PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SUMMARY

A. Perform all work required to complete the work of the Section, as indicated including, but is not limited to, the following:

1. Expanded Polystyrene Geofoam

B. Related Sections include the following:

1. Section 04 43 00 – Site Stone Masonry
2. Section 31 20 00 – Earthwork
3. Section 32 13 13.13 – Exposed Aggregate Concrete Paving
4. Section 32 14 40 – Stone Paving
5. Section 32 16 13.43 – Stone Curbs
6. Section 32 91 00 – Planting Soil System
7. Section 32 93 00 – Planting and Fine Grading

1.3 SUBMITTALS

A. Product Data: For each type of product indicated below, provide manufacturer's product data including specifications, test compliances, construction details, material descriptions, dimensions of individual components and profiles, and installation instructions:

1. EPS Geofoam
2. EPS Connectors

B. Shop Drawings: Provide shop drawings of the products indicated below. Contractor shall not commence work until all required Shop Drawings are approved.

1. EPS Geofoam Installation Plan:
   (a) Installation sequence showing block sizes and layout pattern.
   (b) Location of connectors between EPS blocks.
   (c) Methods of temporarily stabilizing EPS blocks to prevent movement prior to final backfill.

1.4 QUALITY ASSURANCE

A. Source: For each type of product required for the work of this Section, provide products of a single manufacturer and source for consistency.

B. Installer Qualifications: An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project.

C. Codes and standards: Perform site improvements work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.

1.5 COORDINATION

A. The work under this Section shall be completely coordinated with adjacent work and the work of other Sections. Verify dimensions and work of other trades, which adjoin materials of this Section before installing items specified.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original unopened protective packaging.

B. Store products in original packaging, under cover, in a manner preventing physical damage, soiling or wetting. Stored Geofoam shall be protected from petroleum –based solvents, such as gasoline or diesel fuel, and shall not be exposed to open flame or other ignition sources

C. Heavy vehicles or any type of machinery shall not be allowed directly on the blocks. Damaged blocks shall be replaced by the Contractor at no additional cost to the Owner.

1.7 GUARANTEE

A. Provide manufacturer's standard warranty for one year from date of Final Acceptance of installation, to repair or replace parts that become defective during warranty period, excluding parts subject to accident, abuse, misuse or neglect.

PART 2 PRODUCTS

2.1 EXPANDED POLYSTYRENE (EPS) GEOFOAM

A. Geofoam shall be produced by a manufacturer with an in-place, third party certification, Quality Control program.

B. Geofoam shall be fabricated using virgin feedstock manufactured into blocks having no more than 15% regrind content. All blocks shall be smooth and flat, and within tolerances of 0.5% of respective height, width, and length dimensions. Additional field and/or shop cutting will be required to fit the geometry of the fill being constructed.

C. EPS Geofoam shall be Type 19 as classified by ASTM D6817. Acceptable manufacturers are:

1. ACH Foam Technologies (800.525.8697), www.achfoam.com
2. Falcon Foam, (800.933.1476), www.FalconFoam.com

3. Insulfoam, (800.248.5995), www.insulfoam.com

4. R-Control EPS Geofoam, (800.255.0176), www.foam-control.com

5. TerraLite EPS Geofoam, GeoTech Systems Corporation (703.759.0300), www.geosyscorp.com

2.2 CONNECTORS

A. Connectors shall be galvanized steel, two-sided multi-barbed designed to provide connection between layers of EPS Geofoam. Each connector shall have a lateral holding strength of at least 60lbs.

PART 3 EXECUTION

3.1 EXAMINATION

A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and notify Landscape Architect in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions.

B. Prior to the installation of EPS Geofoam, check that surrounding and adjacent work has been sufficiently completed and coordinated to accept the work under this section.

C. Correct all unsatisfactory conditions as necessary prior to proceeding with the EPS Geofoam installation.

3.2 INSTALLATION, GENERAL

A. Excavate to the lines and grades shown on the Contract Drawings.

B. In all fill areas, remove all disturbed and soft subgrade soils. Remove any rocks or other objects that project more than 1” above the compacted soil subgrade.

C. EPS Geofoam:

1. Grade and compact the subgrade for the EPS Geofoam as shown on the Contract Drawings.

2. Place the EPS Geofoam as indicated on the Contract Drawings and in strict accordance with the approved Shop Drawings. All blocks shall accurately fit relative to adjacent blocks. Refer to Contract Drawings for size and location of gaps on vertical joints between the blocks.

