Dowels for Load Transfer in Floors

Provide greased dowels for load transfer in floors of the type, design, weight, and dimensions indicated. Provide dowel bars that are plain-billet steel conforming to [ASTM A615/A615M](#), Grade 40.

2.6.7 Welding

- a. Provide weldable reinforcing bars that conform to [ASTM A706/A706M](#) and [ASTM A615/A615M](#) and Supplement S1, Grade **60**, except that the maximum carbon content must be 0.55 percent.
- b. Comply with [AWS D1.4/D1.4M](#) unless otherwise specified. Do not tack weld reinforcing bars.
- c. Welded assemblies of steel reinforcement produced under factory conditions, such as welded wire reinforcement, bar mats, and deformed bar anchors, are allowed.
- d. After completing welds on zinc-coated (galvanized), epoxy-coated, or zinc and epoxy dual-coated reinforcement, coat welds and repair coating damage as previously specified.

PART 3 EXECUTION

3.1 EXAMINATION

- a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.
- b. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

- c. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Contractor to complete a pre-placement conference to discuss project scope and ensure quality control procedures at least 3 days in advance of placing drilled piers, pier caps and grade beams, and slab-on-grade. Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

- a. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.
- b. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Slabs on Ground

- a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.
- b. Previously constructed subgrade or fill must be cleaned of foreign materials
- c. Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of **1/4 inch** when tested with a **10-foot** straightedge parallel with and at right angles to building lines.
- d. Finished surface of subgrade or fill under exterior slabs on ground must not be more than **0.02-foot** above or **0.10-foot** below elevation indicated.

3.2.3 Edge Forms and Screed Strips for Slabs

- a. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment.
- b. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.4 Reinforcement and Other Embedded Items

- a. Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.
- b. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 FORMS

- a. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade.
- b. Chamfer above grade exposed joints, edges, and external corners of concrete **0.75 inch**. Place

chamfer strips in corners of formwork to produce beveled edges on permanently exposed surfaces. Do not bevel reentrant corners or edges of formed joints of concrete.

- c. Provide formwork with clean-out openings to permit inspection and removal of debris.
- d. Inspect formwork and remove foreign material before concrete is placed.
- e. At construction joints, lap form-facing materials over the concrete of previous placement. Ensure formwork is placed against hardened concrete so offsets at construction joints conform to specified tolerances.
- f. Provide positive means of adjustment (such as wedges or jacks) of shores and struts. Do not make adjustments in formwork after concrete has reached initial setting. Brace formwork to resist lateral deflection and lateral instability.
- g. Fasten form wedges in place after final adjustment of forms and before concrete placement.
- h. Provide anchoring and bracing to control upward and lateral movement of formwork system.
- i. Construct formwork for openings to facilitate removal and to produce opening dimensions as specified and within tolerances.
- j. Provide runways for moving equipment. Support runways directly on formwork or structural members. Do not support runways on reinforcement. Loading applied by runways must not exceed capacity of formwork or structural members.
- k. Position and support expansion joint materials, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with removable material to prevent concrete entry into voids.
- l. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign materials before concrete placement.

3.3.1 Coating

- a. Cover formwork surfaces with an acceptable material that inhibits bond with concrete.
- b. If formwork release agent is used, apply to formwork surfaces in accordance with manufacturer's recommendations before placing reinforcement. Remove excess release agent on formwork prior to concrete placement.
- c. Do not allow formwork release agent to contact reinforcement or hardened concrete against which fresh concrete is to be placed.

3.3.2 Reuse

- a. Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.
- b. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.
- c. Remove leaked mortar from formwork joints before reuse.

3.3.3 Forms for Standard Rough Form Finish

Provide formwork in accordance with **ACI 301** Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.4 Forms for Standard Smooth Form Finish

Provide formwork in accordance with [ACI 301](#) Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view.

3.3.5 Form Ties

- a. After ends or end fasteners of form ties have been removed, repair tie holes in accordance with [ACI 301](#) Section 5 requirements.

3.3.6 Tolerances for Form Construction

- a. Construct formwork so concrete surfaces conform to tolerances in [ACI 117](#).
- b. Position and secure sleeves, inserts, anchors, and other embedded items such that embedded items are positioned within [ACI 117](#) tolerances.
- c. To maintain specified elevation and thickness within tolerances, install formwork to compensate for deflection and anticipated settlement in formwork during concrete placement. Set formwork and intermediate screed strips for slabs to produce designated elevation, camber, and contour of finished surface before formwork removal. If specified finish requires use of vibrating screeds or roller pipe screeds, ensure that edge forms and screed strips are strong enough to support such equipment.

3.3.7 Removal of Forms and Supports

- a. If vertical formed surfaces require finishing, remove forms as soon as removal operations will not damage concrete.
- b. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection.
- c. Do not damage concrete during removal of vertical formwork for columns, walls, and sides of beams. Perform needed repair and finishing operations required on vertical surfaces. If forms are removed before end of specified curing period, provide curing and protection.
- d. Leave formwork and shoring in place to support construction loads and weight of concrete in beams, slabs, and other structural members until in-place required strength of concrete is reached.
- e. Form-facing material and horizontal facing support members may be removed before in-place concrete reaches specified compressive strength if shores and other supports are designed to allow facing removal without deflection of supported slab or member.

3.3.8 Strength of Concrete Required for Removal of Formwork

If removal of formwork, reshoring, or backshoring is based on concrete reaching a specified in-place strength, mold and field-cure cylinders in accordance with [ASTM C31/C31M](#). Test cylinders in accordance with [ASTM C39/C39M](#). Alternatively, use one or more of the methods listed herein to evaluate in-place concrete strength for formwork removal.

- a. Tests of cast-in-place cylinders in accordance with [ASTM C873/C873M](#). This option is limited to slabs with concrete depths from 5 to 12 in.
- b. Penetration resistance in accordance with [ASTM C803/C803M](#).
- c. Pullout strength in accordance with [ASTM C900](#).

- d. Maturity method in accordance with [ASTM C1074](#). Submit [maturity method data](#) using project materials and concrete mix proportions used on the project to demonstrate the correlation between maturity and compressive strength of laboratory cured test specimens to the Contracting Officer.

3.4 WATERSTOP INSTALLATION AND SPLICES

- a. Provide waterstops in construction joints as indicated.
- b. Install formwork to accommodate waterstop materials. Locate waterstops in joints where indicated in Contract Documents. Minimize number of splices in waterstop. Splice waterstops in accordance with manufacturer's written instructions. Install factory-manufactured premolded mitered corners.
- c. Install waterstops to form a continuous diaphragm in each joint. Make adequate provisions to support and protect waterstops during progress of work. Protect waterstops protruding from joints from damage.

3.4.1 PVC Waterstop

Make splices by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. Reform waterstops at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled, must show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

3.4.2 Rubber Waterstop

Rubber waterstops must be spliced using cold bond adhesive as recommended by the manufacturer.

3.4.3 Thermoplastic Elastomeric Rubber Waterstop

Fittings must be shop made using a machine specifically designed to mechanically weld the waterstop. A portable power saw must be used to miter or straight cut the ends to be joined to ensure good alignment and contact between joined surfaces. Maintain continuity of the characteristic features of the cross section of the waterstop (for example ribs, tabular center axis, and protrusions) across the splice.

3.4.4 Hydrophilic Waterstop

Miter cut ends to be joined with sharp knife or shears. The ends must be adhered with adhesive.

3.5 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

- a. Unless otherwise specified, placing reinforcement and miscellaneous materials must be in accordance to [ACI 301](#). Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement.
- b. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.
- c. Nonprestressed cast-in-place concrete members must have concrete cover for reinforcement given in the following table:

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Cast against and permanently in contact with ground	All	All	3
Exposed to weather or in contact with ground	All	No. 6 through No. 18 bars	2
		No. 5 bar, W31 or D31 wire, and smaller	1-1/2
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars	1-1/2
		No. 11 bar and smaller	3/4
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	1-1/2

3.5.1 General

Provide details of reinforcement that are in accordance with the Contract Documents.

3.5.2 Vapor Retarder

- a. Install in accordance with **ASTM E1643**. Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of **12 inches** and tape.
- b. Remove torn, punctured, or damaged vapor retarder material and provide with new vapor retarder prior to placing concrete. Concrete placement must not damage vapor retarder.

3.5.3 Reinforcement Supports

Provide reinforcement support in accordance with **CRSI RB4.1** and **ACI 301** Section 3 requirements. Supports for coated or galvanized bars must also be coated with electrically compatible material for a distance of at least **2 inches** beyond the point of contact with the bars.

3.5.4 Splicing

As indicated in the Contract Documents. For splices not indicated follow **ACI 301**. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus **2 inches**.

3.5.5 Future Bonding

Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Provide bolt threads that match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.5.6 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.5.7 Inspection of Reinforcement

Inspect and verify proper reinforcement grade, shape, cross section and condition. Do not use reinforcement with the following defects:

- a. Bar lengths, depths, and bends beyond specified fabrication tolerances.
- b. Bends or kinks not indicated on drawings or approved shop drawings.
- c. Bars with reduced cross section due to rusting or other cause.

3.5.8 Placing Reinforcement

Place reinforcement in accordance with [ACI 301](#).

For slabs on grade (over earth or over capillary water barrier), support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than **1 inch** from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than **3-1/2 by 3-1/2 inches**, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

- a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with [ACI 301](#) and [CRSI 10MSP](#). Do not use supports to support runways for concrete conveying equipment and similar construction loads.
- b. Equip supports on ground and similar surfaces with sand-plates.
- c. Support welded wire reinforcement as required for reinforcing bars.
- d. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than **16 gage**.
- e. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to the Contract Documents.

- f. Bending of reinforcing bars partially embedded in concrete is permitted only as specified in the Contract Documents.

3.5.9 Spacing of Reinforcing Bars

- a. Spacing must be as indicated in the Contract Documents.
- b. Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.5.10 Concrete Protection for Reinforcement

Additional concrete protection must be in accordance with the Contract Documents.

3.5.11 Welding

Welding must be in accordance with [AWS D1.4/D1.4M](#).

3.6 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with [ASTM C94/C94M](#), [ACI 301](#), [ACI 302.1R](#) and [ACI 304R](#), except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.6.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.6.2 Mixing

- a. Mix concrete in accordance with [ASTM C94/C94M](#), [ACI 301](#) and [ACI 304R](#).
- b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates. A retarder shall be used to facilitate placing and finishing when concrete temperature is [85 degrees F](#) or greater.
- c. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture, within the manufacturer's recommended dosage, to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.
- d. When fibers are used, add fibers together with the aggregates and never as the first component in the mixer. Fibers must be dispensed into the mixing system using appropriate dispensing equipment and procedure as recommended by the manufacturer.

3.6.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.7 PLACING CONCRETE

Place concrete in accordance with [ACI 301](#) Section 5. Concrete shall be placed within 15 minutes of

discharge into non-agitating equipment.

3.7.1 Pumping

ACI 304R and **ACI 304.2R**. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed **2 inches** at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.7.2 Cold Weather

Cold weather concrete must meet the requirements of **ACI 301** unless otherwise specified. Do not allow concrete temperature to decrease below **50 degrees F**. Obtain approval prior to placing concrete when the ambient temperature is below **40 degrees F** or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain **50 degrees F** minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to **5 degrees F** in any one hour and **18 degrees F** per 24 hours after heat application.

3.7.3 Hot Weather

Hot weather concrete must meet the requirements of **ACI 301** unless otherwise specified. Maintain required concrete temperature using Figure 4.2 in **ACI 305R** to prevent the evaporation rate from exceeding **0.2 pound of water per square foot** of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.7.4 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

- a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.
- b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.
- c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than **6 gallons** of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of **1/16 inch**. Deposit fresh concrete before cement grout has attained its initial set.

3.8 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.8.1 Mixing Equipment

Before concrete pours, designate on-site area to be paved later in project for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.8.2 Hardened, Cured Waste Concrete

Use hardened, cured waste concrete as aggregate in concrete mix if approved by Contracting Officer.

3.8.3 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.8.4 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material. Institute deconstruction and construction waste separation and recycling for use in manufacturer's programs. When such a program is not available, seek local recyclers to reclaim the materials.

3.9 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.9.1 Defects

Repair surface defects in accordance with [ACI 301](#) Section 5.

3.9.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.9.3 Formed Surfaces

3.9.3.1 Tolerances

Tolerances in accordance with [ACI 117](#) and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with [ACI 301](#).

3.9.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with [ACI 301](#).

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

In accordance with [ACI 301](#) and [ACI 302.1R](#), unless otherwise specified. Slope floors uniformly to drains where drains are provided. Depress the concrete base slab where quarry tile, ceramic tile, or walk-off mats are indicated. Where straightedge measurements are specified, Contractor must provide straightedge.

3.10.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater. Grate tampers ("jitterbugs") shall not be used.

3.10.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. Finish concrete in accordance with **ACI 301** Section 5 for a scratched finish.

3.10.1.2 Floated

Use for exterior slabs where not otherwise specified. Finish concrete in accordance with **ACI 301** Section 5 for a floated finish.

3.10.1.3 Steel Troweled

Use for floors intended as walking surfaces, and for reception of floor coverings. Finish concrete in accordance with **ACI 301** Section 5 for a steel troweled finish.

3.10.1.4 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with **ACI 301** Section 5 for a broomed finish.

3.10.1.5 Pavement

Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straightedge to check slope and flatness; correct and refloat as necessary. Obtain final finish by a burlap drag. Drag a strip of clean, wet burlap from **3 to 10 feet wide and 2 feet longer** than the pavement width across the slab. Produce a fine, granular, sandy textured surface without disfiguring marks. Round edges and joints with an edger having a radius of **1/8 inch**.

3.10.1.6 Chemical-Hardener Treatment

Apply liquid-chemical floor hardener where indicated after curing and drying concrete surface. Dilute liquid hardener with water and apply in three coats. First coat must be one-third strength, second coat one-half strength, and third coat two-thirds strength. Apply each coat evenly and allow to dry 24 hours between coats.

Approved proprietary chemical hardeners must be applied in accordance with manufacturer's printed directions.

3.10.2 Flat Floor Finishes

ACI 302.1R. Construct in accordance with one of the methods recommended in Table 10.15.3a, "Slab-on-ground flatness/levelness construction guide" or Table 10.15.3b, "Suspended slab flatness/levelness construction guide" appropriate for the type of construction. **ACI 117** for tolerance tested by **ASTM E1155**.

a. Specified Conventional Value:

Floor Flatness (Ff) 25, 20 minimum

3.10.2.1 Measurement of Floor Tolerances

Test slab within 24 hours of the final troweling. Provide tests to Contracting Officer within 12 hours after collecting the data. Floor flatness inspector is required to provide a [tolerance report](#) which must include:

- a. Key plan showing location of data collected.
- b. Results required by [ASTM E1155](#).

3.10.2.2 Remedies for Out of Tolerance Work

Contractor is required to repair and retest any floors not meeting specified tolerances. Prior to repair, Contractor must submit and receive approval for the proposed repair, including product data from any materials proposed. Repairs must not result in damage to structural integrity of the floor. For floors exposed to public view, repairs must prevent any uneven or unusual coloring of the surface.

3.10.3 Concrete Walks

Provide [4 inches](#) thick minimum. Provide contraction joints spaced every [5 linear feet](#) unless otherwise indicated. Cut contraction joints [1 inch](#) deep, or one fourth the slab thickness whichever is deeper, with a jointing tool after the surface has been finished. Provide [0.5 inch](#) thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every [50 feet](#) maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to [1/4 inch in 5 feet](#).

3.10.4 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.10.5 Curbs and Gutters

Provide contraction joints spaced every [10 feet](#) maximum unless otherwise indicated. Cut contraction joints [3/4 inch](#) deep with a jointing tool after the surface has been finished. Provide expansion joints [1/2 inch](#) thick and spaced every [100 feet](#) maximum unless otherwise indicated. Perform pavement finish.

3.11 JOINTS

3.11.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Locate construction joints as follows:

3.11.1.1 Construction Joints for Constructability Purposes

- a. In walls, at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of deepest beam or girder framing into wall.
- b. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier.
- c. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.

Provide keyways at least 1-1/2-inches deep in construction joints in walls and between walls and footings.

3.11.2 Isolation Joints in Slabs on Ground

- a. Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
- b. Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.11.3 Contraction Joints in Slabs on Ground

- a. Provide joints to form panels as indicated.
- b. Sawcut contraction joints into slab on ground in accordance with ACI 301 Section 5.

3.11.4 Sealing Joints in Slabs on Ground

- a. Contraction and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.
- b. Sealed groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.12 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer, hardener, or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs, including .

3.12.1 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.12.2 Curing Periods

ACI 301 Section 5, except 10 days for retaining walls, pavement or chimneys. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.12.3 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.12.4 Curing Unformed Surfaces

- a. Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.
- b. Accomplish final curing of unformed surfaces by any of curing methods specified, as applicable.
- c. Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

3.12.5 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 5 degrees F in any one hour nor 49 degrees F in any 24-hour period.

3.12.6 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.12.7 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.13 FIELD QUALITY CONTROL

3.13.1 Aggregate Testing

3.13.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C136/C136M and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall be immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.13.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with **ASTM C136/C136M** for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.13.2 Concrete Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. **ASTM C31/C31M** for making test specimens.

3.13.3 Concrete Testing

3.13.3.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each 20 cubic yards (maximum) of concrete.

3.13.3.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.13.3.3 Compressive Strength Tests

ASTM C39/C39M. Make eight 6 inch by 12 inch or twelve 4 inch by 8 inch test cylinders for each set of tests in accordance with **ASTM C31/C31M**, **ASTM C172/C172M** and applicable requirements of **ACI 305R** and **ACI 306R**. Take precautions to prevent evaporation and loss of water from the specimen. Test two 6 inch by 12 inch or three 4 inch by 8 inch cylinders at 7 days, two 6 inch by 12 inch or three 4 inch by 8 inch cylinders at 28 days, and hold four 6 inch by 12 inch or six 4 inch by 8 inch cylinders in reserve. Take samples for strength tests for each concrete mixture placed each day not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two 6 inch by 12 inch or three 4 inch by 8 inch cylinders from the same concrete sample tested at 28 days. Concrete compressive tests must meet the requirements of this section, the Contract Document, and **ACI 301**.

3.13.3.4 Air Content

ASTM C173/C173M or **ASTM C231/C231M** for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.13.3.5 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

- a. Failure to meet compressive strength tests as evaluated.
- b. Reinforcement not conforming to requirements specified.
- c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
- d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.
- e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.
- f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.13.3.6 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.13.3.7 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with [ASTM C42/C42M](#), and as follows:

- a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.
- b. Test cores after moisture conditioning in accordance with [ASTM C42/C42M](#) if concrete they represent is more than superficially wet under service.
- c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.
- d. Strength of cores from each member or area are considered satisfactory if their average compressive strength is equal to or greater than 85 percent of the design compressive strength, and if no single core strength is less than 75 percent of the design compressive strength. Additional testing of cores extracted from locations represented by erratic core strength results will be permitted only when approved by the Contracting Officer.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.14 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.14.1 Crack Repair

Prior to final acceptance, all cracks in excess of **0.02 inches** wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.14.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than **1/4 inch** thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than **1/4 inch** thick must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.14.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

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SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 207	(2016; R 2017) Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components
AISC 325	(2017) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 360	(2016) Specification for Structural Steel Buildings
AISC DESIGN GUIDE 10	(1997) Erection Bracing of Low-Rise Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel
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AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1	(2020) Surface Texture, Surface Roughness, Waviness and Lay
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AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS QC1	(2016) Specification for AWS Certification of Welding Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM A6/A6M	(2024a) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A29/A29M	(2023) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A53/A53M	(2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2023) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2022) Standard Specification for Structural Steel Shapes
ASTM B695	(2021) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C827/C827M	(2023) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM F436/F436M	(2019) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F844	(2019; R 2024) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F959/F959M	(2017a; R 2023) Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series
ASTM F1136/F1136M	(2011) Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F2329/F2329M	(2015; R 2023) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F2833	(2011; R 2017) Standard Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type

ASTM F3125/F3125M (2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70 (2020) Specification for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1 (2024) Shop, Field, and Maintenance Coating of Metals

SSPC Paint 20 (2019) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)

SSPC Paint 29 (2002; E 2004) Zinc Dust Sacrificial Primer, Performance-Based

SSPC SP 3 (2018) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01 (2023; with Change 3, 2025) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR Part 1926, Subpart R Steel Erection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section **01 33 00 SUBMITTAL PROCEDURES**:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G, DO

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G, DO

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods; G

Non-Shrink Grout; G

Tension Control Bolts; G

Recycled Content for Structural Steel; S

Recycled Content for Structural Steel Tubing; S

Recycled Content for Steel Pipe; S

SD-05 Design Data

Shoring and Temporary Bracing; G, DO

SD-06 Test Reports

Class B Coating

Bolts, Nuts, and Washers

Weld Inspection Reports; G

Direct Tension Indicator Washer Inspection Reports; G

Bolt Testing Reports; G

SD-07 Certificates

Steel

Bolts, Nuts, and Washers

Galvanizing AISC Structural Steel Fabricator Quality Certification; G

AISC Structural Steel Erector Quality Certification; G

Welding Procedures and Qualifications

Welding Electrodes and Rods

Certified Welding Inspector

NDT Technician

Welding Procedure Specifications (WPS)

Under Running Crane Rail Beam

1.3 AISC QUALITY CERTIFICATION

Work must be fabricated by an AISC Certified Structural Steel Fabricator, in accordance with [AISC 207](#), Category BU. Submit [AISC Structural Steel Fabricator quality certification](#).

Work must be erected by an AISC Structural Steel Certified Erector, in accordance with [AISC 207](#), Category CSE. Submit [AISC Structural Steel erector quality certification](#).

1.4 QUALITY ASSURANCE

1.4.1 Preconstruction Submittals

1.4.1.1 Erection and Erection Bracing Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to [AISC 303](#).

1.4.2 Fabrication Drawing Requirements

Submit [fabrication drawings](#) for approval prior to fabrication. Prepare in accordance with [AISC 303](#), [AISC 326](#) and [AISC 325](#). Fabrication drawings must not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use [AWS A2.4](#) standard welding symbols. [Shoring and temporary bracing](#) must be designed and sealed by a registered professional engineer and submitted for record purposes, with calculations, as part of the drawings. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.4.3 Certifications

1.4.3.1 [Welding Procedures and Qualifications](#)

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welder or welding operator is more than 6 months old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in [AWS D1.1/D1.1M](#).

1.4.3.2 Overhead, [Under Running Crane Rail Beam](#)

Submit written field survey results for overhead, under running crane rail beam verifying tolerance requirements per [CMAA 70](#).

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with [AISC 303](#), [AISC 360](#), and [UFC 3-301-01](#) except as modified in this contract.

2.2 [STEEL](#)

2.2.1 Structural Steel

Wide flange and WT shapes, [ASTM A992/A992M](#). Angles, Channels and Plates, [ASTM A36/A36M](#). Provide structural steel containing a minimum of 80 percent recycled content. Submit data identifying percentage of [recycled content for structural steel](#).

2.2.2 Structural Steel Tubing

[ASTM A500/A500M](#), Grade C. Provide structural steel tubing containing a minimum of 25 percent recycled content. Submit data identifying percentage of [recycled content for structural steel tubing](#).

2.2.3 Steel Pipe

[ASTM A53/A53M](#), Type E or S, Grade B, weight class STD (Standard) or as indicated. Provide steel pipe containing a minimum of 50 percent recycled content. Submit data identifying percentage of [recycled content for steel pipe](#).

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

ASTM A307, Grade A, plain finish. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.3.1.2 Nuts

ASTM A563, Grade A, heavy hex style.

2.3.1.3 Washers

ASTM F844.

2.3.2 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretensioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

2.3.2.1 Tension Control Bolts

ASTM F3125/F3125M, Grade F1852 or F2280, Type 1, twistoff style assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be plain. Submit product data for tension control bolts.

2.3.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.3.2.3 Washers

ASTM F436/F436M, plain carbon steel.

2.3.3 Foundation Anchorage

2.3.3.1 Anchor Rods

ASTM F1554 Gr 36 or 55, Class 1A.

2.3.3.2 Anchor Nuts

ASTM A563, Grade A, hex style.

2.3.3.3 Anchor Washers

ASTM F844.

2.3.3.4 Anchor Plate Washers

ASTM A36/A36M.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M. Submit product data for welding electrodes and rods.

2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Submit product data for non-shrink grout.

2.4.3 Welded Shear Stud Connectors

ASTM A29/A29M, Grades 1010 through 1020. AWS D1.1/D1.1M, Table 7.1, Type B.

2.5 GALVANIZING

ASTM F2329/F2329M, ASTM F1136/F1136M, ASTM F2833 or ASTM B695 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

Do not splice truss top and bottom chords except as approved by the Contracting Officer. Provide chord splices at panel joints at approximately the third point of the span. The center of gravity lines of truss members must intersect at panel points unless otherwise approved by the Contracting Officer. When the center of gravity lines do not intersect at a panel point, make provisions for the stresses due to eccentricity. Camber of trusses must be 1/8 inch in 10 feet unless otherwise indicated.

2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

2.6.2 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces designed as part of a composite steel concrete section, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking and shear studs are to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer to a minimum dry film thickness of 2.0 mil. Submit shop primer product data.

Prime slip critical surfaces with a **Class B coating** in accordance with **AISC 325**. Submit test report for Class B coating.

*AM0002 Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer ~~in foggy or rainy weather~~; when the ambient temperature is below **45 degrees F** or over **95 degrees F**; or when the primer may be exposed to temperatures below **40 degrees F** within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer. AM0002*

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to **SSPC SP 3** when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter must be **1/2 inch** and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

- a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of **AISC 325**, **AISC 303** and **29 CFR Part 1926, Subpart R**.
- b. For low-rise structural steel buildings (**60 feet** tall or less and a maximum of 2 stories), erect the structure in accordance with **AISC DESIGN GUIDE 10**.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with **AISC 360**. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

Tighten **ASTM A307** bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 High-Strength Bolts

Provide direct tension indicator washers in all **ASTM F3125/F3125M**, Grade **A325** and Grade **A490** bolted connections. Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a

connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

3.2.2.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, install the DTIW under the bolt head and tighten the nut. If the DTIW is installed adjacent to the turned element, provide a flat washer between the DTIW and nut when the nut is turned for tightening, and between the DTIW and bolt head when the bolt head is turned for tightening. In addition to the LIW, provide flat washers under both the bolt head and nut when [ASTM F3125/F3125M](#), Grade [A490](#) bolts are used.

3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with [AWS D1.1/D1.1M](#). Provide [AWS D1.1/D1.1M](#) qualified welders, welding operators, and tackers.

Develop and submit the [Welding Procedure Specifications \(WPS\)](#) for all welding, including welding done using prequalified procedures. Submit for approval all WPS, whether prequalified or qualified by testing.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas. Remove backing strips from bottom flange of moment connections, backgouge the root pass to sound weld metal and reinforce with a [5/16 inch](#) fillet weld minimum.

3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.5.1 Field Priming

Field prime steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using [ASTM A780/A780M](#) zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing, except that electric power for field tests will be furnished as set forth in Division 1. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A **Certified Welding Inspector** must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of **AWS QC1**.

Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics of welding sets in use.

3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with **AWS D1.1/D1.1M**. Ultrasonic testing must be performed in accordance with Table 8.2 of **AWS D1.1/D1.1M**. Test locations must be as indicated. All personnel performing NDT must be certified in accordance with **ANSI/ASNT CP-189** in the method of testing being performed. Submit certificates showing compliance with **ANSI/ASNT CP-189** for all **NDT technicians**. If more than 20 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit **weld inspection reports**.

Testing frequency: Provide the following types and number of tests:

<u>Test Type</u>	<u>Number of Tests</u>
Ultrasonic	50 percent of CJP Welds
Magnetic Particle	50 percent of PJP and Fillet Welds
Dye Penetrant	50 percent of PJP and Fillet Welds

3.7.2 Direct Tension Indicator Washers

3.7.2.1 Direct Tension Indicator Washer Compression

Test direct tension indicator washers in place to verify that they have been compressed sufficiently to provide the **0.015 inch** gap, as required by **ASTM F959/F959M**. Submit **direct tension indicator washer inspection reports**.

3.7.2.2 Direct Tension Indicator Gaps

In addition to the above testing, an independent testing agency as approved by the Contracting Officer, must test in place the direct tension indicator gaps on 20 percent of the installed direct tension indicator washers to verify that the **ASTM F959/F959M** direct tension indicator gaps have been achieved. If more than 10 percent of the direct tension indicators tested have not been compressed sufficiently to provide the average gaps required by **ASTM F959/F959M**, test all in place direct tension indicator washers to verify that the **ASTM F959/F959M** direct tension indicator gaps have been

achieved. Test locations must be selected by the Contracting Officer.

3.7.3 High-Strength Bolts

3.7.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in [AISC 360](#), depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit [bolt testing reports](#).

3.7.3.2 Inspection

Inspection procedures must be in accordance with [AISC 360](#). Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

Inspect calibration of torque wrenches for high-strength bolts.

3.7.3.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.7.4 Inspection and Testing of Steel Stud Welding

Perform verification inspection and testing of steel stud welding conforming to the requirements of [AWS D1.1/D1.1M](#), Stud Welding Clause. The Contracting Officer will serve as the verification inspector. Bend test studs that do not show a full 360 degree weld flash or have been repaired by welding as required by [AWS D1.1/D1.1M](#), Stud Welding Clause. Studs that crack under testing in the weld, base metal or shank will be rejected and replaced by the Contractor at no additional cost.

-- End of Section --

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SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16 (2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE FUN IP (2021) Fundamentals Handbook, I-P Edition

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B29.400 (2001; (R 2008) (R 2013) (R 2018) (R 2023)) Combination, "H" Type Mill Chains, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel

ASTM A47/A47M (1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings

ASTM A53/A53M (2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A123/A123M (2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M (2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A307 (2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

ASTM A653/A653M (2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A666 (2023) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

ASTM A780/A780M (2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E330/E330M	(2014; R 2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION (DASMA)

ANSI/DASMA 108	(2017) Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2022) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2020) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA MG 1	(2021) Motors and Generators
NEMA ST 1	(1988; R 1994; R 1997) Specialty Transformers (Except General Purpose Type)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 325	(2017; Reprint Feb 2020) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overhead Coiling Doors; G, DO

Counterbalancing Mechanism; G, DO

Electric Door Operators; G, DO

Bottom Bars; G, DO

Guides; G, DO

Mounting Brackets; G, DO

Hood; G, DO

Installation Drawings; G, DO

SD-03 Product Data

Overhead Coiling Doors; G, DO

Hardware; G, DO

Counterbalancing Mechanism; G, DO

Electric Door Operators; G, DO

Recycled content for steel curtain slats; S

SD-05 Design Data

Overhead Coiling Doors; G

Hardware; G

Counterbalancing Mechanism; G

Electric Door Operators; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals, Data Package 2; G

SD-11 Closeout Submittals

Warranty; G

1.3 QUALITY CONTROL

1.3.1 Warranty

*AM0002

Furnish a written guarantee that the helical spring and counterbalance mechanism are free from defects in material and workmanship for not less than two years after completion and acceptance of the project.

AM0002*

Warrant that upon notification by the Government, any defects in material, workmanship, and door operation are immediately correct within the same time period covered by the guarantee, at no cost to the Government.

1.3.2 Operation And Maintenance Submittals

Submit 6 copies of the [operation and maintenance manuals](#) 30 calendar days prior to testing the Overhead Coiling Door Assemblies. Update and resubmit data for final approval no later than 30 calendar days prior to cContract completion.

Submit Operation and Maintenance Manuals for Overhead Coiling Door Assemblies, including the following items:

Manual Door Operators

Electric Door Operators

Hood

Counterbalancing Mechanism

Painting

Provide operation and maintenance manuals which are consistent with manufacturer's standard brochures, schematics, printed instructions, operating procedures, and safety precautions.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store doors in an adequately ventilated dry location that is free from dirt and dust, water, or other contaminants. Store in a manner that permits easy access for inspection and handling. Handle doors carefully to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide overhead coiling doors with interlocking slats, complete with anchoring and door hardware, guides, hood, and operating mechanisms, and designed for use on openings as indicated. Doors must be spring counterbalanced, rolling type, and designed for use on exterior or interior openings, as indicated. Doors must be operated by electric-power with auxiliary hand chain operation. Doors to be surface-mounted type with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position. Mount exterior doors as indicated .

2.1.1 Design Requirements

2.1.1.1 Door Detail Shop Drawings

Provide [installation drawings](#) for door assemblies which show: elevations of each door type, shape and thickness of materials, finishes, details of joints and connections, details of [guides](#) and fittings, rough opening dimensions, location and description of hardware, anchorage locations, and counterbalancing mechanism and door operator details. [Show locations of replaceable fusible links on wiring diagrams for power, signal and controls.](#) For motor-operated doors include supporting brackets for motors, location, type, and ratings of motors, and safety devices. Include a schedule showing the location of each door with the drawings.

2.1.2 Performance Requirements

2.1.2.1 Wind Loading

Design and fabricate door assembly to withstand the wind loading pressure of at least 30 [pounds per square foot](#) in accordance with [ANSI/DASMA 108](#). Provide test data showing compliance with

ASTM E330/E330M. Sound engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested. Ensure that the complete assembly meets or exceeds the requirements of **ASCE 7-16**.

2.1.2.2 Operational Cycle Life

Design all portions of the door, hardware and operating mechanism that are subject to movement, wear, or stress fatigue to operate through a minimum number of 10 cycles per hour. One complete cycle of door operation is defined as when the door is in the closed position, moves to the fully open position, and returns to the closed position.

2.2 COMPONENTS

2.2.1 Overhead Coiling Doors

2.2.1.1 Curtain Materials and Construction

Provide curtain slats fabricated from Grade A steel sheets conforming to **ASTM A653/A653M**, with the additional requirement of a minimum yield point of 33,000 psi. Provide 20 gauge sheets, Grade 40 steel with galvanized steel zinc coating in conformance with **ASTM A653/A653M** and **ASTM A924/A924M**. Provide steel curtain slats containing a minimum of 20 percent recycled content. Submit data identifying percentage of **recycled content for steel curtain slats**.

Fabricate doors from interlocking cold-rolled slats, with section profiles as specified, designed to withstand the specified wind loading. Ensure the provided slats are continuous without splices for the width of the door.

Provide slats filled with manufacturer's standard thermal insulation, complying with the maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to **ASTM E84**. Enclose the insulation completely within the slat faces on the interior surface of the slats.

2.2.1.2 Insulated Curtains

Form curtains from manufacturer's standard shapes of interlocking slats. Supply a slat system with a minimum R-value of 4 when calculated in accordance with **ASHRAE FUN IP**. Slats to consist of a urethane core not less than 11/16 inch thick, completely enclosed within metal facings. Slat steel thickness as required by the size of the door to meet specified performance requirements. The insulated slat assembly requires a flame spread rating of not more than 25 and a smoke development factor of not more than 50 when tested in accordance with **ASTM E84**.

2.2.1.3 Curtain Bottom Bar

Install curtain **bottom bars** as pairs of angles or using extrusions from the manufacturer's standard steel, stainless and aluminum extrusions not less than 2.0 by 2.0 inches by 0.188 inch. Do not use aluminum on doors more than 16 feet wide. Ensure steel extrusions conform to **ASTM A36/A36M**. Stainless steel extrusions conforming to **ASTM A666**, Type 304. Aluminum extrusions conforming to **ASTM B221**. Galvanize angles and fasteners in accordance with **ASTM A653/A653M** and **ASTM A924/A924M**. Coat welds and abrasions with paint conforming to **ASTM A780/A780M**.

Provide two minimum 2 inch by 2 inch by 1/8 inch structural steel angles.

2.2.1.4 Endlocks (and Windlocks)

Provide endlocks of Grade B cast steel conforming to **ASTM A47/A47M**, galvanized in accordance with **ASTM A153/A153M**. Secure locks at every other curtain slat. In addition to endlocks, exterior doors which are more than 16 feet wide or which have a design wind load of more than 20 pounds per square foot, must have windlocks of manufacturer's standard design. Windlocks must prevent curtain from leaving guide because of deflection from wind pressure or other forces.

2.2.1.5 Weather Stripping

Provide a hood baffle inside the hood that is a minimum **1/16 inch** thick sheet of vinyl, neoprene rubber or equivalent. Provide guide weather stripping that is a minimum **1/16 inch** thick sheet of vinyl, neoprene rubber, or equivalent.

Provide bottom bar weather-stripping that is a minimum **1/16 inch** thick sheet of vinyl, neoprene rubber, or equivalent.

2.2.1.6 Locking Devices

Ensure that the slide bolt engages through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

Provide a locking device assembly which includes cylinder lock, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

Provide a chain lock keeper suitable for a standard padlock.

2.2.1.7 Safety Interlock

Equip power-operated doors with a safety interlock switch to disengage power supply when the door is locked, or provide an operator with an internal lock sensing device to prevent the door opening when the door is locked.

2.2.2 Hardware

Ensure that all hardware conforms to **ASTM A153/A153M**, **ASTM A307**, and **ASTM F568M**.

2.2.2.1 Guides

Fabricate curtain jamb guides from the manufacturer's standard angles or channels of same material and finish as curtain slats unless otherwise indicated. Provide guides with sufficient depth or incorporate a steel locking bar to retain the curtain in place under the wind pressure specified. Ensure curtain operates smoothly. Slot bolt holes for track adjustment. Securely attach guides to adjoining construction with not less than **3/8 inch** diameter bolts, spaced near each end and not over **30 inches** apart.

Fabricate with structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Flare the top of inner and outer guide angles outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

2.2.2.2 Hood

Provide a hood with a minimum stainless steel sheet metal, flanged at top for attachment to header and flanged at bottom to provide longitudinal stiffness. The hood encloses the curtain coil and counterbalance mechanism.

Provide a weather baffle at the lintel or inside the hood of each exterior door.

2.2.3 Counterbalancing Mechanism

Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted, around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed or self-lubricating bearings for rotating members.

2.2.3.1 Brackets

Provide the manufacturer's standard [mounting brackets](#) with one located at each end of the counterbalance barrel conforming to [ASTM A36/A36M](#). Provide brackets of hot-rolled steel.

2.2.3.2 Counterbalance Barrels

Curtain must roll up on a barrel supported at head of opening on brackets and be balanced by a torsion spring system in the barrel. Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, conforming to [ASTM A53/A53M](#) or equivalent. Ensure the barrel is of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats. Limit barrel deflection to not more than [0.03 inch per foot](#) of span under full load.

a. Barrel

Provide steel pipe capable of supporting curtain load with maximum deflection of [0.03 inches per foot](#) of width.

b. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that effort to operate manually operated units does not exceed [25 lbs](#). At least 80 percent of the door weight must be counterbalanced at any position. Provide wheel for applying and adjusting spring torque.

2.2.3.3 Spring Balance

Install one or more oil-tempered, heat-treated steel helical torsion springs within the barrel, capable of producing sufficient torque to assure easy operation of the door curtain. Provide and size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

2.2.3.4 Torsion Rod for Counter Balance

Fabricate rod from the manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

2.2.3.5 Counterbalance Shaft Assembly

a. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that maximum effort to operate does not exceed [25 pounds](#). Provide wheel for applying and adjusting spring torque.

2.2.4 Electric Door Operators

Provide electrical wiring and door operating controls conforming to the applicable requirements of [NFPA 70](#) and [UL 325](#). The door manufacturer must furnish automatic control and safety devices, including extra flexible type SO cable and spring-loaded automatic takeup reel or equivalent device, as required for proper operation of the doors. Conduit, wiring, and mounting of controls are specified in [Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM](#).

Electric door-operator assemblies need to be the sizes and capacities recommended and provided by the door manufacturer for specified doors. Furnish complete assemblies with electric motors and factory-prewired motor controls, starter, gear reduction units, solenoid-operated brakes, clutch, remote-control stations, manual or automatic control devices, and accessories as required for proper operation of the doors.

Design the operators so that motors may be removed without disturbing the limit-switch adjustment and affecting the emergency auxiliary operators.

Provide a manual operator of crank-gear or chain-gear mechanisms with a release clutch to permit manual operation of doors in case of power failure. Arrange the emergency manual operator so that it may be put into and out of operation from floor level, and its use does not affect the adjustment of the limit switches. Provide an electrical or mechanical device that automatically disconnects the motor from the operating mechanism when the emergency manual operating mechanism is engaged.

2.2.4.1 Door-Operator Types

Provide an operator mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

2.2.4.2 Electric Motors

Provide motors which are the high-starting-torque, reversible, constant-duty electrical type with overload protection of sufficient torque and horsepower to move the door in either direction from any position. Ensure they produce a door-travel speed of not less than 8 nor more than 12 inches per second without exceeding the horsepower rating.

Provide motors which conform to NEMA MG 1 designation, temperature rating, service factor, enclosure type, and efficiency to the requirements specified. Motors must be suitable for operation on current of the characteristics indicated. Install motors in approved locations.

2.2.4.3 Motor Bearings

Select bearings with bronze-sleeve or heavy-duty ball or roller antifriction type with full provisions for the type of thrust imposed by the specific duty load.

Pre-lubricate and factory seal bearings in motors less than 1/2 horsepower.

Equip motors coupled to worm-gear reduction units with either ball or roller bearings.

Equip bearings in motors 1/2 horsepower or larger with lubrication service fittings. Fit lubrication fittings with color-coded plastic or metal dust caps.

In any motor, bearings that are lubricated at the factory for extended duty periods do not need to be lubricated for a given number of operating hours. Display this information on an appropriate tag or label on the motor with instructions for lubrication cycle maintenance.

2.2.4.4 Motor Starters, Controls, and Enclosures

Provide each door motor with: a factory-wired, unfused, disconnect switch; a reversing, across-the-line magnetic starter with thermal overload protection; 24-volt operating coils with a control transformer limit switch; and a safety interlock assembled in a NEMA ICS 6 type enclosure as specified herein. Ensure control equipment conforms to NEMA ICS 1 and NEMA ICS 2.

Provide adjustable switches, electrically interlocked with the motor controls and set to stop the door automatically at the fully open and fully closed position.

2.2.4.5 Control Enclosures

Provide control enclosures that conform to NEMA ICS 6 for general purpose NEMA Type 1.

2.2.4.6 Transformer

Provide starters with 230/460 to 115 volt control transformers with one secondary fuse when required to reduce the voltage on control circuits to 24volts or less. Provide a transformer conforming to **NEMA ST 1**.

2.2.4.7 Sensing-Edge Device

Provide each door with a pneumatic or electric sensing device that meets **UL 325**, extends the full width of the door, and is located within a U-section neoprene or rubber astragal, mounted on the bottom rail of the bottom door section. Device needs to immediately stop and reverse the door upon contact with an obstruction in the door opening or upon failure of the device or any component of the control system and cause the door to return to its user-defined open position. Any momentary door-closing circuit must be automatically locked out and the door must be operable manually or with constant pressure controls until the failure or damage has been corrected. A sensing device is not a substitute for a limit switch.

Connect sensing device to the control circuit through a retracting cord and reel.

2.2.4.8 Remote-Control Stations

Remote control stations must be at least **5 feet** above the floor line, and all switches must be located so that the operator will have complete visibility of the door at all times. Provide interior remote control stations that are full-guarded, momentary-contact three-button, heavy-duty, surface-mounted **NEMA ICS 6** type enclosures as specified. Mark buttons "OPEN," "CLOSE," and "STOP." The "OPEN" and "STOP" buttons must be of the type requiring only momentary pressure to operate. The "CLOSE" button must be of the type either requiring constant pressure to maintain the closing motion of the door or momentary pressure when installed with a monitored entrapment detection device which, upon failure of the device or any component of the control system, cause the door to return to its full open position. When the door is in motion and the "STOP" button is pressed, ensure the door stops instantly and remains in the stopped position. From the stopped position, the door may then be operated in either direction by the "OPEN" or "CLOSE" buttons. When the door is in motion, and the "CLOSE" button of the constant pressure type is released, the door must stop and remain in the stop position or reverse to the user set up position; from the stop position, the door may then be operated in either direction by the "OPEN" or "CLOSE" buttons. Controls must be adjustable to automatically stop the doors at their fully open and closed positions. Open and closed positions must be readily adjustable.

2.2.4.9 Speed-Reduction Units

Provide speed-reduction units consisting of hardened-steel worm and bronze worm gear assemblies or planetary gear reducers running in oil or grease and inside a sealed casing, coupled to the motor through a flexible coupling. Drive shafts need to rotate on ball- or roller-bearing assemblies that are integral with the unit.

Provide minimum ratings of speed reduction units in accordance with AGMA provisions for class of service.

Ground worm gears to provide accurate thread form; machine teeth for all other types of gearing. Surface harden all gears.

Provide antifriction type bearings equipped with oil seals.

2.2.4.10 Chain Drives

Provide roller chains that are a power-transmission series steel roller type conforming to **ASME B29.400**, with a minimum safety factor of 10 times the design load.

Heat-treat or otherwise harden roller-chain side bars, rollers, pins, and bushings.

Provide high-carbon steel chain sprockets with machine-cut hardened teeth, finished bore and keyseat, and hollow-head setscrews.

2.2.4.11 Brakes

Provide 360-degree shoe brakes or shoe and drum brakes. Ensure the brakes are solenoid-operated and electrically interlocked to the control circuit to set automatically when power is interrupted.

2.2.4.12 Clutches

Ensure clutches are friction type or adjustable centrifugal type.

2.2.4.13 Weather/Smoke Seal Sensing Edge

Provide automatic stop control by an automatic sensing switch within neoprene astragal extending the full width of door bottom bar.

Provide an electric sensing edge device. Ensure the door immediately stops downward travel when contact occurs before door fully closes. Provide a self-monitoring sensing edge connection to the motor operator.