3. Layers of EPS Geofoam blocks shall be placed I a running bond pattern to avoid joints aligned through several layers. The edge of each layer shall be set back from the layer below a dimension not less than the layer height.

4. Blocks shall be cut using a saw or hot wire tool.

5. Connectors shall be installed per the manufacturer’s recommendations at 24” on center or less, and firmly seated into the layers of the EPS blocks, to avoid misalignment or oversized gaps between blocks.

6. Provide temporary weights, tie-downs or lateral bracing during installation to ballast and stabilize the EPS Geofoam blocks. Remove temporary devices prior to final backfill.

3.3 PLACING AND COMPACTION OF BACKFILL

A. Place and compact the backfill in accordance with Section 31 20 00 – Earthwork and the following additional requirements:

1. Backfill lifts shall be placed to equal elevations on both sides of the EPS block to avoid eccentric lateral forces on the blocks.

2. Backfill material placed within 2 feet of the EPS Geofoam shall be compacted by handheld equipment only. Maintain at least 6" clearance between the EPS Geofoam and hand compactors.

3. Minimum cover shall be per the manufacturer's recommendations.

3.4 PLACING OF PLANTING SOILS

1. Refer to Section 32 91 00 – Planting Soil System.

3.5 CLEANING

A. The Contractor shall remove all debris, construction equipment and scrap material from all areas within the limit of work prior to the final inspection and acceptance.

END OF SECTION

SECTION 31 23 33
EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the excavation, bedding, and backfilling of utilities necessary to perform work indicated on Drawings and Contract Documents.

B. Comply with the City of Bentonville – Water Utilities Department Specifications 2021. If conflict should be found between this section and the City Standards, City Standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

1.2 RELATED REQUIREMENTS

A. Section 31 25 00 Erosion Prevention

B. Section 33 05 05 Pipe Laying

1.3 LOCAL REQUIREMENTS

A. Contractor to verify with city officials that this specification meets or exceeds local requirements. Local requirements shall supercede requirements of this specification unless noted otherwise.

1.4 SUBMITTALS

A. Shop Drawings or details pertaining to Site Utilities are required. Do not perform work until required shop drawings have been accepted by Architect.

PART 2 PRODUCTS

2.1 BEDDING MATERIAL

A. #67 Stone: Processed sand and gravel free from clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

U.S. Sieve Size	Percent Passing (by weight)
1 Inch	100
3/4 Inch	90-100
3/8 Inch	20-55
No. 4	0-10
No. 8	0-5

2.2 DETECTION TAPE

A. Provide metallic detection tape located approximately 12” above pipe or conduit, where in ground utility lines are buried outside building footprint. Tape shall be continuous and be marked, indicating utility type (i.e. water, sewer, gas electric, etc.)

PART 3 EXECUTION

3.1 SUMMARY

A. Set all lines, elevations, and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

B. Maintain in operating condition existing utilities, active utilities, and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.

3.2 EXCAVATION, TRENCHING, AND BACKFILLING

A. Perform excavation as indicated for specified depths. During excavation, pile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave- ins.

B. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation(s) shall be disposed of as specified.

C. Prevent surface water from flowing into trenches, pipes or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

D. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

3.3 TRENCH EXCAVATION

A. The local utility companies shall be contacted before excavation shall begin. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.

B. All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

D. Trench width requirements below the top of the pipe shall not be less than 12" nor more than 18" wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

E. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances.

3.4 SHEETING AND BRACING

A. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen required. Sheeting may be removed after excavation has been backfilled sufficiently to protect against damaging or injurious caving.

3.5 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit that is installed to designated elevations and grades to line and grade 4" below bottom of pipe and to width as specified. Place 4" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place select backfill and compact in maximum 8" layers, measured loose, to the top of the trench.

3.6 TRENCH BACKFILLING

A. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

B. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in lifts or layers not exceeding 8" of loose material. Compact to minimum density of 95% of optimum density in accordance with ASTM D 698.

C. Compaction: Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.
D. Compaction Testing: The soils engineer shall perform test at intervals not exceeding 200'-0" of trench for each 8" of compacted trench backfill and furnish copies of test results as specified. Contractor to pay for compaction testing.
E. Finished Surface: After compaction and testing are complete, cap the trench with an assembly that is flush with and matches the existing construction in materials and method of application.

END OF SECTION

SECTION 31 25 10
EROSION PREVENTION

PART 1 GENERAL

1.1 RELATED SECTIONS

A. The contractor is responsible for implementing Erosion Control measures in accordance with State and Federal requirements and the Bentonville Stormwater Ordinance 2006-167. The information provided on the Drawings should be considered a minimum for the anticipated construction and conditions. The contractor shall be responsible for adding additional measures as conditions change at no additional cost to the Owner as required by the Inspector or the Engineer if warranted by site conditions and Contractor's maintenance of site. Additional straw mulch, silt fencing and rip-rap shall be stockpiled on site as needed to quickly maintain or expand erosion control measures as needed due to changing weather and site conditions.

B. This Section includes the following:
   1. Silt fence, diversion ditches and rock ditch checks.
   2. Rock protection at ditch and pipe outfalls (Quarry Spalls aka "Rip-Rap")
   3. Surface stabilization (seed, sod, poly-ethylene sheeting)
   4. Measures to keep streets clean.

1.2 RELATED SECTIONS

A. Section 31 23 33 – Excavation, Backfilling, and Compacting for Utilities.

1.3 SUBMITTALS

A. Product Submittals: Product catalog cuts for silt fence and wattles. Aggregate Materials: Sieve/Pit Analysis of rip-rap for stabilized construction entrance.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties and water resources from erosion and sediment damage throughout life of contract.

1.5 CONTRACTOR RESPONSIBILITIES

A. Maintain erosion control after substantial completion per this Section and as approved by the Inspector and the Engineer.

PART 2 PRODUCTS

2.1 RIP-RAP

A. Hard and durable quarry stone with less than 35% wear when tested for resistance to abrasion in conformance with ASTM C535

B. Size shall be between 4-inch and 8-inch maximum dimension unless noted otherwise in the documents.

C. Bulk density shall not be less than 160 pounds per dry cubic foot.

D. The least dimension of any one piece shall not be less than 1/3 the greatest dimension. Smaller pieces will be allowed only to fill in the voids in the larger stone.

E. Rip-rap shall be placed to a minimum depth of 12 inches.

2.2 FILTER FABRIC

A. Nonwoven polypropylene or polyester fabric.
B. Manufacturer: Typar 3601, Mirafi Inc. 160N, or equal.

PART 3 EXECUTION

3.1 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion control systems in accordance with Construction Drawings.
B. The Owner or his designated representative has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures. Contractor will be required to incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls. Cut slopes shall be permanently seeded and mulched when finish grades are achieved as excavation proceeds to extent considered desirable and practical.
C. Temporary erosion control systems installed by Contractor shall be constantly maintained to control siltation during life of contract. Contractor must respond to maintenance or additional work as required by the Owner or his designated representative within 48 hours.
D. Contractor is totally responsible to protect all slopes when erosion begins by whatever methods necessary.

3.2 INSTALLATION

A. Review Construction Drawings.
B. Deficiencies or changes on Construction Drawings as it is applied to current conditions will be brought to the attention of the Owner or his designated representative for remedial action.
C. Rip-Rap:
    1. Machine place rip-rap over filter fabric a minimum of 12 inches thick to limits shown on Drawings.
    2. Install rip-rap at locations where water is released from drainage system, to prevent scour.
    3. Place stone rip-rap on compacted sub-grade.
D. Install sediment barriers, diversion ditches, and ditch checks in accordance with this Section and Drawings.
E. Trench Dewatering:
    1. Use ditch checks to control the collection of storm water in trenches. Water shall be allowed to sit in trench until silt settles out.
    2. If water must be removed immediately, water shall be filtered. Filtration shall be performed by natural vegetation, bale filters or silt filters.
    3. Use of a settling basin to allow silt to filter out shall be used when no other options are available.

3.3 OVERLAND CONSTRUCTION

A. Construction Working Surface:
   1. In areas where Contractor will be operating equipment or storing construction material, installation of Construction Working Surface shall be required.
   2. Use rip-rap stone, 2-inch to 4-inch in size at a thickness of 8-inches minimum. installed over filter-fabric.
   3. Cover rip-rap with a minimum of 2-inches of Class 7 Crushed Material as a working surface.
   4. Replace rock and crushed material as needed due to wear from construction equipment and weather conditions.