2.2.5 Surface Finishing

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Noticeable variations in the same metal component are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.2.5.1 Galvanized and Shop-Primed Finish

Surfaces specified must have a zinc coating, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. The galvanized coating must conform to [ASTM A653/A653M](#), coating designation Z275 (G90), for steel sheets, and [ASTM A123/A123M](#) for iron and steel products. The weight of coatings for products must be as designated in Table I of [ASTM A123/A123M](#) for the thickness of base metal to be coated. The prime coat must be a type especially developed for materials treated by phosphates and adapted to application by dipping or spraying. Repair damaged zinc-coated surfaces by the materials and methods conforming to [ASTM A780/A780M](#) and spot prime. At the option of the Contractor, a two-part system including bonderizing, baked-on epoxy primer, and baked-on enamel top coat may be applied to slats and hoods before forming, in lieu of prime coat specified.

2.2.5.2 Baked-Enamel or Powder-Coat Finish

Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with the coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 EXECUTION

3.1 INSTALLATION

Install overhead coiling door assembly, anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories in accordance with approved detail drawings and manufacturer's written instructions. Upon completion of installation, ensure doors are free from all distortion.

Install overhead coiling doors, motors, hoods, and operators at the mounting locations as indicated for each door in the Contract Documents and as required by the manufacturer.

Install overhead coiling doors, switches, and controls along accessible routes in compliance with

regulatory requirements for accessibility and as required by the manufacturer.

3.1.1 Field Painted Finish

Ensure field painted steel doors and frames are in accordance with Section 09 90 00 PAINTS AND COATINGS and the manufacturer's written instructions. Protect the weather stripping from paint. Ensure that the finishes are free of scratches or other blemishes.

3.2 ADJUSTING AND CLEANING

3.2.1 Acceptance Provisions

After installation, adjust the hardware and moving parts. Lubricate bearings and sliding parts as recommended by manufacturer to provide smooth operating functions for ease movement, free of warping, twisting, or distortion of the door assembly.

Adjust seals to provide a weather-tight fit around entire perimeter.

Engage a factory-authorized service representative to perform startup service and checks according to the manufacturer's written instructions.

Test the door opening and closing operation when activated by controls or alarm-connected fire-release system. Adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Reset the door-closing mechanism after a successful test.

Test and make final adjustment of new doors at no additional cost to the Government.

3.2.1.1 Maintenance and Adjustment

Not more than 90 calendar days after completion and acceptance of the project, examine, lubricate, test, and re-adjust doors as required for proper operation.

3.2.1.2 Cleaning

Clean doors in accordance with manufacturer's approved instructions.

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SECTION 08 34 16.20
VERTICAL LIFT FABRIC DOORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

- AA ADM** (2020) Aluminum Design Manual
- AA DAF45** (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

- AAMA 611** (2014) Voluntary Specification for Anodized Architectural Aluminum

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

- AISC 325** (2017) Steel Construction Manual
- AISC 360** (2016) Specification for Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

- ANSI/ASNT CP-189** (2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel

AMERICAN WELDING SOCIETY (AWS)

- AWS A5.10/A5.10M** (2023) Welding Consumables - Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys - Classification
- AWS D1.1/D1.1M** (2020; Errata 1 2021) Structural Welding Code - Steel
- AWS D1.2/D1.2M** (2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

- ASTM A36/A36M** (2019) Standard Specification for Carbon Structural Steel
- ASTM A653/A653M** (2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM A992/A992M** (2022) Standard Specification for Structural Steel Shapes
- ASTM A1023/A1023M** (2021) Standard Specification for Stranded Carbon Steel

Wire Ropes for General Purposes

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D751	(2019) Standard Test Methods for Coated Fabrics
ASTM D2136	(2002; R 2012) Coated Fabrics - Low-Temperature Bend Test
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1	(2002) Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
NEMA ICS 1	(2022) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2020) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 5	(2017) Industrial Control and Systems: Control Circuit and Pilot Devices
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA KS 1	(2013) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
NEMA MG 1	(2021) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 79	(2015) Electrical Standard for Industrial Machinery
NFPA 220	(2024) Standard on Types of Building Construction
NFPA 409	(2022) Standard on Aircraft Hangars

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-889	(2021; Rev D) Galvanic Compatibility of Electrically Conductive Materials
UFC 1-200-01	(2022; with Change 3, 2024) DoD Building Code

UFC 3-301-01	(2023; with Change 3, 2025) Structural Engineering
UFC 4-010-06	(2023) Cybersecurity of Facility-Related Control Systems
UL SOLUTIONS (UL)	
UL 98	(2016; Reprint Jan 2022) UL Standard for Safety Enclosed and Dead-Front Switches
UL 248-1	(2011) Low Voltage Fuses - Part 1: General Requirements
UL 248-12	(2011; Reprint Aug 2020) Low Voltage Fuses - Part 12: Class R Fuses
UL 489	(2025) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 508	(2018; Reprint Jul 2021) UL Standard for Safety Industrial Control Equipment
UL 698A	(2018; Rev 2019) UL Standard for Safety Industrial Control Panels Relating to Hazardous (Classified) Locations
UL 1449	(2021; Reprint Dec 2022) UL Standard for Safety Surge Protective Devices

1.2 SUBMITTALS

AM0002 Government approval is required for submittals with a "G" or "S" classification. ~~Submittals not having a "G" or "S" classification are for Contractor Quality Control approval.~~ Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES: AM0002

SD-01 Preconstruction Submittals

Manufacturer's Qualifications; G, DO

Installer's Qualifications; G, DO

SD-02 Shop Drawings specific to this project, sealed by the Door Manufacturer's Registered Professional Engineer.

Door Design; G, DO

SD-03 Product Data

Diagrams, performance curves and characteristic curves of equipment and systems.

Electric Operator; G

Motors; G

Doors; G

Controls; G

Door Fabric; G

Surge Protection Device (SPD); G

SD-05 Design Data

Calculations; G, DO

Door Load Diagrams; G, DO

Door Compliance Matrix; G

SD-06 Test Reports

Safety Arrester Operation Test; G

Door Fabric: ASTM D2136; G

Door Fabric: ASTM E84; G

Door Fabric Connection; G

Weld Inspection Report; G

SD-07 Certificates

Manufacturer's Qualifications; G

Installers Qualifications; G

Welding Procedures and Qualifications; G

SD-09 Manufacturer's Field Reports

Acceptance Testing Procedure and Report; G

SD-10 Operation and Maintenance Data

Door Operation, Data Package 2; G

Emergency and Routine Preventative Maintenance Plan; G

SD-11 Closeout Submittals

Acceptance Testing Procedure and Report; G

Manufacturer's Warranty; G

1.3 DESIGN REQUIREMENTS

1.3.1 Door Design and Components

The vertical lift fabric doors and components indicated in the construction documents are representative of a commercially-available door. Design and fabricate the door to fit within the space allocated and in accordance with the criteria specified herein and without binding, interfering, or damaging the adjacent structure or itself. Provide a door with a minimum maintenance free operation for 3 years or 1,500 cycles, whichever occurs first, as counted by the door close limit switch. Construct the door with limited combustible construction materials in accordance with NFPA 220 and NFPA 409.

Include a [Door Compliance Matrix](#) along with your submittal which references each specification requirement and the corresponding document and page number where compliance may be verified by the reviewer.

Shop drawings of motors, all electrical control devices, and all electrical control panels, including schematic diagrams, dimensional drawings of control panels, details of control panel installations, internal wiring diagrams of control panels, and wiring diagrams indicating all external connections between control panels and from control panels to remote control devices. Furnish list of materials for all control devices, both inside and remote from control panels including manufacturer's model number, electrical ratings, location, and quantity of each item furnished.

Show all vertical lift fabric doors and components, including types, sizes, locations, fabric, supporting, bracing and framing steel and aluminum members, metal gages, fasteners, speed, hardware provisions, signage, installation details, and other details of construction. Include supporting brackets for motors, location of motors, and safety devices. Include personnel door, mullion pit and cover or retractable pin and strike if utilized. Provide details for the closure between bulkhead and doors. Include details for supporting and bracing the door assembly from the structure. Demonstrate through detailing that the indicated superstructure's non-dead load, service level deflections are accommodated in both the downward and upward directions. Indicate finishes to be used.

1.3.1.1 Steel Door Components

The door manufacturer's registered professional engineer is responsible for designing all supporting, bracing and framing steel members associated with the door system for the specified loads in accordance with the requirements of [AISC 325](#) and [AISC 360](#). Comply with the [AWS D1.1/D1.1M](#) Standards for all steel welding. Refer to Section [05 12 00 STRUCTURAL STEEL](#) for other requirements, including bolted connections.

1.3.1.2 Aluminum Door Components

The door manufacturer's registered professional engineer is responsible for designing all supporting, bracing and framing aluminum members associated with the door system for the specified loads in accordance with the requirements of the Aluminum Association ([AA ADM](#)). Comply with the [AWS D1.2/D1.2M](#) Standards for all aluminum welding.

1.3.1.3 Door Operational Performance

Provide a door which does not bind, catch or become adversely out of level during door operation. Door operation includes (1) fully opening then closing, (2) partially opening then closing, and (3) partially opening, then fully opening, and then closing. Partially opened doors may occur at any intermediate point and smooth operation of the door is required with smooth operation without binding.

1.3.2 Loads

Use the governing design loads for the design of the door system in accordance with [UFC 1-200-01](#), [UFC 3-301-01](#) and all other applicable criteria.

1.3.2.1 Wind Loads

In the closed position, design the entire door system to withstand the component and cladding wind pressures as indicated on the drawings for a Partially Enclosed building, based upon the indicated design wind velocity, geometry and other factors. Design all elements of the door's components and cladding to withstand both the highest positive and negative pressures based upon the actual tributary area from the wind, as indicated.

In addition, design the entire door system to be both fully open and fully operational for wind velocities up to [78 mph](#). Calculate the applicable component and cladding wind pressures, including importance factor, and utilize the controlling wind pressures or a positive and negative wind pressure of [15 psf](#) on the surface of the door, whichever is greater. Design door mullions and jambs for the unbalanced

positive or negative pressure on the surface of a closed adjacent door with the other adjacent door being open.

Submit complete [calculations](#) for all components sealed by the door manufacturer's registered professional engineer for review. Include calculations with analysis of the intermediate and bottom beams using the above applied wind conditions and door positions. Do not design intermediate or bottom beams to rely upon stabilization or bracing from the fabric when the door is not in the closed position. In both the open and closed position, design all intermediate beams for the maximum potential rotation permitted by manufacturer detailing such that applied wind loads are not assumed to act in only the strong axis.

1.3.2.2 Other Loads

Provide door mullions and jambs of adequate strength to transmit the forces from design wind loads, in addition to the other loads resulting from door operations or the door's action as a tributary element, with no detrimental effect on the operation of the door. Submit the vertical and horizontal loads imposed upon the building structure by the vertical lift fabric door system.

1.3.3 Door Speed

Provide for each door leaf to open fully with a minimum speed of [6 inches](#) per second under all design conditions. Provide door mullion(s), when required by the contract documents, to rotate with a minimum wire rope retraction speed of [6 inches](#) per second.

1.3.4 Door Weight

Submit [door load diagrams](#) of the door in the closed and governing open position(s). Provide details showing clearance and attachment requirements for coordination with the structural steel, miscellaneous steel, slab/foundation, and demonstration that superstructure's unfactored deflections are accommodated by the design of the mullions, pits and door leaves.

1.3.5 Cybersecurity

Design all control systems (including systems separate from a utility monitoring and control system) in accordance with [UFC 4-010-06](#) and as required by Section [25 05 11.03](#) CYBERSECURITY FOR FACILITY-RELATED CONTROL SYSTEMS: ESS. Implement cybersecurity requirements to mitigate vulnerabilities to all facility-related control systems.

1.4 QUALITY ASSURANCE

1.4.1 [Manufacturer's Qualifications](#)

Use a vertical lift fabric door product from a manufacturer who is regularly engaged in the design, fabrication, erection, and service of vertical lift fabric doors of type and size required for this project. The manufacturer must have at least 5 years of similar vertical lift fabric door design experience. Similar doors must have comparable function and design including size, configuration, type of use, retractable or moving elements, safety features, controls, and other key engineering elements as the door being specified. It is acceptable to show that a series of similar doors collectively meet all comparable elements to the door being specified, although not necessarily individually. Submit written manufacturer evidence on similar past door designs and installations listing the name, location, contact information of owners, installation dates, overall sizes, features, and other relevant information for experience and qualifications evaluation. Only manufacturers who can submit this evidence of actual installations where the products have proven practical, durable, and require a minimum of maintenance, will be qualified under this specification.

1.4.2 [Installer's Qualifications](#)

A manufacturer's representative, skilled and experienced in the erection of vertical lift fabric doors of the type specified herein, is required to supervise installation of the door system(s) in accordance with

approved shop drawings. For each Installer, submit written evidence of similar past door installations listing the name, locations, contacts information of owners, installation dates, overall sizes, features, and other relevant information for experience and qualifications evaluation.

1.4.3 Warranty

Provide a three-year warranty for all mechanical and electrical components against defects in material and workmanship beginning on the date of Project Acceptance. Manufacturer is responsible for items requiring adjustment, repair or replacement for the three-year maintenance-free warranty period, or 1500 door cycles, whichever occurs first. Provide a ten year warranty for defects in the fabric material.

1.4.3.1 Maintenance and Repair Action Plan

Provide an [Emergency and Routine Preventative Maintenance Plan](#). In Data Package SD-10 "Operation and Maintenance Data", include a list of phone numbers and personnel contacts and provide a list of suggested spare parts materials and tools to be purchased by the Contracting Officer. Include a list of annual visual safety inspections to be performed or contracted by the government and provide a door design which accommodates each of the visual inspection items with removable panels or viewing ports where inspection items are not directly viewable. A Preventative Maintenance Plan which requires adjustment or maintenance intervals less than 3 years or 1,500 cycles is not permitted.

Submit vertical lift fabric door manuals in accordance with Section [01 78 23 OPERATION AND MAINTENANCE DATA](#).

1.4.4 Delivery, Storage and Handling

Provide shipment of all materials required for door installation in protective packaging. Protect door and accessories from damage during delivery, storage, and handling. Mark all packaging clearly with manufacturer's brand name, door model and job site location. Store in dry location with adequate ventilation, and free from dust and water. Storage must permit easy access for inspection and handling. Remove damaged items that cannot be restored to like new condition or provide new items.

1.5 WELDING PROCEDURES AND QUALIFICATIONS

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welder or welding operator is more than 6 months old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Comply with applicable provisions of [AWS D1.1/D1.1M](#) for Steel.

Comply with applicable provisions of [AWS D1.2/D1.2M](#) for Aluminum.

PART 2 PRODUCTS

2.1 MATERIALS

Select materials based on durability, low maintenance, weather resistance and strength (permanent deformation from loading is not permitted). Comply with [ASTM E84](#) for limited combustible construction for all door system materials.

2.1.1 Steel Plate and Bars

[ASTM A36/A36M](#)

2.1.2 Steel Sheet

ASTM A653/A653M

2.1.3 Steel Shapes

ASTM A992/A992M

2.1.4 Aluminum Extrusions

ASTM B221, Alloy 6063-T6, Alloy 6005-T5 or 6000 Series Aluminum

2.1.5 Aluminum Sheets and Strips

ASTM B209, alloy and temper best suited for the purpose.

2.1.6 Aluminum Welding Rods and Bare Electrodes

AWS A5.10/A5.10M.

2.1.7 Door Fabric

Provide fabric material that is a heavy-duty, rip stop, vinyl coated polyester fabric weighing not less than 19 oz/square yard, capable of carrying 250 lb/in per panel. Provide fabric that is impervious and resistant to solvents, fuel, lubricants, and other similar fluids commonly found in aircraft maintenance hangars. Provide fabric that is ultraviolet (UV) stabilized, self-extinguishing (0-75 flame spread), and suitable to withstand temperatures between plus 158 to minus 31 degrees F in compliance with ASTM D2136. Use a translucent fabric material in approximately the top 10 feet of the door to allow daylighting of the hangar aircraft servicing area. Provide translucent fabric material that meets the same requirements and loadings as the standard door fabric. Fabric color will be selected by the Government from the manufacturer's standard colors. Construct door system such that fabric is tight between the intermediate beams when the door is closed and the wind locks engaged. Test the fabric to meet the criteria of ASTM E84 (flame spread - Class A interior wall and ceiling finish), ASTM D2136 (cold cracking, brittleness and temperature), and ASTM D751 (tensile and tear strength). Provide a minimum 4:1 factor of safety on the fabric design while accounting for degradation due to UV and temperature effects.

Submit door fabric panel samples for weight, strength, and color approval.

2.1.8 Wire Rope

ASTM A1023/A1023M.

2.2 DOORS

Door system consists of individual hoist-up fabric door leaves with intermediate aluminum beams or trusses. Maximum wind load deflection of steel structural door members is not to exceed the member length divided by 120. Maximum wind load deflection of extruded aluminum door members is not to exceed the member length divided by 30. Design and install the door system to accommodate the anticipated downward deflection due to self weight of the door system after all the building dead load has been applied. Then provide a door system which accommodates the stated unfactored downward and upward deflections of the superstructure to which it is being attached.

2.2.1 Fabric Door Leaves

When one-piece fabric construction is utilized, loop fabric over the uppermost beam and attach the fabric to both flanges of the intermediate beams, top beam, and bottom beam with self-tapping screws through corrosion resistant anodized or coated aluminum batten strip. Provide independent, third party laboratory testing to demonstrate door fabric connection has a minimum 2:1 factor of safety above the

required connection forces while accounting for fabric degradation due to UV and temperature effects.

Alternatively, when fabric panel construction is utilized, attach the fabric at all beams using a keder type connection. Provide independent, third party laboratory testing to demonstrate connections are stronger than the fabric.

2.2.2 Intermediate Door Beams

Provide corrosion resistant, extruded aluminum intermediate beams of a suitable depth dependent on the door width and the wind load requirements with a spacing not to exceed 6 feet. Provide, at each end of the beams, a guide block of self-lubricating material or rollers that run along the guides. Built-up members meeting these requirements are acceptable. Design the intermediate door beams and guide block or rollers to carry the full design wind load without failure and without being pulled from the door guides. Guide block or roller design cannot put the intermediate beam into tension under design wind load which would cause pulling forces on door jambs. Provide guide block material of nylon, polyoxymethylene (POM), or Ultra High Molecular Weight (UHMW) polyethylene. Provide rollers that are galvanized steel with maintenance free, lifetime sealed ball-bearings in case-hardened steel races. Midspan splices are prohibited in intermediate beams.

2.2.3 Door Guides

The vertical door guides are an integral part of the door, made of extruded aluminum with a suitable depth and width dependent on the size of the intermediate beams and wind load requirements. Provide guide rails with a T-shaped center guide designed to prevent guide blocks from escaping the guides and designed to prevent placing the intermediate beam in tension under design winds loads (catenary effect). Design the guides to provide weather sealing on the inside and outside faces. Provide adequate space inside the guides, or within the door, for all required components such as the nylon belt, polyester belt, or wire rope of the drive unit, windlocks and safety arresters. Provide removable door guides with anchorage to the mullion and jambs, as applicable, of the size and type required to carry the full design wind load without failure and without permanent deformation. Removable door guides will be mechanically fastened to permit the guide rail to be readily removed with standard tools. Provide guide blocks or roller, inside the guides, sufficient to prevent scraping or damage to the guide rail during normal door operation.

2.3 ELECTRIC OPERATORS

2.3.1 Drive Units

Provide each door leaf with a motor drive system with horsepower sized as appropriate for the weight of the door leaf plus door friction to account for operational wind speeds and corresponding pressures. Equip the gear motor with a drum on which the nylon belt, polyester belt, or wire ropes are wound, including required safety wraps and connections. For dead ends on wire ropes, provide a minimum of two unclamped dead wraps on the wire rope drum with the dead end anchored on the drum barrel by clamps or by inserting end fitting into reinforced pockets. For hoists using synthetic belts, provide a minimum of five dead wraps and belt anchorage to the drum.

If a single motor drive is used, wind the belts and wire ropes on the same drum. When using wire ropes, provide a grooved drum. Attach the belts and wire ropes to the bottom beam via the safety arresters. Provide a hand crank device or other manual means on the motor for manual operation of the door in the event of a power failure. Provide a gear motor that is removable without disturbing limit switch adjustment. Coordinate the drive units with the location of aircraft such that the drive units are accessible while aircraft are in the hangar.

Submit drive unit system horsepower, belt type, and locations. Safety arrestor type, test reports, and brake system details.

2.3.2 Belt/Wire Rope System

Properly select and utilize belts and/or wire ropes to transmit motive force to each door leaf. Install

belts/wire ropes free of any kinks and design the system and sheave diameter to prevent the occurrence of any kinks, and abnormal stress in the operating belts/wire ropes. Where belts/wire ropes pass through openings of the building structure, construct the openings to prevent abrasion, wear, or damage to the belts/wire ropes. Design belts, wire ropes, and their connections to have a minimum 6:1 factor of safety, including impact loads.

Do not use belt systems where individual lifted door weight exceeds **6,200 Lbs**. Include edge wear indicators on belts and properly terminate at all connections. Provide fully stitched flat eye belt terminations which are permanent and do not require routine adjustment or maintenance.

Properly swage wire rope ends and include thimble loops to prevent wire rope abrasion at end connections. Provide wire rope end connections which are permanent and do not require routine adjustment or maintenance.

Minimize the quantity of motors, sheaves and drums used to guide the belts or wire ropes to reduce maintenance requirements. Provide sheave units in accessible locations that allow inspection and preventive maintenance. Do not locate motors, sheaves, and drums in enclosed locations, which are not readily accessible for visual inspection and maintenance.

2.3.3 Door Drop Prevention

2.3.3.1 Door Leaf Safety Arresters

Supply each door leaf with safety arresters at each jamb door guide that automatically activate and support the door in case the door lifting system fails similar to a belt or wire rope breaking. Attach safety arresters to each end of the bottom beam which travel in the vertical guide tracks and cannot escape from, or pull off of, the door's guide rails. Provide safety arresters that immediately engage to stop the downward movement of the door in case of belt/wire rope failure in accordance with the below test requirements.

Perform a "Safety Arrestor Operation Test" on each set of safety arresters by a nationally recognized independent testing source to withstand at least 110 percent of the maximum door leaf weight.

The "Safety Arrestor Operation Test" will be deemed successful when it contains at least the following minimum criteria:

- a. Test door weight to at least 110 percent of the specific project's door weight.
- b. Test by simulating the door lifting system abruptly disengaging, similar to a belt or wire rope breaking.
- c. Verify the Safety Arresters automatically engage.
- d. Verify door leaf is brought to rest after an initial downward movement (or drop) of not more than **12 inches** and that the door leaf is held firmly in this position.
- e. Verify that damage from activation of the Safety Arresters is limited to localized replaceable components, such as the guide rails or safety arresters, and not a system failure which would require repair or replacement of any other portion of the door system or its structural support.

Submit independent testing source documentation of successful "[Safety Arrestor Operation Test](#)".

2.3.3.2 Door Leaf Safety Arrester Alternative

Door leaf safety arresters may be omitted, if each door leaf is provided with four or more lifting belts/wire ropes and if it is demonstrated through analysis of the entire door system that the door leaf remains stable, without falling, with the loss of either end belt/wire rope, or any two intermediate belts/wire ropes. Additionally demonstrate, that other failure mechanisms inherent in the door system will not result in a falling door leaf.

2.3.4 Slack Belt/Wire Rope Breaker

Use a safety device on all belts and wire ropes that will send a slack belt/wire rope condition to the appropriate drive unit(s) and prevent unsafe operation or any other unsafe condition.

2.3.5 Motors

NEMA MG 1, high-starting torque, reversible type with sufficient horsepower and torque output to move the door in either direction from any position. Provide a motor to produce a door travel speed of not less than **6 inches** per second without exceeding the rated capacity. Provide motors that operate on the indicated voltage. Provide motor enclosures that are drip-proof type or NEMA totally enclosed. Supply a hand crank which fits the motor for manual operation of the door in the event of a power failure. Install motors in approved locations. Provide motors that have a minimum service factor of 1.2 at continuous duty under maximum full load. Provide motors in accordance with Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM** and requirements listed above.

When two or more motors are used, provide mechanical linkage, electronic position monitoring and/or logic to eliminate the possibility that the door may bind, catch or become adversely out of level during door operation.

Submit motor characteristics including horsepower, service factor, safety factor, and standards compliance.

2.3.6 Controls

Provide control equipment in accordance with **NEMA ICS 2**. Provide control enclosures in accordance with **NEMA ICS 6**, Type 12 or Type 4X. Provide door electrical controls in accordance with **NEMA AB 1**, **NEMA ICS 2**, **NEMA ICS 5**, and **NEMA KS 1**. Provide door electrical controls in accordance with **NEMA ICS 1**, **NEMA ICS 6**, **NFPA 70**, **NFPA 79**, **UL 98**, **UL 248-1**, **UL 248-12**, **UL 489**, **UL 508**, **UL 1449**, and **UL 698A**. Provide UL listed door control components. Provide each Door Module with the following operators:

- a. Main Control Panel (Station) NEMA Type 4X enclosure.
- b. Remote (Auxiliary) Control Panel (Station) at the opposite end of hangar door NEMA Type 4X enclosure to match Main Control Panel.
- c. Provide emergency Stop Buttons located outside at the end of each hangar bay in a NEMA Type 4X enclosure.
- d. Provide "Open" operator on the exterior of each bay of doors, keyed for use by Fire Department personnel to allow entry in the event of an emergency, in a NEMA Type 4X enclosure.

Provide conduit and control wiring between Main, Auxiliary, emergency stop controls, proximity switches, limit switches, and each door motor drive unit. Provide power and controls wiring and conduit in accordance with Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM**.

Submit controls characteristics including all electrical components and devices used in the control system, enclosures, safety devices, transformer size and voltage, and emergency power connection.

2.3.6.1 Control Panel Enclosures

Provide **NEMA ICS 6**, Type 12 or Type 4X control panel enclosures. Provide an integral main power disconnect switch that is mechanically interlocked with the control panel door at each control panel. Provide factory wired field wiring terminal strip in each control panel and instantaneous three-phase thermal overload relays. Provide each control panel enclosure including an internal motor starter or VFD with adequate integral ventilation (air conditioning if required) for operation in a **120 degree F** ambient environment. Provide NEMA rated control relays. Provide main control panel with

programmable logic controller.

Provide a three phase UL 1449 listed surge protection device (SPD) for the incoming power to each door control panel. Provide a UL 1449 listed surge suppression device (SPD) for each control circuit (limit switch, proximity switch, motor, brake, solenoid, indicating light, and pushbutton) that is routed external from each door main control panel.

Submit data for each incoming and outgoing power feeder and each control circuit.

Provide devices to control the logic and sequence of door and mullion operation to ensure safe, smooth and dependable operation at each control panel. Provide interlocks to preclude personnel injury, including an interlock between the power supply system and use of the hand crank for manual operation of the door. Provide constant-pressure type, fully guarded, illuminated push buttons on the control panel for both up and down operations. Provide mushroom type emergency stop button on each control panel. Utilize individual user password protected touch screen interface to select desired door or mullion motion. Door motion will be initiated via fully guarded push buttons.

*AM0002 ~~Provide back-up power hook-up at the control panel to connect to a portable generator provided by the Base via a pin and sleeve female receptacle (coordinate with Base) and manual transfer switch provided on the main control panel.~~

AM0002*

2.3.7 Limit Switches

Provide limit switches or proximity switches to automatically stop doors at the fully open and fully closed positions. Provide limit switches or proximity switch positions that are readily adjustable. Provide limit switches or proximity switches for the wind lock with visual indication on the control panel for each door leaf. Provide visual indication to notify the door operator that the wind locks are engaged for all door leaves.

Demonstrate the operability of all limit switches prior to Government occupancy.

2.3.8 Door Control Alarms

Provide an audible alarm device on each door main control panel (minimum 100 dbA) that sounds 5 seconds before the door moves and continues to sound when the door is moving. Coordinate this audible signal such that it is clearly different from all of the other audible signals utilized in the hangar bay.

Provide a visual alarm device above each door main control panel (LED beacon with 1600 lumens) that operates 5 seconds before the door moves and continues to operate when the door is moving. Coordinate the color of this visual signal such that it is clearly a different color than all of the other visual signals utilized in the hangar bay.

2.3.9 Safety Device

Provide an intrinsically safe (suitable for a Class I Division 2 hazardous location) electric safety edge on the bottom of the edge of each door, continuous over the full length of the door. Provide a safety edge located inside of a rubber cushioned bottom weather sealing edge (or boot) with sufficient vertical height (factoring in the time and distance that it takes to stop a closing door) to prevent collision damage along the bottom edge of the door. Activate the safety edge when the door is closing and do not allow the safety edge to prevent the door from completely closing and properly sealing along its entire length.

2.3.10 Control Transformers

Provide fused transformers inside of each Main Control Panel as necessary to reduce the voltage on the control circuits to 120 volts or less.

2.3.11 Electrical Components

NFPA 70. Provide automatic control and safety devices, including failsafe battery powered wireless limit switches or hard-wired limit switches electrified components. Wire rope reel type take-up devices are not allowed. Provide control wiring in accordance with **NFPA 70**. Provide conduit, wiring, and mounting of controls in accordance with Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM**.

2.4 HEADER BOX

Construct the header boxes of carbon steel and finished in accordance with the paragraph FINISHES.

2.5 BOTTOM BEAM

Construct the bottom beam of carbon steel and finished in accordance with the paragraph FINISHES. Provide a bottom beam of a suitable width and depth to carry the load of the intermediate beams when the door is not closed, and to ensure full closing and a tight floor seal under full design wind speeds spanning between windlocks located at each jamb. Provide a heavy-duty bottom rubber seal to form a tight seal with the floor under all design conditions. Provide a bottom edge safety device that is integral with the bottom seal.

Design bottom beams to span between safety arrestors at the jambs and support the weight of the door, including intermediate beams, while remaining stable and within the door guides. If the door leaf safety arrestor alternative is utilized per paragraph DOOR LEAF SAFETY ARRESTERS, design the bottom beam to support the weight of the door, including intermediate beams with either end belt/wire rope, or any two intermediate belts/wire ropes, removed while remaining stable and within the door guides. Midspan splices are prohibited in the bottom beam.

2.6 WIND LOCK

At each door leaf provide wind locks at each jamb, which automatically activate and lock the bottom beam into place when the door reaches its closed position to maintain a tight floor seal and intermediate beam stability with tight fabric under design wind conditions. Provide a limit switch, or a proximity switch, with indicator to notify the door operator that all wind locks are engaged properly. Provide switches located below **18 inches** above finish floor that are compliant with **NFPA 70**, Class I, Division 2 hazardous environment.

2.7 PERSONNEL DOOR

Personnel doors are not required in Hangar doors.

2.8 OPERATION

2.8.1 Door Operation

Provide a vertical lift fabric door which guides up and down in weather sealed vertical guides attached to the structure. Provide a door system which operates by lifting the bottom beam upwards in each door leaf, thereby stacking the intermediate beams one on top of the other, with the fabric material folding in pleats. Door operational safety is of paramount importance.

When the door system is fully open, all door system components will be outside of the required clearance area for the door opening.

When the door system is fully closed the door system will seal the opening and form a portion of the building's air barrier. The intermediate beams hang between the two fabric faces thus pulling the fabric material tight and sealing along the guides at each jamb. The tension created in the fabric panels is permitted to stabilize the intermediate beams, if proven capable by the manufacturer, and the bottom beam seal will fit tightly along the entire length of the door threshold.

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Including wiring diagrams and the complete manufacturer's instructions for operation and maintenance of the doors, door mullions where indicated, and accessories, including emergency operation, in the event of general building power failure to the doors.

2.8.2 Electrical Operation

Provide the main control panel with control logic such that when the remote building manual transfer switch "dry" auxiliary contact with the portable emergency generator is closed in the "emergency" position the control panel will automatically limit only one door lift motor or one mullion lift motor to operate at a time.

The door will be stopped by a primary limit switch when the door is opened completely. In case of over travel, the door will be stopped by a secondary limit switch to prevent damage. Slack belt/wire rope breakers will stop the drive unit when the door is closed. In case of belt/wire rope break/rupture or if an obstruction should prevent the door from being closed the slack belt/wire rope breakers will also stop the drive unit. Weight or springs activate the slack breakers.

A touch screen (HMI) control panel station is required at the main and at all auxiliary stations.

Control door operation by three buttons marked "OPEN", "CLOSE", and "STOP". The "OPEN" and "STOP" buttons require only momentary pressure to operate. The "CLOSE" button requires constant pressure to maintain the closing motion of the door. The door will immediately stop, and remain in that position, when the door is in motion and the "STOP" button is pressed or the "CLOSE" button is released. From that stop position, the door operation is then continued in either direction by the "OPEN" or "CLOSE" buttons. Removing the pressure from the "CLOSE" button results in stopping the motor drive and setting the brake.

Two buttons marked "Horizontal Position and Vertical Position" control the mullion operation. Both buttons are controlled by constant pressure to open and to close. Removing the pressure from either button stops the motor drive and sets the brake. The electrical control panel provides an interlock function to coordinate door leaf and mullion operation.

Buttons are illuminated on the HMI (control panel) and utilize simple flashing/solid illumination schemes to inform the operator of door status (fully open, closed, in motion, etc.). The large touch screen display graphically illustrates the door system to permit the user to select desired operation and inform the user of current door status. Door operation on the HMI (Control Panel) are password protected, by individual user, to prevent accidental or unauthorized operation.

2.9 FINISHES

2.9.1 Ferrous Metal

Provide cleaned, prepared and shop-finished ferrous metal surfaces in accordance with Section 09 90 00 PAINTS AND COATINGS . Follow coating system manufacturer's written instructions. Shop finishing of all ferrous metal coatings is required with field coatings limited to touch-up painting and coating of only unfinished accessories such as bolts and brackets.

2.9.2 Aluminum

Before fabrication, clean the units and provide the coating system specified below in accordance with the requirements of the Aluminum Association Designation System, AA DAF45.

Clear Anodized: Conforming to AA-M12-C22-A41 in accordance with NAAMM AMP 500 and complying with AAMA 611. The minimum finish thickness is 0.7 mil or greater.

2.10 SIGNAGE

Provide a placard sign immediately adjacent to all control panels indicating the below Notice. Include

the service level wind speed which corresponds to the ultimate wind speed used in design of the open/operational door in paragraph WIND LOADS in the Notice post..

Notice:

Vertical lift fabric doors will be closed and not operated when wind speeds above 60 mph are expected.

Vertical lift fabric doors will be transferred to back-up power for operation when commercial power is not available.

PART 3 EXECUTION

3.1 PROTECTIVE COATINGS

3.1.1 Cleaning

After fabrication, clean all metal surfaces thoroughly of all mill scale, rust, oil, grease and other foreign substances. Apply rust-preventive primer to all steel parts immediately after cleaning.

3.1.2 Shop Painting

After cleaning, coat with primer all steel surfaces other than machine-finished parts. Keep paint off finished bearing surfaces. Before assembly, prime surfaces that will be inaccessible after assembly. Handle painted materials with care to avoid scraping and breaking the protective film. Ferrous metal surfaces that will be exposed after fabrication will be shop coated and touch-up painted in the field in accordance with the paragraph FINISHES.

3.1.3 Metal Protection

Provide in accordance with Chapter 4 of [UFC 1-200-01](#) when door system is in a corrosion prone location or where door system components use dissimilar metals. If dissimilar metals are used, also provide in accordance with [MIL-STD-889](#). Provide added corrosion protection to the design such as, but not limited to, the following. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact masonry or concrete, protect against corrosion by painting contact surfaces with bituminous coating.

3.2 WELDS

3.2.1 Visual Inspection

Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections in accordance with [AWS D1.1/D1.1M](#). Perform visual inspections on 100 percent of all welds with a Certified Welding Inspector. Document this inspection with the Nondestructive Testing.

Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics of welding sets in use.

3.2.2 Nondestructive Testing

Perform nondestructive testing in accordance with [AWS D1.1/D1.1M](#). Perform ultrasonic testing in accordance with Table 6.2 or 6.3 of [AWS D1.1/D1.1M](#). Test 50 percent of all welds, with sampling representative of all weld types and locations for the entire door system and for the duration of the fabrication schedule. All personnel performing NDT are required to be certified in accordance with [ANSI/ASNT CP-189](#) in the method of testing being performed. Submit certificates showing compliance with [ANSI/ASNT CP-189](#) for all NDT technicians. If more than 10 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder are

required to be tested by ultrasonic testing, and all fillet welds made by that welder are required to be inspected by magnetic particle testing (MT) or dye penetrant testing (PT). When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit [weld inspection report](#).

3.3 ERECTION

Provide all work associated with these door systems under the direct supervision and control of the fabricator for safety, control of product liability, and Engineer of Record responsibilities. Coordinate the erection of the doors with the work of other trades. Coordinate the design, fabrication and erection of the door systems and adjust for actual camber, fabrication, and erection tolerances of the supporting structure including simulated door weight load testing and survey to ensure proper fit-up of the final door system. Coordinate mullion pit locations (including their drains), alignment and orientation. Ensure that all steel support, bracing and framing members are furnished and accurately installed. Coordinate electrical work, including locations of all panels, equipment, motors and other components for required clearances, access and routing of power.

3.3.1 Assembly

Assemble and install the doors and accessories in accordance with the manufacturer's recommendations and installation manual. Secure guides to the walls plum, level, and in-line. Anchor guides at spacing indicated on the manufacturer's installation drawings. Provide additional supports as necessary for attachment of guides, brackets, doors, and operation mechanisms. After erection is complete and before touch-up field painting is applied, thoroughly clean all abraded surfaces, field welds, and field bolts; coat in accordance with paragraph FINISHES.

3.3.2 Cleaning

Clean both the interior and exterior of doors after the completion of erection.

3.3.3 Control Panel Installation

Locate all door control panels indoors, adjacent to the door opening, and with an unobstructed line of sight for the entire door opening. Provide all conduit entries into the bottom of the control panel. Mount control panels and provide three phase power to each control panel.

3.4 ELECTRICAL WORK

NFPA 70. Provide all conduit, wiring, and mounting of controls in accordance with Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM**.

Door manufacturer to coordinate with the qualified, licensed electrical contractor who will provide and install all 480 3-phase supply power to all components (such as Main, auxiliary, controllers, panels, motors, and other electrical devices) which require this low voltage supply power. The qualified, licensed electrical contractor will provide and install all conduit for the control level power under the review and approval of the door manufacturer. Either the qualified, licensed electrical contractor or a factory authorized technician may provide and install all wiring for control level power under the review and approval of the door manufacturer in accordance with the approved construction submittals.

3.5 ACCEPTANCE TESTING PROCEDURE AND REPORT

Submit an [Acceptance Testing Procedure](#) for approval, which includes coordination with Section **01 91 00.15 BUILDING COMMISSIONING** for such items as hangar door position switches which interact with HVAC controls. After Government approval, perform the testing and submit a report of the results. Provide acceptance testing for the entire door system, including every component, performed by the door manufacturer and suppliers. The following subparagraphs are included in the acceptance testing.

3.5.1 General

Upon completion of installation, including work by other trades, lubricate, adjust, and test doors to verify operation in accordance with manufacturer's product data. Final adjustments will be made by the Manufacturer's authorized representative. Adjust and re-test the doors until the entire installation is fully operational and acceptable. Acceptance testing must consist of operating each door open and closed (one cycle) ten times successfully and consecutively within a nine-hour time interval in accordance with manufacturer's recommended time interval between open/close cycles. Provide Contracting Officer's Representative a copy of the final acceptance testing report with completed tests.

3.5.2 Door Drop Prevention Demonstration

Perform a non-destructive demonstration of the safety arrester function by slowly engaging the installed safety arresters on the guiderails at a height of **3 feet** above closed position in a controlled manner so as to not fall and not damage any door system components or adjacent structure. Perform demonstration on all door leaves and components in the presence of the Contracting Officer's Representative.

If the door leaf safety arrester alternative is utilized per paragraph DOOR LEAF ARRESTER ALTERNATIVE, perform a non-destructive demonstration showing the bottom beam is able to support the door with the loss of either end belt/wire rope, or any two intermediate belts/wire ropes, in a safe and controlled manner so as to not fall and not damage any door components or adjacent structure. Perform demonstration on all door leaves and components in the presence of the Contracting Officer's Representative.

3.6 PERSONNEL TRAINING

Provide an 8-hour on-site training session for the door operating personnel and maintenance department. In the training, outline door safety, operation, troubleshooting and repair guidelines. Record this on-site training and provide a video presented in a coherent fashion such that the Government may use the video as the sole training program for future user operators. In multiple locations throughout the video, specifically mention the door system must be completely closed prior to experiencing **60 mph** wind speeds. It is acceptable to utilize stock training video content in this video provided the door operation, safety and controls are identical to the door system provided.

3.7 EXTRA MATERIALS

Supply a door fabric patch kit with approximately **45 square feet** of fabric for each hangar door and all other materials required for door panel repair. Provide all unique tools required to maintain the door system. Provide a patch kit with color matched fabric and associated repair materials and tools.

3.8 INSPECTION AND ADJUSTMENT

Within the 12 month warranty period, following the initial period of use and changes in seasonal temperature, the manufacturer's authorized representative will return to inspect and adjust doors to confirm the door system is fully operational and acceptable. Provide the Contracting Officer's Representative an inspection report outlining observations, door condition, operation, and all items requiring adjustment or requiring repair/replacement under the door system warranty. Include a report with recommended annual inspection and maintenance items. As needed, schedule a follow-up visit to complete items requiring adjustment, repair or replacement. Manufacturer is responsible for items requiring adjustment, repair or replacement for the 3 year maintenance-free warranty period or 1500 cycles, whichever occurs first, beginning after the first 12 month contractor's warranty period.

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HIGH PERFORMANCE COATING FOR STEEL STRUCTURES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D1200	(2010; R 2014) Viscosity by Ford Viscosity Cup
ASTM D1640/D1640M	(2014) Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings
ASTM D3276	(2015; E 2016) Standard Guide for Painting Inspectors (Metal Substrates)
ASTM D3925	(2002; R 2015) Sampling Liquid Paints and Related Pigmented Coatings
ASTM D4285	(1983; R 2018) Indicating Oil or Water in Compressed Air
ASTM D7127	(2017) Standard Test Method for Measurement of Surface Roughness of Abrasive Blast Cleaned Metal Surfaces using a Portable Stylus Instrument
ASTM E11	(2024) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 9001	(2015) Quality Management Systems- Requirements
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SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007) Brush-Off Blast Cleaning
SSPC AB 2	(2015; E 2016) Cleanliness of Recycled Ferrous Metallic Abrasive
SSPC AB 3	(2023; R 2023) Ferrous Metallic Abrasive
SSPC Guide 6	(2021) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
SSPC Guide 12	(2023) Guide for Illumination of Industrial Painting Projects
SSPC PA 1	(2024) Shop, Field, and Maintenance Coating of Metals

SSPC PA 2	(2015; E 2018) Procedure for Determining Conformance to Dry Coating Thickness Requirements
SSPC QP 1	(2019) Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors (Field Application to Complex Industrial Steel Structures and Other Metal Components)
SSPC QP 5	(2022) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies
SSPC QS 1	(2015) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2015) Near-White Blast Cleaning
SSPC SP COM	(2016; E 2017) Surface Preparation Commentary for Steel and Concrete Substrates
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-STD-595A	(2017) Colors used in Government Procurement
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U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-22262	(1993; Rev B; Am 1 1994; Am 2 1996; Notice 1 2021) Abrasive Blasting Media Ship Hull Blast Cleaning
MIL-DTL-24441	(2009; Rev D; Notice 1 2021) Paint, Epoxy-Polyamide, General Specification for
MIL-DTL-24441/19	(2009; Rev C; Notice 1 2023) Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
MIL-DTL-24441/31	(2009; Rev B; Notice 1 2021) Paint, Epoxy-Polyamide, White, Formula 152, Type IV
MIL-PRF-85285	(2022; Rev F) Topcoat, Aircraft and Support Equipment

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1000	Air Contaminants
29 CFR 1926.59	Hazard Communication

1.2 DEFINITIONS

Definitions are provided throughout this Section, generally in the paragraph where used, and denoted by capital letters.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-05, Design Data

- Containment System

SD-06 Test Reports

- Joint Sealant Qualification Test Reports

- Coatings Qualification Test Reports

- Metallic Abrasive Qualification Test Reports

- Coating Sample Test Reports

- Abrasive Sample Test Reports

- Inspection Report Forms

- Daily Inspection Reports

- Recycled Metallic Abrasive Field Test Reports (Daily and Weekly)

SD-07 Certificates

- Contract Errors, Omissions, and Other Discrepancies

- Corrective Action Procedures

- Coating Work Plan

- Qualifications of Certified Industrial Hygienist (CIH)

- Qualifications Of Individuals Performing Abrasive Blasting

- Qualifications of Certified Protective Coatings Specialist (PCS)

- Qualifications of Coating Inspection Company

- Qualifications of QC Specialist Coating Inspector

- Qualifications of Testing Laboratory for Coatings

- Qualifications of Testing Laboratory for Abrasive

- Qualifications of Coating Contractors

- Joint Sealant Materials

- Coating Materials

- Coating System Component Compatibility

Non-metallic Abrasive

Metallic Abrasive

SD-08 Manufacturer's Instructions

Joint Sealant Instructions

Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive

Inspection Logbook; G,

1.4 QUALITY ASSURANCE

1.4.1 Contract Errors, Omissions, and Other Discrepancies

Submit all errors, omissions, and other discrepancies in contract documents the Contracting Officer within 30 days of contract award for all work covered in this Section, other than the work that will not be uncovered until a later date. All such discrepancies shall be addressed and resolved, and the Coating Work Plan modified, prior to beginning the Initial and Follow-Up phases of work.

Discrepancies that become apparent only after work is uncovered shall be identified at the earliest discoverable time and submitted for resolution. Schedule time (Float) should be built into the project schedule at those points where old work is to be uncovered or where access is not available during the first 30 days after award, to allow for resolution of contract discrepancies.

1.4.2 Corrective Action (CA)

CA shall be included in the Quality Control Plan.

1.4.2.1 Corrective Action Procedures

Develop procedures for determining the root cause of each non-compliance, developing a plan to eliminate the root cause so that the non-compliance does not recur, and following up to ensure that the root cause was eliminated. Develop Corrective Action Request (CAR) forms for initiating CA, and for tracking and documenting each step.

1.4.2.2 Implement Corrective Action

The Contractor shall take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These procedures shall apply to non-compliance in the work, and to non-compliance in the QC System. Corrective actions shall be appropriate to the effects of the non-compliance encountered. Each CAR shall be serialized, tracked in a Log to completion and acceptance by the Contracting Officer, and retained in project records. The Corrective Action Log, showing status of each CAR, shall be submitted to the Contracting Officer monthly. A CAR may be initiated by either the Contractor or the Contracting Officer. The Contracting Officer must approve each CAR at the root cause identification stage, the plan for elimination stage, and the close out stage after verification that the root cause has been eliminated.

1.4.3 Coating Work Plan

This work plan shall be considered as part of the Quality Control Plan.

Provide procedures for reviewing contract documents immediately after award to identify errors, omissions, and discrepancies so that any such issues can be resolved prior to project planning and

development of detailed procedures.

Provide procedures for verification of key processes during Initial Phase to ensure that contract requirements can be met. Key processes shall include surface preparation, coating application and curing, inspection, and documentation, and any other process that might adversely impact orderly progression of work.

Provide procedures for all phases of coating operations, including planned work, rework, repair, inspection, and documentation. Address mobilization and setup, surface preparation, coating application, coating initial cure, tracking and correction of noncompliant work, and demobilization. Coordinate work processes with health and safety plans and confined space entry plans. For each process, provide procedures that include appropriate work instructions, material and equipment requirements, personnel qualifications, controls, and process verification procedures. Provide procedures for inspecting work to verify and document compliance with contract requirements, including inspection forms and checklists, and acceptance and rejection criteria.

Provide procedures for correcting noncompliant work. Detailed procedures are required in advance to avoid delays in meeting overcoat windows as well as to avoid delays in production. Provide procedures for repairing defects in the coating film, such as runs, drips, sags, holidays, overspray, as well as how to handle correct coating thickness noncompliance, any other areas of repair or rework that might be adversely affected by delays in preparing and approving new procedures.

If a procedure is based on a proposed or approved request for deviation, the deviation shall be referenced. Changes to procedures shall be noted by submittal number and date approved, clearly delineating old requirements and new requirements, so that the records provide a continuous log of requirements and procedures.

1.4.4 Design Data

1.4.4.1 Containment System

Submit complete design drawings and calculations for the scaffolding and containment system, including an analysis of the loads which will be added to the structure by the containment system and waste materials. A registered engineer shall approve calculations and scaffold system design.

1.4.5 Test Reports

1.4.5.1 Joint Sealant Qualification Test Reports

Submit test results from independent laboratory of representative samples of joint sealant material. Samples must have been tested within the last three years. Submit results as required in paragraph QUALITY ASSURANCE PROVISIONS of [ASTM C920](#). Note that testing in accordance with QUALITY ASSURANCE PROVISIONS is a pre-qualification requirement.

1.4.5.2 Coatings Qualification Test Reports

Submit test results from independent laboratory of representative samples of each coating material. U.S. Department of Defense laboratories are considered to be independent laboratories for purposes of compliance with "QUALIFICATION INSPECTION" requirements herein. Samples must have been tested within the last three years. Submit results for epoxy materials as required in paragraph QUALIFICATION INSPECTION of [MIL-DTL-24441](#), and as revised by paragraph COATING SYSTEM herein. Submit results for polyurethane materials as required in paragraph QUALIFICATION INSPECTION of [MIL-PRF-85285](#), and as revised by paragraph COATING SYSTEM herein. Note that requirement for QUALIFICATION INSPECTION is a pre-qualification requirement, and involves the same testing required for listing in the Qualified Products List of the respective material. See appropriate Military Specification for specific test requirements.

1.4.5.3 Metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of **SSPC AB 3**. Submit test results from independent laboratory of representative samples of each abrasive to be used on the jobsite. Samples must have been tested within the last three years. Note that this testing is for the purpose of prequalifying the abrasive.

1.4.5.4 Recycled Metallic Abrasive Field Test Reports (Daily and Weekly)

Submit test results from independent laboratory of daily and weekly Quality Control testing required by **SSPC AB 2**, as modified in paragraph ABRASIVE.

1.4.6 Qualifications

1.4.6.1 Qualifications of Certified Industrial Hygienist (CIH)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party CIH. Submit documentation that hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. Provide evidence of experience with hazards involved in industrial coating application work.

1.4.6.2 Qualifications of Certified Protective Coatings Specialist (PCS)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party PCS. Submit documentation that specialist is certified by SSPC: The Society for Protective Coatings (SSPC) as a PCS, including certification number and date of certification/recertification. If the PCS is employed by the same coating inspection company to which the coating inspector is employed, this does not violate the independent third-party requirements. The PCS shall remain certified during the entire project, and the Contracting Officer shall be notified of any change in certification status within 10 days of the change. The PCS shall not be the designated coating inspector.

1.4.6.3 Qualifications of Coating Inspection Company

Submit documentation that the coating inspection company that will be performing all coating inspection functions is certified by SSPC to the requirements of **SSPC QP 5** prior to contract award, and shall remain certified while accomplishing any coating inspection functions. The coating inspection company must remain so certified for the duration of the project. If a coating inspection company's certification expires, the firm will not be allowed to perform any inspection functions, and all surface preparation and coating application work must stop, until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in coating inspection company certification status.

1.4.6.4 Qualifications of QC Specialist Coating Inspector

Submit documentation that each coating inspector is employed, and qualified to **SSPC QP 5**, Level III, by the selected coating inspection company. Each inspector shall remain employed by the coating inspection company while performing any coating inspection functions.

1.4.6.5 Qualifications Of Individuals Performing Abrasive Blasting

Submit name, address, and telephone number of each person that will be performing abrasive blasting. Submit documentation that each blaster is qualified by SSPC to the SSPC C-7 Dry Abrasive Blaster Qualification Program. Each blaster shall remain qualified during the entire period of abrasive blasting, and the Contracting Officer shall be notified of any change in qualification status.

1.4.6.6 Qualifications of Testing Laboratory for Coatings

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that persons performing analyses are qualified.

1.4.6.7 Qualifications of Testing Laboratory for Abrasive

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of abrasive for compliance with specification requirements. Submit documentation that laboratory has experience in testing samples of abrasive for conformance with specifications, and that persons performing analyses are qualified.

1.4.6.8 Qualifications of Coating Contractors

All Contractors and Subcontractors that perform surface preparation or coating application shall be certified to either **ISO 9001** or **SSPC QP 1** and **SSPC QS 1** prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application. The painting Contractors and painting Subcontractors must remain so certified for the duration of the project. If a Contractor's or Subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in Contractor certification status.

1.4.6.9 Joint Sealant Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.10 Coating Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.11 Coating System Component Compatibility

Provide certification from each manufacturer of components of the coating system, epoxy primer, epoxy intermediate, and polyurethane topcoat, that the supplied coating material is suitable for use in the specified coating system. Each manufacturer shall identify the specific products, including manufacturer's name, which their product may be used with. The certification shall provide the name of the manufacturer that will provide technical support for the entire system. When all coating materials are manufactured by one manufacturer, this certification is not required.

1.4.6.12 Non-metallic Abrasive

Provide manufacturer's certification that the materials are currently approved by the Naval Sea Systems Command and listed on the Qualified Products Lists (QPL) for the specified materials.

1.4.6.13 Metallic Abrasive

Provide manufacturer's certification of conformance to contract requirements and provide copies of test results.

1.4.7 Protective Coating Specialist (PCS)

The PCS shall be considered a QC Specialist and shall report to the QC Manager, as specified in Section **01 45 00 QUALITY CONTROL**. The PCS shall approve all submittals prior to submission to the QC Manager for approval or submission to the government for approval.

1.4.8 Pre-Application Meeting

After approval of submittals but prior to the initiation of coating work, Contractor representatives, including at a minimum, project superintendent and QC manager, paint foreman, coating inspector, and PCS shall have a pre-application coating preparatory meeting. This meeting shall be in addition to the pre-construction conference. Specific items addressed shall include: corrective action requirements and procedures, coating work plan, safety plan, coordination with other Sections, inspection standards, inspection requirements and tools, test procedures, environmental control system, safety plan, and test logs. Notify Contracting Officer at least ten days prior to meeting.

1.5 PRODUCT DATA

1.5.1 Joint Sealant Instructions

Submit manufacturer's printed instructions including detailed application procedures, minimum and maximum application temperatures, and curing procedures. Include Safety Data Sheets (SDS) for materials to be used at the job site in accordance with [29 CFR 1926.59](#).

1.5.2 Coating System Instructions

Submit manufacturer's printed instructions including detailed mixing and application procedures, number and types of coats required, minimum and maximum application temperatures, and curing procedures. Include Safety Data Sheets (SDS) for materials to be used at the job site in accordance with [29 CFR 1926.59](#).

1.6 DELIVERY AND STORAGE

Ship, store, and handle materials in accordance with [SSPC PA 1](#), and as modified in this Section. Maintain temperature in storage spaces between [40 and 85 degrees F](#), and air temperature more than [5 degrees F](#) above the dew-point at all times. Inspect materials for damage prior to use and return non-compliant materials to manufacturer. Remove materials with expired shelf life from government property immediately and notify the Contracting Officer.

If materials are approaching shelf life expiration and an extension is desired, samples may be sent to the manufacturer, along with complete records of storage conditions, with a request for shelf life extension. If the manufacturer finds the samples and storage data suitable for shelf life extension, the manufacturer may issue an extension, referencing the product evaluation and the review of storage records. Products may not be extended longer than allowed in the product specification.

1.7 COATING HAZARDS

Ensure that employees are trained in all aspects of the safety plan. Specified coatings may have potential health hazards if ingested or improperly handled. The coating manufacturer's written safety precautions shall be followed throughout mixing, application, and curing of the coatings. During all cleaning, cleanup, surface preparation, and paint application phases, ensure that employees are protected from toxic and hazardous chemical agents which exceed concentrations in [29 CFR 1910.1000](#). Comply with respiratory protection requirements in [29 CFR 1910.134](#). The CIH shall approve work procedures and personal protective equipment.

1.8 JOB SITE REFERENCES

Make available to the Contracting Officer at least one copy each of [ASTM D3276](#), [ASTM D3925](#), [ASTM D4285](#), [ASTM D7127](#), [SSPC SP COM](#), [SSPC SP 1](#), [SSPC 7/NACE No.4](#), [SSPC SP 10/NACE No. 2](#), [SSPC PA 1](#), [SSPC PA 2](#), [SSPC Guide 6](#), [SSPC VIS 1](#), [SSPC QP 1](#), [SSPC QS 1](#), and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 JOINT SEALANT

TT-S-00230, Type II, Class B

2.2 COATING SYSTEM

Alternate systems or products will not be considered. Provide a complete system (primer, intermediate coat, top coat) material from one supplier.

Prepare surface and apply the complete coating system in the shop. Follow all temperature, humidity, and testing requirements listed herein.

The Military specification epoxy and polyurethane products specified in this Section do not require approval for listing on the QPL prior to contract award, as indicated in paragraph 3.2 of MIL-DTL-24441 and paragraph 3.1 of MIL-PRF-85285. Testing of products by an independent laboratory to the QUALIFICATION INSPECTION requirements of MIL-DTL-24441 and MIL-PRF-85285 prior to contract award is required. See specific submittal requirements in paragraph QUALITY ASSURANCE.

2.2.1 Zinc-Rich Epoxy Primer Coat

Epoxy polyamide, MIL-DTL-24441/19 (Formula 159, Type III).

2.2.2 Epoxy Intermediate Coat

Epoxy polyamide, MIL-DTL-24441/31 (Formula 152, Type IV, White (Tinted)). Tint to approximately SAE AMS-STD-595A color number 27778 parchment using pigment dispersions prepared for epoxy paint tinting. Manufacturer shall tint material and appropriately label. All other requirements of this Military Specification apply.

2.2.3 Polyurethane Topcoat

Polyurethane coating topcoat of MIL-PRF-85285, Type II, White SAE AMS-STD-595A color number 17925.

Modify paragraph 3.6.4 of MIL-PRF-85285, Viscosity and Pot Life, as follows:

The viscosity of the admixed coating, when tested in accordance with ASTM D1200 through a No. 4 Ford cup, shall be as follows:

Time from mix (minimum)	Maximum time through a No. 4 Ford cup
Initially	30 seconds
2 hours	60 seconds
4 hours	No gel

Modify paragraph 3.7.1 of MIL-PRF-85285, Drying Time, as follows:

When applied by spray techniques and when tested in accordance with ASTM D1640/D1640M, the coating shall be set-to-touch within four hours and dry-hard within eight hours (see 4.6 and table I).

2.3 COATING SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit that contains one quart can for the base of each coating material, an appropriately sized

can for each activator, dipping cups for each component to be sampled, a shipping box sized for the samples to be shipped, and packing material. Mark cans for the appropriate component. Provide shipping documents, including either pre-paid shipping or a shipper number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.4 ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit that contains one suitable plastic bag or container for each sample to be collected. Mark containers for the appropriate component. Provide shipping documents, including either pre-paid shipping or a shipper number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.5 TEST KITS

2.5.1 Test Kit for Measuring Chloride, Sulfate and Nitrate Ions on Steel and Coated Surfaces

Provide test kits that meet all of the following requirements:

- a. Contains all materials, supplies, tools, and instructions for field testing and on-site quantitative evaluation of chloride, sulfate, and nitrate ions;
- b. Extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;
- c. Components and solutions are mercury free and environmentally friendly;
- d. Contains new materials and solutions for each test extraction;
- e. Contains an extraction test container (vessel, sleeve, cell) that creates a sealed, encapsulated environment during salt ion extraction;
- f. Contains a test extract container suitable for testing the following steel surfaces: horizontal (up/down configuration), vertical, flat, curved, smooth, pitted, and rough;
- g. All salt ion concentrations are directly measured in micrograms per square centimeter.

2.5.2 Test Kit for Identifying Amine Blush on Epoxy Surfaces

Provide test kits that meet all of the following requirements:

- a. Is a completely self-contained field test kit with all materials, supplies, tools, and instructions to perform tests and indicate the presence of unreacted amines;
- b. Uses an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;
- c. Contains no mercury or lead and is environmentally friendly;
- d. Contains a solution of an unreacted amine for the purpose of "self checking" the indicator solution;

2.6 ABRASIVE

The referenced abrasive specifications have maximum limits for soluble salts contamination, however, this maximum level of contamination does not guarantee that contamination will not be transferred to the steel surface during abrasive blasting. Other factors such as on-site handling and recycling can allow contamination of abrasive. Contractors are cautioned to verify that the chosen abrasive, along with work and storage processes, allow the final surface cleanliness requirements to be achieved. Successful testing of chlorides in abrasive does not negate the final acceptance testing of steel surfaces.

2.6.1 Non-metallic Abrasive

Conform to MIL-A-22262, Type I (Inorganic materials). Abrasive shall be approved by the Naval Sea Systems Command and listed on the appropriate Qualified Products List (QPL) for the specified materials. Use sampling procedures and testing frequencies as prescribed in MIL-A-22262. Use abrasive that is specifically selected and graded to provide a sharp, angular profile to the specified depth. Do not use ungraded abrasive. Make adjustments to processes or abrasive gradation to achieve specified surface profile. Recycled non-metallic abrasive shall meet all requirements of the specification each time that it is placed in the blast pot.

2.6.2 Metallic Abrasive

2.6.2.1 New and Remanufactured Steel Grit

Conform to the chemical and physical properties of SSPC AB 3 Class 1 (Steel) only. Class 2 (Iron) abrasive shall not be used.

To develop a suitable work mix from new steel abrasive, a minimum of 200 - 400 recycles is required, therefore, it is advantageous for a Contractor to use remanufactured steel grit or grit reclaimed from a previous project. Such grit shall be considered to conform if it can be traced to new grit conforming to SSPC AB 3 Class 1 and it meets all cleanliness requirements of SSPC AB 3 Class 1 when brought to the current jobsite. Submit one representative sample of this work mix to the laboratory for testing, along with samples of new material. Acceptance and use of this work mix shall not be used to justify any deviation from surface preparation requirements.

2.6.2.2 Recycled Steel Grit

Conform to the chemical and physical properties of SSPC AB 2

2.7 WHITE ALUMINUM OXIDE NON-SKID GRIT

Size #60, dust free (washed and dry), minimum 99 percent pure, having the following sieve analysis when tested in accordance with ASTM E11 using a 2.2 pound sample:

Sieve #	Percent Retained
40	0
50	15-40
60	60-85

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coating Work Plan.

3.1 COATING AND ABRASIVE SAMPLE COLLECTION AND TESTING

Sample and test materials delivered to the jobsite. Notify Contracting Officer three days in advance of sampling. The QC Manager and either the PCS or coating inspector shall witness all sampling.

3.1.1 Coating Sample Collection

Provide a sample collection kit as required in paragraph COATING SAMPLE COLLECTION AND SHIPPING KIT. From each lot, obtain a one quart sample of each base material, and proportional samples of each activator based on mix ratio, by random selection from sealed containers in accordance with ASTM D3925. Prior to sampling, mix contents of each sealed container to ensure uniformity. As an alternative to collecting small samples from kits, entire kits may be randomly

selected and shipped to laboratory, observing all requirements for witnessing and traceability. For purposes of quality conformance inspection, a lot is defined as that quantity of materials from a single, uniform batch produced and offered for delivery at one time. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Identify samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by the paragraph COATING SAMPLE TEST REPORTS.

3.1.2 Abrasive Sample Collection

Provide a sample collection kit as required in paragraph ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT. For purposes of quality conformance inspection, a lot shall consist of all abrasive materials of the same type from a single, uniform batch produced and offered for delivery at one time. Obtain samples of each abrasive lot using the sampling techniques and schedule of MIL-A-22262. The addition of any substance to a batch shall constitute a new lot. Identify samples by designated name, specification number, lot number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by the paragraph ABRASIVE SAMPLE TEST REPORTS.

3.1.3 Coating Sample Test Reports

Submit test results for each lot of coating material delivered to the jobsite. Test samples of primer, intermediate, and topcoat materials for compliance with requirements of Table I. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.1.4 Abrasive Sample Test Reports

Submit test results for each lot of abrasive delivered to the jobsite. Test samples of metallic abrasive to the requirements of paragraph REQUIREMENTS of SSPC AB 3, except paragraph 4.1.5 DURABILITY. Test samples of non-metallic abrasive as required in paragraph QUALITY CONFORMANCE INSPECTION of MIL-A-22262. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.2 SURFACES TO BE COATED

AM0002 ~~Coat exterior surfaces of structure~~ Shop coat exposed interior ferrous metal primary and secondary framing for Aircraft Maintenance Bays. AM0002

3.3 LIGHTING

Provide lighting for all work areas as prescribed in SSPC Guide 12.

3.4 ENVIRONMENTAL CONDITIONS

3.4.1 Containment

Design and provide a containment system for the capture, containment, collection, storage and disposal of the waste materials generated by the work under this Section, to meet the requirements of SSPC Guide 6, Class 1. Vapor concentrations shall be kept at or below 10 percent of Lower Explosive Limit (LEL) at all times. Containment may be designed as fixed containment for complete structure or portable containment for sections of structure, however, containment shall remain in any one place from beginning of abrasive blasting through initial cure of coating. Waste materials covered by this paragraph shall not include any material or residue from removal of coatings containing lead, chromium, cadmium, PCB, or any other hazardous material.

It is the Contractors responsibility to insure the feasibility and workability of the containment system. The Contractor shall perform his operations and work schedule in a manner as to minimize leakage of the containment system. The containment system shall be properly maintained and shall not deviate from the approved drawings. If the containment system fails to function satisfactorily, the Contractor shall suspend all operations, except those required to minimize adverse impact on the environment or government property. Operations shall not resume until modifications have been made to correct the cause of the failure.

3.4.2 Automated Monitoring Requirements

Provide continuous monitoring of temperature, relative humidity, and dew point data at pertinent points on the structure, during surface preparation, coating application, and initial cure. Locate sensors to provide pertinent data for the surface preparation and coat application being performed. Monitor any heating, cooling, or dehumidification equipment used. Make data available to the Contracting Officer through Internet access. Provide monitoring equipment to perform as follows:

- a. Data is collected in the field unit in one minute increments, and available for download (on-site) in a standard format. Contractor shall collect this data and make available to the Contracting Officer;
- b. Monitoring equipment shall have backup power such that data collection and transmission to web server will be uninterrupted during the entire period of the dehumidification requirement;
- c. Monitoring equipment shall have capability to measure surface temperatures at a minimum of four locations anywhere on a 150 foot diameter by 50 foot high tank;
- d. Monitoring equipment shall have capability to measure interior and exterior dry bulb temperature (DB), relative humidity (RH), and dewpoint temperature (DP);
- e. Data shall be available continuously through secure Internet connection, using widely available web browsers;
- f. Internet accessible data shall be collected and stored in maximum 15 minute increments, and lag time between data collection and online availability shall be no greater than 70 minutes;
- g. Internet accessible data shall be available for viewing online in tabular format, and graphical format using selected data;
- h. Internet accessible data shall be available for download in user-defined segments, or entire project to date, in a standard format usable by Microsoft Excel and other spreadsheet programs.
- i. Internet-based controls shall provide alerts to pre-designated parties through email messaging;
- j. Internet-based controls shall monitor data uploads from field unit and issue alert if data not initiated within 60 minutes of last upload;
- k. Internet-based controls shall monitor operation of DH equipment and issues alert when power remains off for more than 15 seconds, or if pre-determined temperature, RH, or DP conditions are exceeded;

The requirements listed here were developed around the Munters Exactaire Monitoring System, as this was the only monitoring system having Internet connectivity known to be commercially available. There is no requirement for connectivity of the monitoring system to control the DH equipment, therefore, any combination of equipment having the required functionality will be accepted.

3.5 SURFACE PREPARATION

3.5.1 Abrasive Blasting Equipment

Use abrasive blasting equipment of conventional air, force-feed, or pressure type. Maintain a

minimum pressure of 95 psig at nozzle. Confirm that air supply for abrasive blasting is free of oil and moisture when tested in accordance with ASTM D4285. Test air quality at each startup, but in no case less often than every five operating hours.

3.5.2 Operational Evaluation of Abrasive

Test abrasive for salt contamination and oil contamination as required by the appropriate abrasive specification daily at startup and every five operating hours thereafter.

3.5.3 Surface Standard

Inspect surfaces to be coated, and select plate with similar properties and surface characteristics for use as a surface standard. Blast clean one or more one foot square steel panels as specified in paragraph SURFACE PREPARATION. Record blast nozzle type and size, air pressure at nozzle and compressor, distance of nozzle from panel, and angle of blast to establish procedures for blast cleaning. Measure surface profile in accordance with ASTM D7127. When the surface standard complies with all specified requirements, seal with a clearcoat protectant. Use the surface standard for comparison to abrasive blasted surfaces throughout the course of work.

3.5.4 Pre-Preparation Testing for Surface Contamination

Perform testing, abrasive blasting, and testing in the prescribed order.

3.5.4.1 Pre-Preparation Testing for Oil and Grease Contamination

Inspect all surfaces for oil and/or grease contamination using two or more of the following inspection techniques: 1) Visual inspection, 2) WATER BREAK TEST, 3) CLOTH RUB TEST. Reject oil and/or grease contaminated surfaces, clean in accordance with SSPC SP 1, and recheck for contamination until surfaces are free of oil and grease.

WATER BREAK TEST - Spray atomized mist of distilled water onto surface, and observe for water beading. If water "wets" surface rather than beading up, surface can be considered free of oil or grease contamination. Beading of water (water forms droplets) is evidence of oil or grease contamination.

CLOTH RUB TEST - Rub a clean, white, lint free, cotton cloth onto surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

3.5.4.2 Pre-Preparation Testing for Soluble Salts Contamination

Test surfaces for soluble salts, and wash as required, prior to abrasive blasting. Soluble salt testing is also required in paragraph PRE-APPLICATION TESTING FOR SOLUBLE SALTS CONTAMINATION as a final acceptance test of prepared surfaces after abrasive blasting, and successful completion of this phase does not negate that requirement. This phase is recommended since pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. Effective removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water washing and soluble salts remover. The soluble salts remover shall be acidic, biodegradable, nontoxic, noncorrosive, and after application, will not interfere with primer adhesion. Delays between testing and preparation, or testing and coating application, may allow for the formation of new contamination. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting. Test methods and equipment used in this phase are selected at the Contractor's discretion.

3.5.5 Abrasive Blasting

Abrasive blast steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2.

Prepared surfaces shall conform to **SSPC VIS 1** and shall match the prepared test-panels. Provide a **2 to 3 mil** surface profile. Reject profile greater than **3 mils**, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with **ASTM D7127**, using Rmax as the measure of profile height. Record all measurements required in this standard. Measure profile at rate of three test areas for the first **1000 square feet** plus one test area for each additional **1000 square feet** or part thereof. When surfaces are reblasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Do not attempt to wipe surface clean.

3.5.6 Disposal of Used Abrasive

Dispose of used abrasive off Government property in accordance with Federal, State, and Local mandated regulations.

3.5.7 Pre-Application Testing For Surface Contamination

3.5.7.1 Pre-Application Testing for Oil and Grease Contamination

Ensure surfaces are free of contamination as described in paragraph PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION, except that only questionable areas need be checked for beading of water misted onto surface.

3.5.7.2 Pre-Application Testing for Soluble Salts Contamination

Test surfaces for chloride contamination using the Test Kit described in TEST KIT FOR MEASURING CHLORIDE, SULFATE AND NITRATE IONS ON STEEL AND COATED SURFACES. Test all surfaces at rate of three tests for the first **1000 square feet** plus one test for each additional **2000 square feet** or part thereof. Perform 30 percent of tests on bare steel at welds, divided equally between horizontal and vertical welds. One or more readings greater than 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as discussed in paragraph PRE-PREPARATION TESTING FOR SOLUBLE SALTS CONTAMINATION, allow to dry, and re-test until all required tests show allowable results. Reblast tested and cleaned areas as required. Label all test tubes and retain for test verification.

3.5.7.3 Pre-Application Testing for Surface Cleanliness

Apply coatings to dust free surfaces. To test surfaces, apply strip of clear adhesive tape to surface and rub onto surface with finger. When removed, the tape should show little or no dust, blast abrasive, or other contaminant. Reject contaminated surfaces and retest. Test surfaces at rate of three tests for the first **1000 square feet** plus one test for each additional **1000 square feet** or part thereof. Provide two additional tests for each failed test or questionable test. Attach test tapes to Daily Inspection Reports.

3.6 MIXING AND APPLICATION OF SEALANT AND COATING SYSTEM

3.6.1 Preparation of Sealant and Coating Materials for Application

Each of the sealant, primer, intermediate, and topcoat materials is a two-component material supplied in separate containers.

3.6.1.1 Mixing Sealant, Primer and Intermediate Coat Materials

Mix in accordance with manufacturer's instructions, which may differ for each product. Do not mix partial kits, or alter mix ratios. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time based on its temperature.

3.6.1.2 Mixing Topcoat Material

Do not mix partial kits, or alter mix ratios. Mix polyurethane coating materials in same temperature conditions specified in paragraph DELIVERY AND STORAGE. The polyurethane coating material is moisture sensitive and any introduction of moisture or water into the material during mixing or application will shorten usable pot life. Use a mixer that does not create a vortex. Do not add solvent without specific written recommendation from the manufacturer. No induction time is required, only thorough agitation of the mixed material.

3.6.1.3 Pot Life

Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Add all required solvent at time of mixing. Do not add solvent to extend pot life. Pot life is based on standard conditions at 70 degrees F and 50 percent relative humidity. For every 18 degrees F rise in temperature, pot life is reduced by approximately half, and for every 18 degrees F drop it is approximately doubled. Usable pot life depends on the temperature of the material at the time of mixing and the sustained temperature at the time of application. Other factors such as the shape of the container and volume of mixed material may also affect pot life. Precooling or exterior icing of components for at least 24 hours to a minimum of 50 degrees F in hot climates will extend pot life. High humidity at time of mixing and application shortens pot life of the Polyurethane topcoat material. Following are approximate pot life times:

Sealant	As specified by manufacturer
Epoxy primer and intermediate materials	4 hours
Polyurethane topcoat materials	2 hours.

3.6.1.4 Application Conditions and Recoat Windows

The application condition requirements for the coating system are very time and temperature sensitive, and are intended to avoid the delamination problems frequently found on industrial structures. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of sealant, primer, stripe coat, intermediate coat and topcoat, use appropriate means of controlling air and surface temperatures, as required. Partial or total enclosures, insulation, heating or cooling, or other appropriate measures may be required to control conditions to allow for orderly application of all required coats.

Maintain air and steel surface temperature between 60 and 100 degrees F during application and the first four hours of cure for epoxy coats and the first eight hours of cure for polyurethane coats. Maintain steel surface temperature more than 5 degrees F above the dew-point of the ambient air for the same period.

Use Table entitled "RECOAT WINDOWS" to determine appropriate recoat windows for each coat after the initial coat. Apply each coat during appropriate RECOAT WINDOW of preceding coat. If a RECOAT WINDOW is missed, the minimum and maximum primer and intermediate coat thickness may be adjusted to accommodate a FILL COAT, however, requirements for total epoxy coating thickness and total coating thickness will not be modified. Missing more than one RECOAT WINDOW may require complete removal of coating if maximum total coating thickness requirements cannot be achieved.

If coating is not applied during RECOAT WINDOW, or if surface temperature exceeds 120 degrees F between applications, provide GLOSS REMOVAL, apply next coat within 24 hours. If next planned coat is topcoat, apply FILL COAT if required to fill sanding marks. Sanding marks from GLOSS REMOVAL of intermediate coat reflecting through topcoat will be considered as noncompliant. Apply FILL COAT within 24 hours of GLOSS REMOVAL, then apply topcoat within RECOAT WINDOW of FILL COAT.

RECOAT WINDOWS						
<u>EPOXY OVER EPOXY</u>						
Temperature degrees F	60-70	71-80	12-36	91-100	101-110	111-120
RECOAT WINDOW (Hrs.)	24-72	18-60	16-48	12-36	8-18	4-6
<u>POLYURETHANE OVER EPOXY</u>						
Temperature degrees F	60-70	71-80	12-36	91-100	101-110	111-120
RECOAT WINDOW (Hrs.)	24-96	24-72	16-48	12-36	10-24	8-16
<u>POLYURETHANE OVER POLYURETHANE</u>						
Temperature degrees F	60-70	71-80	12-36	91-100	101-110	111-120
RECOAT WINDOW (Hrs.)	8-48	6-48	4-36	3-24	2-12	1-2

The temperature ranges shown in the table above are for determining recoat windows. Choose recoat window based on the highest surface temperature that was sustained for one or more hours between coats. This applies to the entire time between coats. Measure and record air and surface temperatures on hourly basis to determine appropriate recoat windows. If surface temperature goes above 100 degrees F, measure and record temperatures every half hour.

FILL COAT - Where indicated, apply coat of intermediate coat epoxy, at 2 to 3 mils DFT, then apply next specified full coat within recoat window of FILL COAT. A FILL COAT may be used to adjust coating thickness to comply with requirements or to fill sanding marks in intermediate coat.

GLOSS REMOVAL - Where required, hand sand in a linear fashion to remove gloss using 120-200 grit wet/dry sandpaper, followed by solvent wiping with a clean rag soaked with denatured alcohol to

remove all dust. GLOSS REMOVAL of primer coat is to scarify surface and shall consist of removal of approximately 1 mil of coating. If steel is exposed during GLOSS REMOVAL, repair in accordance with paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING. GLOSS REMOVAL of intermediate coat may include removal of up to 3 mils of coating to avoid excess thickness, prior to application of FILL COAT.

3.6.2 Amine Blush Testing of Epoxy Coat Prior to Overcoating

Test epoxy surfaces prior to application of roof joint sealant, epoxy coat, or polyurethane topcoat for amine blush contamination using the Test Kit described in paragraph TEST KIT FOR IDENTIFYING AMINE BLUSH ON EPOXY SURFACES. Test all surfaces at rate of three tests for the first 1000 square feet plus one test for each additional 2000 square feet or part thereof. Remove any identified contamination using an approved procedure.

3.6.3 Application of Coating System and Joint Sealant

Apply coatings in accordance with SSPC PA 1 and as specified herein. Apply coatings to surfaces that meet all stated surface preparation requirements.

After application of primer coat and prior to application of each subsequent coat, perform testing prescribed in paragraph PRE-APPLICATION TESTING FOR SURFACE CONTAMINATION, as necessary, to ensure minimal intercoat contamination. This testing may be reduced to one half of the prescribed rate for bare steel if the testing indicates no contamination when sampling is evenly distributed over surfaces being tested. If contamination is found between coats, revert to the specified testing rate. Generally, oil and grease contamination and soluble salts contamination are not encountered if subsequent coats are applied within specified recoat windows and unusual atmospheric events do not occur. Such atmospheric events as a coastal storm blowing onshore can bring unusual chloride contamination. Concern for intercoat contamination should be continually prevalent, and spot testing should be accomplished to verify satisfactory conditions. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.

Apply each coat in a consistent wet film, at 90 degrees to previous coat. Ensure that primer and intermediate coat "cold joints" are no less than six inches from welds. Apply stripe coat by brush. For convenience, stripe coat material may be delivered by spray if followed immediately with brush-out and approved procedures include appropriate controls on thickness. Apply all other coats by spray application. Use appropriate controls to prevent airborne coating fog from drifting beyond 15 feet from the structure perimeter. Cover or protect all surfaces that will not be coated. The cleanliness, temperature, recoat windows, and airborne paint containment requirements may necessitate the use of enclosures, portable shelters, or other appropriate controls.

Apply coatings at the following specified thickness:

Coat	Minimum DFT (Mils)	Maximum DFT (Mils)
Primer	3	5
Intermediate	3	5
Top	2	3
Total system	8	13

3.6.3.1 Application of Primer

Apply primer coat, maintaining paint supply container height within 3 feet of the paint nozzle for applying zinc primer. Maintain constant agitation of paint pot to ensure that zinc does not settle in container.

3.6.3.2 Application of Stripe Coat

Apply a stripe coat of intermediate coat epoxy material within RECOAT WINDOW of primer, allowing sufficient dry time to allow application of intermediate coat within RECOAT WINDOW of primer. Apply by brush, working material into corners, crevices, angles, and welds, and onto outside corners and angles.

3.6.3.3 Application of Intermediate Coat

Apply intermediate coat within RECOAT WINDOW of primer coat.

3.6.3.4 Non-skid for Stairs and Top

Where non-skid is required, apply a second intermediate coat, and immediately follow with application of non-skid grit, broadcast at the rate of 2 pounds per 100 square feet, and backroll. Apply topcoat as specified.

3.6.3.5 Application of Topcoat

Make all required repairs to primer and intermediate coats as specified in paragraph entitled "Procedure for Holiday and Spot Repairs of Newly Applied Coating" prior to applying topcoat. Apply topcoat within RECOAT WINDOW of intermediate coat. The polyurethane topcoat may require multiple passes to achieve desired aesthetics and required thickness. Consult manufacturer for thinning and application procedures for anticipated temperature, humidity, and wind conditions. Touch-up blemishes and defects within recoat window of polyurethane topcoat. Retain sample of polyurethane topcoat, from the same batch used to coat structure, to make touch-ups that might be required later.

3.6.3.6 Application of Joint Sealant

Apply joint sealant to back-to-back steel joints that are less than 3/8 inches wide and are not seal welded. Apply sealant to top and bottom, or each side, of narrow joints. Apply sealant within 48 hours of application of the topcoat, and touch-up with topcoat after appropriate cure of the sealant.

3.6.3.7 Procedure for Holiday and Spot Repairs of Newly Applied Coating

Repair coating film defects at the earliest practicable time, preferably before application of the succeeding coat. Observe all requirements for soluble salts contamination, cleanliness between coats, and application conditions. Prepare defective area in accordance with [SSPC SP 10/NACE No. 2](#), and feather coating as required to leave [4 inches](#) of each succeeding coat feathered and abraded. Protect adjacent areas from damage and overspray. Remove dust and solvent wipe the prepared area plus an additional [4 inches](#) beyond the prepared area with clean denatured alcohol. Apply each coat within RECOAT WINDOW of preceding coat. Within four hours of preparation, apply zinc-rich primer to prepared steel and feather onto prepared primer. Apply intermediate coat to primed area and feather to prepared intermediate area. Apply topcoat to intermediate coat and feather to prepared topcoat. Apply each repair coat to approximate thickness of surrounding coating system.

3.6.3.8 Structure Occupancy After Coating Application

Use clean canvas or other approved shoe covers when walking on coated surfaces, regardless of curing time allowed. For heavily trafficked areas, provide cushioned mats for additional protection.

3.7 PROJECT IDENTIFICATION

At the completion of the work, stencil the following information on the structure in 3/4 to one inch Helvetica style letters of contrasting color using acrylic stencil paint:

Date exterior coated:

Project Number:
Contractor:
Address:
Coating System
Surface Prep: SSPC SP ____ Profile: ____
Primer: _____ Thickness: ____
Intermediate: _____ Thickness: ____
Topcoat: _____ Thickness: ____
Total Thickness: _____

3.8 FIELD QUALITY CONTROL

For marking of tank surfaces, use chalk for marking bare steel, and water based markers for marking coated surfaces, and remove marks prior to coating. Do not use any wax or grease based markers, or any other markers that leave a residue or stain.

3.8.1 Coating Inspector

The coating inspector shall be considered a QC Specialist and shall report to the QC Manager, as specified in Section 01 45 00 QUALITY CONTROL. The Coating Inspector shall be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, during all coating repair work, and during completion activities as specified in Section 01 45 00 QUALITY CONTROL. The Coating Inspector shall provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system. The requirements for inspection listed in this Section are in addition to the QC inspection and reporting requirements specified in Section 01 45 00 QUALITY CONTROL.

3.8.2 Field Inspection

3.8.2.1 Inspection Requirements

Perform field inspection in accordance with ASTM D3276 and the approved Coating Work Plan. Document Contractor's compliance with the approved Coating Work Plan.

Provide all tools and instruments required to perform the required testing, as well as any tools or instruments that the inspector considers necessary to perform the required inspections and tests. Document each inspection and test, including required hold points and other required inspections and tests, as well as those inspections and tests deemed prudent from on-site evaluation to document a particular process or condition, as follows:

- a. Location or area;
- b. Purpose (required or special);
- c. Method;
- d. Criteria for evaluation;
- e. Results;
- f. Determination of compliance;
- g. List of required rework;
- h. Observations.

Collect and record Environmental Conditions as described in ASTM D3276 on a 24 hour basis, as follows:

- a. During surface preparation, every two hours or when changes occur;
- b. During coating application and the first four days of initial cure, every hour, or when changes occur;
- c. Note location, time, and temperature of the highest and lowest surface temperatures each day;
- d. Use a non-contact thermometer to locate temperature extremes, then verify with contact

thermometers.

Document all equipment used in inspections and testing, including manufacturer, model number, serial number, last calibration date and future calibration date, and results of on-site calibration performed.

Document Contractors compliance with the approved Coating Work Plan.

3.8.2.2 Inspection Report Forms

Develop project-specific report forms as required to report measurements, test results, and observations being complete and conforming to contract requirements. This includes all direct requirements of the contract documents and indirect requirements of referenced documents. Show acceptance criteria with each requirement and indication of conformity of each inspected item. The data may be in any format, but must be legible and presented so that entered data can be quickly compared to the appropriate requirement.

3.8.2.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 00 QUALITY CONTROL. Each report shall be signed by the coating inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

3.8.2.4 Inspection Logbook

A continuous record of all activity related to this Section shall be maintained in an Inspection Logbook on a daily basis. The logbook shall be hard or spiral bound with consecutively numbered pages, and shall be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. The Coating Inspector's Logbook that is sold by NACE is satisfactory. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.8.2.5 Inspection Equipment

All equipment shall be in good condition, operational within its design range, and calibrated as required by the specified standard for use of each device.

3.9 FINAL CLEANUP

Following completion of the work, remove debris, equipment, and materials from the site. Remove temporary connections to Government or Contractor furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

TABLE 1						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Table 1a - Zinc-rich Epoxy Primer Coat MIL-DTL-24441/19 Formula 159						
Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Pigment content, percent (zinc dust)	---	---	81.5	85.5	---	---
Volatiles, percent	42.8	44.3	8.0	8.4	---	---
Non-volatile vehicle percent	53.7	57.7	8.3	8.7	---	---
Weight, Kilograms/liter	0.87	1.01	3.30	3.40	2.80	2.91
Weight, Pounds/gallon	7.3	8.4	27.5	28.4	23.4	24.4
Flashpoint, Degrees C	35.6	---	37.8	---	---	---
Flashpoint, Degrees F	96	---	100	---	---	---
Consistency, grams	---	---	250	500	150	300
Set to touch time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	2
Dry hard time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	8
Pot life, hours at 23 degrees C, 73 degrees F	---	---	---	---	4	---
Sag resistance, Micrometers	---	---	---	---	300	---
Sag resistance, Mils	---	---	---	---	12	---
VOC, Grams/liter	---	---	---	---	---	304
VOC, Pounds/gallon	---	---	---	---	---	2.5

TABLE 1						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Table Ia - Zinc-rich Epoxy Primer Coat MIL-DTL-24441/19 Formula 159						
<u>Test</u>	<u>Component A</u>		<u>Component B</u>		<u>Mixed</u>	
	<u>Min.</u>	<u>Max.</u>	<u>Min.</u>	<u>Max.</u>	<u>Min.</u>	<u>Max.</u>
NOTES: Test methods as specified in MIL-DTL-24441 .						

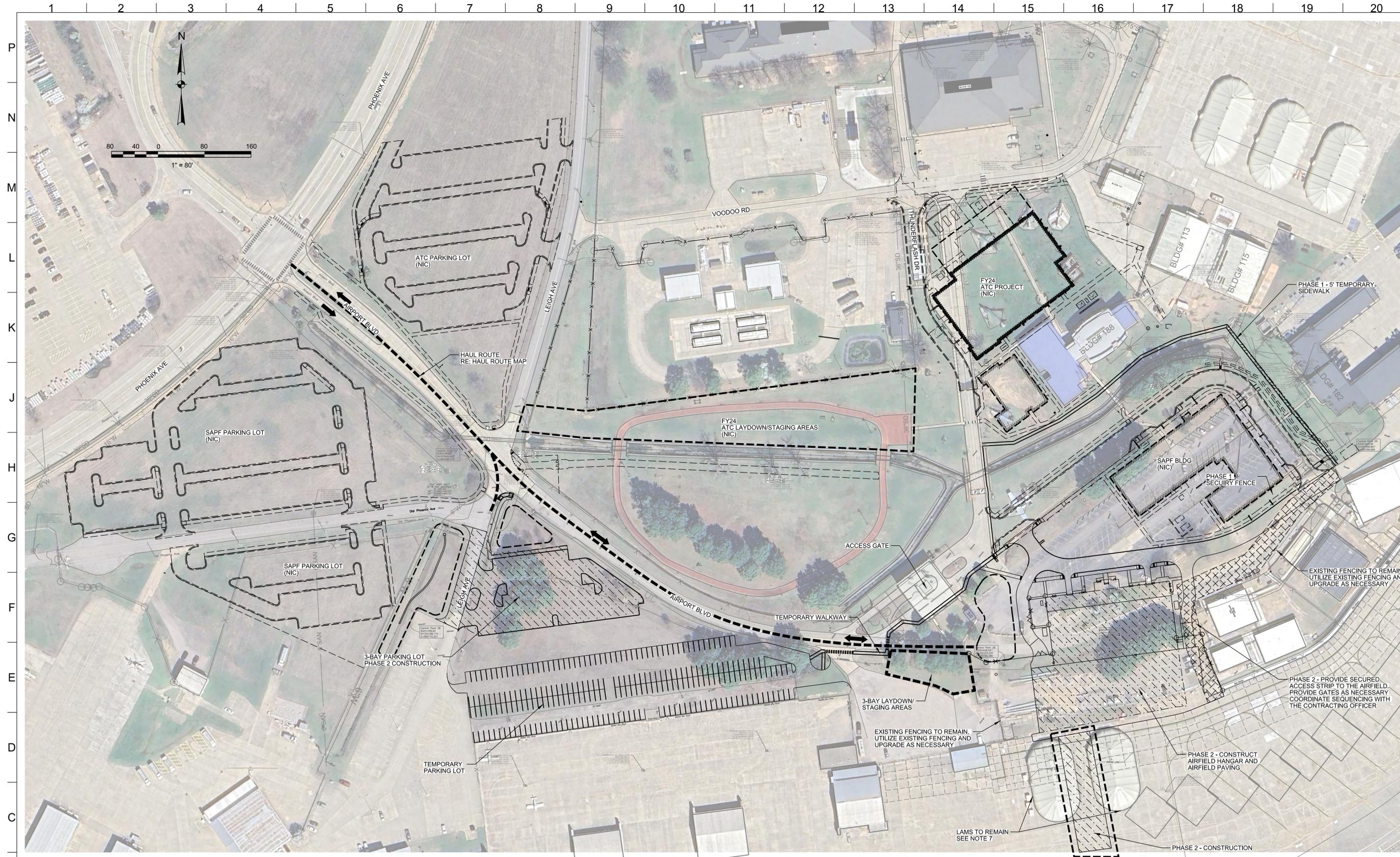
TABLE 1						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Table 1b - Epoxy Intermediate Coat MIL-DTL-24441/31 Formula 152 Type IV (White (Tinted))						
Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Pigment content, percent	44.0	49.0	33.0	38.0	---	---
Volatiles, percent	29.0	35.0	16.0	21.0	---	---
Non-volatile vehicle percent	17.5	23.5	44.0	49.0	---	---
Coarse particles, percent	---	0.3	---	0.3	---	---
Consistency, grams	180	320	300	470	180	245
Weight, Kilograms/liter	1.39	1.45	1.29	1.35	1.34	1.4
Weight, Pounds/gallon	11.6	12.1	10.8	11.3	11.2	11.7
Set to touch time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	3
Dry hard time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	8
Fineness of grind, Hegman	4	---	4	---	---	---
Flashpoint, Degrees C	35.5	---	37.8	---	---	---
Flashpoint, Degrees F	96	---	100	---	---	---
Titanium dioxide, percent of pigment	91	---	---	---	---	---
Pot life, hours at 23 degrees C, 73 degrees F	---	---	---	---	4	---
Sag resistance, Micrometers	---	---	---	---	300	---
Sag resistance, Mills	---	---	---	---	12	---

TABLE 1						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Table 1b - Epoxy Intermediate Coat MIL-DTL-24441/31 Formula 152 Type IV (White (Tinted))						
Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Color of dry film to approximate color of SAE AMS-STD-595A color 27778	---	---	---	---	---	Conform
Contrast ratio, at 75 micrometers, 3 mils DFT	---	---	---	---	.098	---
Gloss, 60 degree specular	---	---	---	---	35	---
VOC, Grams/liter	---	---	---	---	---	340
VOC, Pounds/gallon	---	---	---	---	---	2.8
GENERAL NOTES: Test methods as specified in MIL-DTL-24441. Where "Conform" is indicated, refer to specific requirements of MIL-DTL-24441/31.						