B. Sediment Barriers (Silt Fence):
   1. In areas where natural vegetation is not present or where sufficient to attain the needed removal of silt, installation of sediment barriers shall be required.
   2. Use silt fences per the Drawings. Install across the foot of slope, parallel to the ground surface unless used for directing flow, per Drawings.
   3. Install silt fences around inlets and around all soil stockpiles.
   4. Silt Fence: Fence post spaced no more than 10 feet apart and driven a minimum of 2 feet into ground.
      a. Above-ground height of fence posts shall be no less than 2 feet.
      b. Fasten metal mesh fence with 6 inch or smaller openings to fence posts to reinforce the silt fence fabric.
      c. Mesh fence shall stand a least 2 feet above ground and buried at least 4 inches below ground. Silt fence fabric that is internally reinforced may be used without a wire mesh support in low flow areas if approved by Engineer.
   5. On gentle slopes, reinforced with wire mesh and may be supplemented with hay or straw bales as a primary barrier to aid in collecting silt and potential sedimentation from entering ditch lines and waterways.

C. Diversion Ditches:
   1. Diversion ditches shall act as a barrier to runoff water. Storm water flow shall be interrupted and diverted around the construction area.
   2. Construct with earth-filled sacks or mounded compacted earth-filled sacks or mounded compacted earth and rock.
   3. On long slopes, use a series of ditches per the Table 1 spacing guidelines.
   4. Spacing depends on the severity of the slope. Maximum spacing for diversion ditches are given in Table 1. Distances may be shortened as situations dictate but should not be lengthened.
   5. Drainage area above diversion ditches shall be stabilized to prevent excessive silt from entering and collecting in the diversion channel.
   6. Runoff water shall be filtered at the outlet end of the ditch by a bale filter or silt fence.
   7. Spacing is related to the severity of right-of-way slopes. Maximum spacing for diversion ditches is given in Table 1.

TABLE 1

Spacing of Diversion Ditches

Slope	Spacing
0 to 5%	200 Feet
5% to 10%	150 Feet
10% to 20%	100 Feet
Greater than 20%	50 Feet

D. Rock Check Dam:
   1. Locations as noted on Drawings.
   2. Construct as shown on Detail Sheet.

E. Non-vegetative Soil Stabilization:
   1. Utilize temporary non-vegetative soil stabilization to provide protection against excessive soil erosion over a short-term period (less than one year).
   2. Non-vegetative methods shall be required in areas that experience high water flows and high runoff velocities (disturbed slopes steeper than 2:1).
   3. Methods employed include mulching, chemical soil stabilizers (binders), brush and slash, netting and matting, and store coverage.
   4. Mulch shall consist of straw, hay, or salt hay applied at an appropriate rate 70-115 pounds per 1000 square feet (1.5 to 2.5 tons/acre). Mulch anchoring shall be implemented promptly where applicable and achieved by one of the following methods:
      a. Peg and twine.
      b. Mulch netting.
      c. Erosion control fabric.
      d. Jute matting, as indicated on Drawings.
      e. Mulch anchoring tool.

F. Temporary Seeding and Re-vegetation:
   1. Soil that is stockpiled for more than 7 days or disturbed areas where there will be no construction for 2 weeks shall be stabilized to prevent erosion.
   2. If natural vegetation does not occur, area shall be temporarily seeded.
   3. Temporary re-vegetation of pipeline shall occur when new lines are established during the spring and summer period.
   4. New lines established in the fall and winter period shall require permanent re-vegetation.
   5. If required to temporary re-vegetate an area during the fall or winter period, a mixture of Austrian winter pea, rye, oats, and wheat shall be used.

6. Provide a combination of milo, millets, and the Arkansas mix for temporary re-vegetation to control erosion. The use of a broadcast seeder after the last frost through July is acceptable.
7. Alternative to Temporary Seeding: Mulching using the methods and rates give in this Section.

G. Polyethylene Sheeting:
1. Provide polyethylene sheeting on all stockpiles and exposed temporary slopes that cannot be protected with mulch. Cover material and slopes if rain is forecast within 24 hours and at all times during rainfall.
2. Overlap joints minimum 28 inches. Overlap in direction of drainage and prevent water from draining onto material being protected.
3. Secure in place to prevent movement and damage.
4. Provide sandbags at 2.5 feet spacing and tie the sand bags together with rope on slopes greater than 3:1. Minimize driving stakes through plastic.

H. Stabilized Construction Entrance:
1. Install at access points to construction site and as shown on plans.
2. Construct as shown on Detail Sheet.

END OF SECTION

SECTION 31 31 16
TERMITE CONTROL

PART 1. GENERAL

1.1 DESCRIPTION

A. Perform foundation and under floor termite control treatment in accordance with the Arkansas Pest Control Law and to qualify construction under this Contract for continuous guaranteed protection specified.

B. Applicable Regulations:

1. Standard Building Code, Section 1703.
2. Arkansas Pest Control Law.
3. Federal Insecticide, Fungicide and Rodenticide Act, (Public Law 92-516 of October 21, 1972 as amended by Public Law 94-140, Nov. 28, 1975).