TABLE I						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Table Ic - Polyurethane Topcoat MIL-PRF-85285 Type II (White and Colors)						
Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Moisture content, percent	---	2	---	---	---	---
Course particles, percent	---	---	---	---	---	.5
Viscosity	---	---	---	---	---	See Note 1
Fineness of grind, Hegman	---	---	---	---	7	---
Drying to touch (See Note 2)	---	---	---	---	---	4
Dry-hard (See Note 2)	---	---	---	---	---	8
VOC, grams per liter	---	---	---	---	---	340
Color	---	---	---	---	delta E+-1.0	
Gloss 60 degree specular gloss						
Gloss	---	---	---	---	---	90
Semi-gloss	---	---	---	---	15	45
Opacity	---	---	---	---	0.95	---
Flexibility	---	---	---	---	---	Conform
Fluid resistance	---	---	---	---	---	Conform
Heat resistance (cure)	---	---	---	---	---	Conform
Solvent resistance (cure)	---	---	---	---	---	Conform
Condition in container	---	---	---	---	---	Conform
Odor	---	---	---	---	---	Conform
Lead percent	---	---	---	---	---	0.06
Cadmium percent	---	---	---	---	---	0.06

TABLE I														
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS														
Table Ic - Polyurethane Topcoat MIL-PRF-85285 Type II (White and Colors)														
Test	Component A		Component B		Mixed									
	Min.	Max.	Min.	Max.	Min.	Max.								
Chromium percent	---	---	---	---	---	0.00								
<p>NOTES:</p> <p>(1) Modify paragraph 3.6.4 Viscosity and Pot Life, of MIL-PRF-85285 as follows:</p> <p>The viscosity of the admixed coating, when tested in accordance with ASTM D1200 through a No. 4 Ford cup, shall be as follows:</p> <table border="1"> <thead> <tr> <th>Time from mix (minimum)</th> <th>Maximum time through a No. 4 Ford Cup</th> </tr> </thead> <tbody> <tr> <td>Initially</td> <td>30 seconds</td> </tr> <tr> <td>2 hours</td> <td>60 seconds</td> </tr> <tr> <td>4 hours</td> <td>No gel</td> </tr> </tbody> </table> <p>(2) Modify paragraph 3.7.1 Drying Time, of MIL-PRF-85285.</p> <p>When applied by spray techniques and when tested in accordance with ASTM D1640/D1640M, the coating shall be set-to-touch within four hours and dry-hard within eight hours (see 4.6 and table I).</p>							Time from mix (minimum)	Maximum time through a No. 4 Ford Cup	Initially	30 seconds	2 hours	60 seconds	4 hours	No gel
Time from mix (minimum)	Maximum time through a No. 4 Ford Cup													
Initially	30 seconds													
2 hours	60 seconds													
4 hours	No gel													
<p>GENERAL NOTES:</p> <p>Test methods as specified in MIL-PRF-85285, except those marked with "***".</p> <p>Where "Conform" is indicated, refer to specific requirements of MIL-PRF-85285.</p>														

-- End of Section --



A1 PHASE 2 CONSTRUCTION
SCALE: AS SHOWN

- REFER TO SHEETS GC101-GC104 FOR GENERAL ACCESS AND SAFETY NOTES.
- CONSTRUCT THE IMPROVEMENTS FOR THE HANGAR, PARKING LOT AND ASSOCIATED SITING WORK IN ACCORDANCE WITH THE DETAILS AND SPECIFICATIONS IN THE CONTRACT DOCUMENTS.
- PROVIDE 20'-24" SECURED VEHICULAR STRIP AND ACCESS GATES AND 4' PERSONNEL GATES AS NECESSARY OR AS INDICATED.
- CONTRACTOR SHALL MAINTAIN ADEQUATE ACCESS FOR SEMI-TRUCK DELIVERIES AND PERSONNEL TO ALL EXISTING SITE FACILITIES THROUGHOUT CONSTRUCTION.

- CONTRACTOR MUST MAINTAIN VEHICULAR ACCESS TO THE EXISTING FACILITY. PROVIDE MINIMUM 24' WIDE AGGREGATE ACCESS DRIVE AND A MINIMUM 6-INCH THICK, WHEN THE FACILITY IS FOD SENSITIVE, PROVIDE A 6-INCH THICK RIGID PAVEMENT ON 6-INCH AGGREGATE BASE.
- CONTRACTOR MUST NOT CROSS ESTABLISHED AIRFIELD SECURITY PERIMETER FENCE WITHOUT COORDINATING WITH BASE SECURITY AND AIRFIELD OPERATIONS. ALL WORK WITHIN INTRUSION DETECTION SYSTEM FENCE SHALL BE COORDINATED WITH BASE SECURITY FORCES A MINIMUM OF 7-DAYS PRIOR TO WORK IN THE AREA.

- THE LAMS (LARGE AREA MAINTENANCE SHELTER) TO REMAIN FUNCTIONAL AND IN PLACE UNTIL OTHER HANGAR SPACE ON BASE, CURRENTLY BEING RENOVATED BY OTHERS, BECOMES AVAILABLE AND READY FOR USE. THE CONTRACTOR TO ASSUME AND SCHEDULE THE APRON REPAIR WORK TO OCCUR NEAR THE END OF THE PROJECT AND MUST IDENTIFY THE APRON REPAIR START MILESTONE IN THE INITIAL PROJECT SCHEDULE, AS REQUIRED BY SECTION 01 32 00.
- THE TEMPORARY PARKING LOT TO REMAIN FUNCTIONAL AND IN PLACE DURING THE 3-BAY HANGAR PROJECT. AT THE CONCLUSION OF THE PROJECT, THE CONTRACTOR SHALL REMOVE THE TEMPORARY PARKING LOT AND RESTORE THE AREA TO ITS PRE-EXISTING CONDITIONS. CONTRACTOR SHALL COORDINATE WITH THE ACO PRIOR TO START THE DEMOLITION OF THE TEMPORARY PARKING LOT.

LEGEND

PHASE 2 WORK AREA

NIC = NOT IN CONTRACT



NO.	DATE	DESCRIPTION
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	MARK
	9 JAN 2026	DATE

ISSUE DATE:	5 DECEMBER 2025
DESIGNED BY:	A.B. J.A.
DRAWN BY:	R. VAJRA
REVIEWED BY:	J. ALVAREZ
PROJECT NO.:	W81PBA/240004
CONTRACT NO.:	-
PLOT SCALE:	AS SHOWN
SUBMITTED BY:	A. BLANKENSHIP, P.E.
FILE NAME:	EANG_512203_C_3BAYH_mdl.dgn
SIZE:	22"x34"

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 E. 81ST STREET
TULSA, OKLAHOMA

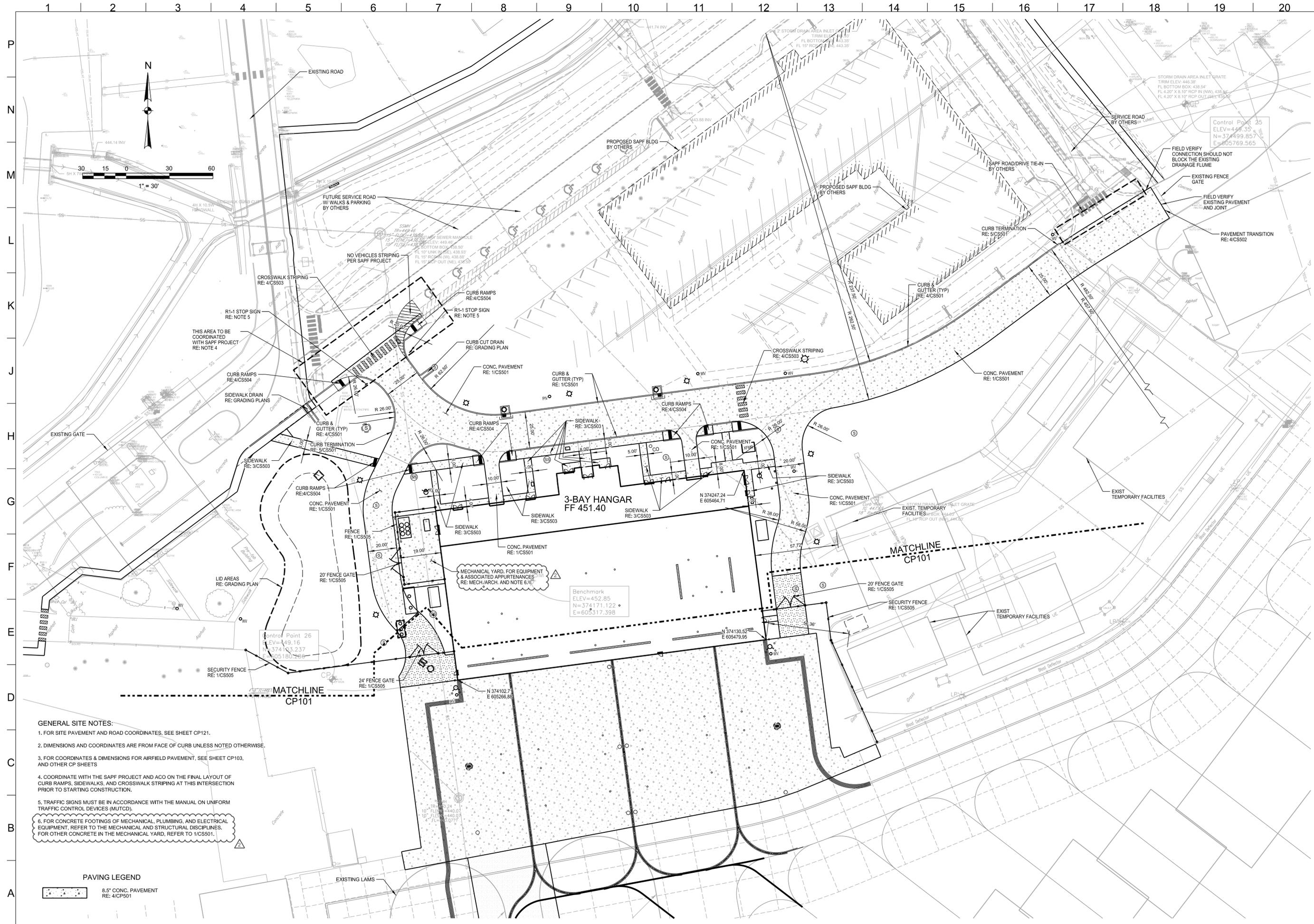
ENGINEERING & CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANG, ARKANSAS
F-35 3-BAY HANGAR
FORT SMITH, AR
PN: 512203

PHASE 2 CONSTRUCTION

SHEET ID
GC106

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION



- GENERAL SITE NOTES:**
1. FOR SITE PAVEMENT AND ROAD COORDINATES, SEE SHEET CP121.
 2. DIMENSIONS AND COORDINATES ARE FROM FACE OF CURB UNLESS NOTED OTHERWISE.
 3. FOR COORDINATES & DIMENSIONS FOR AIRFIELD PAVEMENT, SEE SHEET CP103, AND OTHER CP SHEETS.
 4. COORDINATE WITH THE SAPF PROJECT AND ACO ON THE FINAL LAYOUT OF CURB RAMPS, SIDEWALKS, AND CROSSWALK STRIPING AT THIS INTERSECTION PRIOR TO STARTING CONSTRUCTION.
 5. TRAFFIC SIGNS MUST BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
 6. FOR CONCRETE FOOTINGS OF MECHANICAL, PLUMBING, AND ELECTRICAL EQUIPMENT, REFER TO THE MECHANICAL AND STRUCTURAL DISCIPLINES. FOR OTHER CONCRETE IN THE MECHANICAL YARD, REFER TO 1/CS501.

PAVING LEGEND

	8.5" CONC. PAVEMENT RE: 4/CP501
	EXISTING CONCRETE
	EXISTING LAMS



ISSUE DATE:	3 DECEMBER 2025
DESIGNED BY:	J. ALVAREZ
DRAWN BY:	J. ALVAREZ
REVIEWED BY:	J. ALVAREZ
PROJECT NO.:	2488 E. 81ST STREET TULSA, OKLAHOMA
CONTRACT NO.:	
PLANT SCALE:	AS SHOWN
FILE NAME:	EANG_512203_C_3BAYH_mdl.dgn
SIZE:	22"x34"
MARK:	2
DESCRIPTION:	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
DATE:	19 JAN 2026

U.S. ARMY CORPS OF ENGINEERS
 TULSA DISTRICT
 2488 E. 81ST STREET
 TULSA, OKLAHOMA

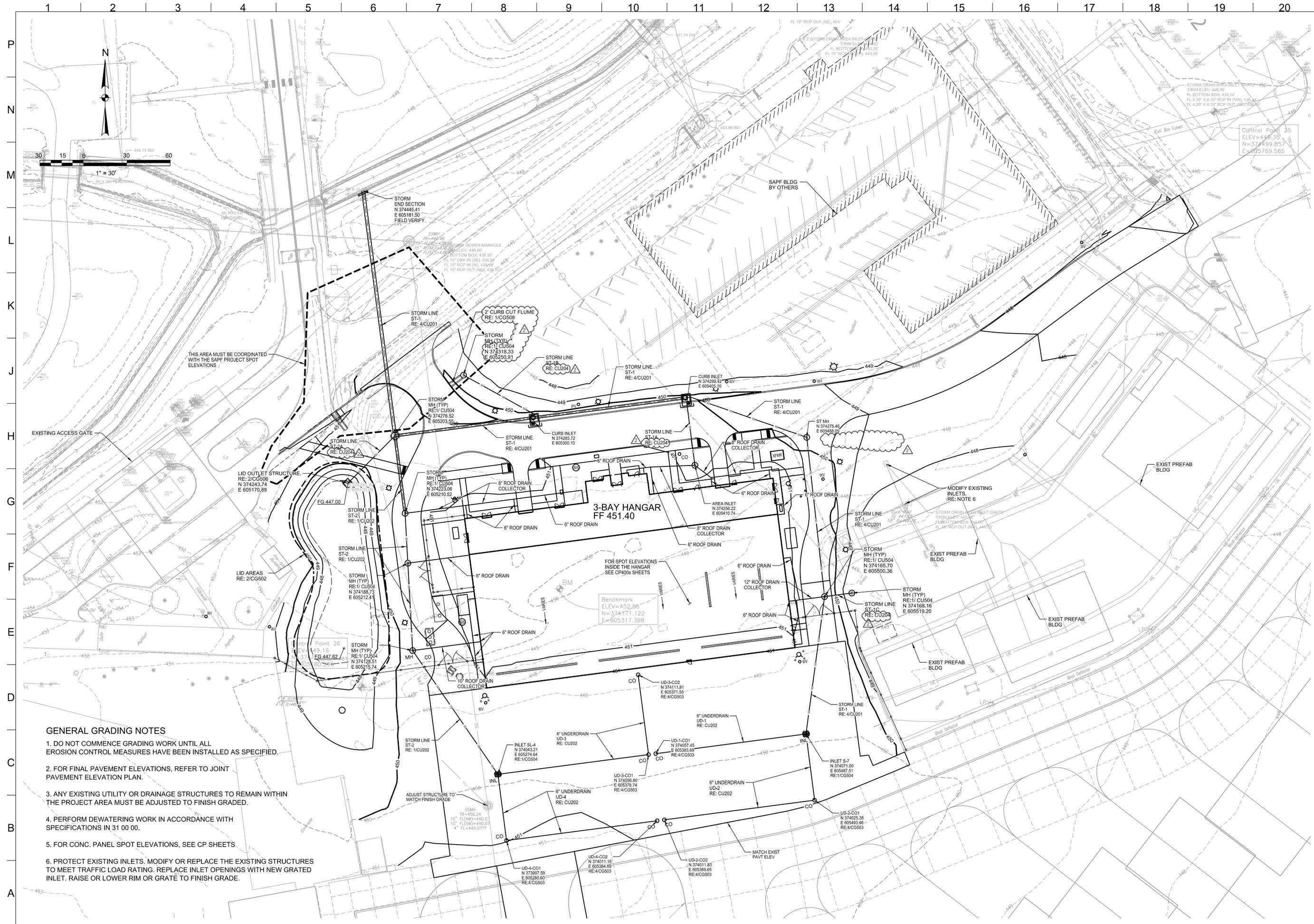
ENGINEERING & CONSTRUCTION DIVISION
 ENGINEERING BRANCH

EBBING ANG, ARKANSAS
 F-35 3-BAY HANGAR
 FORT SMITH, AR
 PN: 512203

SITE PLAN

SHEET ID
CS101

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION



GENERAL GRADING NOTES

1. DO NOT COMMENCE GRADING WORK UNTIL ALL EROSION CONTROL MEASURES HAVE BEEN INSTALLED AS SPECIFIED.
2. FOR FINAL PAVEMENT ELEVATIONS, REFER TO JOINT PAVEMENT ELEVATION PLAN.
3. ANY EXISTING UTILITY OR DRAINAGE STRUCTURES TO REMAIN WITHIN THE PROJECT AREA MUST BE ADJUSTED TO FINISH GRADE.
4. PERFORM DEWATERING WORK IN ACCORDANCE WITH SPECIFICATIONS IN 31 00 00.
5. FOR CONC. PANEL SPOT ELEVATIONS, SEE CP SHEETS.
6. PROTECT EXISTING INLETS. MODIFY OR REPLACE THE EXISTING STRUCTURES TO MEET TRAFFIC LOAD RATING. REPLACE INLET OPENINGS WITH NEW GRATED INLET. RAISE OR LOWER RIM OR GRATE TO FINISH GRADE.



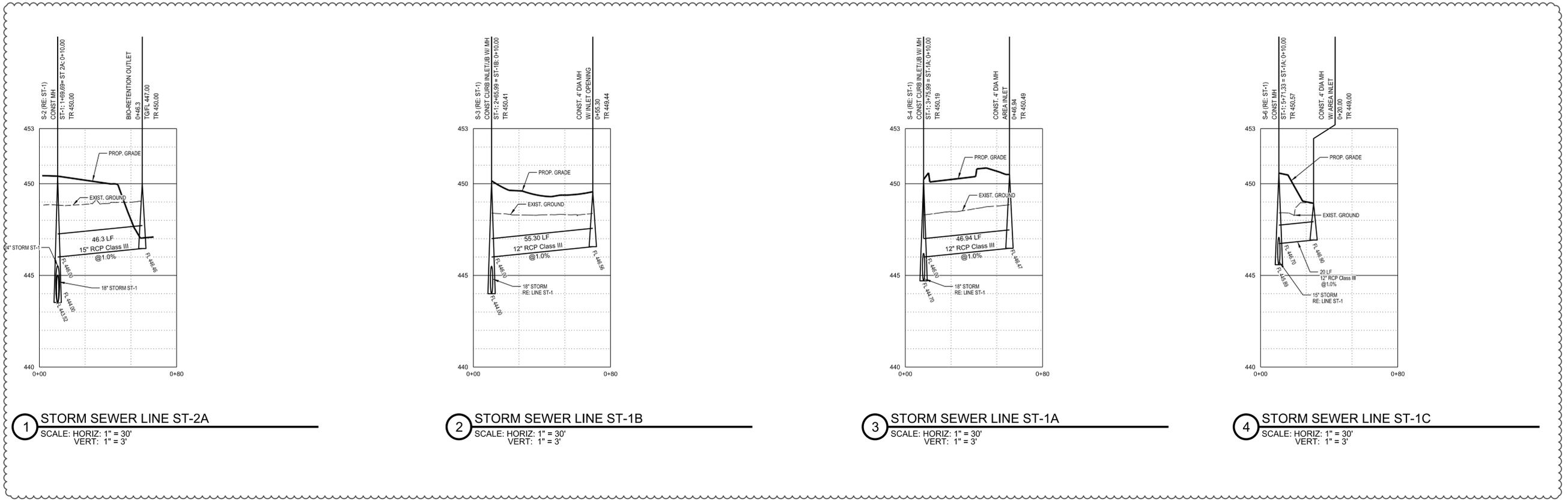
ISSUE DATE:	3 DECEMBER 2025	DATE	19 JAN 2026
DESIGNED BY:	J. ALVAREZ	NO.:	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
DRAWN BY:	J. ALVAREZ	CONTRACT NO.:	
REVIEWED BY:	J. ALVAREZ	MARK	2
DESCRIPTION			

DESIGNED BY:	J. ALVAREZ	ISSUE DATE:	3 DECEMBER 2025
DRAWN BY:	J. ALVAREZ	NO.:	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
REVIEWED BY:	J. ALVAREZ	CONTRACT NO.:	
DESCRIPTION			
U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT 2488 E. 81ST STREET TULSA, OKLAHOMA	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH	FILENAME:	EANG_512203_C_3BAYH_mdl.dgn
SIZE:	22"x34"	PLOT SCALE:	AS SHOWN

EBBING ANG, ARKANSAS F-35 3-BAY HANGAR FORT SMITH, AR PN: 512203	GRADING PLAN
---------------------------------------------------------------------------	--------------

SHEET ID
CG101

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION



1 STORM SEWER LINE ST-2A
SCALE: HORIZ: 1" = 30'
VERT: 1" = 3'

2 STORM SEWER LINE ST-1B
SCALE: HORIZ: 1" = 30'
VERT: 1" = 3'

3 STORM SEWER LINE ST-1A
SCALE: HORIZ: 1" = 30'
VERT: 1" = 3'

4 STORM SEWER LINE ST-1C
SCALE: HORIZ: 1" = 30'
VERT: 1" = 3'



MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY: J. ALVAREZ	ISSUE DATE: 5 DECEMBER 2025
DRAWN BY: J. ALVAREZ	DRAWING NO.: W01/BA/BA004
REVIEWED BY: J. ALVAREZ	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PLOT SCALE: AS SHOWN
SIZE: 22"x34"	FILENAME: EANG_512203_C_3BAYH_mdl.dgn

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 E. 81ST STREET
TULSA, OKLAHOMA

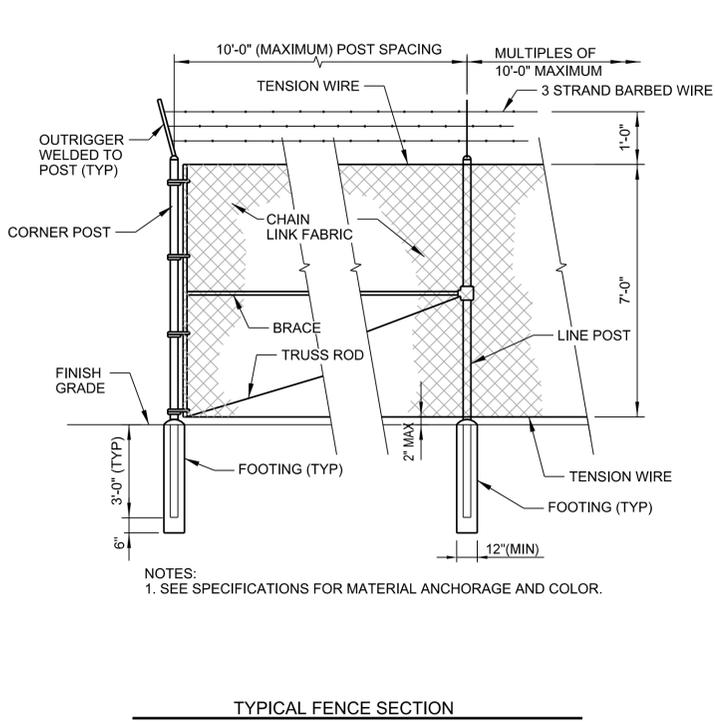
ENGINEERING &
CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANG, ARKANSAS
F-35I 3BAY HANGAR
FORT SMITH, AR
PN: 512203

UTILITY & STORM PROFILES

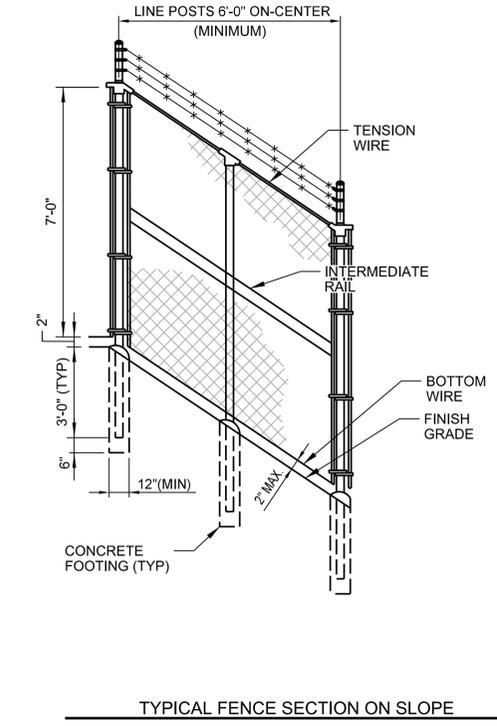
SHEET ID
CU204

P
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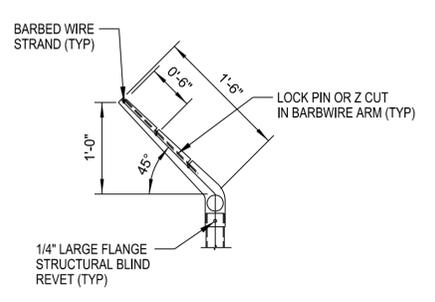
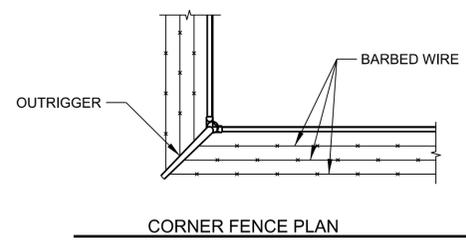


TYPICAL FENCE SECTION

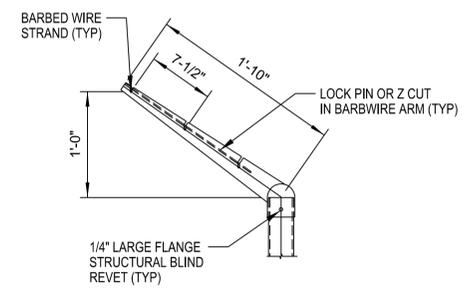
1 CHAIN-LINK SECURITY FENCE
SCALE: NTS



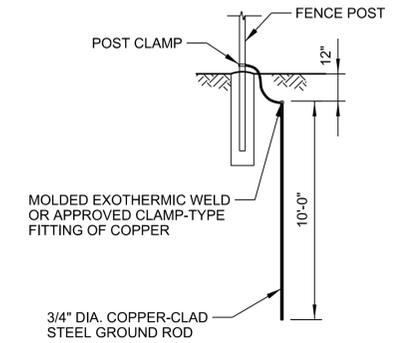
TYPICAL FENCE SECTION ON SLOPE



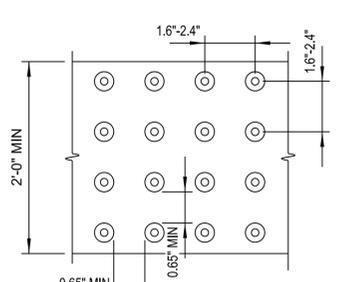
LINE POST



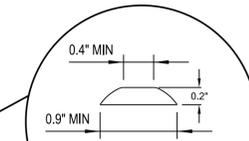
CORNER POST



GROUNDING DETAIL



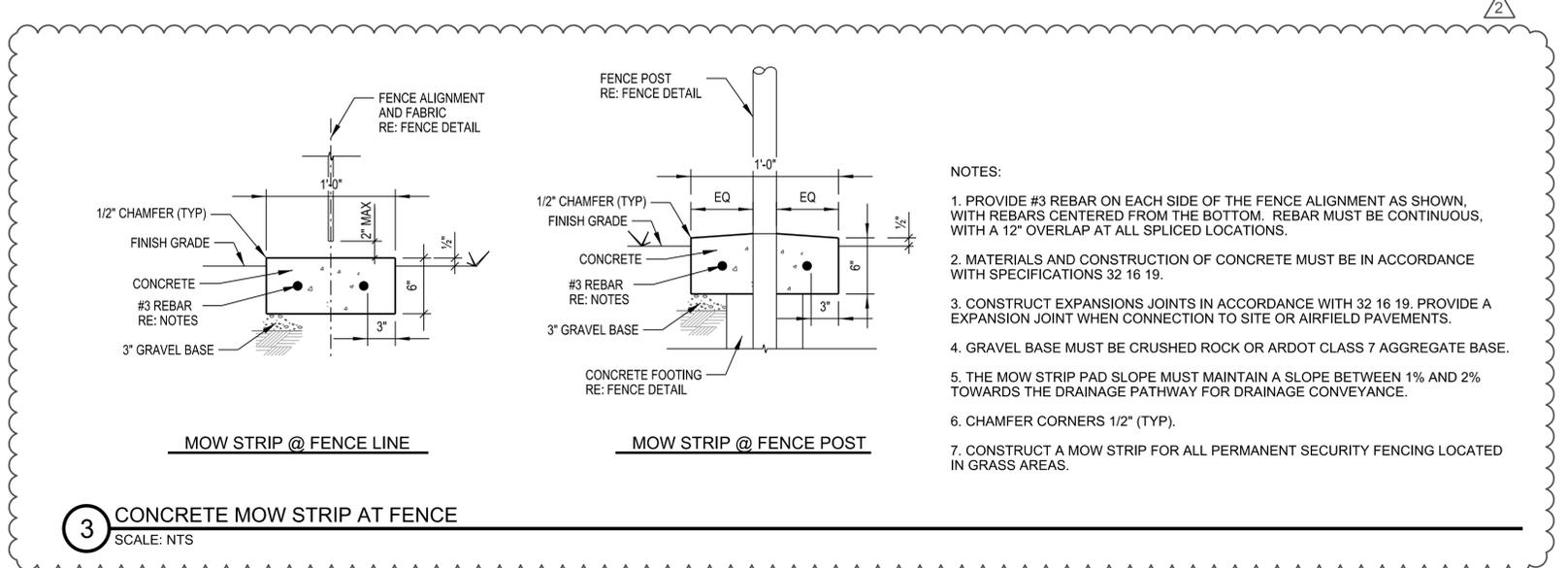
TRUNCATED DOME PLAN



TRUNCATED DOME SECTION

- NOTES:
1. PROVIDE ACCESSIBLE WARNING PAD FOR SIDEWALKS OR WALKWAYS AS INDICATED IN PLANS OR REQUIRED BY CODE.
 2. DETECTABLE WARNING PAD MUST BE 2'-0" MINIMUM IN THE DIRECTION OF TRAVEL AND EXTEND THE FULL WIDTH OF RAMP OR SIDEWALK WIDTH.
 3. TRUNCATED DOMES MUST BE IN ACCORDANCE WITH THE ACCESSIBILITY STANDARDS AND AS INDICATED HEREIN.
 4. DETECTABLE WARNING PAD MUST BE COORDINATED WITH ACO AND EBBING PRIOR TO CONSTRUCTION.

2 ACCESSIBLE DETECTABLE WARNING PAD
SCALE: NTS



3 CONCRETE MOW STRIP AT FENCE
SCALE: NTS

- NOTES:
1. PROVIDE #3 REBAR ON EACH SIDE OF THE FENCE ALIGNMENT AS SHOWN, WITH REBARS CENTERED FROM THE BOTTOM. REBAR MUST BE CONTINUOUS, WITH A 12" OVERLAP AT ALL SPliced LOCATIONS.
 2. MATERIALS AND CONSTRUCTION OF CONCRETE MUST BE IN ACCORDANCE WITH SPECIFICATIONS 32 16 19.
 3. CONSTRUCT EXPANSIONS JOINTS IN ACCORDANCE WITH 32 16 19. PROVIDE AN EXPANSION JOINT WHEN CONNECTION TO SITE OR AIRFIELD PAVEMENTS.
 4. GRAVEL BASE MUST BE CRUSHED ROCK OR ARDOT CLASS 7 AGGREGATE BASE.
 5. THE MOW STRIP PAD SLOPE MUST MAINTAIN A SLOPE BETWEEN 1% AND 2% TOWARDS THE DRAINAGE PATHWAY FOR DRAINAGE CONVEYANCE.
 6. CHAMFER CORNERS 1/2" (TYP).
 7. CONSTRUCT A MOW STRIP FOR ALL PERMANENT SECURITY FENCING LOCATED IN GRASS AREAS.



DATE	19 JAN 2026
DESCRIPTION	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
MARK	2

DESIGNED BY:	J. ALVAREZ	ISSUE DATE:	5 DECEMBER 2025
DRAWN BY:	D. ALVAREZ	PROJECT NO.:	W019B/AR0004
REVIEWED BY:	J. ALVAREZ	CONTRACT NO.:	-
SUBMITTED BY:	A. BLANKENSHIP, P.E.	PLOT SCALE:	AS SHOWN
SIZE:	22"x34"	FILENAME:	EANG_512203_C_3BAYH.mxd.dgn

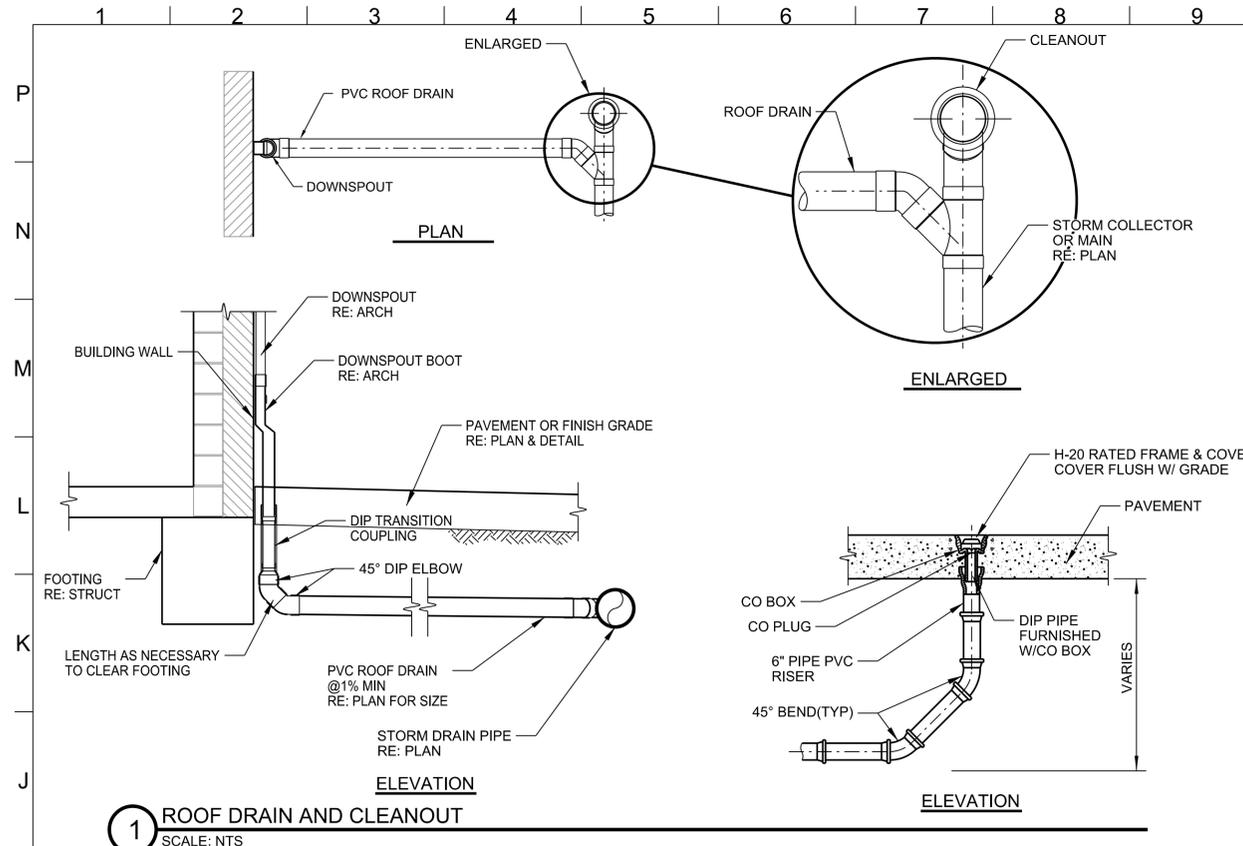
U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 E. 81ST STREET
TULSA, OKLAHOMA

ENGINEERING &
CONSTRUCTION DIVISION
ENGINEERING BRANCH

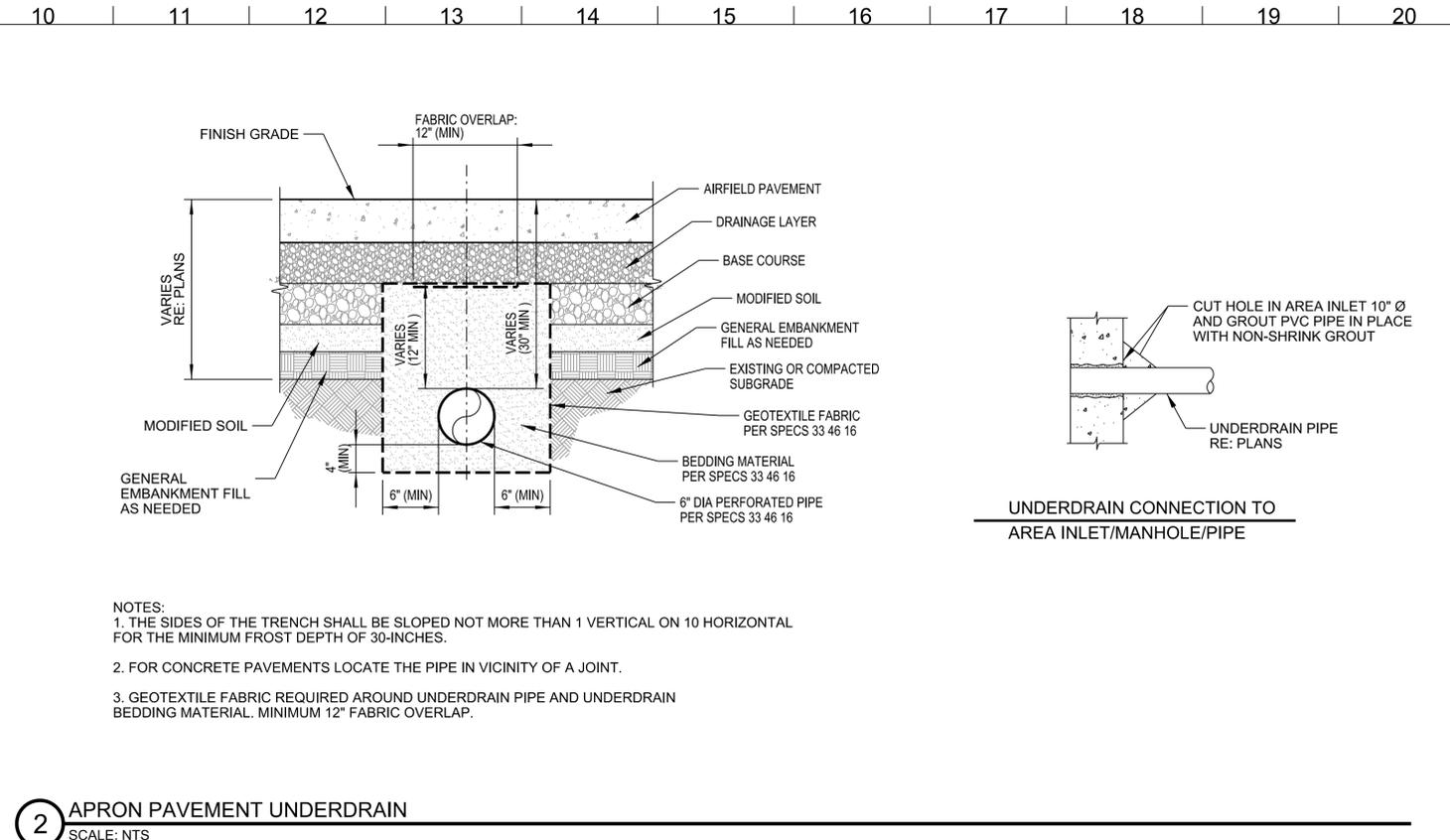
EBBING ANG, ARKANSAS
F-35, 3-BAY HANGAR
FORT SMITH, AR
PH: 512203

SITE DETAILS - 6

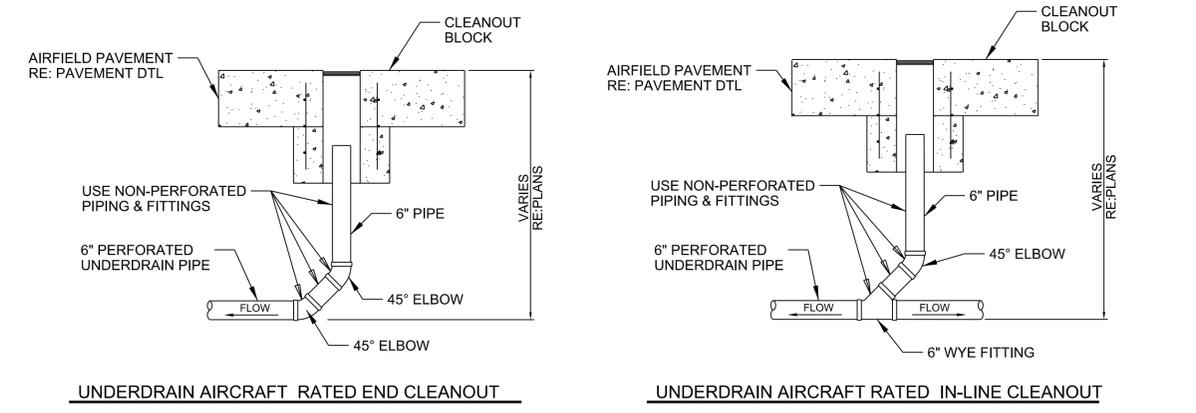
SHEET ID
CS506



1 ROOF DRAIN AND CLEANOUT
SCALE: NTS

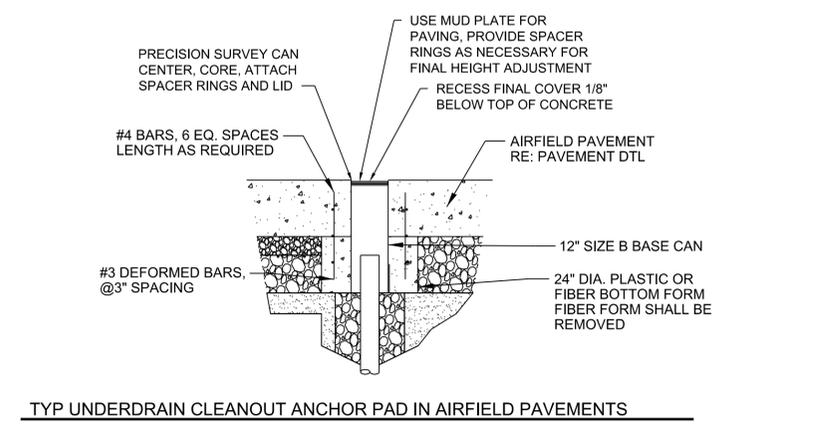


2 APRON PAVEMENT UNDERDRAIN
SCALE: NTS



3 UNDERDRAIN AIRCRAFT RATED END CLEANOUT

3 UNDERDRAIN AIRCRAFT RATED IN-LINE CLEANOUT



4 TYP UNDERDRAIN CLEANOUT ANCHOR PAD IN AIRFIELD PAVEMENTS

3 NOT USED
SCALE: NTS

4 AIRFIELD UNDERDRAIN CLEANOUT
SCALE: NTS



NO.	DATE	DESCRIPTION
1	19 JAN 2026	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
2		MARK

DESIGNED BY: J. ALVAREZ	ISSUE DATE: 5 DECEMBER 2025
DRAWN BY: D. ALVAREZ	PROJECT NO. / W81FB12R0004
REVIEWED BY: J. ALVAREZ	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PLOT SCALE: AS SHOWN
SIZE: 22"x34"	FILENAME: EANG_512203_C_3BAYH_mdl.dgn