PART 2. PRODUCTS

2.1 TERMITE CONTROL CHEMICALS

A. Use chemicals approved by the Arkansas State Plant Board and of type required to give guaranteed protection specified.

PART 3. EXECUTION

3.1 PREPARATION

A. From investigation at the site determine soil texture or otherwise obtain this information from the County Agent, Soil Conservation Service or other approved authorities, if not already known.

B. Remove wood and cellulose containing materials from earth sub-grade to be treated before chemical is applied.

3.2 TREATMENT

A. Perform foundation and under floor termite control treatment at buildings to be constructed under this Contract. Use type chemical approved by the Arkansas State Plant Board and currently known to give guaranteed protection for the soil and fill used at this Project. Apply chemical using applicator licensed by the Arkansas State Plant Board. Apply in sufficient quantity under and around the structures, to qualify building and contents for continuous guaranteed protection against damage by subterranean termites.

B. Reapply soil treatment solution to areas disturbed by subsequent excavation or construction activities following application.

C. Under Slabs: Apply under slabs at the rate of one gallon per 10 square feet for sand and 1-1/2 gallons per 10 square feet for gravel. Apply prior to placement of any sand cushion, gravel drainage fill, etc. When necessary to ensure proper penetration, the ground surface will be left loose or lightly scarified until treatment has been completed.

D. Critical Areas: Treat a one-foot strip along critical areas under walls, around interior piers and pipes rising from the ground at the rate of two additional gallons per five linear feet. Treatment shall be applied as specified for overall treatment under slabs.

E. Outside of Foundations: Apply a one-foot strip along the outside of the foundations of the building at the rate of two gallons per five linear feet. Apply in a trench dug to a depth of approximately 2" below finish grade. Loosen earth in trench to a depth of 12" before treating. This treatment is to be performed prior to finish grading.

3.3 GUARANTEE

A. Furnish damage guarantee with service and re-service for any subterranean termite infestation without cost to Owner. Write Damage Guaranty Contract additionally to cover any and all subterranean termite damage to the structures and contents in amount of $10,000.00. Such damage to be repaired, replaced or corrected at Contractor’s expense.

B. Furnish damage guarantee effective for 5-year period after completion of initial treatment without payment of additional fees or premiums by Owner. Upon expiration of 5-year period, Owner has option of extending damage guarantee contract an annual fee mutually agreed upon by Owner and applicator. Owner reserves the right to cancel as of any anniversary date. Service, re-service, and Damage Guaranty provisions of the extended damage contract are noncancellable by applicator. Annual fee subject to revision by giving advance written notice to Owner.

C. Upon completion of the Work, issue damage guarantee in triplicate, one copy for General contractor, one for Engineer and one for Owner.

3.4 PROTECTION

A. Unless treated surfaces are to be immediately covered, take means necessary to prevent disturbance of treated areas by human or animal contact.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Drilled Piers.
   2. All work normally related to the above or specified under the Section.

B. Related Sections:
   1. Section 015000 "Temporary Facilities and Controls."
   2. Section 310010 "Site Preparation"

C. Work installed but furnished under other Sections:
   1. Drilled Pier Reinforcing and Dowels: Furnished under Division 3, Section "Cast-in-Place Concrete."
   2. Concrete for Drilled Pier: Furnished under Division 3, Section "Cast-in-Place Concrete."
   3. Anchor Rods: Furnished under Division 3, Section for "Precast Concrete" and Division 5, Section for "Structural Steel."

1.03 UNIT PRICES

A. Unit prices are included in Section 012200 "Unit Prices."

B. Drilled Piers: Actual length of drilled piers in place and approved. Actual length, may vary, to coincide with elevations where satisfactory bearing strata are encountered. Adjustments will be made on net variation of total quantities, based on design length for shafts.
   1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, and the diameter of shaft.
   2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, and other items for complete drilled-pier installation.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.

D. Methods Statement: When ground surface elevation at time of drilling is more than 24 inches (610 mm) above top of drilled pier concrete elevation. See requirements herein.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.
   1. The Owner's testing and inspection agency shall be the project geotechnical engineer.

B. Drilled-Pier Standard: Comply with ACI 336.1, latest edition, unless modified in this Section.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to drilled piers including, but not limited to, the following:
      a) Review geotechnical report.
      b) Discuss existing utilities and subsurface conditions.
      c) Review coordination with temporary controls and protections.
      d) Review testing and inspection requirements.
      e) Discuss concrete placement method.
      f) Installation of reinforcing.
      g) Drilling, casing (if necessary), cleaning and dewatering (if necessary) drilled shafts.
      h) Ground elevation at time of drilling relative to top of drilled pier concrete elevation.
      i) Drilling slurry.

1.06 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
   1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.

B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
   1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
   2. Do not proceed with interruption of utility without Architect's written permission.

C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
   1. The geotechnical report is included in the Project Manual.
      a) The boring log and accompanying report are believed to be accurate; however, neither the owner, architect, or structural engineer guarantees the information contained therein, nor do they guarantee the conditions indicated to exist at the locations of the test holes will prevail at other locations on the site.

D. Survey Work: Engage a qualified surveyor to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record

actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

A. Meet the requirements of Section 033000, "Cast-in-Place Concrete."

2.02 CONCRETE MATERIALS

A. Meet the requirements of Section 033000, "Cast-in-Place Concrete."

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

B. Ground surface at time of drilling shall preferably be within 24 inches (610 mm) of top of drilled pier. If ground surface at time of drilling is more than 24 inches (610 mm) above top of drilled pier elevation, contractor shall submit a methods statement explaining how top of concrete will be kept free of debris and how drilled pier and dowels will be protected from damage during subsequent excavation.

3.02 EXCAVATION

A. Construct drilled piers to indicated diameter and length with penetration into bearing material as indicated or directed by the on-site project geotechnical engineer. Use of permanent casing is not permitted.

B. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.

1. Obstructions: Unclassified excavation may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. No changes in the Contract Sum or the Contract Time will be authorized for removal of obstructions.

C. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

D. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.

1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
2. Cleaning and Dewatering: Shafts shall be thoroughly cleaned and dewatered prior to placing concrete. Pumps, in operating condition, shall be provided of proper type and capacity with sufficient hose to carry water away from excavations. Shafts shall be dewatered such that no more than 3 inches (76 mm) of standing water remains at the time of concrete placement.

3. If specified or directed by project geotechnical engineer cut series of grooves about perimeter of shaft to height from bottom of shaft, vertical spacing, and dimensions indicated. If specified or directed by project geotechnical engineer roughen sides of shaft.

E. Notify and allow project geotechnical engineer to inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
2. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.

F. Excavate shafts for closely spaced drilled piers (those within 3 diameters center-to-center) and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set. Set is achieved when concrete reaches 500 psi compressive strength.

G. The use of mud slurry (such as that made with on-site soils) to seal off water or lubricate temporary casings will be allowable only with the prior written approval of the project geotechnical & structural engineers.

H. Temporary Casings: Where necessary, install watertight steel casings of sufficient length and thickness to prevent soil collapse or water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls. Casing inside diameter shall equal specified drilled pier diameter to within tolerances specified in ACI 336.1. Casing shall conform to ACI 336.1 requirements.

I. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances as amended below.
1. Shaft Diameter Tolerance, in inches:

Specified Diameter	Undersize Tolerance	Oversize Tolerance
12"	0	+1
18" to 42"	-1	+1
48" to 96"	-2	+1

2. Top Elevation Tolerance: Plus 0 inches, minus 2 inches.
3. If tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

J. Entire shaft shall be excavated and completely filled with concrete within the same day.

3.03 STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit. Place cage prior to concreting. One and two bar bundles in center of shaft may be placed after concreting if bars are inserted plumb and centered in shaft.

D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement. Bottom 12" of shaft may be unreinforced. Reinforcing may rest on soil at bottom of excavation.

E. Use templates to set dowels, anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.

F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.04 CONCRETE PLACEMENT

A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by the project geotechnical engineer.
   1. Place concrete in one continuous operation without construction joints for full pier height.

B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking earth at sides of shaft.
   1. Where concrete cannot be directed down shaft without striking earth at side of shaft, place concrete with chutes, tremies, or pumps. Free fall concrete shall not exceed 20 feet for 24 inch (610 mm) and smaller piers.
   2. Vibrate top 60 inches (1500 mm) of concrete.

C. Wet Method: When dry method can not be used place concrete by pumping with end of pump hose at bottom of hole. Leave end of hose at bottom hole until entire shaft is full of concrete.

D. Casing Removal: Pull temporary casing with a slow and smooth vertical motion maintaining a plumb position. Casing shall not be pulled until concrete has been placed to a minimum of five feet above external water, slurry, or unstable soil level. During pulling, maintain concrete level a minimum of five feet above external water, slurry, or unstable soil level. Vibrate top five feet of concrete after casing is removed.

E. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation. Enlargement or "mushrooming" at the top of the pier is not permitted.

F. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
   1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.

G. If hot-weather conditions exist that would impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F (32 deg C).

3.05 FIELD QUALITY CONTROL

A. Testing and Inspection: As indicated on drawings.

3.06 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property. Material removed during shaft drilling operations shall not be used for fill.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes Helical Piles and brackets for new foundations as shown on the drawings Provide and design helical piles to achieve the performance criteria on the drawings and as listed herein:

1.02 SUBMITALS

A. Submit data demonstrating helical piles satisfy the performance criteria including downward, upward, and lateral capacity, stiffness, and longevity of the pile system.

B. Product Data: Submit product data for all manufacturers' stock items under this section

C. Code Approval Reports: Submit current report showing compliance to the current building code.

D. Shop Drawings: Submit shop drawings and calculations for all fabricated items under this section. Indicate shaft size and length, helix sizes and spacings, connections, attachments, brackets, size and type of fasteners, and accessories. Indicate welded connections using standard AWS welding symbols. Submit calculations, test data and drawings stamped and signed by an engineer registered in the state of the project. Calculations shall address the following:
   1. Eccentricity between center of bearing area or bracket to centerline of pile.
   2. Strength and stiffness of splices.
   3. Ultimate bearing capacity of helix on the bearing stratum.
   4. Documentation of torque-to-capacity ratios for each shaft diameter and configuration.
   5. Reduction in shaft capacity due to corrosion during the service life. A minimum service life of 100 years shall be considered.
   6. Planned installation depth and the number of lead and extension sections. State any minimum length requirements in drilling anchor.

E. Load Test:
   1. Submit proposed test piles, reaction piles, and procedure for load testing a pile. Include reaction forces and a certificate stating the testing assembly and procedure was reviewed by a licensed engineer.
   2. Submit load test results.

F. Calibration Data:
   1. Submit current calibration data for torque motor and torque monitoring device.

G. Qualification Data: For Manufacturer and Installer.

H. Weld inspection reports for all shop welding.

I. Submit data and calculations demonstrating a 100-year service life.

1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: A professional with at least four years of experience and experienced in fabrication of helical piles and related brackets, whose work has resulted in construction with a record of successful in-service performance and has worked on four similar projects in the last five years.

B. Installer Qualifications: Installation shall be performed by an authorized installation contractor. Proof of current certification as an authorized installer of the helical piles being used shall be submitted prior to starting installation.

C. Welding: Meet requirements of AWS "Structural Welding Code," D1.1 latest edition.

D. Code Approval: Helical piles shall have a current ICC ES Code approval/report based on acceptance criteria AC358 or shall fully conform to the IBC.

E. Preinstallation Conference: Review:
   1. Geotechnical report and subsurface conditions
   2. Existing utilities
   3. Plan, elevation layout, and control
   4. Testing and inspection requirements
   5. Load test(s)
   6. Tolerances
   7. Coatings and coating repair

1.04 DELIVERY, STORAGE, AND HANDLING

A. Transport, store, and handle piles in a manner to prevent damage to the piles.

B. Piles shall be stored above ground on platforms, skids, or other supports.

C. Protect coatings and repair any damaged coating before installing piles.

1.05 PROJECT/SITE CONDITIONS

A. Protect any adjacent material or construction from damage during installation.

B. Existing Utilities: Locate exiting underground utilities before excavating drilled piles. If utilities are to remain in place, provide protection from damage during drilled-pile operations.
   1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.

C. Site Information: A geotechnical report has been prepared for the Project and is referenced elsewhere in the Project Manual for information only.
   1. The drilling log and accompanying report are believed to be accurate; however, neither the Owner, Architect, nor the Structural Engineer guarantees the information contained nor do they guarantee the conditions indicated to exist at the location of the test holes will prevail at other locations on the site.

1.06 PERFORMANCE REQUIREMENT

A. All helical piles and connections shall be designed in accordance with the IBC to support the design allowable load(s) shown in the contract documents.

B. All helical pile components shall be selected to provide a minimum factor of safety against failure of two (2). Required pile service loads are shown on the drawings.

C. The depth of installation shall be determined by the contractor to achieve the design loads noted, but not less than the embedment shown on the drawings.

D. Provide deflection performance criteria (down, up).

E. Provide longevity performance criteria.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel: ASTM A36 or better.

B. Welding Electrodes: Conform to AWS D1.1, 70 Series.

C. Finish: All material shall be hot dipped galvanized in accordance with ASTM 123.

2.02 FABRICATION

A. General: Fabricated helical pile components shall conform to submittals. All materials shall be new stock of types and sizes indicated.