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 E. 81ST STREET
TULSA, OKLAHOMA

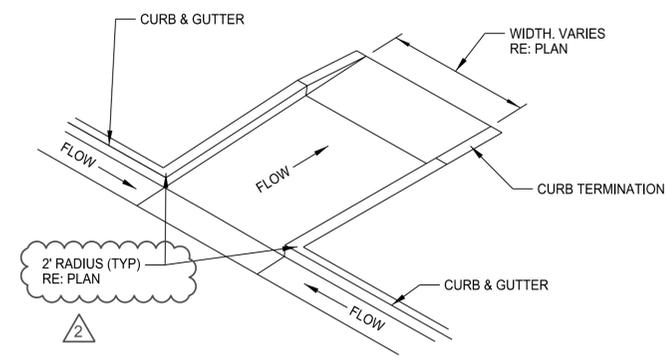
ENGINEERING &
CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANG, ARKANSAS
F-35; 3-BAY HANGAR
FORT SMITH, AR
PN: 512203

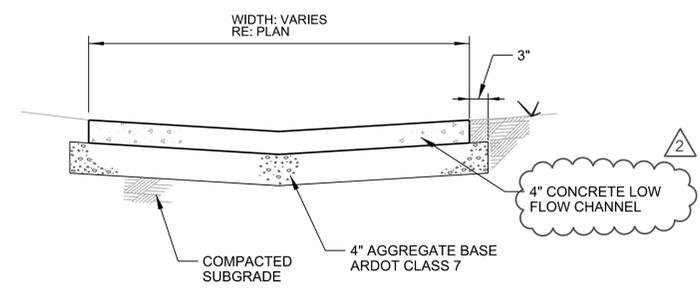
STORM SEWER DETAILS - 2

SHEET ID
CG503

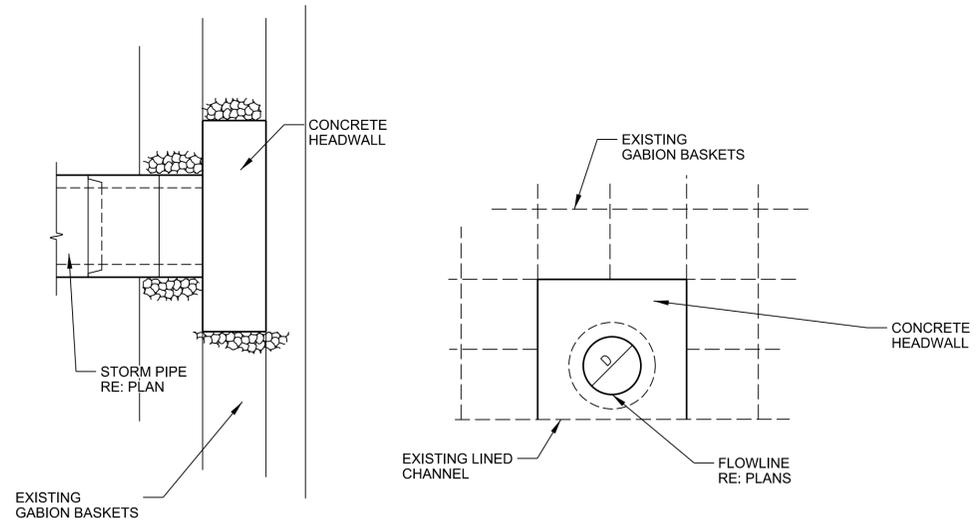
100% READY TO ADVERTISE - NOT FOR CONSTRUCTION



1 CURB CUT FLUME
SCALE: NTS



2 TRICKLE LOW FLOW CHANNEL
SCALE: NTS



NOTES:
1. DEMO GABION BASKETS AS NECESSARY AND RESTORE TO EXISTING CONDITIONS

3 END SECTION/HEADWALL TO THRU EXISTING GABION
SCALE: NTS



MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	19 JAN 2026

DESIGNED BY: J. ALVAREZ	ISSUE DATE: 5 DECEMBER 2025
DRAWN BY: J. ALVAREZ	PROJECT NO.: W91PBA/0004
REVIEWED BY: J. ALVAREZ	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PLOT SCALE: AS SHOWN
SIZE: 22"x34"	FILENAME: EANG_512203_C_3BAYH_mdl.dgn

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 E. 81ST STREET
TULSA, OKLAHOMA

ENGINEERING &
CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANG, ARKANSAS
F-357, 3-BAY HANGAR
FORT SMITH, AR
PH: 512203

STORM SEWER DETAILS - 7

SHEET ID
CG508

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DRILLED PIER SCHEDULE							
TYPE	SHAFT DIA	REINFORCEMENT			MINIMUM ROCK SOCKET DEPTH	BID LENGTH	REMARKS
		VERTICAL	TIES AT TOP	TIES BALANCE			
DP24	24"	(7)#8	(3)#4 @3" OC	#4@16" OC	5'-0"	40'-0"	-
DP30	30"	(9)#8	(3)#4@3" OC	#4@16" OC	5'-0"	39'-0"	-
DP36	36"	(11)#9	(3)#4@3" OC	#4@16" OC	6'-0"	40'-0"	-
DP42	42"	(11)#10	(3)#4@3" OC	#4@16" OC	7'-0"	40'-0"	-

GRADE BEAM REINFORCEMENT SCHEDULE								
MARK	WIDTH (IN)	DEPTH (IN)	LONGITUDINAL REINFORCEMENT			S1 STIRRUPS		REMAINDER STIRRUPS
			TOP	BOTTOM	SIDE	BAR SIZE AND SPACING	EXTENT L	
GB1	16"	24"	(3)#8	(3)#8	N/A	#4@10" OC	FULL LENGTH	N/A
GB2	24"	36"	(5)#8	(5)#8	(2)#5	#4@10" OC	FULL LENGTH	N/A
GB3	30"	36"	(5)#9	(5)#9	N/A	#4@12" OC	FULL LENGTH	N/A
GB4	16"	36"	(3)#8	(3)#8	(1)#8 EF	#4@12" OC	FULL LENGTH	N/A
GB5	24"	24"	(4)#8	(4)#8	N/A	#4@10" OC	FULL LENGTH	N/A
GB6	52"	36"	(8)#8	(8)#8	N/A	#4@12" OC	FULL LENGTH	N/A

COLUMN SCHEDULE			
COLUMN GRID LOCATION	COLUMN SIZE	BASE PLATE TYPE	COMMENTS
D-1	W12X87	BP1	
D-2	W14X90	BP3	
D-3	W14X90	BP3	
D-4	W12X87	BP1	
D-5	W12X87	BP1	
D-6	W12X87	BP1	
D-7	W12X87	BP1	
D-8	W14X90	BP3	
D-9	W14X90	BP3	
D-10	W12X87	BP1	
E-1	W14X90	BP2	
E-4	W14X120	BP4	
E-7	W14X120	BP4	
E-10	W14X90	BP2	
F-1	W14X90	BP2	
F-4	W14X120	BP4	
F-7	W14X120	BP4	
F-10	W14X90	BP2	
G-1	W12X87	BP1	
G-4	W12X87	BP1	
G-7	W12X87	BP1	
G-10	W12X87	BP1	
G.8-1	W12X87	BP1	
G.8-4	W12X87	BP1	
G.8-7	W12X87	BP1	
G.8-10	W12X87	BP1	
H-1	W12X87	BP1	
H-4	W12X87	BP1	
H-7	W12X87	BP1	
H-10	W12X87	BP1	



US Army Corps of Engineers®

MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY: C. KENNEDY, P.E., SE	ISSUE DATE: 5 DECEMBER 2025
DRAWN BY: B. SUDRANK, P.E., SE	PROJECT NO.: 512203
CHECKED BY: A. STUART, P.E., SE	FILE NAME: EAANG_512203_S_3BAYH_RVT22.rvt
SUBMITTED BY:	ANSID:

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 EAST 81ST ST
TULSA, OK 74137

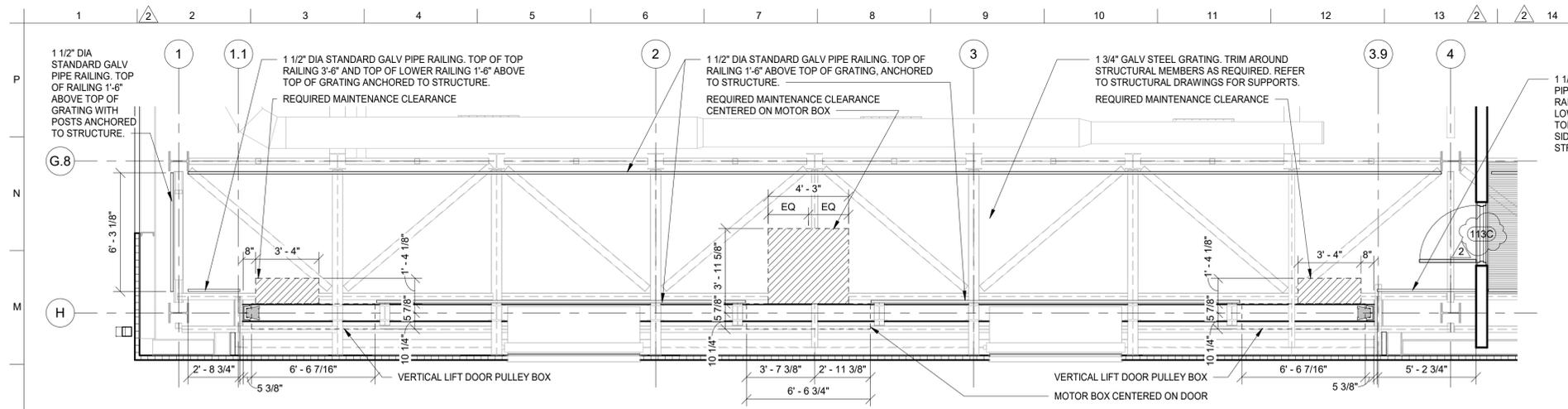
ENGINEERING & CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35; 3 BAY HANGAR
PN: 512203

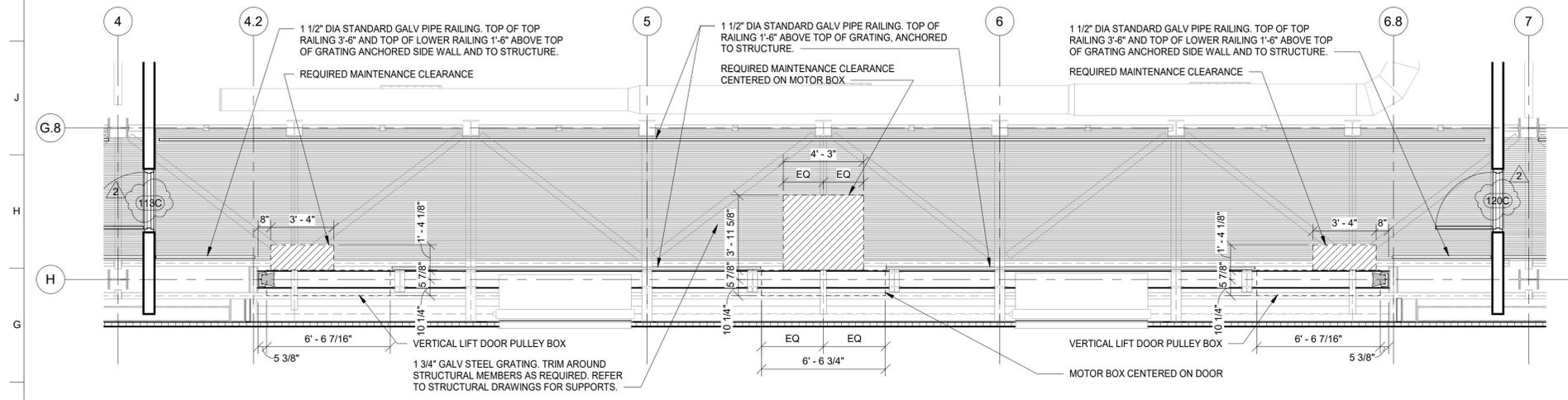
SCHEDULES

SHEET ID
S-601

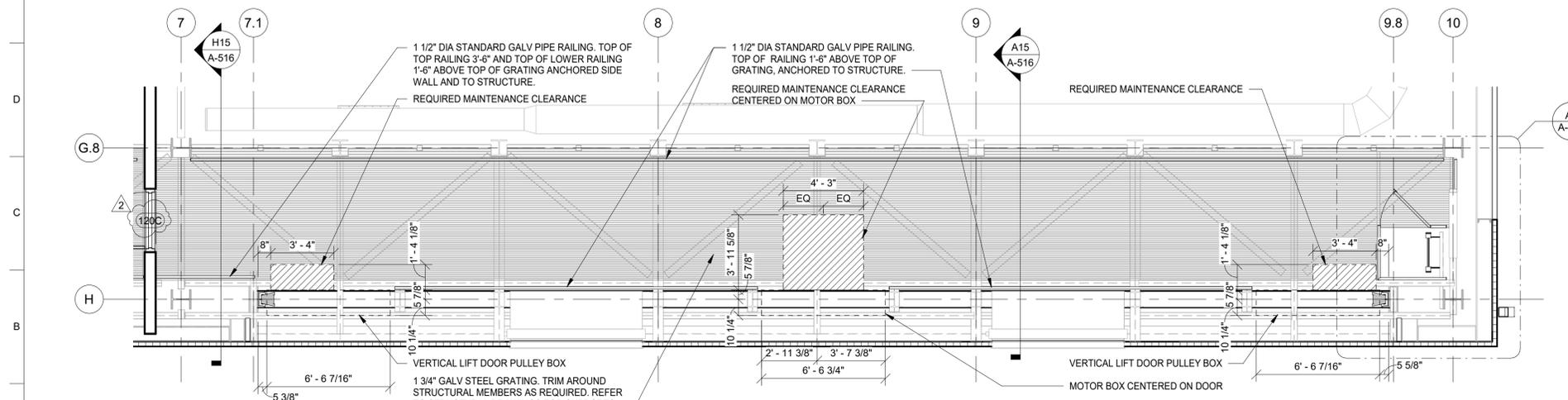
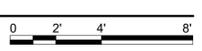
100% READY TO ADVERTISE - NOT FOR CONSTRUCTION



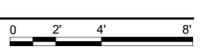
L1 ENLARGED ACCESS CATWALK FLOOR PLAN - AREA D
1/4" = 1'-0"



F1 ENLARGED ACCESS CATWALK FLOOR PLAN - AREA E
1/4" = 1'-0"



A1 ENLARGED ACCESS CATWALK FLOOR PLAN - AREA F
1/4" = 1'-0"

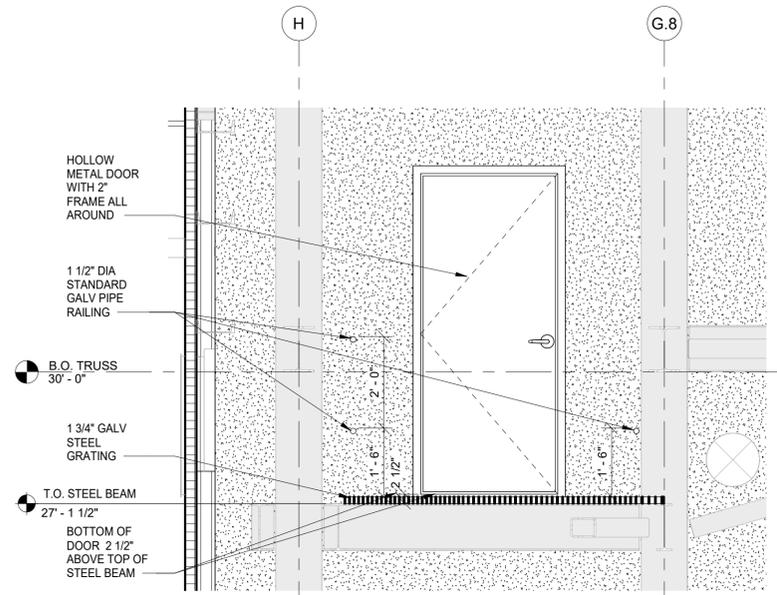


GENERAL CATWALK NOTES

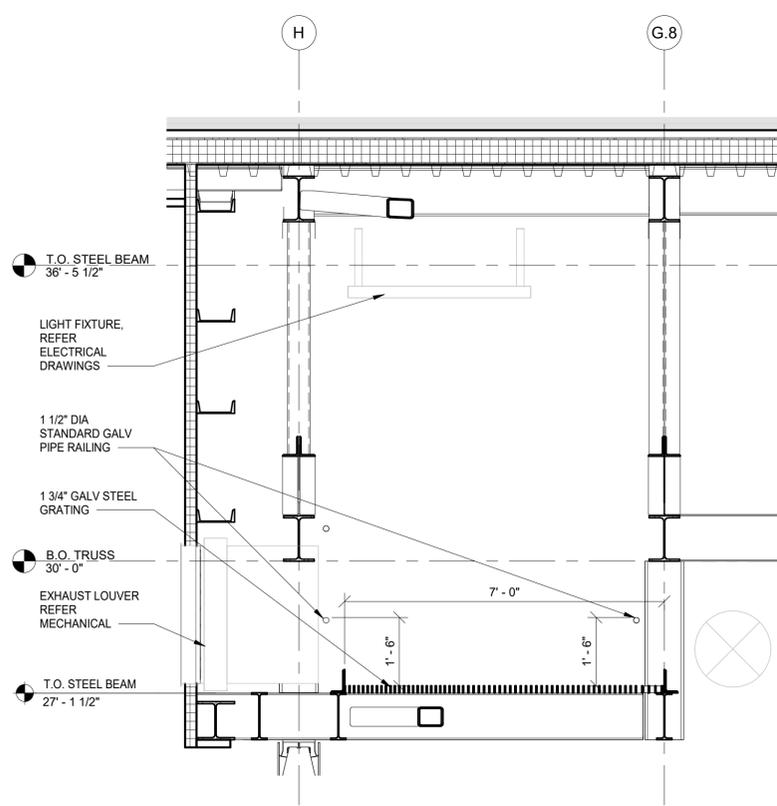
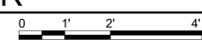
1. CONTRACTOR MUST VERIFY SELECTED VERTICAL LIFT DOOR MANUFACTURER'S MACHINERY AND MAINTENANCE REQUIREMENTS AND ADJUST DIMENSIONS ACCORDINGLY.



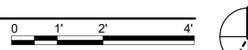
DATE	9 JAN 2026
DESCRIPTION	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
MARK	2



H15 CATWALK SECTION AT DOOR
1/2" = 1'-0"



A15 CATWALK SECTION
1/2" = 1'-0"



DESIGNED BY:	C. LONGCORE	ISSUE DATE:	5 DECEMBER 2025
DRAWN BY:	R. READER	SOLICITATION NO.:	W912B28RA004
CHECKED BY:	M. HOOVER, R.A.	CONTRACT NO.:	
SUBMITTED BY:	A. BLANKENSHIP, P.E.	PROJECT NO.:	512203
SIZE:	ANSI D	FILE NAME:	EANG_512203_A_3BAYH_RVT22.rvt

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2408 EAST 61ST ST
TULSA, OK 74117

ENGINEERING & DESIGN
CONSTRUCTION DIVISION
ENGINEERING BRANCH

ACCESS CATWALK PLAN AND DETAILS

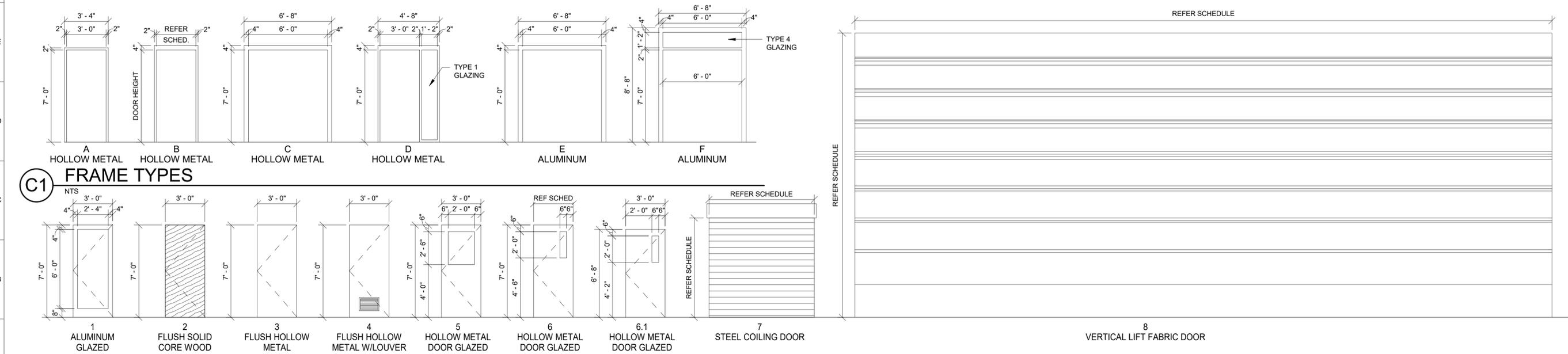
SHEET ID
A-516

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION

P	DOOR NUMBER	DOOR LOCATION	DOOR SIZE			DOOR TYPE	DOOR MATERIAL			FRAME TYPE	FRAME MATERIAL		FRAME THICKNESS	GLASS TYPE	DETAILS			HARDWARE SET	RATING		REMARKS
			WIDTH	HEIGHT	THICKNESS		DOOR MATERIAL	DOOR FINISH	FRAME MATERIAL		FRAME FINISH	HEAD			JAMB	SILL	STC/MISC.		FIRE - MIN.		
															STC/MISC.	FIRE - MIN.					
	100A	ENTRY VEST - 100	PR 3'-0"	7'-0"	1 3/4"	1	AL	ANZ	F	AL	ANZ	4"	4	K1/A-602	E1/A-602	A1/A-602	1			2	
	100B	ENTRY VEST - 100	PR 3'-0"	7'-0"	1 3/4"	1	AL	ANZ	F	AL	ANZ	4"	4	J16/A604	E16/A-604	A1/A-602 SIM	10				
	101A	CORRIDOR - 101	PR 3'-0"	7'-0"	1 3/4"	1	AL	ANZ	E	AL	ANZ	4"	4	K8/A602	E1/A602 & E8/A-602	A8/A-602	2				
	101B	CORRIDOR - 101	PR 3'-0"	7'-0"	1 3/4"	1	AL	ANZ	E	AL	ANZ	4"	4	K8/A602	E1/A602 & E8/A-602	A7/A-602	2				
N	102	FIRE PUMP - 102	PR 3'-0"	7'-0"	1 3/4"	3	HM	PTD	C	HM	PTD	4"	-	K14/A602	E14/A602	A14/A-602	7				
	103A	TOOL RM/ALIS STATION - 103	PR 3'-0"	7'-0"	1 3/4"	6	HM	PTD	C	HM	PTD	4"	1	E11/A604	A16/A604	-	18				
	103B	TOOL RM/ALIS STATION - 103	10'-0"	8'-8"	-	7	INSUL MTL	-	-	-	-	-	-	F12/A-605	A1/A-605 & A7/A-605	A13/A-605	MANUF			1	
	104	ELECTRICAL - 104	PR 3'-0"	7'-0"	1 3/4"	3	HM	PTD	C	HM	PTD	4"	-	F15/A-603	A15/A-603 & E14/A-602	A14/A-602	8				
M	105	MECHANICAL - 105	PR 3'-0"	7'-0"	1 3/4"	3	HM	PTD	C	HM	PTD	4"	-	F15/A-603	A15/A-603 & E14/A-602	A14/A-602	7				
	106A	HOIST BAY - 106	59'-10"	26'-6"	-	8	FABRIC	-	-	-	-	-	-	A1/A-611	A8/A-611 & A15/A-611	-	MANUF				
	106B	HOIST BAY - 106	3'-0"	6'-8"	1 3/4"	6.1	HM	PTD	B	HM	PTD	4" / 2"	4	F15/A-603	A8/A-603 & A1/A-603	A14/A-602	6				
	107A	VEST - 107	PR 3'-0"	7'-0"	1 3/4"	5	HM	PTD	C	HM	PTD	4"	1	E11/A604	A16/A604	-	19				
	107B	VEST - 107	PR 3'-0"	7'-0"	1 3/4"	5	HM	PTD	C	HM	PTD	4"	2	E11/A604	A16/A604	-	20		45		
L	108	JAN - 108	PR 3'-0"	7'-0"	1 3/4"	3	HM	PTD	C	HM	PTD	4"	-	E11/A604	A16/A604	-	21				
	109A	RVE STORAGE - 109	3'-8"	7'-0"	1 3/4"	6	HM	PTD	B	HM	PTD	4" / 2"	2	E11/A604	A11/A604	-	12		45		
	109B	RVE STORAGE - 109	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	E11/A604	A11/A604	-	13				
	110	MOTHER'S ROOM - 110	3'-0"	7'-0"	1 3/4"	2	WD	STN	B	HM	PTD	4" / 2"	-	E6/A604	A6/A604	-	14	45			
	111	OFFICE - 111	3'-0"	7'-0"	1 3/4"	2	WD	STN	D	HM	PTD	4" / 2"	-	E6/A604	A6/A604	-	15	45			
	112A	VEST - 112	PR 3'-0"	7'-0"	1 3/4"	5	HM	PTD	C	HM	PTD	4"	1	E11/A604	A16/A604	-	19				
	112B	VEST - 112	PR 3'-0"	7'-0"	1 3/4"	5	HM	PTD	C	HM	PTD	4"	2	E11/A604	A16/A604	-	20		45		
K	113A	MAINTENANCE BAY - 113	59'-10"	26'-6"	-	8	FABRIC	-	-	-	-	-	-	A1/A-611	A8/A-611 & A15/A-611	-	MANUF				
	113B	MAINTENANCE BAY - 113	3'-0"	6'-8"	1 3/4"	6.1	HM	PTD	B	HM	PTD	4" / 2"	4	F15/A-603	A8/A-603 & A1/A-603	A14/A-602	6				
	113C	MAINTENANCE BAY - 113	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	E1/A604	A1/A604	E1/A604 O.H.	11			4	
	115	ELEC - 115	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4"	-	E11/A604	A11/A604	-	16				
	116	COMM - 116	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	K14/A602	A1/A-603	A14/A-602	3				
J	117	WOMEN'S TOILET - 117	3'-0"	7'-0"	1 3/4"	2	WD	STN	A	HM	PTD	2"	-	E1/A604	A1/A604	-	17	45			
	118	MEN'S TOILET - 118	3'-0"	7'-0"	1 3/4"	2	WD	STN	A	HM	PTD	2"	-	E1/A604	A1/A604	-	17	45			
	119A	VEST - 119	PR 3'-0"	7'-0"	1 3/4"	5	HM	PTD	C	HM	PTD	4"	1	E11/A604	A16/A604	-	19				
	119B	VEST - 119	PR 3'-0"	7'-0"	1 3/4"	5	HM	PTD	C	HM	PTD	4"	2	E11/A604	A16/A604	-	20		45		
	120A	WASH BAY - 120	59'-10"	26'-6"	-	8	FABRIC	-	-	-	-	-	-	A1/A-611	A8/A-611 & A15/A-611	-	MANUF				
H	120B	WASH BAY - 120	3'-0"	6'-8"	1 3/4"	6.1	HM	PTD	B	HM	PTD	4" / 2"	4	F15/A-603	A8/A-603 & A1/A-603	A14/A-602	6				
	120C	WASH BAY - 120	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	E1/A604	A1/A604	E1/A604 O.H.	11			4	
	121A	WASH EQUIPMENT - 121	PR 3'-0"	7'-0"	1 3/4"	4	HM	PTD	C	HM	PTD	4"	-	E11/A604	A16/A604	-	9		45		
	121B	WASH EQUIPMENT - 121	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	F15/A-603	A8/A-603 & A1/A-603	A14/A-602	4				
	122A	MECHANICAL - 122	10'-0"	8'-8"	-	7	INSUL MTL	-	-	-	-	-	-	F12/A-605	A1/A-605 & A7/A-605	A13/A-605	MANUF			1	
G	122B	MECHANICAL - 122	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	F15/A-603	A8/A-603 & A1/A-603	A14/A-602	5				
	122C	MECHANICAL - 122	3'-0"	7'-0"	1 3/4"	3	HM	PTD	B	HM	PTD	4" / 2"	-	F15/A-603	A8/A-603 & A1/A-603	A14/A-602	5				
	123	ELECTRICAL - 123	PR 3'-0"	7'-0"	1 3/4"	3	HM	PTD	C	HM	PTD	4"	-	F15/A-603	A15/A-603 & E14/A-602	A14/A-602	8				

GENERAL NOTES:	
1) SEE SPEC SECTION 08 71 00 FOR HARDWARE SETS	
2) SEE INTERIORS SHEETS FOR FINISH INFO.	
3) SEE INTERIORS SHEETS FOR SIGNAGE INFO.	
4) SEE SHEET A-601 FOR DOOR & FRAME TYPES.	
ABBREVIATIONS:	
AL	ALUMINUM
ANZ	ANODIZE
GL	GLASS
HM	HOLLOW METAL
PTD	PAINTED
ST	STEEL
STN	STAIN, STAINED
WD	WOOD
WM	WIRE MESH
MISCELLANEOUS, OTHER COLUMN:	
COMP.	COMPUTER
COMM.	COMMUNICATION
CORR.	CORRIDOR
ELEC.	ELECTRICAL
ELEV.	ELEVATOR
EQUIP.	EQUIPMENT
JAN.	JANITOR
MECH.	MECHANICAL
STOR.	STORAGE
GLASS TYPES:	
1	TEMPERED
2	FIRE RATED - TEMPERED
3	LAMINATED
4	TEMPERED / LAMINATED

- REMARKS:
- ELECTRICALLY OPERATED OVERHEAD COILING DOOR. SEE SPEC SECTION 08 33 23 FOR ADDITIONAL INFORMATION.
 - GLAZING IN EXTERIOR DOORS SHALL BE 1" INSULATED WITH INTERIOR PANE CONSISTING OF 1/4" LAMINATED GLASS COMPLYING WITH THE REQUIREMENTS OF UFC 4-010-01, STANDARD 10.
 - PROVIDE SECURITY CARD READER PER NOTES IN THE HARDWARE SCHEDULE, SPEC SECTION 08 71 00.
 - ACCESS DOOR BETWEEN HANGAR BAYS AT CATWALK LEVEL.



ISSUE DATE:	5 DECEMBER 2025
DESIGNED BY:	C. LONGAGRE
DRAWN BY:	R. READER
CHECKED BY:	M. HOOVER, R.A.
PROJECT NO.:	512203
FILE NAME:	EANG_512203_A_3BAYH_RVT22.rvt
ANSI D:	17/2026 4:15:40 PM
MARK:	2
DESCRIPTION:	AM 002 - REVISED IN ACCORDANCE WITH AMENDMENT 2
DATE:	9 JAN 2026

US ARMY CORPS OF ENGINEERS
 TULSA DISTRICT
 2408 EAST 91ST ST
 TULSA, OK 74115

ENGINEERING & CONSTRUCTION DIVISION
 ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
 F-38: 3 BAY HANGAR
 PN: 512203

DOOR SCHEDULE AND DOOR TYPES

SHEET ID
A-601

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

P
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GENERAL SHEET NOTES

1. REFERENCE INTERIOR FINISH MATERIALS LEGEND FOR FINISH TYPES; REFER A-711.
2. REFER TO ELECTRICAL DRAWINGS FOR CONNECTION HEIGHTS.
3. SURFACE MOUNTED MOP RACK WITH SHELF SHALL BE PROVIDED ABOVE FLOOR MOP SINK. REFER FLOOR AND PLUMBING PLANS FOR LOCATIONS.
4. INSTALL FIBERGLASS REINFORCED PANELS (FRP) ON GYPSUM BOARD WALLS ADJACENT TO MOP SINK TO 4'-0" A.F.F.
5. ALL BULLETIN BOARDS SHALL BE MOUNTED FROM THE TOP OF THE FRAME 7'-0" A.F.F. SIZE AS INDICATED.
6. CENTER WALL MOUNTED ITEMS HORIZONTALLY BETWEEN ADJACENT WALL UNLESS OTHERWISE NOTED.

ELEMENTS LEGEND

CODE	DESCRIPTION	SPECIFICATION
BEN	BENCH	09 06 00
BUL	BULLETIN BOARD 48" X 48"	09 06 00
CG	CORNER GUARD	10 11 00
FRP	FIBERGLASS REINFORCED PLASTIC	07 42 63
LK	LOCKER	10 51 13
MR-S	MOP RACK WITH SHELF	10 28 13



MARK	DESCRIPTION	DATE
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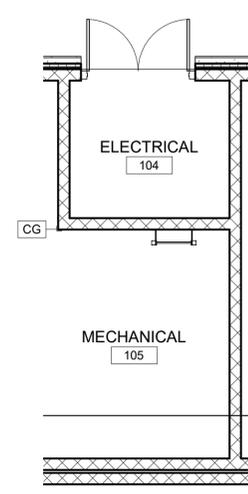
DESIGNED BY: T. MANN	ISSUE DATE: 5 DECEMBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912BVT28RA004
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
ANSI D:	FILE NAME: EANG_512203_A_3BAYH_RVT22.rvt

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2408 EAST 151ST
TULSA, OK 74137

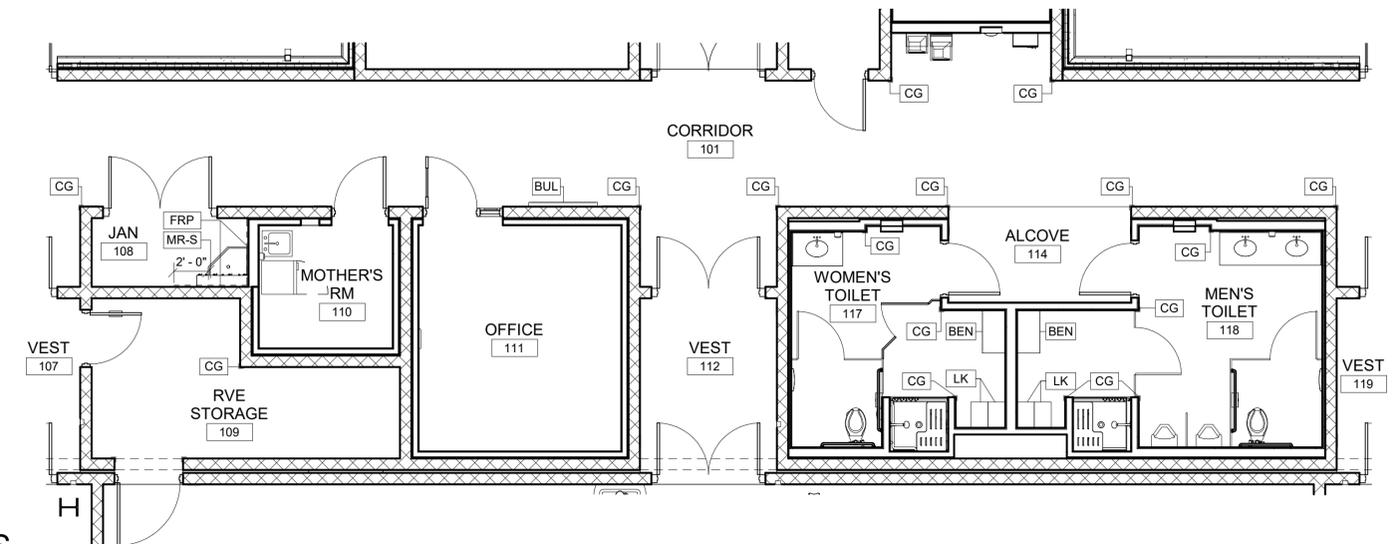
ENGINEERING & CONSTRUCTION DIVISION
ENGINEERING BRANCH

ENLARGED ELEMENTS PLANS

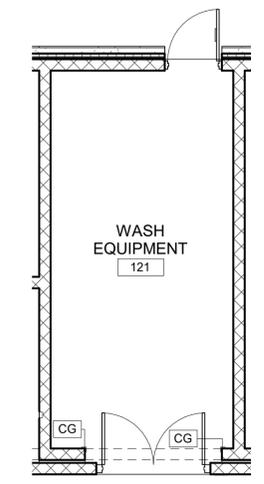
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I-104



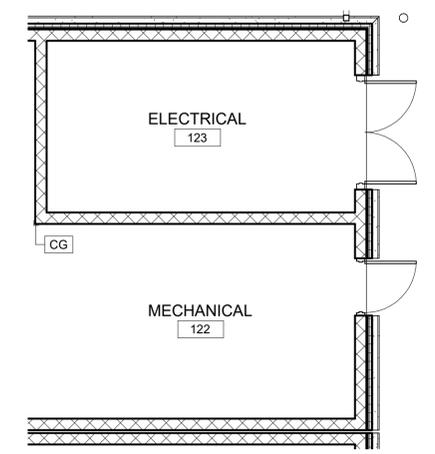
A1 ENLARGED ELEMENTS PARTIAL PLAN - AREA A
3/16" = 1'-0"



A5 ENLARGED ELEMENTS PARTIAL PLAN - AREA B
3/16" = 1'-0"



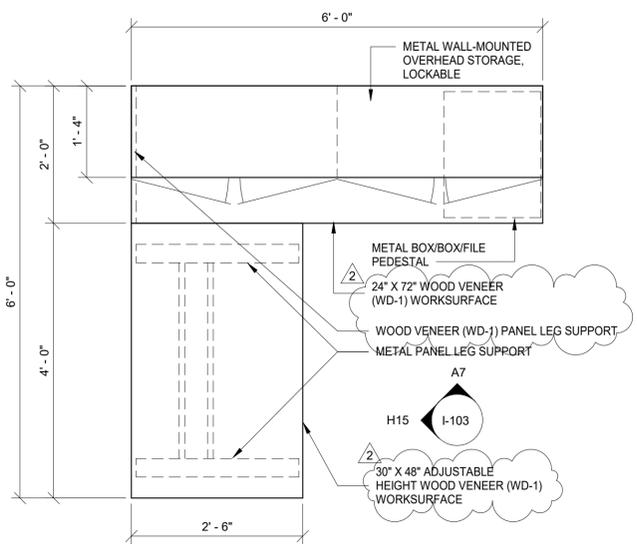
A14 ENLARGED ELEMENTS PARTIAL PLAN - AREA C
3/16" = 1'-0"



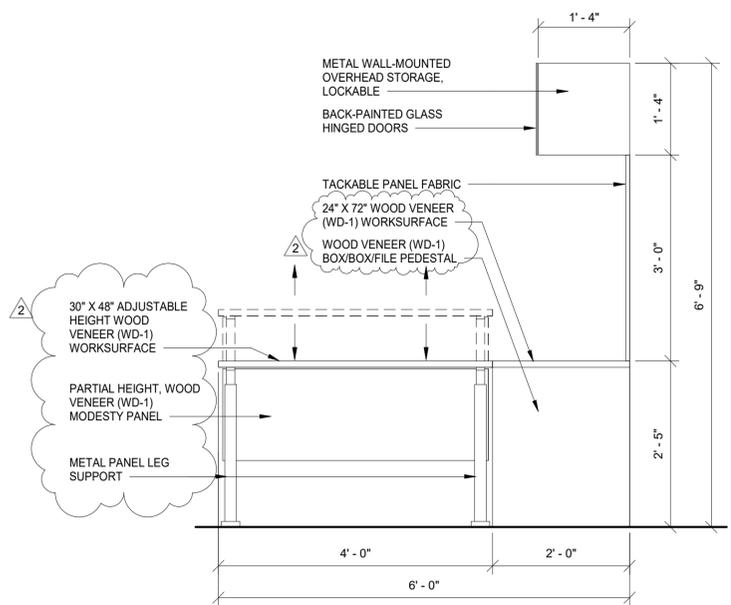
A17 ENLARGED ELEMENTS PARTIAL PLAN - AREA C
3/16" = 1'-0"

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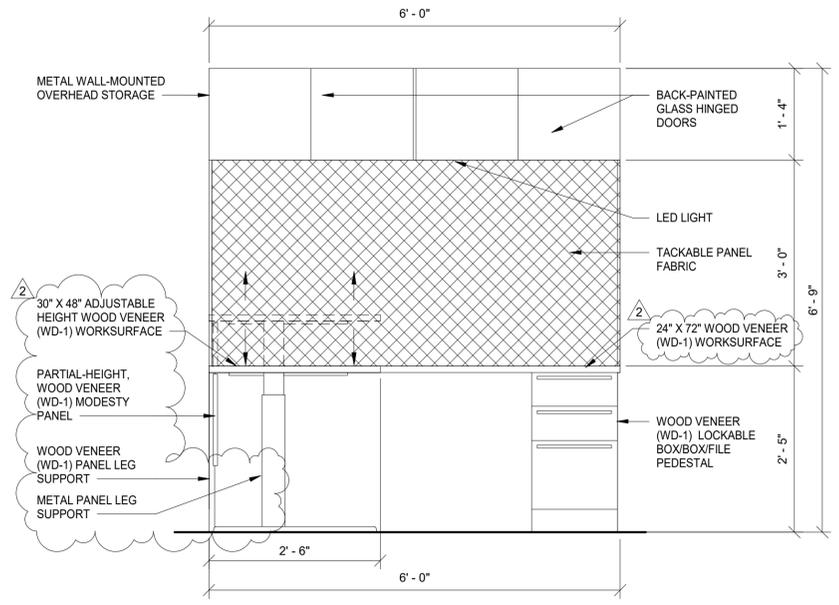
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H7 DESK PLAN
 3/4" = 1'-0"
 0 0.5' 1' 2' 3'



H15 DESK ELEVATION
 3/4" = 1'-0"
 0 0.5' 1' 2' 3'



A7 DESK ELEVATION
 3/4" = 1'-0"
 0 0.5' 1' 2' 3'



A15 DESK ILLUSTRATION
 NTS



MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY: T. MANN	ISSUE DATE: 5 DECEMBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912B28RA004
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
ANSI D	FILE NAME: EANG_512203_A_3BAYH_RV722.rvt

US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74157	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH
------------------------------------------------------------------------------------	-----------------------------------------------------------

EBBING ANGB - ARKANSAS F-35; 3 BAY HANGAR PN: 512203	DESK PLAN AND ELEVATIONS
SHEET ID	I-111

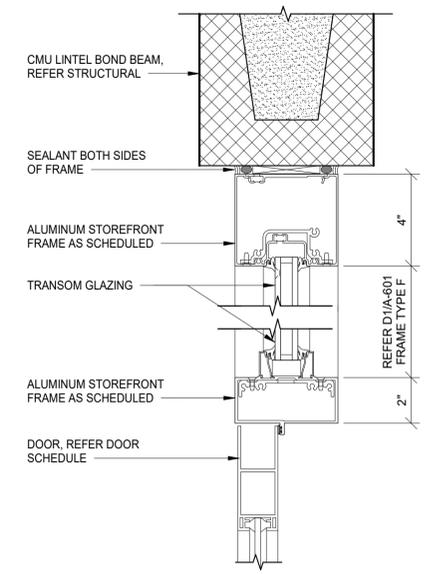
MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY:	C. LONGACRE	ISSUE DATE:	5 DECEMBER 2025
DRAWN BY:	R. READER	SOLICITATION NO.:	W912B728RA004
CHECKED BY:	M. HOOVER, R.A.	CONTRACT NO.:	
SUBMITTED BY:	A. BLANKENSHIP, P.E.	PROJECT NO.:	
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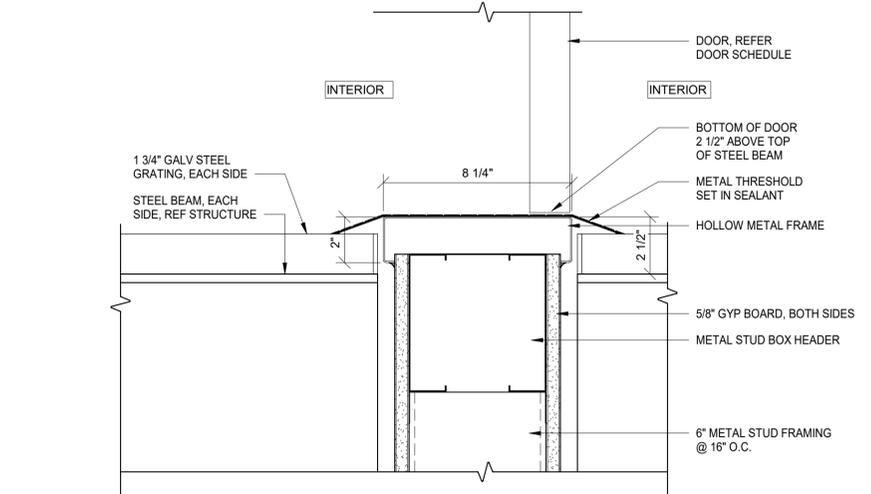
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74157	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH
------------------------------------------------------------------------------------	-----------------------------------------------------------

EBBING ANGB - ARKANSAS F-35: 3 BAY HANGAR PN: 512203	DOOR DETAILS
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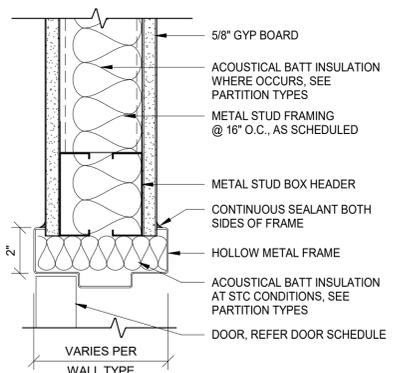
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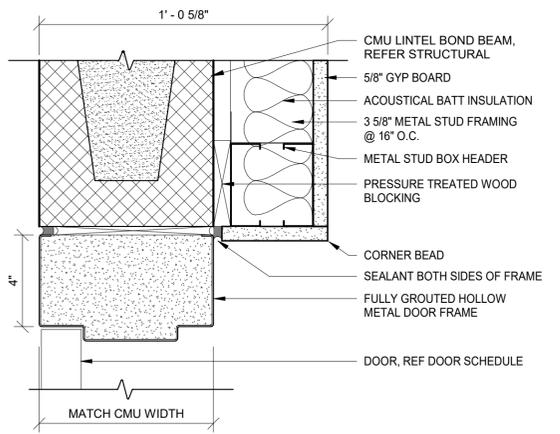
(J16) ALUMINUM HEAD INTERIOR VESTIBULE
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



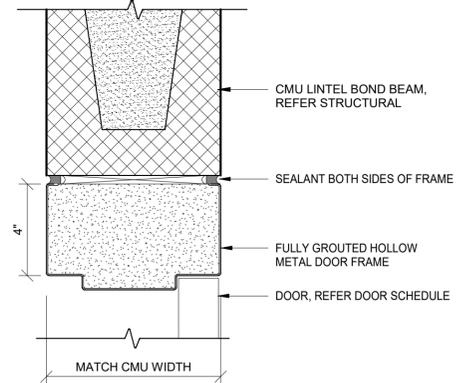
(J1) INTERIOR HOLLOW METAL DOOR THRESHOLD
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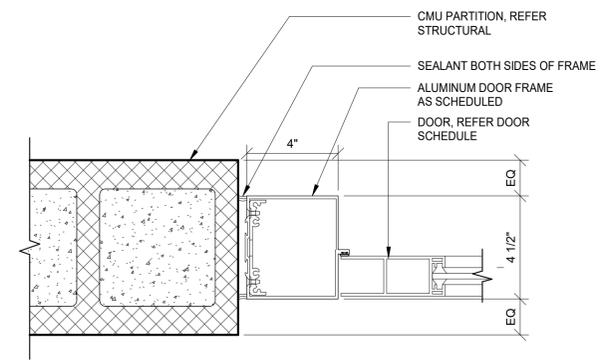
(E1) HOLLOW METAL DOOR HEAD - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



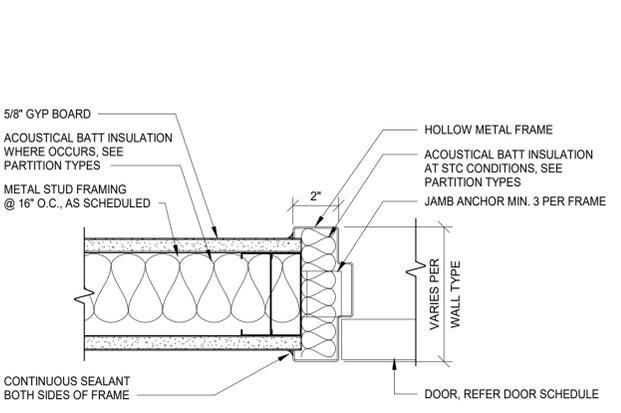
(E6) HOLLOW METAL DOOR HEAD - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



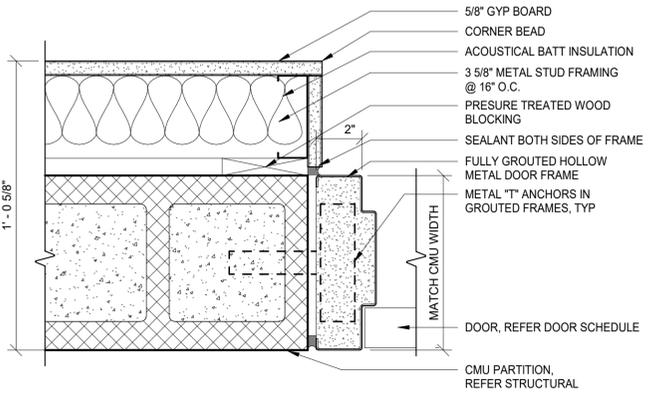
(E11) HOLLOW METAL DOOR HEAD - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



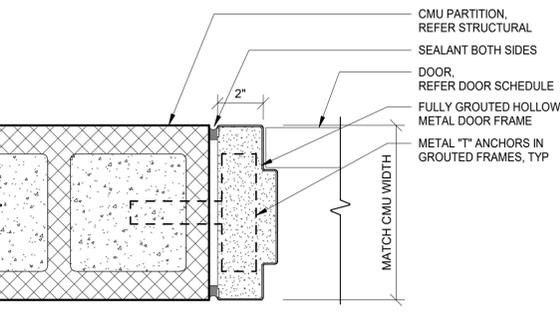
(E16) ALUMINUM JAMB INTERIOR VESTIBULE
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



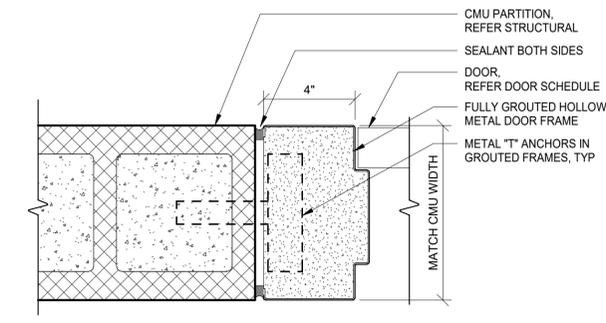
(A1) HOLLOW METAL DOOR JAMB - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



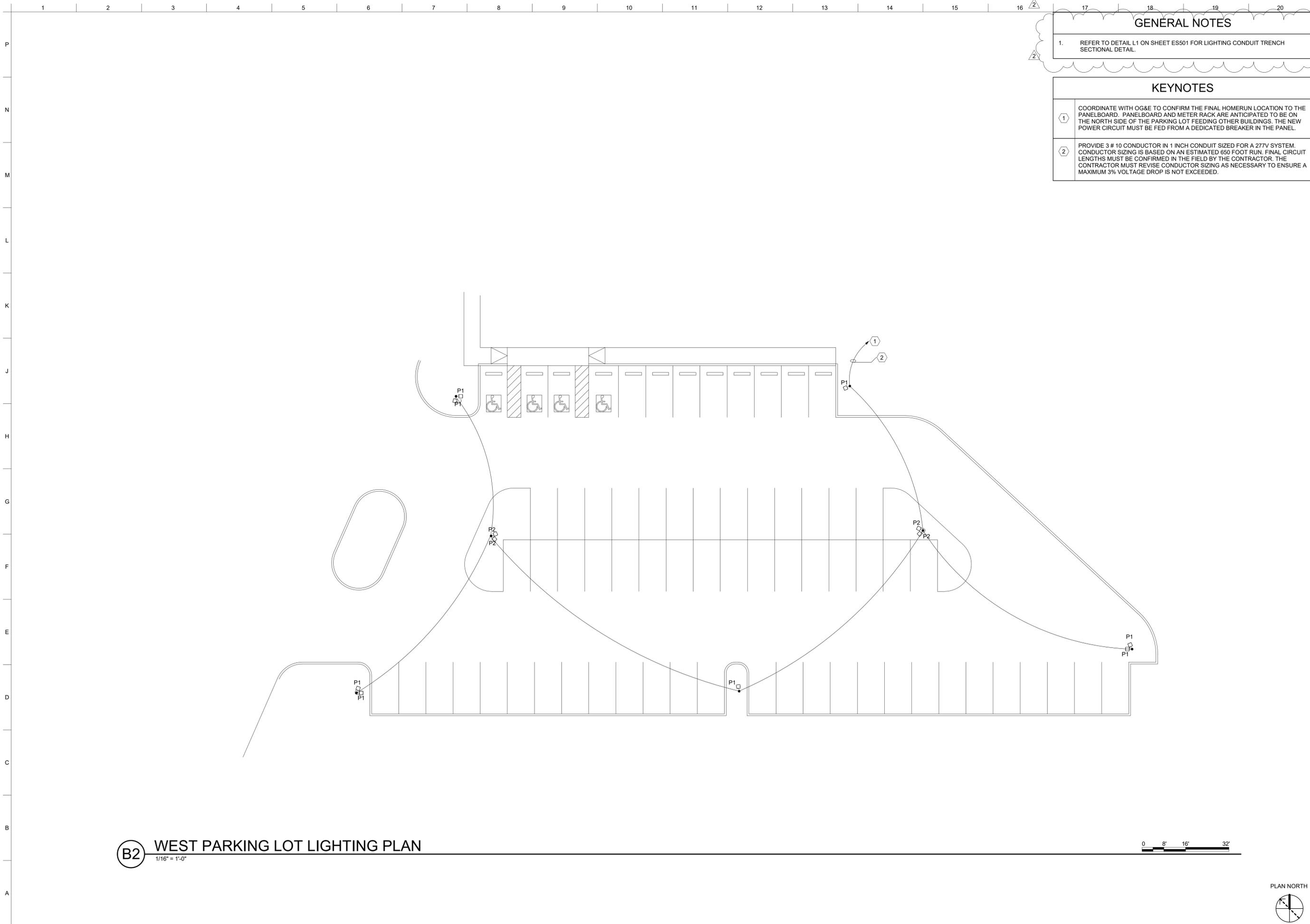
(A6) HOLLOW METAL DOOR JAMB - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



(A11) HOLLOW METAL DOOR JAMB - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



(A16) HOLLOW METAL DOOR JAMB - INTERIOR
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



GENERAL NOTES

- REFER TO DETAIL L1 ON SHEET ES501 FOR LIGHTING CONDUIT TRENCH SECTIONAL DETAIL.

KEYNOTES

- | | |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① | COORDINATE WITH OG&E TO CONFIRM THE FINAL HOMERUN LOCATION TO THE PANELBOARD. PANELBOARD AND METER RACK ARE ANTICIPATED TO BE ON THE NORTH SIDE OF THE PARKING LOT FEEDING OTHER BUILDINGS. THE NEW POWER CIRCUIT MUST BE FED FROM A DEDICATED BREAKER IN THE PANEL. |
| ② | PROVIDE 3 # 10 CONDUCTOR IN 1 INCH CONDUIT SIZED FOR A 277V SYSTEM. CONDUCTOR SIZING IS BASED ON AN ESTIMATED 650 FOOT RUN. FINAL CIRCUIT LENGTHS MUST BE CONFIRMED IN THE FIELD BY THE CONTRACTOR. THE CONTRACTOR MUST REVISE CONDUCTOR SIZING AS NECESSARY TO ENSURE A MAXIMUM 3% VOLTAGE DROP IS NOT EXCEEDED. |



MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY: J. AMATYA	ISSUE DATE: 5 DECEMBER 2025
CHECKED BY: J. AMATYA	WORK ORDER NO.:
SUBMITTED BY: S. KUNAPULI, P.E.	CONTRACT NO.:
ANSID:	PROJECT NO.:
FILE NAME: E:\ANG_512203_E_3BAYH_RVT22.rvt	FILE PATH:

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 EAST 81ST ST
TULSA, OK 74137

ENGINEERING &
CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35; 3 BAY HANGAR
PN: 512203

LIGHTING PLAN - WEST PARKING LOT

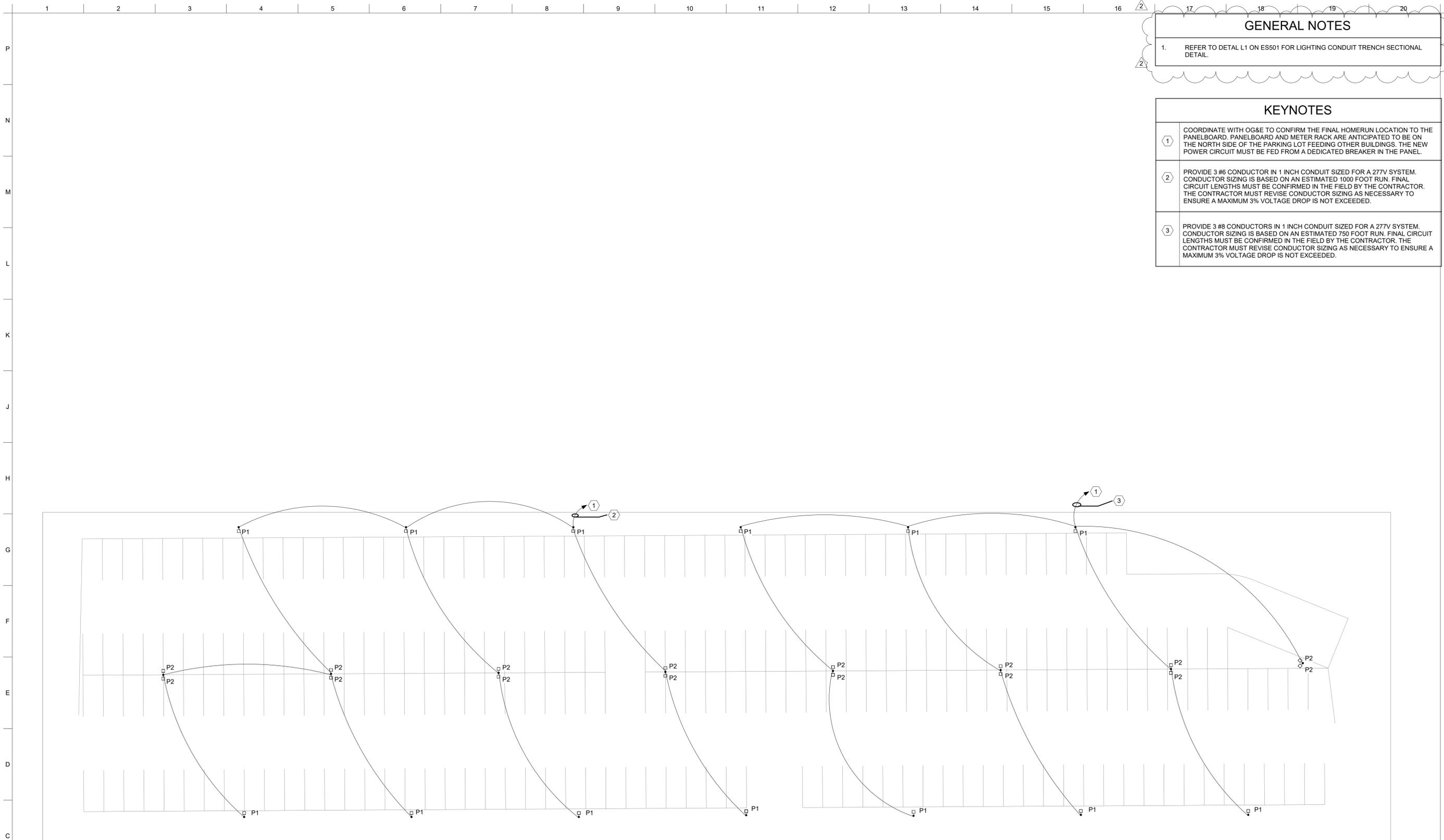
B2 WEST PARKING LOT LIGHTING PLAN
1/16" = 1'-0"



SHEET ID
ES103

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Plot Date: 1/9/2026 10:44:24 AM File Path: \\SWF\neap\re\CDM\Projects\EBing ANGB\F00_Working\Plan01_Discipline Model\ANG_512203_E_3BAYH_RVT22.rvt



GENERAL NOTES

- REFER TO DETAL L1 ON ES501 FOR LIGHTING CONDUIT TRENCH SECTIONAL DETAIL.

KEYNOTES

1	COORDINATE WITH OG&E TO CONFIRM THE FINAL HOMERUN LOCATION TO THE PANELBOARD. PANELBOARD AND METER RACK ARE ANTICIPATED TO BE ON THE NORTH SIDE OF THE PARKING LOT FEEDING OTHER BUILDINGS. THE NEW POWER CIRCUIT MUST BE FED FROM A DEDICATED BREAKER IN THE PANEL.
2	PROVIDE 3 #6 CONDUCTOR IN 1 INCH CONDUIT SIZED FOR A 277V SYSTEM. CONDUCTOR SIZING IS BASED ON AN ESTIMATED 1000 FOOT RUN. FINAL CIRCUIT LENGTHS MUST BE CONFIRMED IN THE FIELD BY THE CONTRACTOR. THE CONTRACTOR MUST REVISE CONDUCTOR SIZING AS NECESSARY TO ENSURE A MAXIMUM 3% VOLTAGE DROP IS NOT EXCEEDED.
3	PROVIDE 3 #8 CONDUCTORS IN 1 INCH CONDUIT SIZED FOR A 277V SYSTEM. CONDUCTOR SIZING IS BASED ON AN ESTIMATED 750 FOOT RUN. FINAL CIRCUIT LENGTHS MUST BE CONFIRMED IN THE FIELD BY THE CONTRACTOR. THE CONTRACTOR MUST REVISE CONDUCTOR SIZING AS NECESSARY TO ENSURE A MAXIMUM 3% VOLTAGE DROP IS NOT EXCEEDED.



MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY: J. AMATA D. AMATA D. AMATA	ISSUE DATE: 5 DECEMBER 2025
CHECKED BY: S. KUNAPULLI, P.E.	WORK ORDER NO.: 1903140004
SUBMITTED BY:	CONTRACT NO.:
SIZE: ANSID	PROJECT NO: 512203
FILE NAME: EAANG_512203_E_3BAYH_RVT22.rvt	

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 EAST 81ST ST
TULSA, OK 74137

ENGINEERING & CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35; 3 BAY HANGAR
PN: 512203

TEMPORARY PARKING LOT

B1 TEMPORARY PARKING LOT POWER PLAN

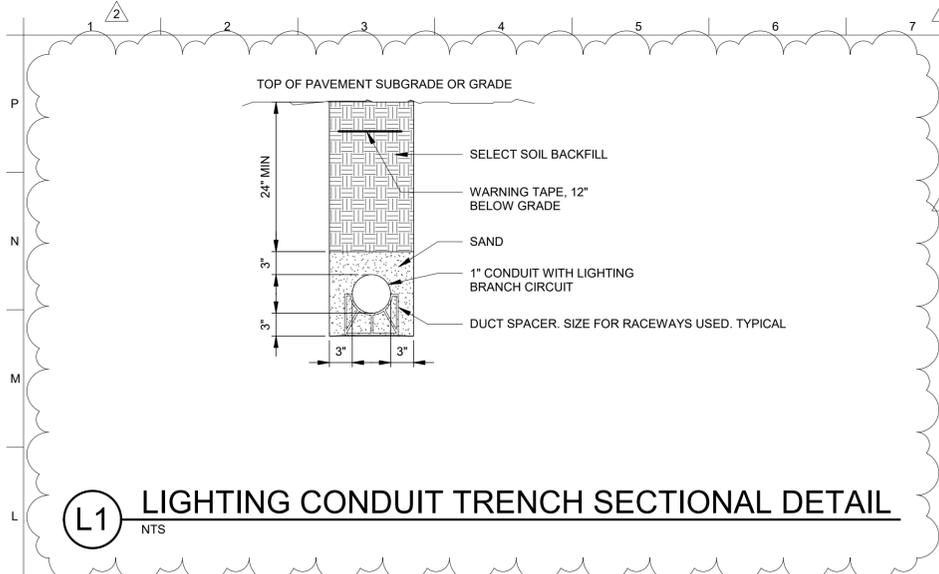
3/64" = 1'-0"



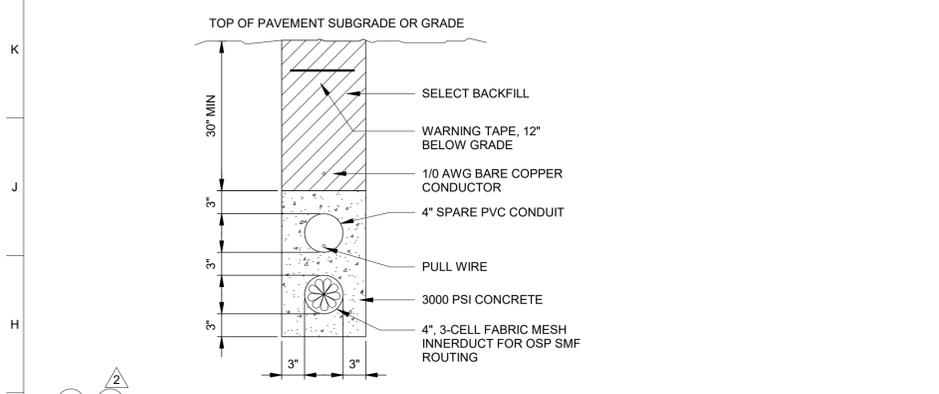
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ES104

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION

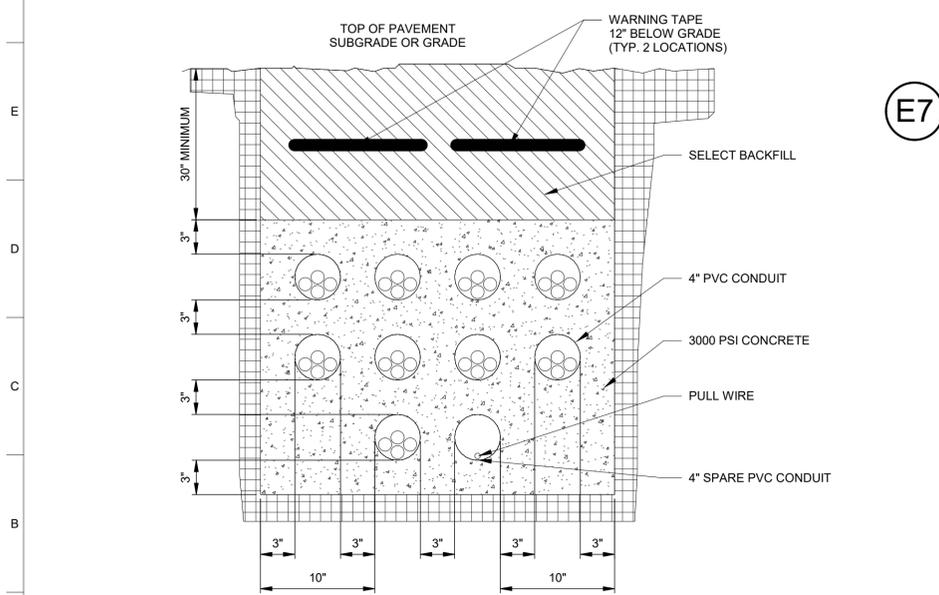
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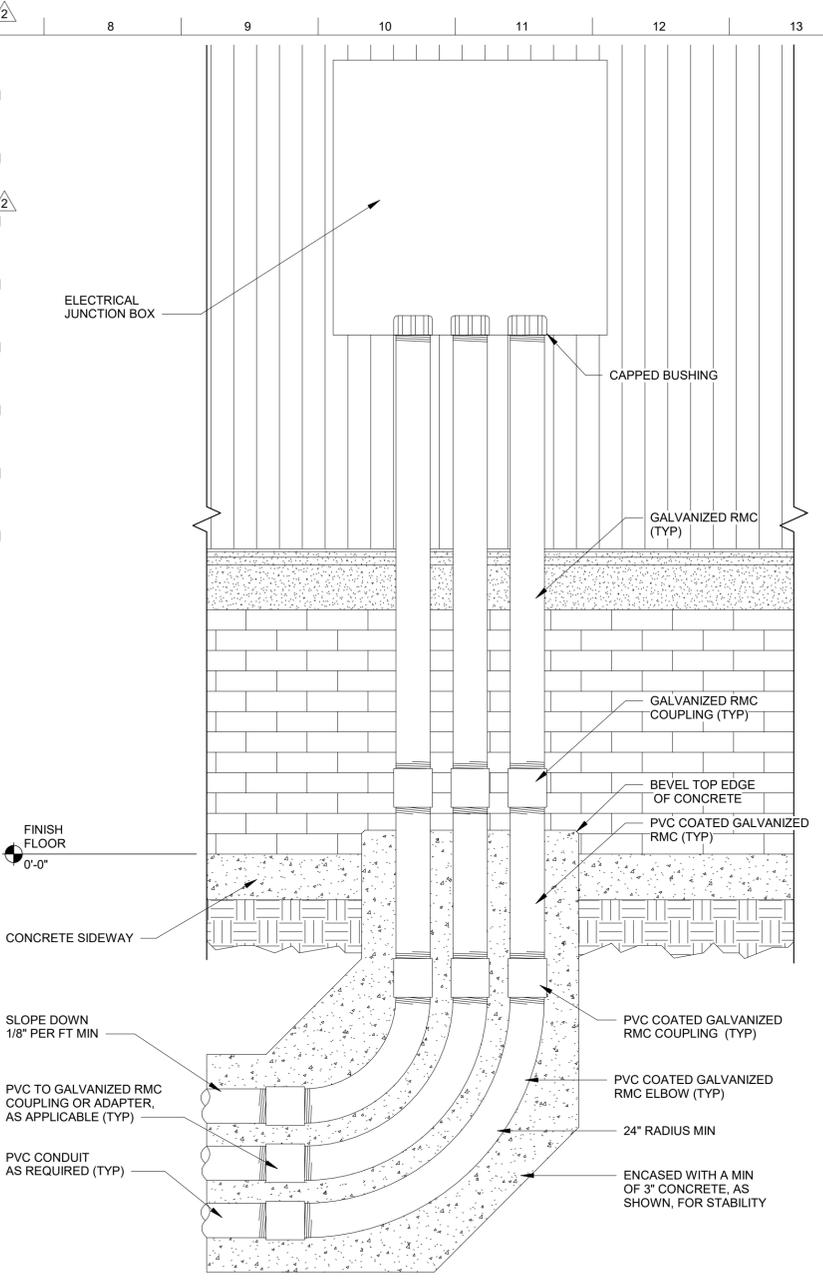
L1 LIGHTING CONDUIT TRENCH SECTIONAL DETAIL
NTS



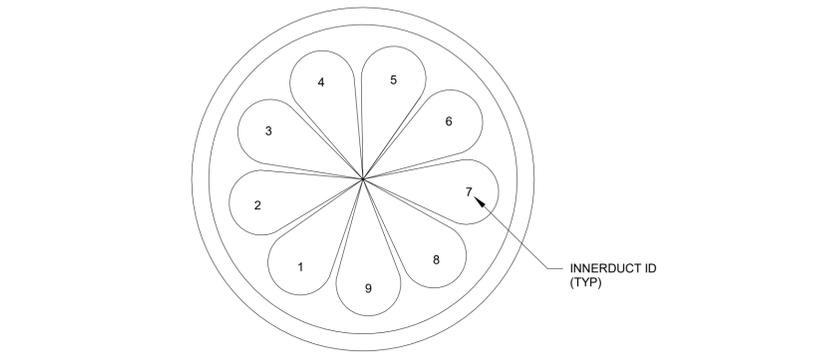
G1 COMMUNICATION DUCTBANK DETAIL
NTS



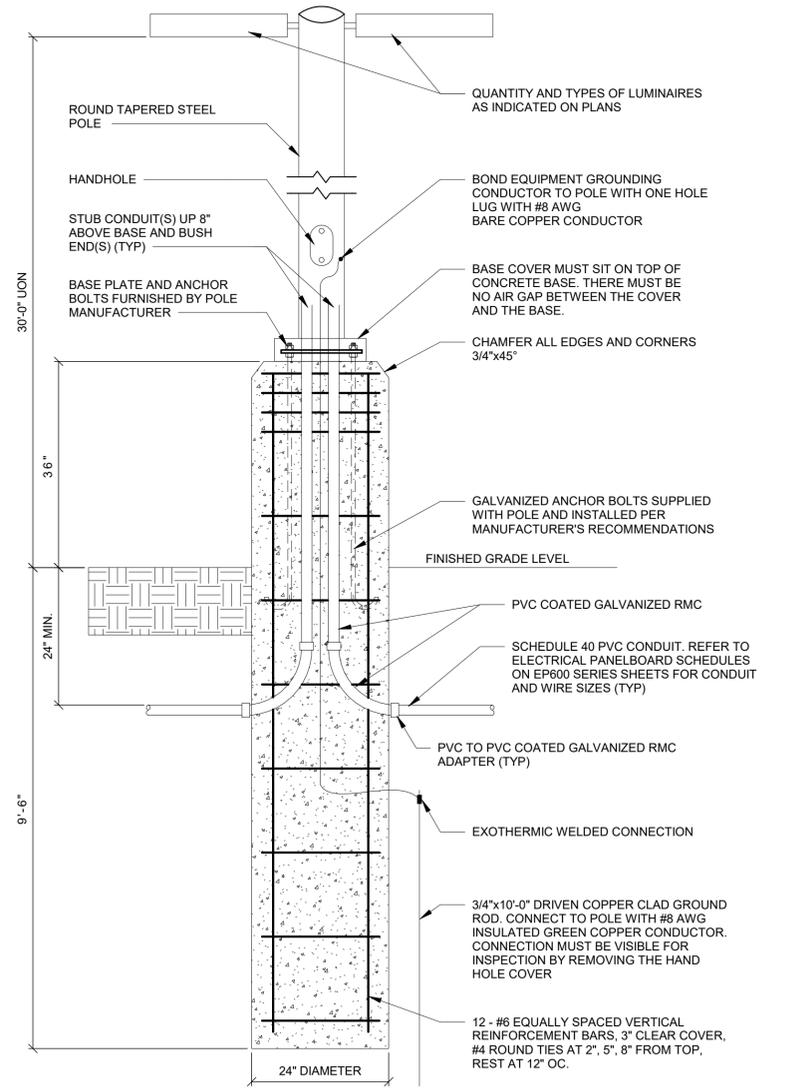
A1 SECONDARY SERVICE ENTRANCE DUCTBANK
NTS



E7 TYPICAL STUBBED DUCTBANK RISER
NTS



A8 FABRIC MESH INNERDUCT DETAIL
NTS



A14 TYPICAL LIGHT POLE BASE
NTS

- NOTES:**
1. BASE MUST BE HAND RUBBED FINISH UNLESS OTHERWISE SPECIFIED.
 2. EQUIPMENT GROUNDING LUGS TO BE FACTORY INSTALLED.
 3. TOP OF ANCHOR BOLTS MUST EXTEND AT LEAST 1/2" ABOVE THE TOP-MOST NUT TO PREVENT WATER ACCUMULATION.
 4. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE MUST BE 4000 PSI AND REINFORCEMENT MUST COMPLY WITH ASTM A615.



US Army Corps of Engineers

MARK	DESCRIPTION	DATE
2	AM 0002 - REVISED IN ACCORDANCE WITH AMENDMENT 2	9 JAN 2026

DESIGNED BY: C. VELOZ	ISSUE DATE: 5 DECEMBER 2025
CHECKED BY: C. VELOZ	NO. OF REVISIONS: 0
CHECKED BY: S. KUNAPULLI, P.E.	CONTRACT NO.:
SUBMITTED BY:	PROJECT NO.:
SIZE: ANSI D	FILE NAME: E:\ANG 512203 E_3BAYH-RVT22.rvt
FILE NO.:	DATE:

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2488 EAST 81ST ST
TULSA, OK 74137

ENGINEERING & CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35; 3 BAY HANGAR
PN: 512203

ELECTRICAL SITE DETAILS

SHEET ID
ES501

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION

EBBING AIR NATIONAL GUARD BASE

F-35: 3-Bay Aircraft Maintenance Hangar

RTA: STRUCTURAL INTERIOR DESIGN (SID) PACKAGE

100% Ready to Advertise (RTA) Submittal – Not for Construction
15 October 2025

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SECTION

TABLE OF CONTENTS

SECTION 01	SID NARRATIVE
SECTION 02	EXTERIOR FINISHES
SECTION 03	INTERIOR FINISHES: FLOORING
SECTION 04	INTERIOR FINISHES: WALL TILE
SECTION 05	INTERIOR FINISHES: PAINT
SECTION 06	INTERIOR FINISHES: CEILING
SECTION 07	INTERIOR FINISHES: MISCELLANEOUS
SECTION 08	DRAWINGS

Notes:

1. Contracting Officer's representative (COR) must approve final colors.
2. Final colors and materials shall match the samples provided.
3. The materials and colors in this submittal have been coordinated and will match some of the existing buildings on base as well as the proposed projects slated to be adjacent to the hangar. These include The Group Operations Facility, Special Access Program Facility (SAPF) and the Academic Training Center (ATC) produced by Burns & McDonnell. The purpose is for consistency and cohesion between the buildings.

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SECTION 01 SID Narrative

1. Design References:

- a UFC 3-120-10, Interior Design
- b UFC 4-211-01 Aircraft Maintenance Hangars

2. General Description:

This project is the new construction of the F-35 3-Bay Aircraft Maintenance Hangar. This facility will function as an aircraft maintenance hangar at Ebbing Air National Guard Base (ANGB). The intent of the interior design is to create a safe, productive, and comfortable environment for aircraft maintenance personnel and administrative staff of the facility.

The exterior finishes will incorporate the same materials and features of the surrounding buildings as well as upcoming projects slated to be adjacent to the hangar to provide cohesion with the other buildings on the base.

3. SID (Structural Interior Design) Narrative:

The interior finishes of the will incorporate the same interior finishes and color schemes on upcoming projects slated to be adjacent to the hangar. The intent is to achieve visual continuity and overall cohesiveness with the rest of the buildings on base. Along with providing long lasting and durable interiors.

- a. **Entry Vestibule:** Flooring will be a recessed walk off mat. The walls are CMU and will be painted Benjamin Moore OC-130 Cloud White with gray resilient wall base, Tarkette: Baseworks 38 Pewter. The ceiling will be white acoustical ceiling tile in a 2'-0" x 2'-0" grid. The doors are an aluminum storefront system.
- b. **Corridor and Alcove:** The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. The color to match Stonhard UTF: TEC4-63B, large flakes by Ston. The wall base will be resinous to match the flooring. The walls are CMU and gypsum board and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White. The epoxy paint will provide better fuel and chemical protection. A graphic of the end user will be implemented in the corridor on the walls, noticeable as personnel enter. The ceiling will be acoustical ceiling tile in a 2'-0" x 2'-0" grid. The doors are an aluminum storefront system.

- c. **The Office and Mother's Room:** The flooring will be a resinous non-slip floor system over concrete. Flooring by StonChem: color to match Stonehard UTF: TEC4-63B, large flakes. The walls gypsum board painted Benjamin Moore OC-130 Cloud White with gray resilient wall base, Tarkette: Baseworks 38 Pewter. The east wall of the Office and the west wall of the other's room will have an accent wall painted Sherwin Williams SW6524 Commodore as an accent wall. The ceiling in the office will be white acoustical ceiling tile in a 2'-0" x 2'-0" grid. The ceiling in the mother's room will be gypsum board painted Sherwin Williams SW7005 Pure White. The doors will be stained, sealed wood. The frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.
- d. **Men's/Women's Toilet:** The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. Flooring by StonChem: color to match Stonhard UTF: TEC4-63B, large flakes. The wall base will be resinous to match the flooring. The restroom walls will be full height ceramic tile starting 4" A.F.F. to ceiling. The two shower enclosures will be solid surface panels and a solid surface shower pan. The ceiling will be moisture-resistant gypsum board – painted with epoxy paint, Sherwin Williams SW7005 Pure White. Knee guards will be finished with plastic laminate. The countertop will be a solid surface material with integral four-inch-high backsplash. The doors will be stained, sealed wood. The frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.
- e. **Tool Crib and ALIS Station:** The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. The color will be white matching the hangar floors. The wall base will be resinous to match the flooring. The walls are CMU and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White. The epoxy paint will provide better fuel and chemical protection. The ceiling will be white acoustical ceiling tile in a 2'-0" x 2'-0" grid. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.
- f. **Janitor:** The flooring will be sealed concrete, non-slip. The walls are CMU and gypsum board and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White with gray resilient wall base, Tarkette: Baseworks 38 Pewter. The epoxy paint will provide better water, fuel and chemical protection. Fibre-reinforced plastic (FRP) will be applied behind the mop sink. The open structure will be painted to match Sherwin Williams SW7075 Web Gray. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.

- g. **Utility Rooms:** Mechanical, Electrical, COMM, Fire Pump: The flooring will be sealed concrete, non-slip. The walls are CMU and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White with gray resilient wall base, Tarkette: Baseworks 38 Pewter. The COMM room will have 4x8 sheets of fire-retardant plywood to 8'-4" A.F.F and will be painted with UL732 Fire

Retardant paint. The open structure will be painted to match Sherwin Williams SW7075 Web Gray. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.

- h. **Radar Verification Equipment (RVE) Storage:** The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. The color will be white matching the hangar floors. The wall base will be resinous to match the flooring. The walls are CMU and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White. The epoxy paint will provide better fuel and chemical protection. The open structure will be painted to match Sherwin Williams SW7005 Pure White. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.

- i. **Wash Equipment:** The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. The color will be white matching the hangar floors. The wall base will be resinous to match the flooring. The walls are CMU and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White. The epoxy paint will provide better fuel and chemical protection. The open structure will be painted to match Sherwin Williams SW7005 Pure White. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.

- j. **Hangar Vestibules:** The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. The color will be white to match the hangar floors and a resinous wall base to match the floors. The walls are CMU and will be painted with epoxy paint, Benjamin Moore OC-130 Cloud White. The epoxy paint will provide better fuel and chemical protection. The ceiling will be acoustical ceiling tile in a 2'-0" x 2'-0" grid. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.

- k. **Hangars:** Hoist Bay, Maintenance Bay, Wash Bay: The flooring will be a resinous 5-layer, fuel resistive, non-slip floor system over concrete. The color will be a white and will include integral safety striping. Safety striping of safety lanes, lead-in lines, nose gear stop lines, grounding points, and other safety markings will comply with the UFC 4-211-01 and will include yellow, white, green, and red resinous stripes. The wall base will be resinous to match the flooring. The walls are CMU painted with epoxy paint, Benjamin Moore OC-130 Cloud White and liner panel, color to match Benjamin Moore OC-130 Cloud White. The epoxy paint will provide better fuel and chemical protection. The open structure, including the metal deck, will be painted with epoxy paint to match Sherwin Williams SW7005 Pure White. The doors and frames will be factory finished, color to match Sherwin Williams SW7075 Web Gray.

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SECTION 02
EXTERIOR FINISHES



ROOFING

DESCRIPTION: STANDING SEAM METAL ROOF
MANUFACTURER: TBD
PRODUCT: N/A
COLOR: DARK BRONZE OR EQUAL



METAL PANEL

DESCRIPTION: INSULATED METAL WALL PANEL
MANUFACTURER: METL-SPAN, A NUCOR COMPANY
PRODUCT: N/A
COLOR: TO MATCH SW7018 DOVE TAIL

SECTION 02
EXTERIOR FINISHES



45% CRIMSON



45% GARNET



10% NAPA VALLEY

BRICK VENEER

DESCRIPTION: BRICK VENEER: RUNNING BOND

MANUFACTURER: ACME OR EQUAL

PRODUCT: N/A

COLOR: FLYING RAZORBACK BLEND: 45% CRIMSON, 45% GARNET, 10 % NAPA VALLEY

MINGLE: VELOUR MODS

BRICK VENEER

DESCRIPTION: BRICK VENEER: SOLDIER COURSE

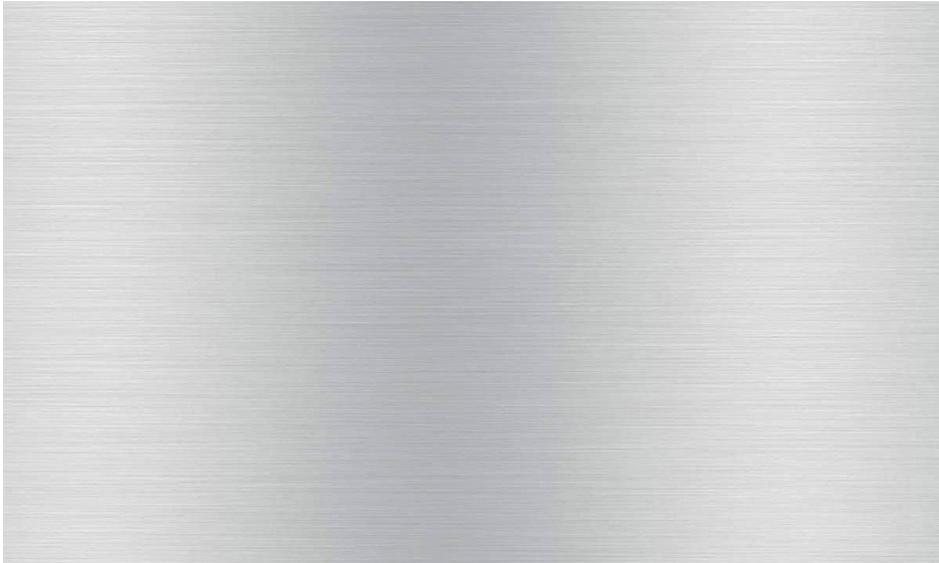
MANUFACTURER: ACME OR EQUAL

PRODUCT: N/A

COLOR: FLYING RAZORBACK BLEND: 45% CRIMSON, 45% GARNET, 10 % NAPA VALLEY

MINGLE: VELOUR MODS

SECTION 02
EXTERIOR FINISHES



DOOR AND FRAME SYSTEM

DESCRIPTION: PREFINISHED ALUMINUM INSULATED DOOR FRAME SYSTEM

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: ANODIZED ALUMINUM, CLEAR (NO. 14 THROUGH NO. 17)

DOOR AND FRAME SYSTEM

DESCRIPTION: PREFINISHED ALUMINUM INSULATED WINDOW SYSTEMS

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: ANODIZED ALUMINUM, CLEAR (NO. 14 THROUGH NO. 17)



ALUMINUM DOOR GLAZING

DESCRIPTION: INSULATED GLASS

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: CLEAR

SECTION 02
EXTERIOR FINISHES



DOOR AND FRAMES

LOCATION: AT METAL PANEL WALLS

DESCRIPTION: INSULATED EXTERIOR PERSONNEL DOOR AND FRAMES AT METAL PANEL

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: TO MATCH SW7018 DOVE TAIL

DOOR AND FRAMES

LOCATION: AT METAL PANEL WALLS

DESCRIPTION: INSULATED EXTERIOR LOADING DOOR

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: TO MATCH SW7018 DOVE TAIL

DOWNSPOUT

LOCATION: AT METAL PANEL WALLS

DESCRIPTION: PREFINISHED METAL DOWNSPOUT

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: TO MATCH SW7018 DOVE TAIL

SECTION 02
EXTERIOR FINISHES



DOOR AND FRAMES

LOCATION: AT FULL BRICK WALLS

DESCRIPTION: INSULATED EXTERIOR PERSONNEL DOOR AND FRAMES AT METAL PANEL

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: DARK BRONZE OR EQUAL

DOWNSPOUT

LOCATION: AT FULL BRICK WALLS

DESCRIPTION: PREFINISHED METAL DOWNSPOUT

MANUFACTURER: N/A

PRODUCT: N/A

COLOR: DARK BRONZE OR EQUAL

GUTTERS

LOCATION: ALL WALLS WITH GUTTERS

DESCRIPTION: PREFINISHED METAL DOWNSPOUT

MANUFACTURER: N/A

PRODUCT: N/A

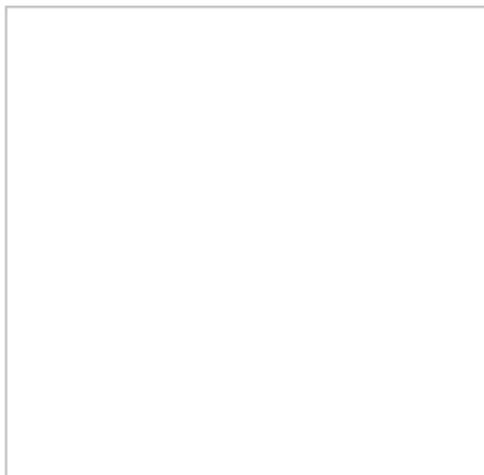
COLOR: DARK BRONZE OR EQUAL

SECTION 02
EXTERIOR FINISHES



CAST STONE

DESCRIPTION: CAST STONE CAP AND WATER TABLE
MANUFACTURER: DFW CAST STONE
PRODUCT: CAST STONE
COLOR: DARK BUFF



FABRIC LIFT DOOR

DESCRIPTION: FABRIC LIFT DOOR
MANUFACTURER: ASSA ABLOY MEGADOOR
PRODUCT: VL31 SERIES - AVIATION
COLOR: WHITE - DC6

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Section 03
INTERIOR FINISHES: FLOORING



RES-1

DESCRIPTION: RESINOUS FLOORING
MANUFACTURER: STONHARD
PRODUCT: STONEC UTF
TYPE: STANDARD
COLOR: TEC4-63B - LARGE FLAKES

RES-2

DESCRIPTION: RESINOUS FLOORING
MANUFACTURER: STONCHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: TO MATCH TEC4-63B - LARGE FLAKES

RESB-1

DESCRIPTION: RESINOUS WALL BASE
MANUFACTURER: STONHARD
PRODUCT: STONTEC UTF
TYPE: STANDARD
COLOR: TEC4-63B - LARGE FLAKES

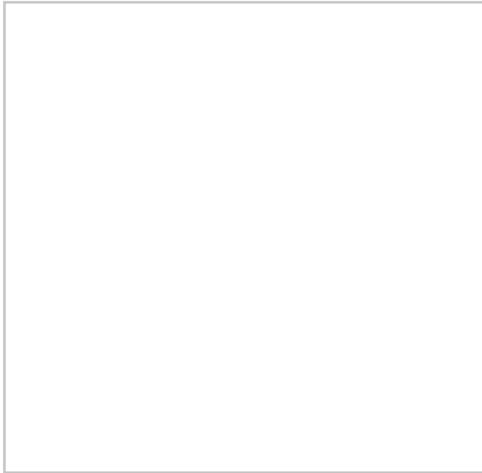
RESB-2

DESCRIPTION: RESINOUS WALL BASE
MANUFACTURER: STONCHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: TO MATCH TEC4-63B - LARGE FLAKES



RES-1 INSTALLATION

Section 03
INTERIOR FINISHES: FLOORING



RES-3

DESCRIPTION: RESINOUS FLOORING
MANUFACTURER: STONECHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: WHITE

RESB-3

DESCRIPTION: RESINOUS WALL BASE
MANUFACTURER: STONECHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: WHITE

RESB-3

DESCRIPTION: RESINOUS FLOOR MARKING
MANUFACTURER: STONECHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: YELLOW STRIPE



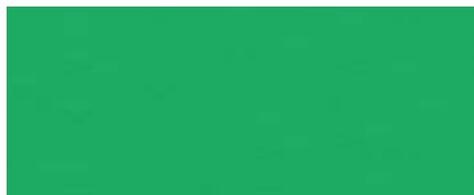
RESB-4

DESCRIPTION: RESINOUS FLOOR MARKING
MANUFACTURER: STONECHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: RED STRIPE

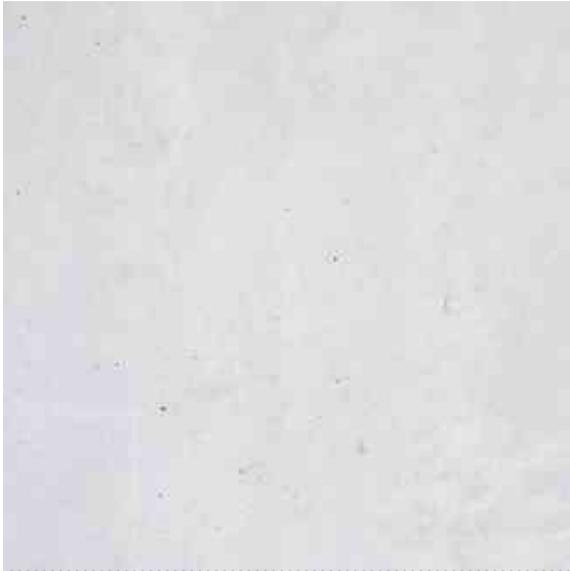


RESB-5

DESCRIPTION: RESINOUS FLOOR MARKING
MANUFACTURER: STONECHEM
PRODUCT: X58/X58HD
TYPE: 5-COAT, FUEL RESISTIVE
COLOR: GREEN STRIPE



Section 03
INTERIOR FINISHES: FLOORING



SC-1

DESCRIPTION: SEALED CONCRETE
MANUFACTURER: N/A
PRODUCT: N/A
COLOR: NATURAL



RB-1

DESCRIPTION: RESILIENT WALL BASE
MANUFACTURER: TARKETT
PRODUCT: BASEWORKS
COLOR: 38 PEWTER



WOM-1

DESCRIPTION: RECESSED WALK-OFF MAT
MANUFACTURER: CONSTRUCTION SPECIALTIES
PRODUCT: PEDIMAT M1
COLOR: 9325 GRAPHITE TREADS,
BLACK RUBBER STANDARD RAIL AND FRAME

Section 04
INTERIOR FINISHES: WALL TILE



TLC-1

DESCRIPTION: CERAMIC TILE, 16" X 48"
MANUFACTURER: MARAZZI
PRODUCT: MATERIKA
COLOR: MT12 OFF WHITE
FINISH: MATTE



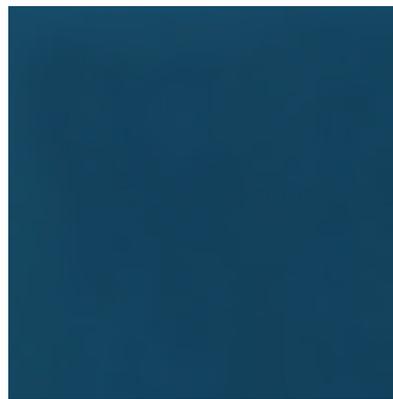
GR-1

DESCRIPTION: GROUT
MANUFACTURER: MAPEI
COLOR: 93 WARM GRAY



TLC-2

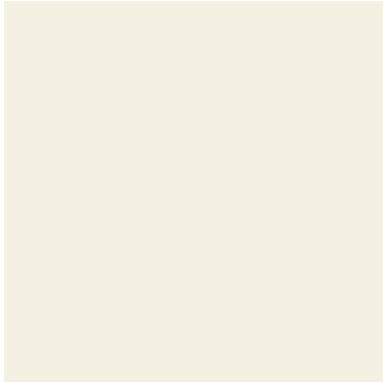
DESCRIPTION: CERAMIC TILE
MANUFACTURER: DALITE
PRODUCT: COLOR WHEEL CLASSIC
COLOR: 1174 SEA BREEZE
FINISH: GLOSS



TLC-3

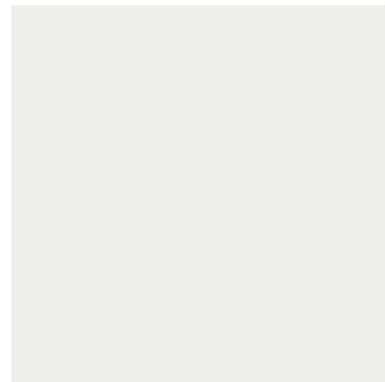
DESCRIPTION: CERAMIC TILE
MANUFACTURER: DALITILE
PRODUCT: COLOR WHEEL CLASSIC
COLOR: 1469 GALAXY
FINISH: GLOSS

Section 05
INTERIOR FINISHES: PAINT



PT-1

DESCRIPTION: PAINT - FIELD
MANUFACTURER: BENJAMIN MOORE
PRODUCT: LAYTEX AND EPOXY
COLOR: OC-130 CLOUD WHITE
FINISH: SEMI-GLOSS



PT-2

DESCRIPTION: PAINT - CEILING
MANUFACTURER: SHERWIN WILLIAMS
PRODUCT: LAYTEX AND EPOXY
COLOR: SW7005 PURE WHITE
FINISH: SEMI-GLOSS



PT-3

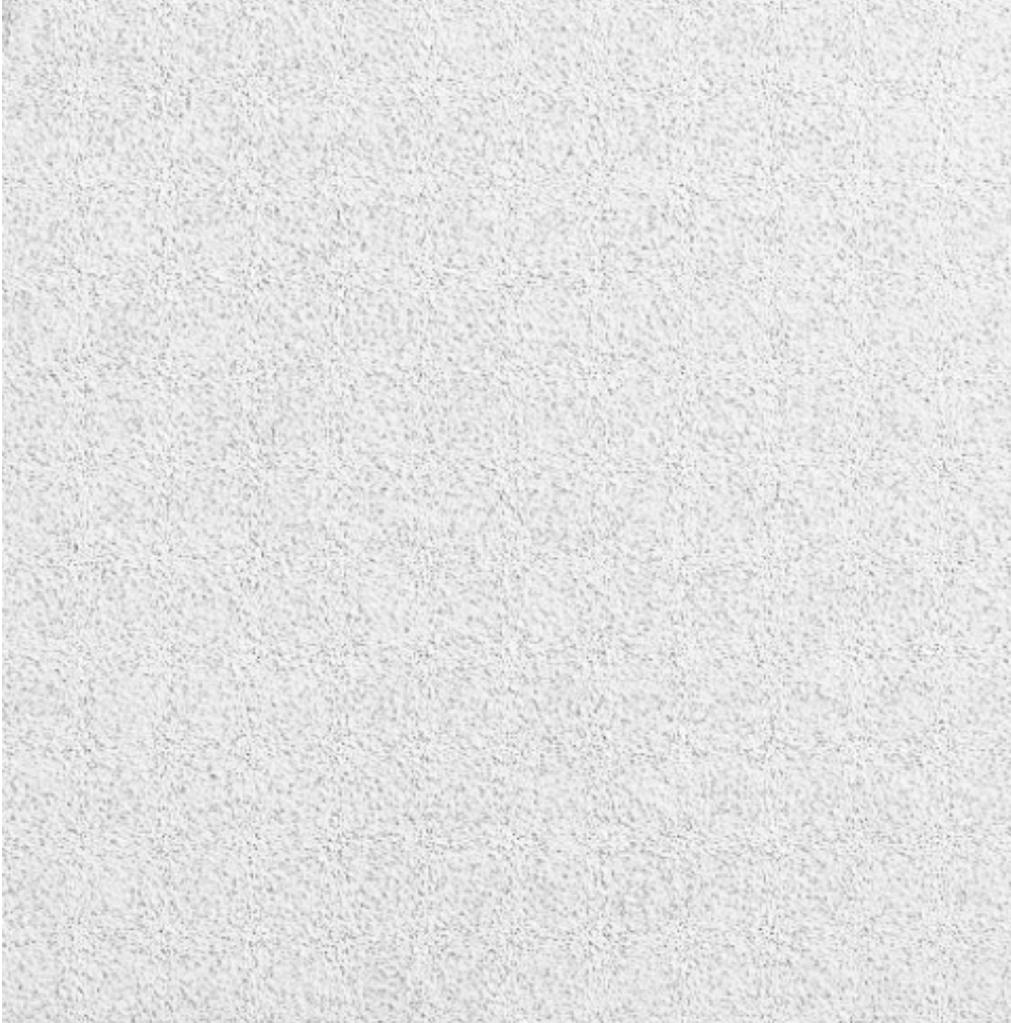
DESCRIPTION: PAINT - ACCENT WALL
MANUFACTURER: SHERWIN WILLIAMS
PRODUCT: LAYTEX
COLOR: SW6524 COMMODORE
FINISH: SEMI-GLOSS



PT-4

DESCRIPTION: PAINT - TRIM AND
INTERIOR DOORS AND FRAMES
MANUFACTURER: SHERWIN WILLIAMS
PRODUCT: LAYTEX AND EPOXY
COLOR: SW7075 WEB GRAY
FINISH: SEMI-GLOSS

Section 06
INTERIOR FINISHES: CEILING



ACT-1
DESCRIPTION: ACOUSTIC CEILING TILE, 24" X 24"
MANUFACTURER: ARMSTRONG CEILINGS
PRODUCT: OPTIMA SQUARE TEGULAR - 3250
COLOR: WHITE

Section 07
INTERIOR FINISHES: MISCELLANEOUS



CG-1

DESCRIPTION: CORNER GUARD, 1" X 1"
MANUFACTURER: CONSTRUCTION SPECIALTIES
PRODUCT: CO-8
COLOR: STAINLESS STEEL



CG-1

DESCRIPTION: FIBERGLASS REINFORCED
PLASTIC PANEL
MANUFACTURER: MARLITE
COLOR: P-151 LIGHT GREY, PEBBLED



PL-1

DESCRIPTION: PLASTIC LAMINATE
MANUFACTURER: WILSONART
PRODUCT: 8213K-28
COLOR: PHANTOM COCOA

WD-1

DESCRIPTION: WOOD
COLOR: TO MATCH WILSONARD 8213K-28
PHANTOM COCOA



LK-1

DESCRIPTION: DOUBLE TIER LOCKER
MANUFACTURER: HOLLMAN
COLOR: DOVE GREY

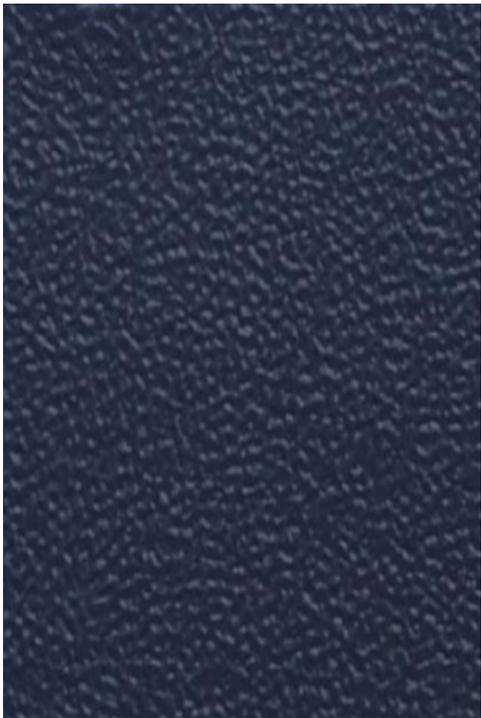
Section 07
INTERIOR FINISHES: MISCELLANEOUS



SSF-1
DESCRIPTION: SOLID SURFACE
MANUFACTURER: FORMICA
PRODUCT: 785
COLOR: BIANCO MINERAL



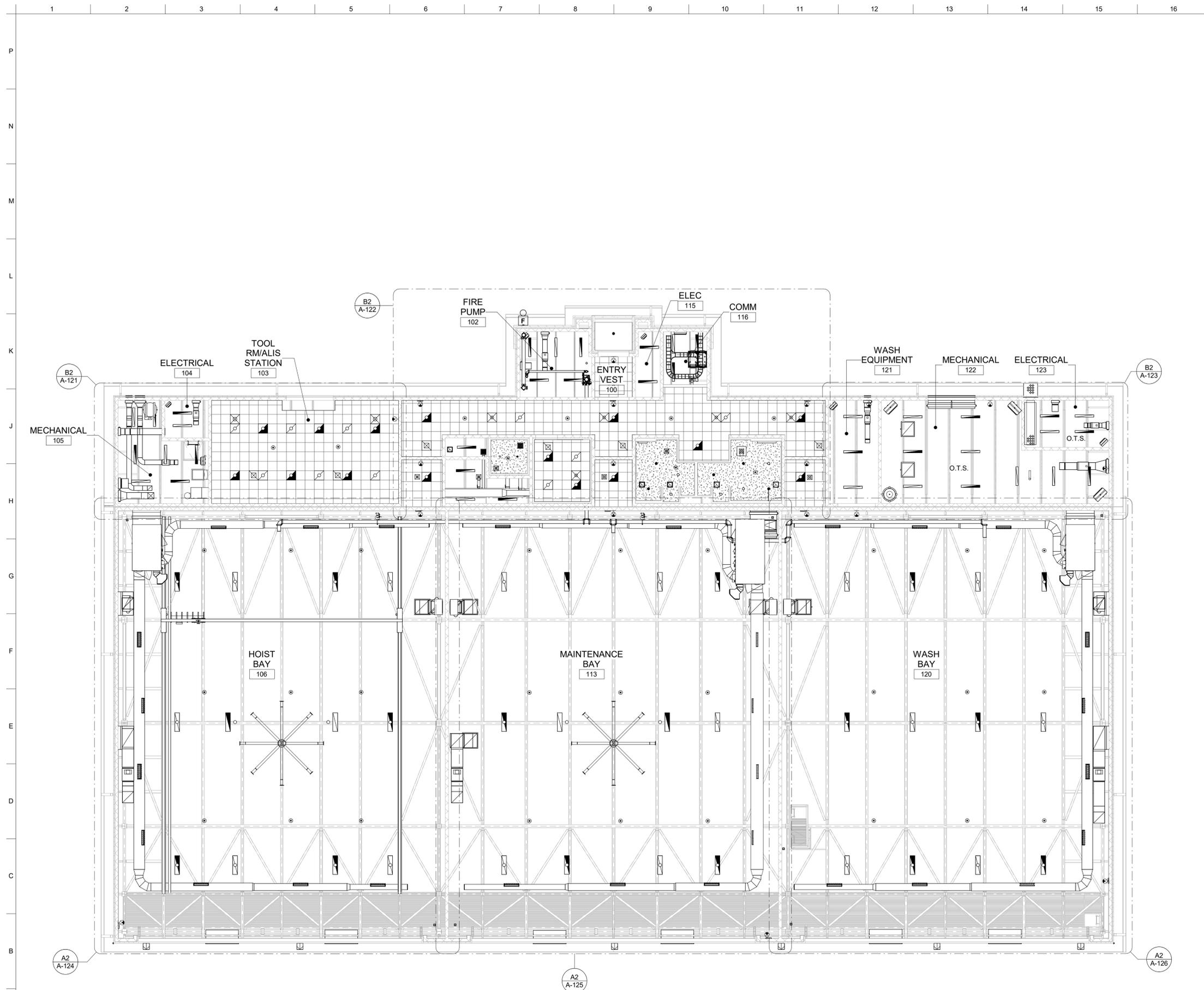
SSF-2
DESCRIPTION: SOLID SURFACE
MANUFACTURER: FORMICA
PRODUCT: 757
COLOR: LUNA SAND



TP-1
DESCRIPTION: TOILET PARTITIONS
MANUFACTURER: SCRANTON PRODUCTS
COLOR: BLUEBERRY

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Section 08
DRAWINGS



- ### GENERAL RCP NOTES
- SEE ELECTRICAL DRAWINGS. FOR LIGHT FIXTURE SCHEDULE AND REQUIREMENTS.
 - SEE INTERIOR DESIGN DRAWINGS FOR FINISHES.
 - COORDINATE CEILING ACCESS PANEL LOCATIONS WITH MECHANICAL AND PLUMBING PLANS.
 - SEE FIRE PROTECTION PLANS FOR LIFE SAFETY REQUIREMENTS.
 - CEILING GRIDS TO BE CENTERED IN ROOM UNLESS SPECIFICALLY OTHERWISE DIMENSIONED.
 - REFER TO SPECIFICATION SECTION 09 51 00 ACOUSTICAL CEILINGS, FOR HOLD DOWN CLIP REQUIREMENTS IN VESTIBULES.

RCP LEGEND

ARCHITECTURAL	
[Symbol]	GYPSUM BOARD CEILING
[Symbol]	SUSPENDED ACOUSTICAL CEILING TILE & FRAME 2 FT X 2 FT.
[Symbol]	OPEN TO STRUCTURE (O.T.S.)
[Symbol]	PREFINISHED METAL SOFFIT
[Symbol]	CEILING HEIGHT AS NOTED
ELECTRICAL	
[Symbol]	LINEAR LED STRIP LIGHT
[Symbol]	EXTERIOR LIGHT - WALL PACK
[Symbol]	HIGH BAY LIGHT
[Symbol]	EMERGENCY LIGHT, TYP. ALL TYPES
[Symbol]	RECESSED LIGHT FIXTURE
[Symbol]	WALL MOUNTED LIGHT FIXTURE
[Symbol]	CEILING MOUNTED EXIT LIGHT
[Symbol]	WALL MOUNTED EXIT LIGHT
[Symbol]	OCCUPANCY SENSOR
MECHANICAL	
[Symbol]	SUPPLY AIR DIFFUSER
[Symbol]	RETURN GRILLE
[Symbol]	EXHAUST GRILLE
[Symbol]	OCCUPANCY SENSOR
[Symbol]	CIRCULATION FAN
[Symbol]	IR HEATING SYSTEM
[Symbol]	UNIT HEATER



MARK	DESCRIPTION	DATE

DESIGNED BY: C. LONGACRE
 DRAWN BY: R. READER
 CHECKED BY: M. HOOVER, R.A.
 SUBMITTED BY: A. BLANKENSHIP, P.E.
 FILE NAME: EANG_512203_A_3BAYH_RVT22.rvt
 ANSID: EANG_512203_A_3BAYH_RVT22.rvt

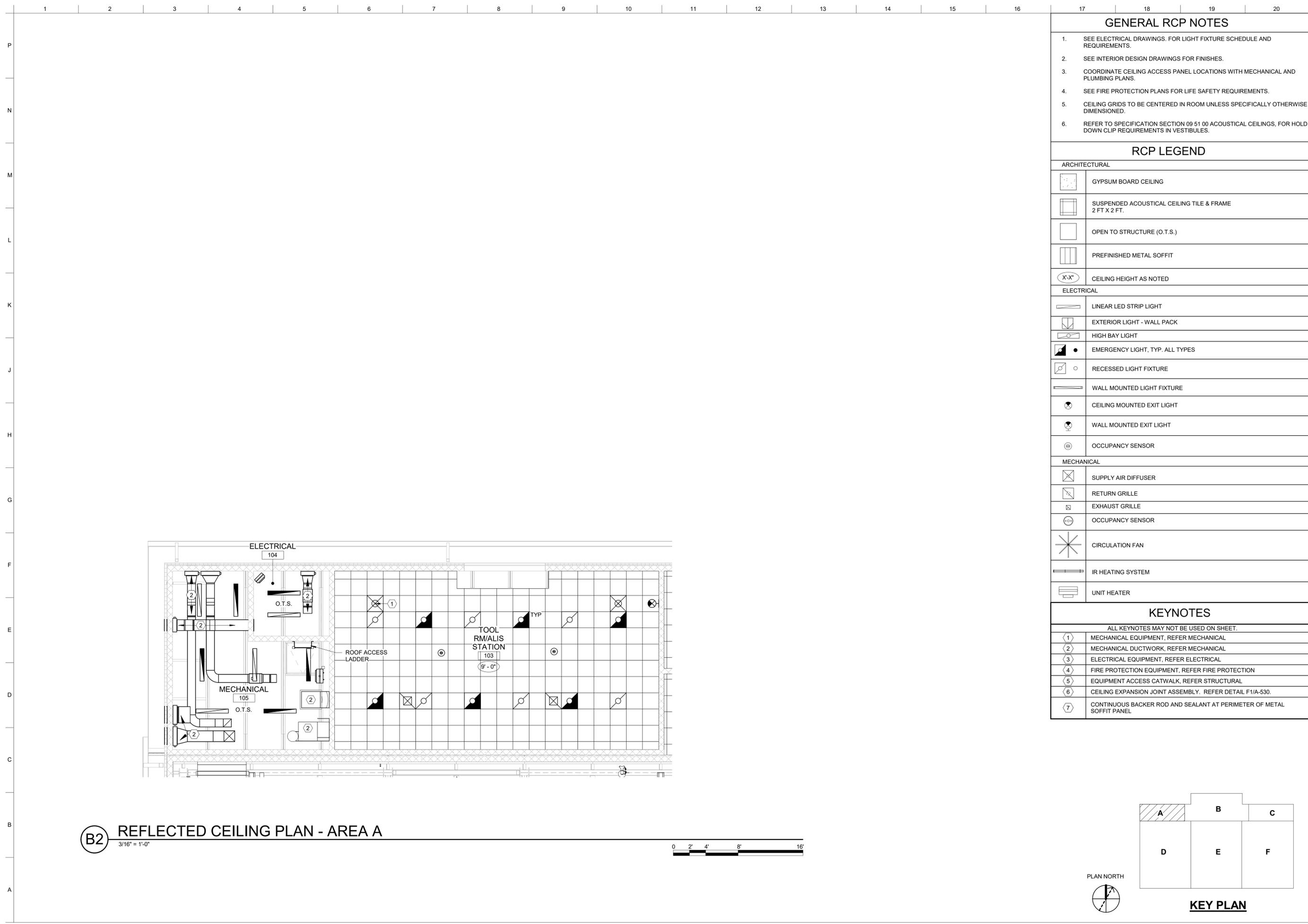
US ARMY CORPS OF ENGINEERS
 TULSA DISTRICT
 2488 EAST 151ST
 TULSA, OK 74107
 ENGINEERING & CONSTRUCTION DIVISION
 ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
 F-35: 3 BAY HANGAR
 PN: 512203
OVERALL REFLECTED CEILING PLAN

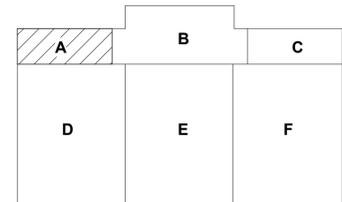
SHEET ID
A-120

A1 OVERALL REFLECTED CEILING PLAN
 3/32" = 1'-0"





B2 REFLECTED CEILING PLAN - AREA A
3/16" = 1'-0"



KEY PLAN

GENERAL RCP NOTES

- SEE ELECTRICAL DRAWINGS. FOR LIGHT FIXTURE SCHEDULE AND REQUIREMENTS.
- SEE INTERIOR DESIGN DRAWINGS FOR FINISHES.
- COORDINATE CEILING ACCESS PANEL LOCATIONS WITH MECHANICAL AND PLUMBING PLANS.
- SEE FIRE PROTECTION PLANS FOR LIFE SAFETY REQUIREMENTS.
- CEILING GRIDS TO BE CENTERED IN ROOM UNLESS SPECIFICALLY OTHERWISE DIMENSIONED.
- REFER TO SPECIFICATION SECTION 09 51 00 ACOUSTICAL CEILINGS, FOR HOLD DOWN CLIP REQUIREMENTS IN VESTIBULES.

RCP LEGEND

ARCHITECTURAL	
	GYPSUM BOARD CEILING
	SUSPENDED ACOUSTICAL CEILING TILE & FRAME 2 FT X 2 FT.
	OPEN TO STRUCTURE (O.T.S.)
	PREFINISHED METAL SOFFIT
	CEILING HEIGHT AS NOTED
ELECTRICAL	
	LINEAR LED STRIP LIGHT
	EXTERIOR LIGHT - WALL PACK
	HIGH BAY LIGHT
	EMERGENCY LIGHT, TYP. ALL TYPES
	RECESSED LIGHT FIXTURE
	WALL MOUNTED LIGHT FIXTURE
	CEILING MOUNTED EXIT LIGHT
	WALL MOUNTED EXIT LIGHT
	OCCUPANCY SENSOR
MECHANICAL	
	SUPPLY AIR DIFFUSER
	RETURN GRILLE
	EXHAUST GRILLE
	OCCUPANCY SENSOR
	CIRCULATION FAN
	IR HEATING SYSTEM
	UNIT HEATER

KEYNOTES

ALL KEYNOTES MAY NOT BE USED ON SHEET.	
①	MECHANICAL EQUIPMENT, REFER MECHANICAL
②	MECHANICAL DUCTWORK, REFER MECHANICAL
③	ELECTRICAL EQUIPMENT, REFER ELECTRICAL
④	FIRE PROTECTION EQUIPMENT, REFER FIRE PROTECTION
⑤	EQUIPMENT ACCESS CATWALK, REFER STRUCTURAL
⑥	CEILING EXPANSION JOINT ASSEMBLY. REFER DETAIL F1/A-530.
⑦	CONTINUOUS BACKER ROD AND SEALANT AT PERIMETER OF METAL SOFFIT PANEL



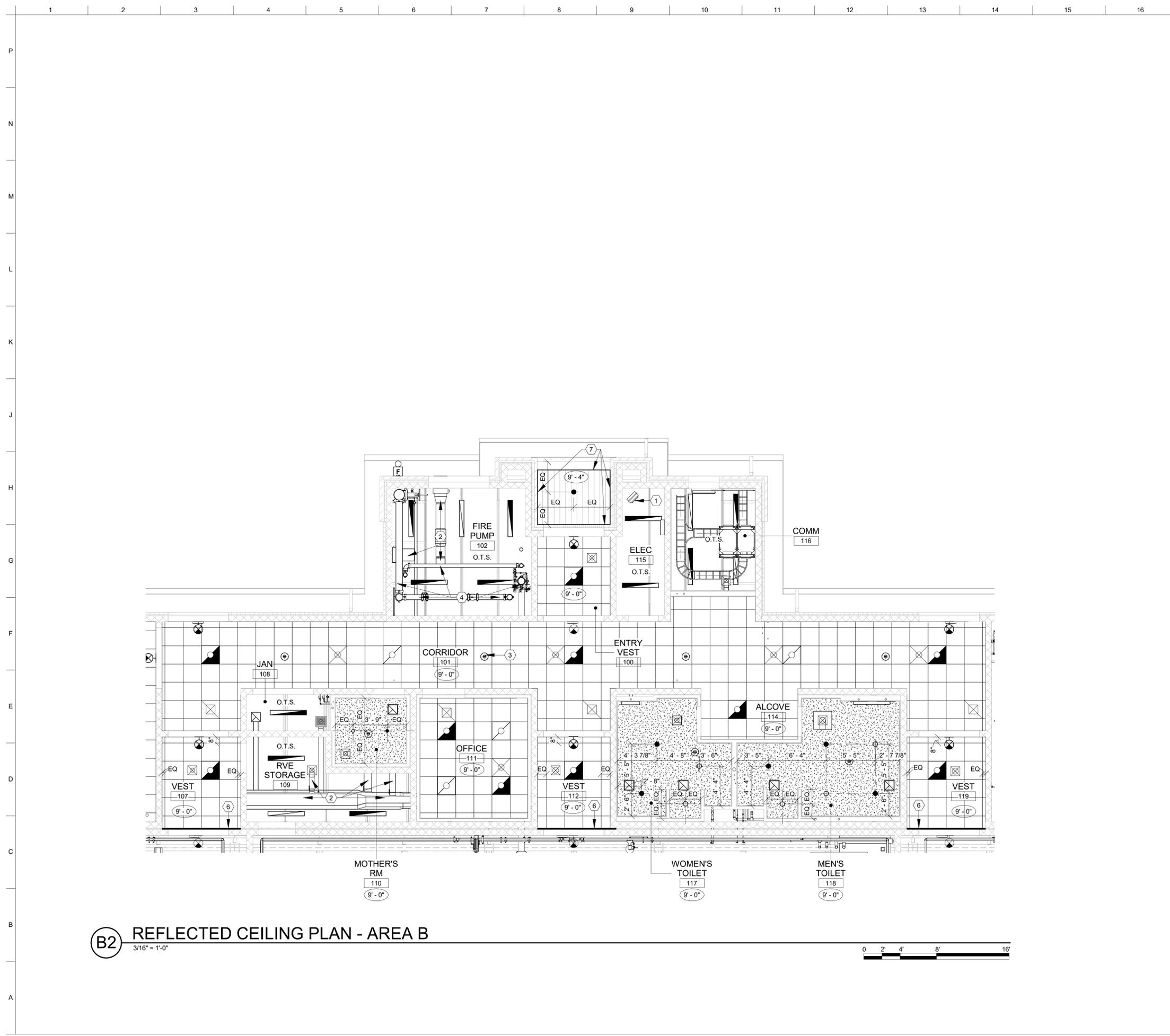
MARK	DESCRIPTION	DATE

DESIGNED BY: C. LONGACRE	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912BVT25RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
ANSI D. FILE NAME: EANG_512203_A_3BAYH_RV722.rvt	FILE NAME: 512203
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 91ST ST TULSA, OK 74117	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH

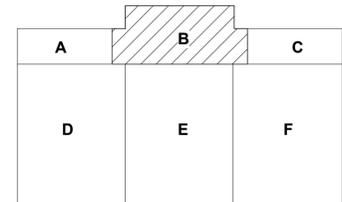
EBBING ANGB - ARKANSAS
F-38: 3 BAY HANGAR
PN: 512203

REFLECTED CEILING PLAN - AREA A

SHEET ID
A-121



B2 REFLECTED CEILING PLAN - AREA B
 3/16" = 1'-0"



KEY PLAN

GENERAL RCP NOTES

- SEE ELECTRICAL DRAWINGS. FOR LIGHT FIXTURE SCHEDULE AND REQUIREMENTS.
- SEE INTERIOR DESIGN DRAWINGS FOR FINISHES.
- COORDINATE CEILING ACCESS PANEL LOCATIONS WITH MECHANICAL AND PLUMBING PLANS.
- SEE FIRE PROTECTION PLANS FOR LIFE SAFETY REQUIREMENTS.
- CEILING GRIDS TO BE CENTERED IN ROOM UNLESS SPECIFICALLY OTHERWISE DIMENSIONED.
- REFER TO SPECIFICATION SECTION 09 51 00 ACOUSTICAL CEILINGS, FOR HOLD DOWN CLIP REQUIREMENTS IN VESTIBULES.

RCP LEGEND

ARCHITECTURAL	
	GYPSUM BOARD CEILING
	SUSPENDED ACOUSTICAL CEILING TILE & FRAME 2 FT X 2 FT.
	OPEN TO STRUCTURE (O.T.S.)
	PREFINISHED METAL SOFFIT
	CEILING HEIGHT AS NOTED
ELECTRICAL	
	LINEAR LED STRIP LIGHT
	EXTERIOR LIGHT - WALL PACK
	HIGH BAY LIGHT
	EMERGENCY LIGHT, TYP. ALL TYPES
	RECESSED LIGHT FIXTURE
	WALL MOUNTED LIGHT FIXTURE
	CEILING MOUNTED EXIT LIGHT
	WALL MOUNTED EXIT LIGHT
	OCCUPANCY SENSOR
MECHANICAL	
	SUPPLY AIR DIFFUSER
	RETURN GRILLE
	EXHAUST GRILLE
	OCCUPANCY SENSOR
	CIRCULATION FAN
	IR HEATING SYSTEM
	UNIT HEATER

KEYNOTES

ALL KEYNOTES MAY NOT BE USED ON SHEET.

1	MECHANICAL EQUIPMENT, REFER MECHANICAL
2	MECHANICAL DUCTWORK, REFER MECHANICAL
3	ELECTRICAL EQUIPMENT, REFER ELECTRICAL
4	FIRE PROTECTION EQUIPMENT, REFER FIRE PROTECTION
5	EQUIPMENT ACCESS CATWALK, REFER STRUCTURAL
6	CEILING EXPANSION JOINT ASSEMBLY. REFER DETAIL F1A-530.
7	CONTINUOUS BACKER ROD AND SEALANT AT PERIMETER OF METAL SOFFIT PANEL



US Army Corps of Engineers

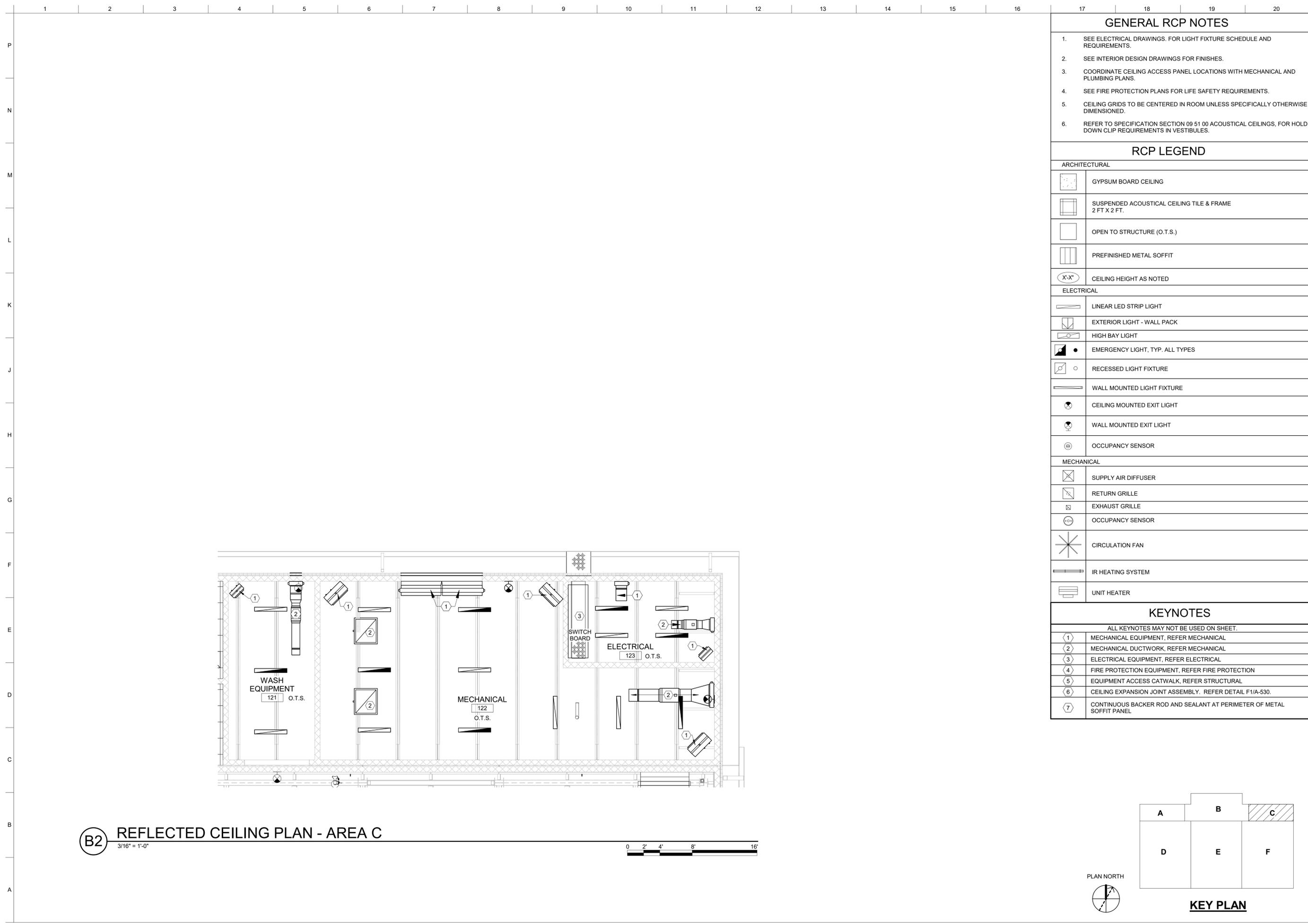
MARK	DESCRIPTION	DATE

DESIGNED BY: C. LONGACRE	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912B725RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
FILE NAME: EANG_512203_A_3BAYH_RV722.rvt	ANSI D:
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 101ST TULSA, OK 74127	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH

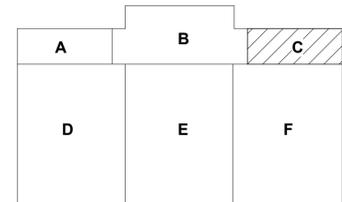
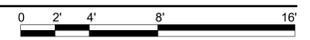
EBBING ANGB - ARKANSAS
 F-38: 3 BAY HANGAR
 PN: 512203

REFLECTED CEILING PLAN - AREA B

SHEET ID
A-122



B2 REFLECTED CEILING PLAN - AREA C
3/16" = 1'-0"



KEY PLAN

GENERAL RCP NOTES

- SEE ELECTRICAL DRAWINGS. FOR LIGHT FIXTURE SCHEDULE AND REQUIREMENTS.
- SEE INTERIOR DESIGN DRAWINGS FOR FINISHES.
- COORDINATE CEILING ACCESS PANEL LOCATIONS WITH MECHANICAL AND PLUMBING PLANS.
- SEE FIRE PROTECTION PLANS FOR LIFE SAFETY REQUIREMENTS.
- CEILING GRIDS TO BE CENTERED IN ROOM UNLESS SPECIFICALLY OTHERWISE DIMENSIONED.
- REFER TO SPECIFICATION SECTION 09 51 00 ACOUSTICAL CEILINGS, FOR HOLD DOWN CLIP REQUIREMENTS IN VESTIBULES.

RCP LEGEND

ARCHITECTURAL	
	GYPSUM BOARD CEILING
	SUSPENDED ACOUSTICAL CEILING TILE & FRAME 2 FT X 2 FT.
	OPEN TO STRUCTURE (O.T.S.)
	PREFINISHED METAL SOFFIT
	CEILING HEIGHT AS NOTED
ELECTRICAL	
	LINEAR LED STRIP LIGHT
	EXTERIOR LIGHT - WALL PACK
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	WALL MOUNTED LIGHT FIXTURE
	CEILING MOUNTED EXIT LIGHT
	WALL MOUNTED EXIT LIGHT
	OCCUPANCY SENSOR
MECHANICAL	
	SUPPLY AIR DIFFUSER
	RETURN GRILLE
	EXHAUST GRILLE
	OCCUPANCY SENSOR
	CIRCULATION FAN
	IR HEATING SYSTEM
	UNIT HEATER

KEYNOTES

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	MECHANICAL EQUIPMENT, REFER MECHANICAL
	MECHANICAL DUCTWORK, REFER MECHANICAL
	ELECTRICAL EQUIPMENT, REFER ELECTRICAL
	FIRE PROTECTION EQUIPMENT, REFER FIRE PROTECTION
	EQUIPMENT ACCESS CATWALK, REFER STRUCTURAL
	CEILING EXPANSION JOINT ASSEMBLY. REFER DETAIL F1/A-530.
	CONTINUOUS BACKER ROD AND SEALANT AT PERIMETER OF METAL SOFFIT PANEL



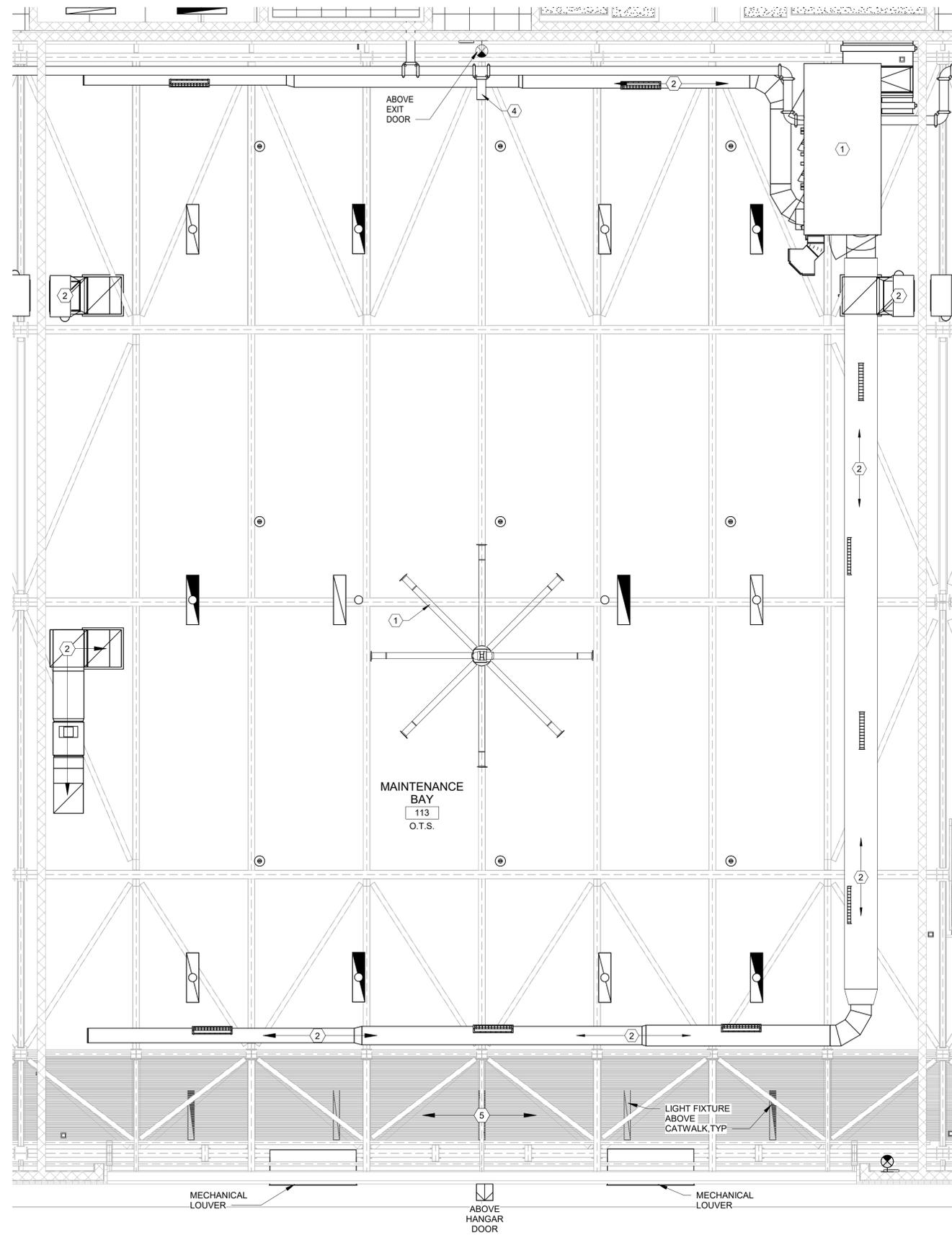
MARK	DESCRIPTION	DATE

DESIGNED BY: C. LONGAGRE	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912BV25RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
ANSI D. FILE NAME: EANG_512203_A_3BAYH_RV722.rvt	FILE NO.:
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74137	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-38: 3 BAY HANGAR
PN: 512203

REFLECTED CEILING PLAN - AREA C

SHEET ID
A-123



A2 REFLECTED CEILING PLAN - AREA E
3/16" = 1'-0"



GENERAL RCP NOTES

- SEE ELECTRICAL DRAWINGS, FOR LIGHT FIXTURE SCHEDULE AND REQUIREMENTS.
- SEE INTERIOR DESIGN DRAWINGS FOR FINISHES.
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- REFER TO SPECIFICATION SECTION 09 51 00 ACOUSTICAL CEILINGS, FOR HOLD DOWN CLIP REQUIREMENTS IN VESTIBULES.

RCP LEGEND

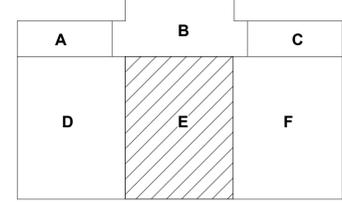
ARCHITECTURAL	
	GYPSUM BOARD CEILING
	SUSPENDED ACOUSTICAL CEILING TILE & FRAME 2 FT X 2 FT.
	OPEN TO STRUCTURE (O.T.S.)
	PREFINISHED METAL SOFFIT
	CEILING HEIGHT AS NOTED
ELECTRICAL	
	LINEAR LED STRIP LIGHT
	EXTERIOR LIGHT - WALL PACK
	HIGH BAY LIGHT
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	RECESSED LIGHT FIXTURE
	WALL MOUNTED LIGHT FIXTURE
	CEILING MOUNTED EXIT LIGHT
	WALL MOUNTED EXIT LIGHT
	OCCUPANCY SENSOR
MECHANICAL	
	SUPPLY AIR DIFFUSER
	RETURN GRILLE
	EXHAUST GRILLE
	OCCUPANCY SENSOR
	CIRCULATION FAN
	IR HEATING SYSTEM
	UNIT HEATER

KEYNOTES

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①	MECHANICAL EQUIPMENT, REFER MECHANICAL
②	MECHANICAL DUCTWORK, REFER MECHANICAL
③	ELECTRICAL EQUIPMENT, REFER ELECTRICAL
④	FIRE PROTECTION EQUIPMENT, REFER FIRE PROTECTION
⑤	EQUIPMENT ACCESS CATWALK, REFER STRUCTURAL
⑥	CEILING EXPANSION JOINT ASSEMBLY. REFER DETAIL F1/A-530.
⑦	CONTINUOUS BACKER ROD AND SEALANT AT PERIMETER OF METAL SOFFIT PANEL

PLAN NORTH



KEY PLAN



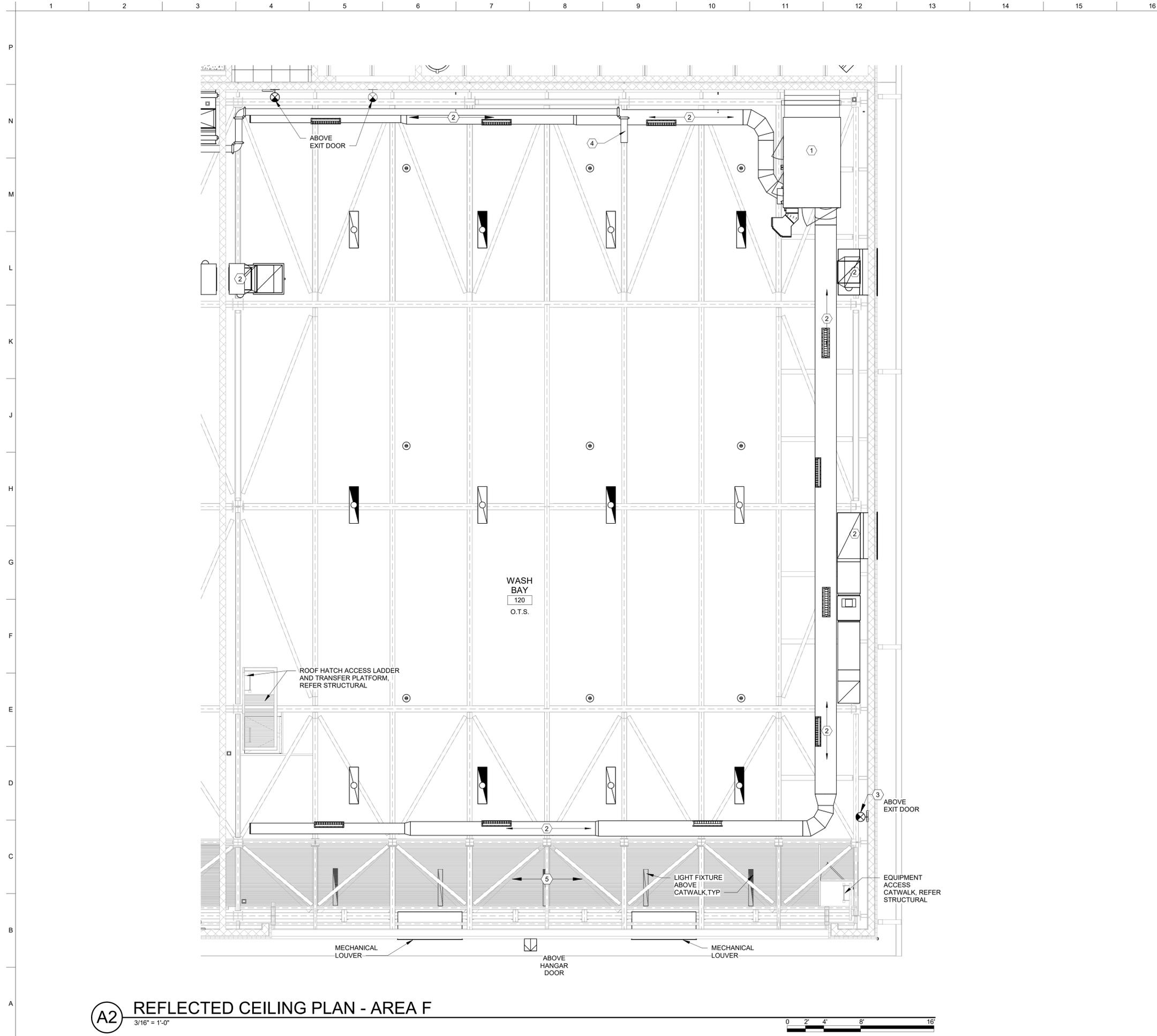
MARK	DESCRIPTION	DATE

DESIGNED BY: C. LONGACRE	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912B725RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.: 512203
FILE NAME: ANSI.D	FILE NAME: A_3BAYH_RVT22.rvt
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2605 EAS & 51ST TULSA, OK 74137	DESIGNED BY: C. LONGACRE
ENGINEERING & SON CONSULTING BRANCH	ISSUE DATE: 15 OCTOBER 2025

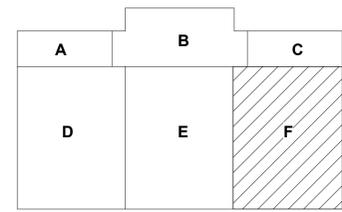
EBBING ANGB - ARKANSAS
F-35 3 BAY HANGAR
PN: 512203

REFLECTED CEILING PLAN - AREA E

SHEET ID
A-125



A2 REFLECTED CEILING PLAN - AREA F
3/16" = 1'-0"



KEY PLAN

GENERAL RCP NOTES

- SEE ELECTRICAL DRAWINGS, FOR LIGHT FIXTURE SCHEDULE AND REQUIREMENTS.
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RCP LEGEND

ARCHITECTURAL	
	GYPSUM BOARD CEILING
	SUSPENDED ACOUSTICAL CEILING TILE & FRAME 2 FT X 2 FT.
	OPEN TO STRUCTURE (O.T.S.)
	PREFINISHED METAL SOFFIT
	CEILING HEIGHT AS NOTED
ELECTRICAL	
	LINEAR LED STRIP LIGHT
	EXTERIOR LIGHT - WALL PACK
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	WALL MOUNTED LIGHT FIXTURE
	CEILING MOUNTED EXIT LIGHT
	WALL MOUNTED EXIT LIGHT
	OCCUPANCY SENSOR
MECHANICAL	
	SUPPLY AIR DIFFUSER
	RETURN GRILLE
	EXHAUST GRILLE
	OCCUPANCY SENSOR
	CIRCULATION FAN
	IR HEATING SYSTEM
	UNIT HEATER

KEYNOTES

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②	MECHANICAL DUCTWORK, REFER MECHANICAL
③	ELECTRICAL EQUIPMENT, REFER ELECTRICAL
④	FIRE PROTECTION EQUIPMENT, REFER FIRE PROTECTION
⑤	EQUIPMENT ACCESS CATWALK, REFER STRUCTURAL
⑥	CEILING EXPANSION JOINT ASSEMBLY. REFER DETAIL F1/A-530.
⑦	CONTINUOUS BACKER ROD AND SEALANT AT PERIMETER OF METAL SOFFIT PANEL



US Army Corps of Engineers

MARK	DESCRIPTION	DATE

DESIGNED BY: C. LONGACRE	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912B725RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
FILE NAME: ANSI.D	FILE NAME: A_3BAY1_RVT22.rvt

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
2605 SAS & 51ST
TULSA, OK 74137

ENGINEERING & SON
CONSULTING ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35 3 BAY HANGAR
PN: 512203

REFLECTED CEILING PLAN - AREA F

SHEET ID
A-126

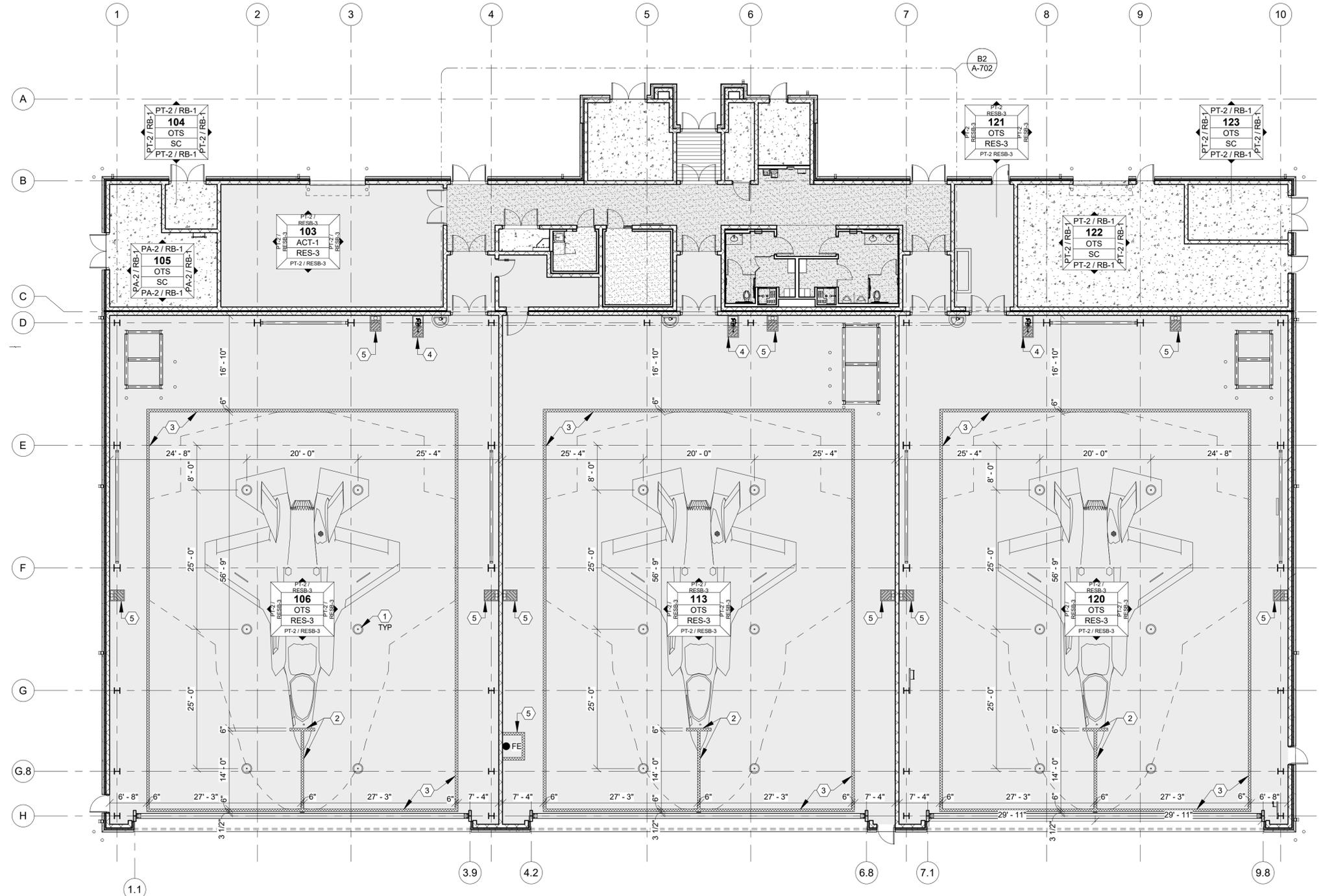
FLOOR MARKING KEYNOTES	
①	GROUNDING RECEPTACLE. REF ELECTRICAL, PAINT PER UFC3-575-01, FIGURE 2-3.
②	AIRCRAFT POSITION CENTERLINE AND NOSE GEAR STOP. 6 INCH (152MM) WIDE STRIPE; COLOR - YELLOW (OR WHITE) TO MATCH MARKINGS FROM OUTSIDE OF THE HANGAR.
③	AIRCRAFT CLEARANCE BOUNDARY LINE. 6 INCH (152MM) WIDE STRIPE; COLOR - YELLOW - RES-4
④	SAFETY EYEWASH/SHOWER; COLOR - GREEN, RES-5. PROVIDE 2 FOOT (610 MM) CLEARANCE FROM SAFETY EQUIPMENT. CONFIRM LOCATION OF EYEWASH/SHOWER PRIOR TO APPLYING FLOOR MARKING. REF PLUMBING, REF K15 / A-813
⑤	FIRE EXTINGUISHERS; COLOR - RED, RES-6. PROVIDE 2 FOOT (610 MM) CLEARANCE FROM SAFETY EQUIPMENT. CONFIRM FINAL LOCATION OF FIRE EXTINGUISHERS PRIOR TO APPLYING FLOOR MARKING; REF F15 / A-813

GENERAL FINISH NOTES	
1.	FOR ARCHITECTURAL GENERAL NOTES, MATERIAL LEGEND, AND ABBREVIATIONS, REFER TO SHEET G-004.
2.	REFER TO ARCHITECTURAL FLOOR PLANS FOR BUILDING LAYOUT, DIMENSIONS AND COORDINATION TO BUILDING SYSTEMS AND STRUCTURE.
3.	ALL MATERIAL/PRODUCTS ARE TO BE INSTALLED PER MANUFACTURER'S INSTALLATION REQUIREMENTS BY THOSE TRAINED AND CERTIFIED IN THEIR SPECIALTY.
4.	SEE A-711 FOR FINISH SCHEDULE AND FINISH LEGEND.
5.	REFER UFC 4-211-01 FOR FLOOR MARKING IN HANGAR.
6.	FEATHER RES-2 FLOORING FROM CORRIDOR TO THE RES-1 FLOORING AT THE OFFICE AND MOTHERS ROOM.

FLOOR FINISH LEGEND	
	RESINOUS FLOORING (RES-1)
	RESINOUS FLOORING (RES-2)
	RESINOUS FLOORING (RES-3)
	RESINOUS FLOOR MARKING (RES-4 - YELLOW, RES-5 - RED, RES-6 - GREEN)
	SEALED CONCRETE (SC)
	WALK OFF MAT (WOM)

FINISH TAG LEGEND	
	NORTH WALL/BASE FINISH ROOM NUMBER.
	EAST WALL/BASE FINISH ROOM NUMBER.
	CEILING FINISH
	FLOOR FINISH TYPE
	SOUTH WALL/BASE FINISH ROOM NUMBER.
	WEST WALL/BASE FINISH ROOM NUMBER.

ROOM LEGEND	
ROOM #	ROOM NAME
100	ENTRY VESTIBULE
101	CORRIDOR
102	FIRE PUMP ROOM
103	TOOL RM/IALIS
104	ELECTRICAL ROOM
105	MECHANICAL ROOM
106	HOIST BAY
107	VESTIBULE
108	JANITOR
109	RVE STORAGE
110	MOTHER'S ROOM
111	OFFICE
112	VESTIBULE
113	MAINTENANCE BAY
114	ALCOVE
115	ELECTRICAL ROOM
116	COMM
117	WOMEN'S TOILET
118	MEN'S TOILET
119	VESTIBULE
120	WASH BAY
121	WASH EQUIPMENT
122	MECHANICAL ROOM
123	ELECTRICAL ROOM



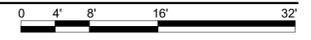
MARK	DESCRIPTION	DATE

DESIGNED BY:	T. MANN	ISSUE DATE:	15 OCTOBER 2025
DRAWN BY:	R. READER	SOLICITATION NO.:	W912B25RA028
CHECKED BY:	M. HOOVER, R.A.	CONTRACT NO.:	
SUBMITTED BY:	A. BLANKENSHIP, P.E.	PROJECT NO.:	512203
FILE NAME:	E:\ANG-512203_A_3BAYH_RVT22.rvt		
ANSI D:			

US ARMY CORPS OF ENGINEERS	ENGINEERING & CONSTRUCTION DIVISION
TULSA DISTRICT	ENGINEERING BRANCH
2488 EAST 15TH	
TULSA, OK 74107	

EBBING ANGB - ARKANSAS	OVERALL ROOM FINISH PLAN PLAN
F-35: 3 BAY HANGAR	
PN: 512203	

A1 OVERALL FINISH PLAN
3/32" = 1'-0"



SHEET ID	A-701
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100% READY TO ADVERTISE - NOT FOR CONSTRUCTION

Plot Date: 10/8/2025 10:45:07 AM File Path: C:\Users\m3c61m\OneDrive - US Army Corps of Engineers\Documents\ANG_512203_A_3BAYH_RVT22_rvt22.rvt

GENERAL SHEET NOTES

- REFER SIGNAGE SCHEDULE GENERAL NOTES.
- REFER TO SIGNAGE SCHEDULE AND DETAIL DRAWINGS FOR ADDITIONAL INFORMATION. REFER TO SIGNAGE SCHEDULE FOR SIGN LOCATION TAG, SIGN TYPE, SIGN TEXT NUMBER, AND PLACE HOLDER MESSAGE TEXT.
- REFER TO THE SIGNAGE MOUNTING HEIGHTS ON SIGNAGE DETAIL DRAWINGS. SIGNS WILL BE WALL-MOUNTED ON THE LATCH SIDE OF DOOR OR AS INDICATED. HEIGHTS, CLEARANCES, AND CONFIGURATIONS SHOWN ARE TYPICAL AND MUST APPLY IN ALL INSTANCES, UNLESS NOTED OTHERWISE.
- EXTERIOR AND INTERIOR SIGNAGE MUST COMPLY WITH THE LATEST VERSION OF REQUIREMENTS, GUIDANCE FOR AIR FORCE SIGNAGE FOUND IN UFC 3-120-01 DESIGN STANDARD AND BASE STANDARDS.



US Army Corps of Engineers

MARK	DESCRIPTION	DATE

DESIGNED BY: T. MANN	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912B25RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
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US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
248 EAST 15TH
TULSA, OK 74107

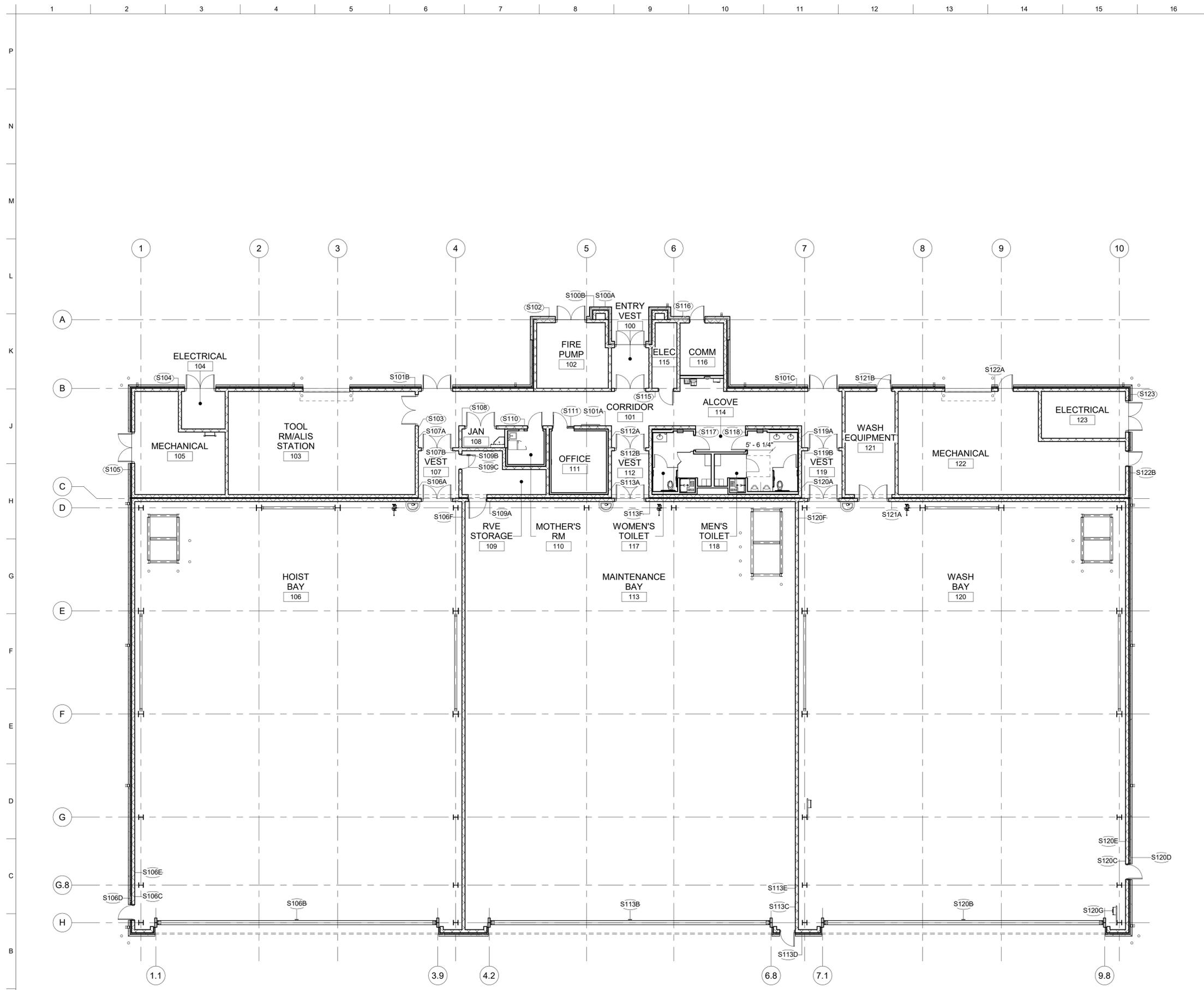
ENGINEERING & CONSTRUCTION DIVISION
ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35 3 BAY HANGAR
PN: 512203

OVERALL SIGNAGE PLAN

SHEET ID
A-801

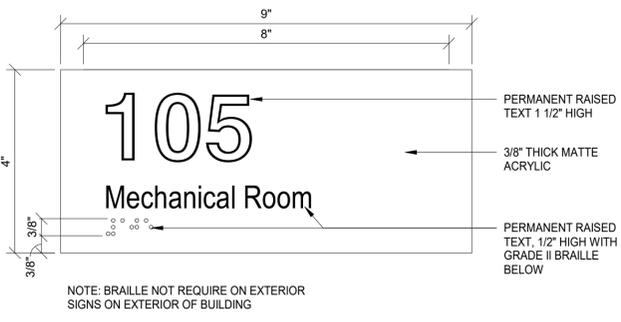
100% READY TO ADVERTISE - NOT FOR CONSTRUCTION



A1 OVERALL SIGNAGE PLAN
3/32" = 1'-0"

PLAN NORTH

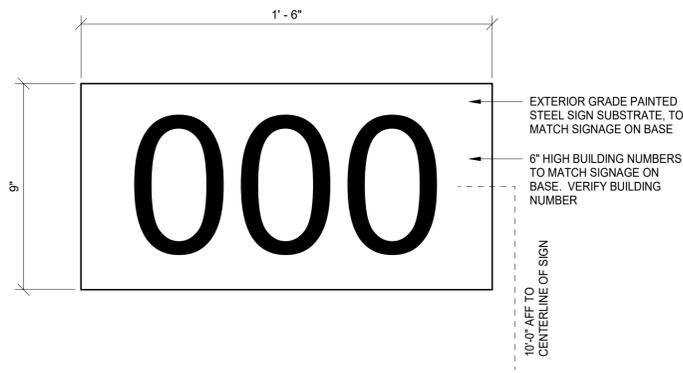




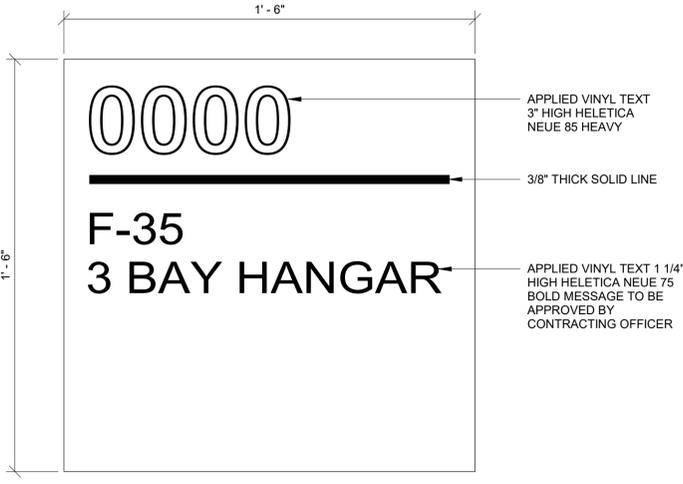
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6" = 1'-0"
0 0.125' 0.25' 0.5' 1'



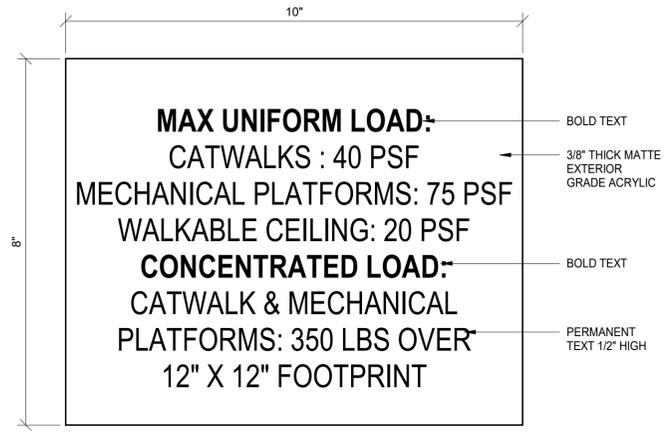
(L7) SIGN TYPE "M"
6" = 1'-0"
0 0.125' 0.25' 0.5' 1'



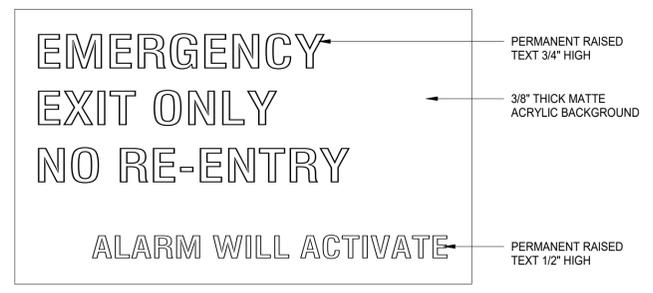
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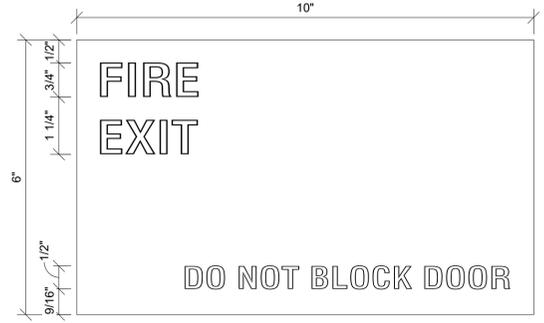
(A1) SIGN TYPE "L"
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



(G7) SIGN TYPE "N"
6" = 1'-0"
0 0.125' 0.25' 0.5' 1'



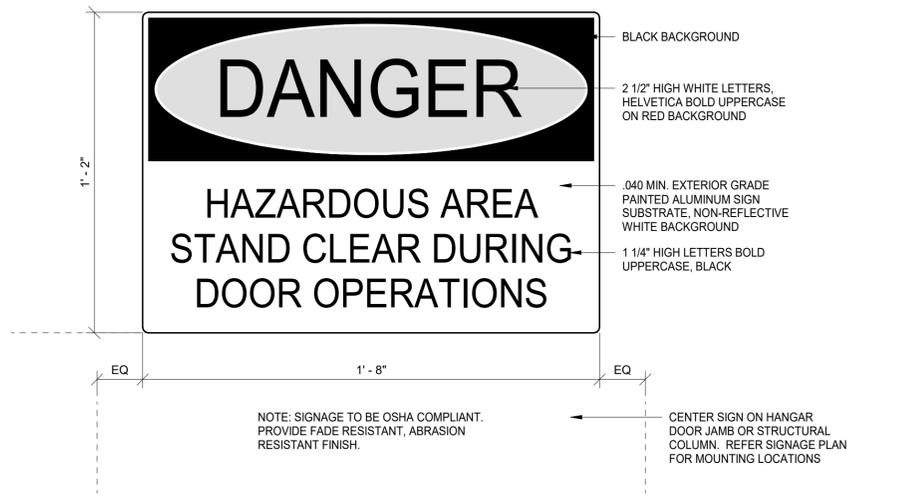
SIGN TYPE V INTERIOR EMERGENCY EXIT SIGN



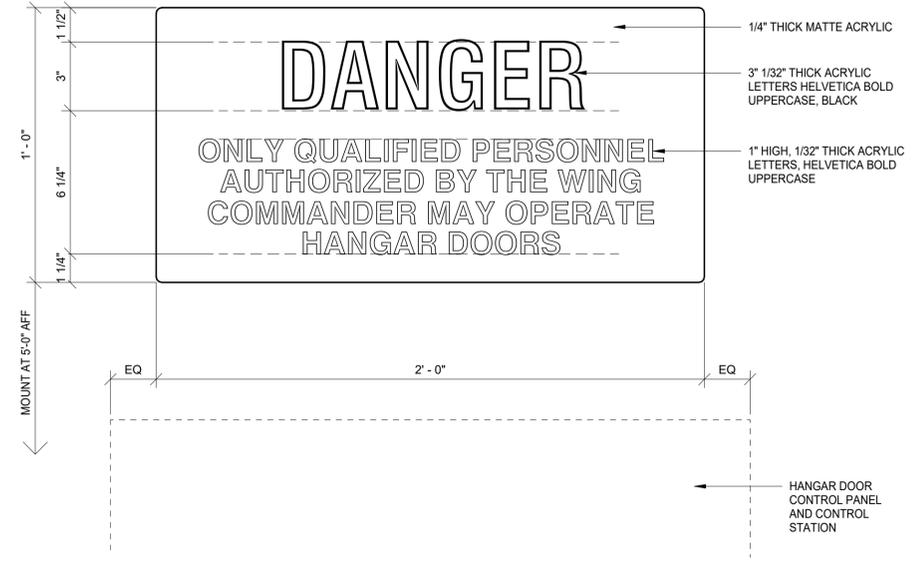
SIGN TYPE V EXTERIOR EMERGENCY EXIT SIGN

SIGN TYPE V SIDE VIEW
SCALE: N.T.S.

(A7) SIGN TYPE "P"
6" = 1'-0"
0 0.125' 0.25' 0.5' 1'



(F13) SIGN TYPE "Q"
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



(A13) SIGN TYPE "R"
3" = 1'-0"
0 0.125' 0.25' 0.5' 1'



MARK	DESCRIPTION	DATE

DESIGNED BY: T. MANN	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912B25RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
FILE NAME: EANG_512203_A_3BAYH_RV722.rvt	FILE SIZE:
ANSI D:	

US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74157	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH
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SHEET ID
A-812



US Army Corps of Engineers

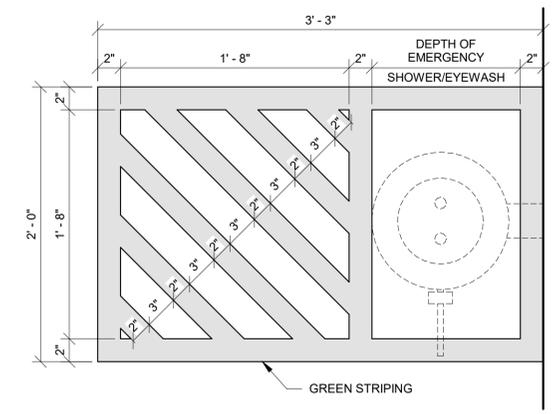
MARK	DESCRIPTION	DATE

US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74157	DESIGNED BY: T. MANN	ISSUE DATE: 15 OCTOBER 2025
	DRAWN BY: R. READER	SOLICITATION NO.: W912B25RA028
ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH	CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
	SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.: 512203
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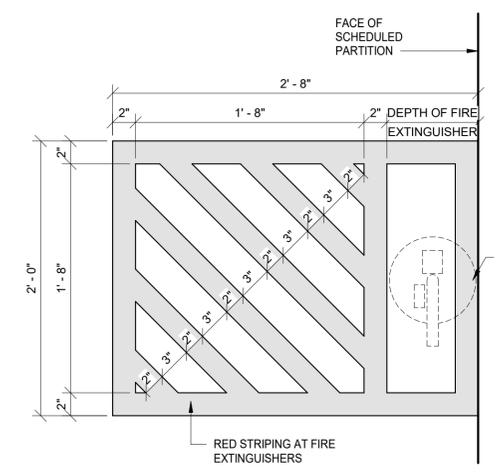
EBBING ANGB - ARKANSAS
 F-35: 3 BAY HANGAR
 PN: 512203

SIGNAGE AND FLOOR MARKING DETAILS

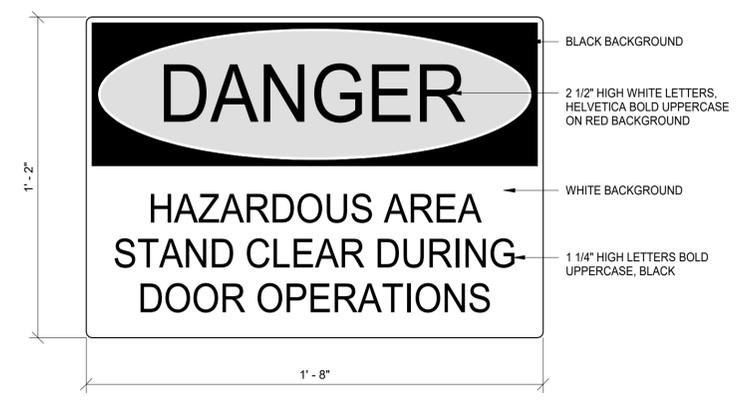
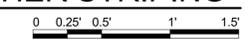
SHEET ID
A-813



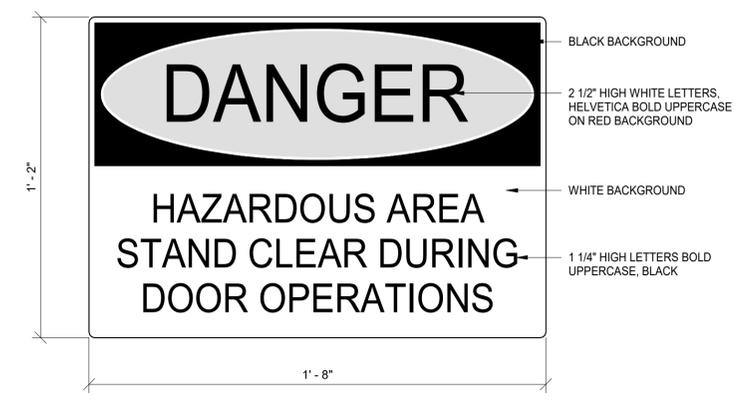
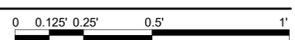
(K15) TYPICAL EYEWASH STRIPING
 1 1/2" = 1'-0"



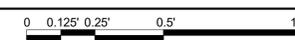
(F15) TYPICAL FIRE EXTINGUISHER STRIPING
 1 1/2" = 1'-0"

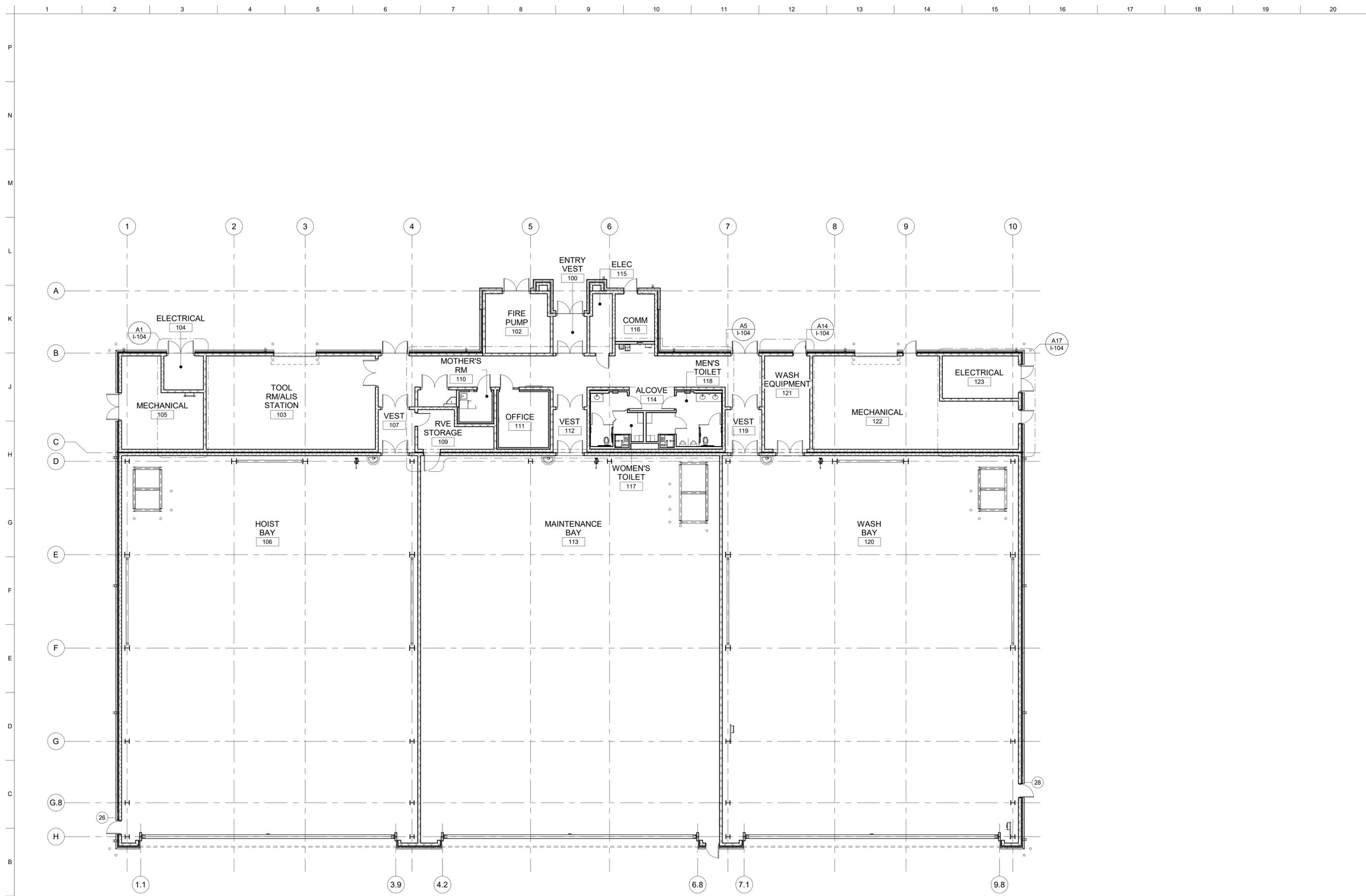


(A9) SIGN TYPE "S"
 3" = 1'-0"



(A15) SIGN TYPE "T"
 3" = 1'-0"





A1 OVERALL ELEMENTS PLAN
3/32" = 1'-0"



MARK	DESCRIPTION	DATE

DESIGNED BY: T. MANN DRAWN BY: R. READER CHECKED BY: M. HOOVER, R.A. SUBMITTED BY: A. BLANKENSHIP, P.E. SIZE: ANSI D	ISSUE DATE: 15 OCTOBER 2025 SOLICITATION NO.: W912B25RA028 CONTRACT NO.: PROJECT NO.: 512203 FILE NAME: EANG_512203_A_3BAYH_RV722.rvt
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74137	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH

EBBING ANGB - ARKANSAS
F-35: 3 BAY HANGAR
PN: 512203

ELEMENTS FLOOR PLAN

SHEET ID
I-103

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

P
N
M
L
K
J
H
G
F
E
D
C
B
A

GENERAL SHEET NOTES

1. REFERENCE INTERIOR FINISH MATERIALS LEGEND FOR FINISH TYPES; REFER A-711.
2. REFER TO ELECTRICAL DRAWINGS FOR CONNECTION HEIGHTS.
3. SURFACE MOUNTED MOP RACK WITH SHELF SHALL BE PROVIDED ABOVE FLOOR MOP SINK. REFER FLOOR AND PLUMBING PLANS FOR LOCATIONS.
4. INSTALL FIBERGLASS REINFORCED PANELS (FRP) ON GYPSUM BOARD WALLS ADJACENT TO MOP SINK TO 4'-0" A.F.F.
5. ALL BULLETIN BOARDS SHALL BE MOUNTED FROM THE TOP OF THE FRAME 7'-0" A.F.F. SIZE AS INDICATED.
6. CENTER WALL MOUNTED ITEMS HORIZONTALLY BETWEEN ADJACENT WALL UNLESS OTHERWISE NOTED.

ELEMENTS LEGEND

CODE	DESCRIPTION	SPECIFICATION
BEN	BENCH	10 51 13
BUL	BULLETIN BOARD 48" X 48"	10 51 13
CG	CORNER GUARD	10 11 00
FRP	FIBERGLASS REINFORCED PLASTIC	07 42 63
LK	LOCKER	10 51 13
MR-S	MOP RACK WITH SHELF	10 28 13

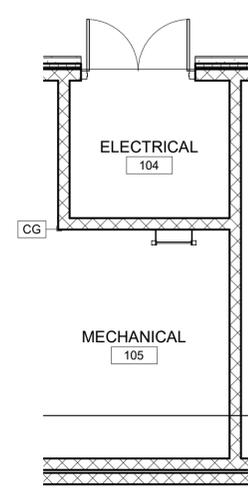


US Army Corps of Engineers

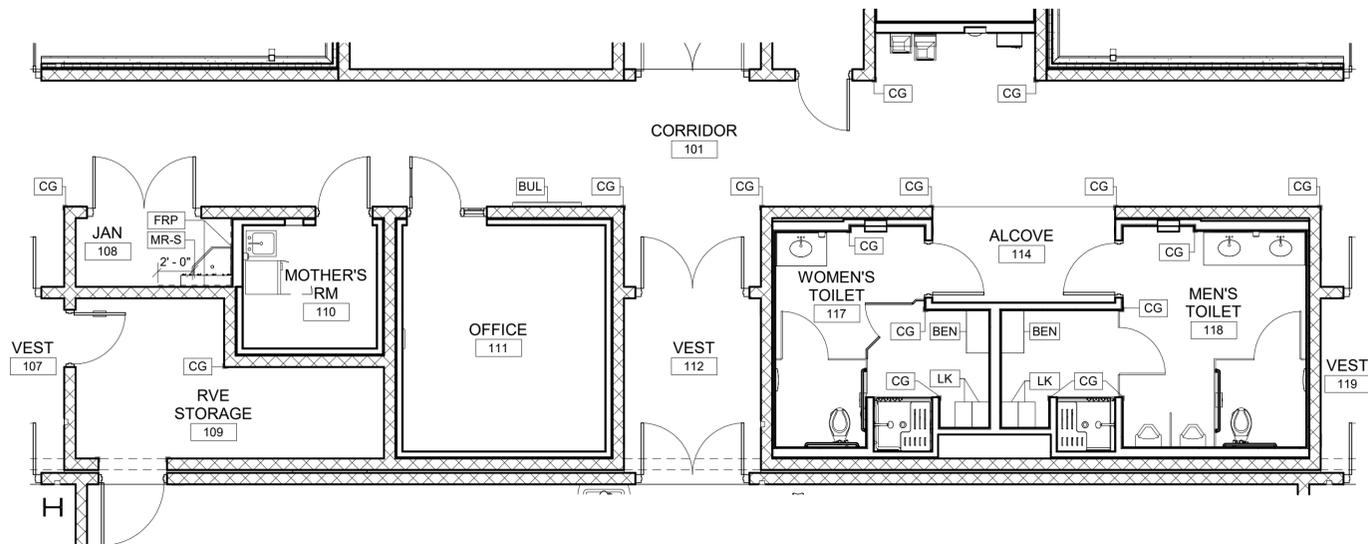
MARK	DESCRIPTION	DATE

DESIGNED BY: T. MANN	ISSUE DATE: 15 OCTOBER 2025
DRAWN BY: R. READER	SOLICITATION NO.: W912BVT25RA028
CHECKED BY: M. HOOVER, R.A.	CONTRACT NO.:
SUBMITTED BY: A. BLANKENSHIP, P.E.	PROJECT NO.:
ANSI D:	FILE NAME: EANG_512203_A_3BAYH_RVT22.rvt
US ARMY CORPS OF ENGINEERS TULSA DISTRICT 2408 EAST 151ST TULSA, OK 74157	ENGINEERING & CONSTRUCTION DIVISION ENGINEERING BRANCH

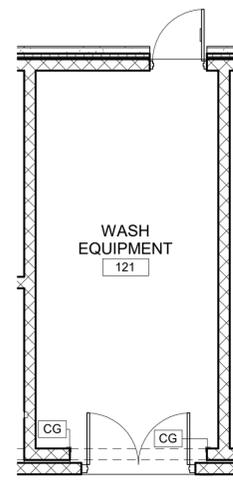
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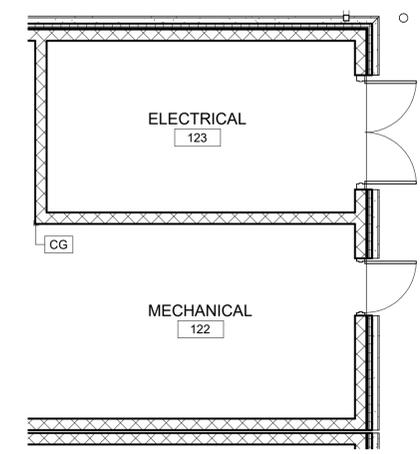
A1 ENLARGED ELEMENTS PARTIAL PLAN - AREA A
3/16" = 1'-0"



A5 ENLARGED ELEMENTS PARTIAL PLAN - AREA B
3/16" = 1'-0"



A14 ENLARGED ELEMENTS PARTIAL PLAN - AREA C
3/16" = 1'-0"



A17 ENLARGED ELEMENTS PARTIAL PLAN - AREA C
3/16" = 1'-0"

EBBING ANGB - ARKANSAS
F-38; 3 BAY HANGAR
PN: 512203
ENLARGED ELEMENTS PLANS

SHEET ID
I-104

100% READY TO ADVERTISE - NOT FOR CONSTRUCTION