B. Welding: Comply with latest AWS standards.

C. Shop Finishing: After fabrication, clean off loose scale, rust, weld slag or flux deposit, oil, grease, dirt or other foreign material. Prepare surfaces as required for finish process indicated.

D. Substitutions: Not allowed without written authorization.

E. Markings: Mark and label pile length in 2 feet increments form tip to top of pile.

F. Helical Bearing Plates: Plates shall be cold pressed into a helix shape such that when affixed to the central shaft are perpendicular with the central shaft, or uniform pitch, and such that leading and railing edges are within 0.375 inches of parallel. Helix shall be continuously welded to central shaft.

2.03 SUPPLIERS

A. Subject to compliance with requirements, provide an AC358 approved helical pier, or one of the following:
   1. Ram Jack Manufacturing, LLC – AC358, Appendix D
   2. MacLean Dixie HFS – AC358, Appendix D
   3. A.B. Chance – AC358, Appendix D
   4. Magnum Piering, Inc. – Provide supporting documentation

PART 3 - EXECUTION

3.01 INSTALLATION

A. Helical piles shall be installed at locations noted on drawings.

B. Installation units shall consist of rotary type torque motor with forward and reverse capabilities. These units shall be either electrically or hydraulically powered, and be capable of developing

the torque required for the project. The units shall be capable of positioning the helical pile at the proper installation angle required for bracket attachment.

C. Adapters approved by the fabricator shall be employed to safely connect the installation units to the helical pile and extensions and shall have a torque rating at least equal to the torque rating of the piles supplied.

D. The torque being applied by the installing units shall be monitored throughout installation by the installer. The torque monitoring device shall be either a part of the installing unit or an independent device in-line with the installing unit. Calibration data for wither unit shall be available for review by the Architect.

E. The helical pile shall be positioned as shown on the drawings. Proper angular alignment shall be established at the start of installation.

F. The helical pile shall be installed in a smooth, continuous manner. The rate of pile rotation shall be in the range of 5 to 20 revolutions per minute with sufficient down pressure applied to advance the pile.

G. Plain extension material may be required to position the pile at the depth required for adequate bearing.

H. Splice shall be by high strength structural bolts or welding, or equivalent means that has been submitted and approved.

I. If underground obstructions are encountered during installation, the installing contractor shall have the option of removing the obstruction if possible or relocating the helical pile to a location approved by the Architect. This latter option may require the relocation of adjacent piles.

J. If the installing contractor cannot achieve the depth and calibrated torque required for design loads, propose a written procedure and secure Architect's written approval prior to proceeding.

K. The twisted portion of the top helical pile shall be removed, and the pile shall be connected to the structure using a fabricator approved steel bracket capable of safely transferring the structural loads to the helical pile.

L. The installer shall provide stainless steel or hot-dip galvanized steel shims as required below existing concrete footing, across width of brackets, to provide a level bearing condition on bracket prior to installing expansion anchors into face of footing. Shims shall be anchored to prevent movement. Submit procedure for approval.

M. The installer shall keep a written installation record for each helical pile. This record shall be copied to all parties noted in Division 01 and shall include the following information as a minimum:
   1. Project name and location
   2. Name of authorized installer
   3. Name of installer's foreman or representative witnessing the installation
   4. Date and time of installation
   5. Location of helical pile
   6. Embedment in bearing material
   7. Distance from top of bearing material to upper-most helix
   8. Maximum torque

9. Design load achieved

3.02 STATIC PILE TESTS

A. General: Static load tests shall be conducted to verify pile length and load capacity.

B. Test shall be axial compressive load test per IBC 2018 Section 1810.3.3.1.2 on one pile.

C. Provide pile reaction frame, anchor piles, equipment, and instrumentation with sufficient capacity to perform tests. Notify Owner, Architect, and Geotechnical Engineer at least 72 hours in advance of performing tests. On completion of testing, remove testing apparatus and anchor piles.

D. Approval Criteria: Allowable design capacity shall be per IBC section noted above. Maximum settlement shall not exceed 1 inch.

E. Testing shall be continuously observed by the Owner's Geotechnical Engineer.

3.03 TOLERANCES

A. Location: +/-1 inch in plan and +/-0.5 inches vertically.

B. Plumbness/Batter Angle: 1 inch in 10 feet from specified installation angle.

3.04 DISPOSAL OF WASTE MATERIALS

A. Disposal: Remove waster material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION