SEALS PAGE

PROJECT:

Name:	Crossroads at NE Grand Blvd
Location:	Oklahoma City, OK

CIVIL ENGINEERING CONSULTANT OF RECORD

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END OF DOCUMENT

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
   2. Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.

B. Related Requirements:
   1. Section 02220 – Site Demolition: Demolition and removal of structures, paving, utilities and other improvements.
   2. Section 02300 – Earthwork: Stripping and removal of topsoil.
   3. Section 02370 - Erosion And Sedimentation Control (Including SWPPP)

1.2 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion and sediment control systems as shown on Construction Drawings and as directed by the "Storm Water Pollution Prevention Plan" (SWPPP) to protect adjacent properties and water resources from erosion and sedimentation.

B. In event that sitework on this project will disturb one or more acres, starting work shall be strictly governed by the sequence of construction as specified in Section 02370 and SWPPP site maps. Contractor shall not begin construction without "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires SWPPP to be in place during construction.

C. Clearing and grubbing shall commence in the proper sequence as stated in the Phase I of the Best Management Practice Sequence specified in Section 02370 and on the SWPPP site map and subsequent to the halt in construction for performance of the inspection and certification of BMPs as stated.

D. Contractor shall conduct storm water management practices in accordance with the project SWPPP and applicable NPDES permit and shall enforce action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

1.3 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their protection throughout construction operations.

3.2 PROTECTION

A. Locate, identify, and protect existing utilities that are to remain.

B. Protect trees, plant growth, and features designated to remain as part of final landscaping.

C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by SWPPP or governing authority. Dust control shall be provided with sprinkling systems or equipment provided by Contractor.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, in kind.

E. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department requirements.

3.3 EQUIPMENT

A. Material shall be transported to and from the project site using well-maintained and operating vehicles. Transporting vehicles operating on site shall stay on designated haul roads and shall not endanger improvements by rutting, over-loading, or pumping.

3.4 CLEARING

A. Clear areas required for access to site and execution of work.

B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations shall be filled to subgrade elevation to avoid ponding of water. Satisfactory fill material shall be placed in accordance with Section 02300.

C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

D. Cut heavy growths of grass from areas before stripping and topsoil removal and remove cuttings with remainder of cleared vegetative material.

END OF SECTION

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavation, filling, and backfilling for structures, pavement, and outparcels.
2. Trenching and backfilling for utilities.
3. Dewatering.
4. Boring under crossings.

B. Related Requirements:
1. Section 02340 - Soil Stabilization.
2. Section 02370 - Erosion Control and Sedimentation. Temporary and permanent erosion control.
3. Section 02375 - Stone Protection. Rip-rap stone for slope protection.
4. Section 02900 - Planting.

1.2 REFERENCES

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

B. ASTM International (ASTM)
1. ASTM D422 - Particle Size Analysis of Soil.
2. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN.m/m^3)).
3. ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN.m/m^3)).
4. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedures).
6. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
7. ASTM D6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
8. ASTM D2321-11 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

C. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO T 88 - Particle Size Analysis of Soils.

D. Oklahoma Department of Transportation (ODOT):
1. Standard Specifications for Highway Construction, 2019 Edition.

E. National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code.

F. American Water Works Association (AWWA)
1. AWWA C200 - Standard for Steel Water Pipe - 6 In. (150 mm) and Larger.
2. AWWA C206 - Field Welding Of Steel Water Pipe.

1.3 DEFINITIONS

A. Satisfactory Materials: ASTM D2487 soil classification groups CL, ML, CL-ML, SM, SC-SM, SW, SP, and GW.
   1. Satisfactory materials shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings.
   2. Satisfactory materials shall contain no debris, waste, frozen materials, vegetation, and other deleterious matter.
   3. Unless specifically stated otherwise on the Drawings, the following table stipulates allowable satisfactory materials to be used as fill in specified areas:

Fill Placement Criteria					
Material	Proctor Type	Minimum % Dry Density	Placement Moisture Content Range	Liquid Limit	Plasticity Index
Structural Fill	Standard	95%	At or above optimum	≤ 35	<15
Landscaped Areas		95%	-2 to +2%		
Utility Trench Backfill		95%	At or above optimum		

References to depth are relative to final subgrade.

B. Unsatisfactory Materials: ASTM D2487 soil classification groups OL, OH, and PT. Also, materials which do not comply with the requirements for satisfactory materials are unsatisfactory.
   1. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material. The Owner shall be notified of any contaminated materials.
   2. Unsatisfactory materials also include satisfactory materials not maintained within the allowable moisture contents at time of compaction as specified in Section 3.13 below.

1.4 SUBMITTALS

A. Submit 30-pound sample of each type of off-site fill material that is to be used at the site in airtight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.

B. Submit gradation and certification of aggregate material that is to be used for trench bedding, haunching, and initial and final backfill for all utility and storm sewer installations to the Engineer for review.

C. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Owner.

D. Submit Dewatering Plans upon request by Owner.

E. Shop drawings or details pertaining to excavating and filling are not required unless otherwise shown on the Drawings or if contrary procedures to Construction Documents are proposed.

F. Shop drawings or details pertaining to site utilities are not required unless required by regulatory authorities or unless uses of materials, methods, equipment, or procedures that are contrary to The Drawings or Specifications are proposed. Do not perform work until Owner has accepted required shop drawings.

G. Contact utility companies and determine if additional easements will be required to complete project. Provide written confirmation of the status of all easements to Owner at time of Preconstruction Conference or no later than 90 days prior to project possession date.

PART 2 - PRODUCTS

2.1 SOIL AND ROCK MATERIALS

A. Fill and Backfill. Satisfactory materials excavated from the site.

B. Imported Fill Material: Satisfactory material provided from offsite borrow areas when sufficient satisfactory materials are not available from required excavations.

C. Trench Backfill: ASTM D2321-11 unless otherwise specified or shown on the drawings. An open-graded material meeting the requirements of ASTM D2321-11 may be used only if the material is wrapped in an approved filter or drainage fabric (See Section 2.2.B. below) and with written permission from the Engineer.

D. Building Subbase Material: Refer to Architectural Specifications.

E. Bedding: Aggregate Type as indicated on the plans or naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; an open-graded material meeting the requirements of ASTM D2321-11 may be used only if the material is wrapped in an approved filter or drainage fabric (See Section 2.2.B. below) and with written permission from the Engineer.

F. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No.8 sieve. Drainage fill, where required, shall be wrapped in an approved filter or drainage fabric (See Section 2.2.B. below).

G. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No.4 sieve. Filter material, where required, shall be wrapped in an approved filter or drainage fabric (See Section 2.2.B. below).

H. Topsoil: Topsoil shall consist of stripping material excavated from the site. Topsoil shall consist of organic surficial soil found in depth of not more than 6-inches. Topsoil shall be as further defined in Section 02900 – Planting.

I. Pond Liner: Unless otherwise specified on the construction drawings, an impervious liner shall be placed in the bottoms and side of ponds, basins, forebays, etc. designed to normally hold water. The liner shall be a minimum of 24 inches thick, consist of clay material, and have a maximum permeability of 10^{-7} cm/s.

2.2 APPURTENANT MATERIALS

A. Stabilization fabrics and geogrids: As specified in Section 02340.

B. Filter and drainage fabrics: As specified in Section 02340.

C. Steel Casing Pipe: Comply with ASTM A 53 Grade A or B, size, and wall thickness as indicated on The Drawings.

D. Trench Utility Locator Tape: Heavy duty 6" wide underground warning tape. Tape shall be made from polyethylene material, 3.5 mils thick, with a minimum tensile strength of 1,750 psi. Place the tape at one-half the minimum depth of cover for the utility line or a maximum of 3 feet, whichever is the less, but never above the top of subgrade. Color of tape shall be determined by as follows:
   1. Natural Gas or Propane – Yellow.
   2. Electric – Red.

3. Telephone – Orange.
4. Water – Blue.
5. Sanitary Sewer – Green.

2.3 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.4 SOURCE QUALITY CONTROL

A. Laboratory testing of materials proposed for use in the project shall be by the Owner's Construction Testing Laboratory. The Contractor shall provide samples of material obtained off-site.

B. Perform California Bearing Ratio (CBR) tests in outparcels and areas to receive pavement for each type of material that is imported from off-site. CBR value shall be equal to or above pavement design subgrade CBR value indicated on Construction Drawings.

C. Following tests shall be performed on each type of on-site or imported soil material used as compacted fill:
1. Moisture and Density Relationship: ASTM D698.
2. Mechanical Analysis: AASHTO T88 or ASTM D422.
3. Plasticity Index: ASTM D4318.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, datum, elevations, and grades necessary for construction as shown on the drawings.

B. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.

C. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on the drawings from excavating equipment and vehicular traffic.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

E. Remove from site, material encountered in grading operations that is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.

F. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:
1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
2. After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.
3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 5'-0" of perimeter of building subgrade, paving or outparcel subgrade. If, after observation, material is found to be unsatisfactory, it shall be removed from site.

G. Locate and identify utilities that have previously been installed and protect from damage.

H. Locate and identify existing utilities that are to remain and protect from damage.

I. Maintain in operating condition existing utilities, previously installed utilities, and drainage systems encountered in utility installation. Repair surface or subsurface improvements shown on the Drawings.

J. Verify location, size, elevation, and other pertinent data required making connections to existing utilities and drainage systems as indicated on the Drawings.

K. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or aggregate material placed and compacted as specified in Section 02340.

3.2 DEWATERING

A. General:
1. Dewatering activities shall conform to applicable provisions in 02370.
2. Provide dewatering systems as required for excavations.
3. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom or sides. Design system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner, termed as a “quick” or “boiling” condition. System shall not be dependent solely upon sumps or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation’s stability.
4. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow Work to be installed in a dry condition.
5. Control, by acceptable means, all water regardless of source. Contractor shall be responsible for disposal of the water.
6. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary, lower water level in advance of excavation utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.
7. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.
8. Open pumping with sumps and ditches will be allowed provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.
9. Install wells or wellpoints, if required, with suitable screens and filters so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping and upon development of wells, levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.
10. Control grading around excavations to prevent surface water from flowing into excavation areas.
11. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

B. Design:
1. Designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.
2. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.
3. Contractor shall be responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

C. Damages:
1. Contractor shall be responsible for and shall repair any damage to work in place, other contractor’s equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation. Contractor responsibility shall also include, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor’s negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

2. Remove subgrade materials rendered unsatisfactory by excessive wetting and replace with approved backfill material at no additional cost to the Owner.

D. Maintaining Excavation in Dewatering Condition:
   1. Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will not be permitted.
   2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
   3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
   4. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.

E. System Removal: Upon completion of the work, remove dewatering equipment from the site, including related temporary electrical service.

F. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.3 TOPSOIL EXCAVATION

A. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.

B. Strip topsoil to a depth of not less than 6 inches from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material

C. Stockpile topsoil in storage piles in areas shown on The Drawings or where directed by Owner. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Remove excess topsoil from site unless specifically noted otherwise on the Drawings.

3.4 GENERAL EXCAVATION

A. Classification of Excavation: The Contractor shall assure himself by site investigation or other necessary means that he is familiar with the type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation.

B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.

C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.

D. Excavate building areas to line and grade as shown on the Drawings being careful not to over excavate beyond elevations needed for building subgrades.

E. Place satisfactory excavated material into project fill areas.

F. Unsatisfactory excavated material shall be disposed of in manner and location that is acceptable to Owner and local governing agencies.

G. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

H. All pipes that penetrate levees, including permanent outlet control devices and temporary discharge pipes from sedimentation ponds, shall be constructed in conjunction with fill placement to ensure these drainage devices are properly placed and the surrounding backfill is adequately tied to the basin levee. Trenching of levees is not permitted. All materials in the levee, including bedding materials for the discharge devices, shall be low permeability, cohesive soils. Soil exhibiting high shrink/swell potential or containing greater than 5% organics shall not be used. Contractor shall provide progressive pictures of the pipe installation to the Owner to document the installation.

3.5 NOT USED

3.6 TRENCHING EXCAVATION FOR UTILITIES

A. Contact local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical, if possible, and remove stones from bottom of trench 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. Replace over-excavation with satisfactory material and dispose of unsatisfactory material.

B. Trench excavation sidewalls shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with 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 exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

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

D. Remove excavated materials not required or not satisfactory as backfill or embankments and waste off-site or at on-site locations approved by the Owner and in accordance with governing regulations. Dispose of structures discovered during excavation as specified in Section 02220.

E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches and other excavations as specified.

F. 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.

G. 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.

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

I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances, whichever is more stringent:
   1. Water Mains: 48 inches to top of pipe barrel or 6 inches below frost line, established by local building official, whichever is deeper.
   2. Sanitary Sewer: Elevations and grades as indicated on the drawings and as specified in Section 02535.
   3. Storm Sewer: Elevations and grades as indicated on the Drawings.
   4. Electrical Conduits: 24 - 60 inches to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or local utility company requirements, whichever is deeper.

5. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company, whichever is deeper.
6. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
7. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.

The above noted depths are minimum requirements. Except where specific elevations and grades are indicated on the drawings, the contractor shall increase the depth as necessary, upon approval of the respective utility company, to ensure minimum clearances and separations are maintained.

3.7 SUBGRADE PREPARATION

A. Scarification and Compaction: Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8 inches and compacted as specified hereinafter.

B. Proofrolling: Subgrades shall be proofrolled by the contractor in the presence of the Owner's Construction Materials Laboratory to detect areas of insufficient compaction and soft pocket, or areas of excess yielding. Proofrolling shall be accomplished by making minimum of two complete passes with fully-loaded tandem-axle dump truck (typically 10 tons/axle), or approved equal, or if not possible due to the granular nature of the soils, a smooth-drum vibratory roller compactor operating at a minimum frequency of 30 Hz, in each of two perpendicular directions. Limit vehicle speed to three mph. Areas of failure such as soft spots, unsatisfactory soils, and areas of excessive pumping or rutting shall be excavated and re-compacted as specified herein. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to Owner. Subgrade exposed longer than 48 hours or on which precipitation has occurred shall be re-proofrolled. The Owner's CTL will document the proofrolling procedure, specific locations, deficiencies, and corrective measures taken by the Contractor.

C. Hand Auger Probing: In small areas where proof rolling is not practical, hand auger probing may be necessary in lieu of proofrolling to ensure the subgrade soils are well compacted, stable and unyielding prior to placing fill or constructing improvements above those soils. Hand auger probing in these areas shall consist of shallow hand auger borings to penetrate any disturbed portions of the subgrade and then using DCP testing, steel probe testing or other testing procedures, as approved by the Owner and Engineer, necessary to ensure the subgrade is stable and unyielding prior to placing new stone base and pavements. Retesting of the subgrade will be required if the new stone base and pavements are not placed within the time limits outlined in the specifications or if the subgrade is subjected to unfavorable weather conditions

3.8 FILLING

A. Fill areas to contours and elevations shown on the Drawings with materials deemed satisfactory.

B. Place fills in continuous lifts specified herein.

C. Fill within proposed building subgrade, paving subgrade, and outparcel subgrades shall not contain rock or stone greater than 3 inches in any dimension unless noted otherwise

D. Unless otherwise specified for rock fill, rock or stone less than 6-inches in largest dimension may be used in fill below structures, paving, outparcels, and graded areas, up to 24 inches below surface of proposed subgrade or finish grade of graded areas when mixed with satisfactory material. Rock or stone less than 2 inches in largest dimension may be used in fill within the upper 24 inches of proposed subgrade or finish grade of graded areas when mixed with satisfactory material.

E. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8 inches loose measure and compacted as specified hereinafter.

F. Material imported from off-site shall have CBR value equal to or above pavement design subgrade CBR value indicated on The Drawings.

G. Building area subgrade pad shall be that portion of site directly beneath and 5 feet beyond building and appurtenances, including limits of future building expansion areas as shown on the Drawings.

3.9 NOT USED

3.10 PIPE BEDDING

A. Excavate trenches for pipe or conduit to 4 inches below bottom of pipe and to the width as specified herein. Place 4 inches of bedding material, compact in bottom of trench, and shape to conform to lower portion of pipe barrel.

B. Place geotextile fabric as specified on the Drawings and in accordance with Section 02340.

3.11 TRENCH BACKFILLING

A. Materials used for trench backfill shall comply with requirements as specified herein.

B. Backfill and compact in accordance with fill and compaction requirements in ASTM D2321 unless otherwise shown on the drawings.

C. Do not backfill trenches until required tests are performed and utility systems comply with and are accepted by applicable governing authorities.

D. Backfill trenches to contours and elevations shown on the Drawings.

E. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

F. All trenches that extend into the building pad and are sloped toward the building shall have a “plug” of 5 feet in length consisting of low plasticity cohesive fill or with lean concrete/flowable fill.

3.12 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS, AND RAILROAD CROSSINGS

A. When indicated by the Drawings, street, road, highway, or railroad crossings for utility mains installed by jacking and boring method shall be in accordance with area specifications and governing authorities.

B. Excavation of approach pits and trenches within right-of-way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6-inches thick for entire length and depth of trench or pit. Compact backfill to 98 percent of maximum dry density in accordance with ASTM D698, obtained at optimum moisture as determined by AASHTO T180. Mechanical tampers may be used after cover of 6 inches has been obtained over top of barrel of pipe.

C. Accomplish boring operation using commercial type boring rig. Bore hole to proper alignment and grade. Bore hole shall be within 2 inches of same diameter as largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made and in no instance shall hole be left unattended while open.

D. In event subsurface operations result in failure or damage to pavement or railroad tracks within 1 year of construction, make necessary repairs to pavement or railroad tracks. If paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, repair or replace disturbed or broken area.

E. Clean, prime, and line interior and exterior of casing pipe with two coats of asphalt coating in accordance with and governing authorities.

F. Butt weld steel casing. Welds shall be full penetration single butt-welds in accordance with AWWA C206.

G. Install casing and utility pipe with end seals, vent pipe, and other special equipment in accordance with area specifications and governing authorities.

3.13 COMPACTION

A. Compaction shall be in accordance with ASTM D698 and as specified in 1.3.A.3.

B. Maintain moisture content as specified in 1.3.A.3.

C. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Corrective Measures for Non-Complying Compaction: Remove and recompact deficient areas until proper compaction is obtained. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to Owner.

3.14 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material with CBR equal to or better than that specified on the drawings. Surface of subgrade after compaction shall be firm, uniform, smooth, stable, and true to grade and cross-section.

D. Construct temporary ditches and perform such grading as necessary to maintain positive drainage away from subgrade at all times.

3.15 BORROW AND SPOIL SITES

A. Comply with NPDES and local erosion control permitting requirements for any and all on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil or borrow operations, clean up spoil or borrow areas in a neat and reasonable manner to the satisfaction of Owner or off-site property owner, if applicable.

3.16 FINISH GRADING

A. Check grading of building subgrades by string line from grade stakes (blue tops) set at not more than 50-foot centers. Allowable tolerance shall be plus or minus 0.10 feet from plan grade. Provide engineering and field staking as necessary for verification of lines, grades, and elevations.

B. Grade areas where finish grade elevations or contours are indicated on the Drawings, other than paved areas, outparcels, and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil, sodding, and seeding requirements refer to Section 02900.

C. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation.

3.17 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I specified below shall not be considered a substitute for the Contractor's responsibility to

perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

B. The Owner will perform testing and inspection (T & I) but only as a means of verification to the Owner of Contractor quality control performance.

3.18 OWNER TESTING AND INSPECTION (T&I)

A. Testing and inspection shall be either continuous or periodic as follows:
   1. Continuous: Perform in areas supporting a structure including, but not limited to, building pad area, retaining walls, etc. When continuous testing and inspection is in progress, conduct testing and inspection in areas outside building pad or structure at the frequencies stated herein. This shall include, but not limited to, the CTL requesting and reviewing GC proofrolling documentation to assure correctness and completeness of proofrolling and any associated corrective actions taken by the Contractor.
   2. Periodic: In addition to continuous inspections specified above, perform unannounced periodic testing visits as follows when continuous testing is not being performed as described above:
      a. Two days during the first week when earthwork starts in a paved area.
      b. Two days each week thereafter until earthwork is complete.

B. Test Frequency:
   1. Number of tests to be taken at each site visit shall be the test frequencies stated based on quantities or occurrences which have accumulated up to, in between, or during each periodic visit.
   2. Not less than one specified test shall be conducted each periodic visit when material has been placed since last visit.
   3. In addition, at least one specified test shall be conducted on work being placed during each periodic visit.

C. Field testing, frequency, and methods may vary as determined by and between the Owner and the CTL.

D. Work shall be performed by a Special Inspector – Technical I unless specified otherwise. Report of testing and inspection results shall be made upon the completion of testing.

E. Classification of Materials: Perform test for classification of materials used and encountered during construction in accordance with ASTM D2488 and ASTM D2487.

F. Laboratory Testing Of Materials: Perform laboratory testing of materials (Proctor, Sieve Analysis, Atterberg Limits, Consolidation Test, etc.) as specified.

G. Proofrolling: Document and explain proofrolling inspection procedures and results in the laboratory inspection report.

H. Field Density Tests (A minimum of two compaction tests are required for each layer of fill placed.)
   1. Building Subgrade Areas, Including 5'-0" Outside of Exterior Building Lines: In cut areas, not less than one compaction test for every 2,500 sq. ft and at locations along all continuous wall footings with intervals not exceeding 100 feet and at each column spread footing. In fill areas, same rate of testing for each 8-inch lift, measured loose and at locations along continuous wall footings with intervals not exceeding 100 feet and at each column spread footing.
      a. Density tests on top of building subgrade shall be performed within 48 hours prior to placement of overlying materials. If inclement weather occurs after testing, retest prior to placement of overlying materials.
   2. Paving Areas and other Areas of Construction Exclusive of Building Subgrade:
      a. In cut areas, not less than one compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.
      b. Truck Route Drives: One compaction test performed per 5,000 square feet of fill per lift.
      c. Bedding, Haunching, and Initial and Final Backfill for Utility and Storm Sewer Trenches: Intervals not exceeding 200-feet of trench for every 4 to 6-inch lift of compacted trench backfill.
   3. Test Method: In-place nuclear density, ASTM D6938.

I. Observation and Inspection:
   1. Observe all subgrades/excavation bases below footings and slabs and verify design bearing capacity is achieved as required. Work shall be performed by a Special Inspector – Technical II.
   2. Observe and document presence of groundwater within excavations.

END OF SECTION

SECTION 02318 - ROCK EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removal including, drilling, blasting, and protection of rock excavation.

B. Related Requirements:
   1. Section 02230 – Site Clearing. Clearing of trees, brush, and vegetation prior to excavation.
   2. Section 02300 – Earthwork: Excavation, filling, and compaction of earth materials and rock fill.

1.2 [RESERVED]

1.3 REFERENCES

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

B. National Fire Protection Association (NFPA)
   1. NFPA495 - Code for Manufacturing, Transportation, Storage, And Use of Explosive Material

C. United States Department of Interior, Bureau of Mines
   1. Seismic Effects of Blasting

D. Occupational Safety & Health Administration (OSHA)
   1. 29CFR1910.109 - Explosives and Blasting Agents

1.4 DEFINITIONS

A. Rock Excavation: Removal of igneous, metamorphic, or sedimentary rock or stone, boulders over two cubic yards in volume in open areas and one cubic yard in volume in trenches; and masonry, concrete, or solid frozen soil that cannot be removed by rippers or other mechanical methods and, therefore, requires drilling and blasting.
   1. The excavation and disposal of all "Rock Excavation" that is indicated by the Soils Report shall be considered unclassified excavation and shall be included with site work grading as part of the lump sum base bid.
   2. If "Rock Excavation" is required that is not indicated by the Soils Report, the Owner shall be notified prior to such rock excavation, and he must then visit the site and verify the necessity for excess "Rock Excavation," determine an estimated quantity and provide the Contractor written approval to proceed. In the event the estimated quantity is exceeded, the Owner shall again be notified to establish a revised estimated quantity and authorize the Contractor to proceed. Payment for the authorized work shall be by a Change Order to the Contract. .

B. Trenches: Excavations having vertical sides whose depths exceed its width, made for storm water drainage, sanitary sewer, water, and gas pipes, electric, communications, and steam conduits, and related uses.

1.5 SUBMITTALS

A. Submit Blasting Plan prior to any blasting and Monitoring Reports to the Owner and Governing Agencies for review.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA495, Bureau of Mines Seismic Effects of Blasting, and OSHA 29CFR1910.109 as applicable.

B. Comply with all applicable laws, rules, ordinances and regulations of the Federal, State and local regulatory authorities and insurers that govern the licensing, transportation, storage, handling, use, and disposition of explosives.

C. Prior to rock excavation, obtain and pay for all powder and blasting permits and licenses from regulatory agencies.

D. If blasting is required or undertaken, the responsible Subcontractor shall be licensed in the State and shall possess a current blasting license issued by the appropriate regulatory authority and be permitted for the transportation of explosives if required.

E. In case of conflict between regulations or between regulations and Specifications, the Contractor shall comply with the strictest applicable codes, regulations or Specifications.

1.7 SITE CONDITIONS

A. Environmental Requirements: Determine environmental effects associated with proposed work and safeguard those concerns as regulated by law and local governing agencies by reasonable and practical methods.

B. Existing Conditions: The Contractor shall be responsible for any and all damage and/or injury from the use of explosives. The Contractor shall save and hold harmless the Owner, Architect and Engineer from any and all claims from the use of explosives. Removal of materials of any nature by blasting shall be done in such a manner and at such times as to avoid damage affecting integrity of existing construction and damage to new or existing dwellings, structures and water wells in or adjacent to the area of the work. It shall be the Contractor's responsibility to determine the method of operation to ensure desired results and integrity of completed work. All damage caused by the Contractor's blasting operations shall be repaired to the full satisfaction of the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Explosives, detonator/delay device, and blast mat materials shall be type recommended by explosive supplier and shall comply with requirements specified herein.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify site conditions and note subsurface conditions affecting work of this section.

B. Identify required lines, levels, and elevations that will determine extent of proposed removals.

3.2 ROCK EXCAVATION

A. Cut rock to form level bearing at bottom of footing and trench excavations. Remove shaled layers to provide sound and unshattered base for footings or foundations. Contractor shall consider reuse of excavated materials on site in accordance with Section 02300. If material cannot be utilized on site, dispose of material offsite.

B. If placed in embankments, perform rock excavation in manner that will produce material of such size as in accordance with Section 02300. Remove rock to allow for construction and/or installation of the site and building improvements as indicated on Construction Drawings. Remove loose or shattered rock, overhanging ledges and boulders which might dislodge.

C. Use lean concrete or suitable materials as directed by registered geotechnical engineer to replace rock overblast or over excavation in building and expansion area to facilitate placement of utilities and foundations systems.

3.3 ROCK BLASTING

A. General
1. The drilling and blasting methods and programs shall be those necessary to accomplish any and all rock excavation required for completion of the improvements shown on the Construction Drawings in accordance with the procedures specified herein. Do not use explosives as a primary means of transporting material outside the excavated prism.
2. Blasting work shall be performed only with necessary permits from all regulatory authorities and after completion of the preblast survey. Blasting work shall take place only after persons in the vicinity have been notified and have reached positions of safety. Take appropriate precautions to prevent all persons from entering the blasting area. Use methods and programs that will prevent damage to, but not limited to, adjacent dwellings, structures, public domain, natural resources, habitat, existing wells and landscape features and that will minimize the scattering of rock, stumps or other debris. All affected roadways shall be inspected, cleared, and opened to traffic within 1 hour of completed blasting or as required by governing authorities.
3. Complete all blasting with experienced powdermen licensed to use explosives in the State.
4. Conduct blasting at such hours so as not to disrupt surrounding residences and businesses, and in accordance with Federal, state and local regulations and/or ordinances with regard to noise.
5. Take all precautions necessary to warn and/or protect any individuals exposed to his operations prior to any blasting. Blasting mats or other approved flyrock protection shall be employed as necessary to protect areas adjacent to blasting.
6. Develop and maintain records covering pertinent data on the location, depth and area of the blast, the diameter, spacing, depth, overdepth, pattern, amount, distribution and powder factor for the explosives used per hole and per blast; the sequence and pattern delays, and description and purpose of special methods. Provide a copy of the records to the Owner upon the Owner's request. Receipt and acceptance by the Owner of blasting data will not relieve the Contractor of responsibility to produce satisfactory results as set forth in these specifications. Drilling and blasting shall be done only to the depth, amount and at such locations, with explosives of such quantity, distribution, and density that will not produce unsafe or damage rock surfaces or damage rock beyond the prescribed excavation limits. The Contractor shall be responsible for the cost of removal of overblast and also for the cost of placement and compaction of suitable replacement fill where overblast removal is required or occurs.
7. When a drilling and blasting program results in damage to the excavation or unacceptable peak particle velocity or frequency values as specified herein, the Contractor will be required to devise and employ revised methods that will prevent such damage or unacceptable ground motions at no cost to the Owner. The revisions may include special methods such as presplit and zone blasting, shallow lifts, reduction in size of individual blasts, small diameter blast holes, closely spaced blast holes, reduction of explosives, greater distribution of explosives by use of decking and primacord or variation in density of explosives and chemical or mechanical splitting of the rock.

B. Explosives
1. Take special precautions for proper use of explosives to prevent harm to human life and damage to surface structures, utility lines, or other subsurface structures.
2. Store, handle, and employ explosives in accordance with Federal, state and local regulations, or, in the absence of such, in accordance with the provisions of the NFPA and OSHA.

C. Blasting Vibration And Limit Criteria
1. The amount of vibration, frequency and overpressure generated by blasting shall not exceed regulatory statutes or directives established by State, local or other authorities. In no case shall the maximum Peak Particle Velocity (PPV) exceed the limits indicated on Figure B-1, Appendix B, of the United States Bureau of Mines Report of Investigations, RI 8507, 1980 or latest edition.
2. The peak airblast overpressure measured at the location of the nearest occupied, aboveground structure (considering wind direction) shall not exceed 0.014 psi.

D. Preblast Survey
1. General:

a. Conduct a preblast survey prior to initiating blasting work. Preblast survey shall be performed by a registered Professional Engineer or specialized consultant licensed in the State of the work covered under this contract and specialized in conducting preblast surveys.

b. The preconstruction/preblast survey shall consist of documenting conditions of all existing dwellings and structures located within a minimum of 500 feet of the limits of all work requiring rock blasting prior to commencement of blasting or further if required by Federal, state or local regulations.

c. The purpose of the preblast survey is to determine the conditions of existing dwellings, structures and water supply wells and document any pre-existing defects and other physical factors that could reasonably be affected by the blasting. Structures such as dams, ponds, pipelines, cables and transmission lines, cisterns, structures of historical significance, and/or structures with unusually costly or vulnerable contents shall be included. The preblast survey shall also note the nature and sensitivity of livestock that may be affected by the blasting.

2. Examination of and Preparation for Survey:

a. The Contractor shall contact the property owners (or their legal representative) of properties within a minimum of 500 feet of the limits of all blasting work in order to obtain permission to conduct a survey of their property. If the property owner does not grant the Contractor permission to conduct the survey, the Contractor shall contact the property owner a second time by registered mail/return receipt requested. The second request for permission to conduct the survey shall include a description of the survey to be performed and the purpose of the survey. At least 72 hours prior to start of blasting work, notify the appropriate local regulatory authority of any property owners who refuse access for the preconstruction survey.

b. Notify the property owners at least 48 hours prior to conducting the preblast survey. After completion of the survey, two copies of the preblast report shall be submitted to the appropriate local regulatory authority for their reference if required. Additionally, one copy shall be kept on file at the location of the project and one copy provided to the Owner upon request.

3. Method:

a. The preblast survey shall include a detailed examination of the interior and exterior of structures located within a minimum of 500 feet of the limits of blasting work. Color photographs, videotapes, and written descriptions shall be taken as required to document the condition of areas within the limits of the survey area. Particular note shall be made of evident structural faults or deficiencies, or recent repairs.

b. The preblast survey shall also include an assessment of water supply wells located within a minimum 500 feet of the limits of all blasting work. This assessment shall include the following items:

1) Information regarding the date of construction of the well, depth, method of construction, yield, water quality and any other existing available data will be requested from each well owner and/or the installer, provided the installer is known.

2) A short duration pump test shall be performed on each well utilizing the existing pump that services each well. The pump shall be activated, the volume of water measured and the drawdown in the well measured for a 1-hour or less period until approximate steady state conditions are achieved. The data obtained from these measurements shall be used to estimate the approximate yield of each well.

3) Upon completion of the above-described short duration pump test, obtain a groundwater sample from the well and submit to a State certified water quality laboratory. Laboratory shall analyze sample for iron, manganese, total dissolved solids, turbidity and total coliform.

4. Survey Report:

a. The Contractor shall prepare a written report summarizing the results of the preblast survey. The final written report shall be signed and sealed by the Contractor's qualified inspector. The report shall contain the following:

1) Location and description of each property
2) Descriptions of the conditions of the on-site elements
3) Summary of the visual inspection
4) Color photographs, sketches, and videotape with vocal summary
5) All data developed from the water supply well assessment

b. Provide videotapes to include supplemental information, as required. Pictorial documentation shall be of professional quality and shall be provided with a scale, where practicable. Clearly label pictorial documentation with an identification number, name of the project and the Engineer or qualified

person conducting the survey, name of the property owner, date the picture or video tape was taken, and sufficient information to determine the location of the area in question.

c. The Contractor's inspector shall immediately report in writing to the Contractor any findings that, in his opinion, indicate that any structure or well will be adversely affected by the required construction and blasting.

d. If, during the course of construction and blasting, the Contractor is requested by an adjacent property owner to view alleged damage to property, the Contractor shall give written notice to the Owner prior to the Contractor's visit to the adjacent owners property.

E. Blast Monitoring:

1. Contractor shall perform seismic blast monitoring in accordance with State and local regulations.
2. Contractor shall provide monitoring of blasting vibrations and over-pressures to allow evaluation of compliance with the specified vibration/over-pressures to criteria. As a minimum, the Contractor will monitor each blast as follows:
   a. Monitor vibrations at the exterior walls of all structures within 500 feet of each blast location.
   b. If no structures are located within 500 feet of the blast location, monitor vibrations at three equally spaced radial points located a minimum of 500 feet from the blast locations.
   c. Monitor over-pressures for all structures within a minimum 500 feet of the blast.
3. If requested by the Owner, report vibration/overpressure-monitoring results to the Owner within two hours of blasting. Monitoring performed by the Contractor does not relieve the Contractor of responsibility for control of vibration and overpressure during blasting operations.

3.4 ROCK CUT FACE EXCAVATION

A. The slope of the soil above the top of any permanently exposed rock cut face shall be no steeper than 3(H):1(V) unless otherwise noted on the Construction Drawings. Slope of the rock face shall meet the requirements below.

TYPE OF ROCK	SLOPE (Horizontal to Vertical)
Solid limestone or sandstone	1:1.2
Interbedded limestone, sandstone or shale	1:1.25
Layered shale (no hard rock)	1:1.5

B. Benches of at least ten feet in width at a maximum of twenty feet in elevation intervals or as noted on the Construction Drawings. The benches shall serve to provide rock traps and divert water from the rock face.

3.5 ROCK TRAP

A. Locate rock traps at the base of permanently exposed rock slopes and construct as indicated in the Construction Documents or Blasting Plan.

3.6 OVEREXCAVATION AND BACKFILL

A. Over excavation which is required to remove unsuitable natural undisturbed bedrock weakened by weathering or other cause not inflicted by the Contractor shall be immediately reported to the Owner and performed as directed by the Owner, and the theoretical lines and grades will be adjusted accordingly. Material outside the excavation limits which are disturbed due to the fault or negligence of the Contractor or due to his failure to exercise sound construction practices, shall be either replaced by the Contractor with suitable materials (earth or concrete), or bolted, or both as directed, at no cost to the Owner.

END OF SECTION

SECTION 02340 - SOIL STABILIZATION

PART 1 GENERAL

1.1 SUMMARY

1.2 It is anticipated that areas of the site will require subgrade stabilization. These areas are to be identified in the field by proving methods such as proof rolling, as further described in Section 02300 – Earthwork. Areas that do not exhibit the necessary stability are required to be stabilized as needed to provide adequate support for the intended improvements. Approved options for stabilizing these areas are presented herein. The means and methods, as well as the implementation of the stabilization, are the responsibility of the contractor. Opinions given by the Engineer or the Owner's CTL regarding the Contractor's stabilization method do not constitute an approval for the method of the stabilization. If the initial method selected by the contractor does not produce an acceptable subgrade subsequent repairs as may be needed, are to be included in the base bid and no additional compensation will be provided.

A. Section Includes:
   1. Excavation, treatment, and backfilling of subgrade for lime, cement, fly ash, or bridge lift stabilization.
   2. Geotextile fabric and geogrid for stabilization of subgrade.

B. Related Requirements:
   1. Section 02300 – Earthwork

1.3 REFERENCES

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

B. ASTM International (ASTM):
   1. ASTM C150 - Portland Cement.
   2. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concre
   3. ASTM C977 - Quicklime and Hydrated Lime for Soil Stabilization.

C. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO M216 - Lime for Soil Stabilization.

D. National Lime Association (NLA):
   1. NLA Bulletin 326 - Lime Stabilization Construction Manual.

E. Oklahoma Department of Transportation (ODOT):
   1. Standard Specifications for Highway Construction, 2019 Edition.

F. Occupational Safety and Health Administration (OSHA):
   1. OSHA 01926.1153 Respirable Crystalline Silica.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 degrees Fahrenheit.

1.5 SUBMITTALS

A. Submit 30-pound sample of each material to be used at the site in airtight containers to the Construction Testing Laboratory (CTL) or submit gradation and certification of material that is to be used to the CTL for review.

B. Submit name of each materials supplier and specific type and source of each material. Obtain approval of Owner prior to change in source.

C. Submit mix designs, materials mix ratio, detailed descriptions of the proposed procedures and equipment to be used, documentation of projects successfully completed within the last five (5) years and laboratory test data to the Engineer 4 weeks prior to beginning stabilization activities. Certify materials and mix ratios will achieve the specified requirements as indicated in the Construction Documents or as specified by state and local agencies for soil stabilization if not stated in the Construction Documents.

D. Submit approved mix designs, materials mix ratio, and laboratory test data to the CTL prior to commencing stabilization activities.

PART 2 PRODUCTS

PART 1 -
PART 2 -
SCHEDULE 0 -
PRODUCT DATA SHEET 0 -

2.1 MANUFACTURERS

A. Provide products from one of the following manufacturers as specified in the Materials paragraph below:
1. TenCate Geosynthetics North America (Mirafi), Pendergrass, GA., (706) 693-2226, www.tencate.com
2. Hanes Geo Components (WEBTEC), Winston Salem, NC. (336) 747-1600, www.hanesgeo.com
3. Tensar International Corp., Atlanta, GA. (888) 828-5126, www.tensarcorp.com
4. Thrace-LINQ Inc., Summerville, SC (843) 873-5800, www.thracelinq.com
5. DuPont (Typar). Summerville, SC (843) 832-6860, www.typargeo.com
6. Synteen Technical Fabrics, Lancaster, SC (800) 796-8336, www.synteen.com

2.2 MATERIALS

A. Soil Treatment Materials:
1. Hydrated Lime: ASTM C977 or AASHTO M216.
2. Portland Cement: ASTM C150, Type I.
3. Fly Ash: ASTM C618.

B. Aggregate:
1. Coarse Aggregate: Crushed carbonate, crushed gravel, crushed air-cooled slag, granulated slag, a mixture of crushed and granulated slag, or other types of suitable material meeting the following gradation requirements:

Sieve Size	Percent Passing
2 inches	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	7-30
No. 200	0-5

2. Fine Aggregate: Sand – Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter meeting the following gradation requirements:
3.

Sieve Size	Percent Passing
No. 4	90-100
No. 50	7-40
No. 200	0-5

C. Subsoil: Existing to be reused.

D. Bridge Lift Material: Surge stone, granular fill, or shot rock fill.

2.3 ACCESSORIES

A. Curing Seal: Asphalt Emulsion Primer.

B. Geotextile Fabric for Stabilization: Provide one of the following:
1. Mirafi HP 370 or HP 570, by TenCate.
2. SF40 or SF65, by DuPont.
3. GTF-200 or 300, by Thrace-LINQ.
4. TerraTex HD, by Hanes.

C. Geogrid for Stabilization: Provide one of the following:
1. Biaxial Geogrid Type 1 (formerly BX 1100), by Tensar.
2. Biaxial Geogrid Type 2 (formerly BX 1200), by Tensar.
3. Mirafi BXG 11, by TenCate.
4. Mirafi BXG 12, by TenCate.
5. SF 11, by Synteen.
6. SF 12, by Synteen

PART 3 EXECUTION
PART 3 -
SCHEDULE 0 -
PRODUCT DATA SHEET 0 -

3.1 PREPARATION

A. Obtain approval of mix design before proceeding with placement.

B. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.

C. Proofroll subgrade to identify areas in need of stabilization.

D. Contractor shall assume all responsibility for proper mix design. Contractor shall perform necessary soil tests to confirm soluble sulfates are not present within soil matrix prior to using any material containing calcium due to possibility of sulfate induced heave. If a product containing calcium is utilized and soil heave issues arise either during or after construction it shall be the responsibility of the Contractor to remediate affected areas in accordance with the owner's requirements.

3.2 EQUIPMENT

A. Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting of material.

3.3 EXCAVATION

A. Excavate subsoil to depth sufficient to accommodate soil stabilization.

B. Remove lumped subsoil, boulders, and rock that interfere with achieving uniform subsoil conditions.

C. Do not excavate within normal 45 degree bearing splay of any foundation.

D. Notify Construction Manager of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.

E. Correct areas over-excavated in accordance with Section 02300.

F. Remove excess excavated material from site.

3.4 GEOTEXTILE FABRIC AND/OR GEOGRID

A. Place geotextile fabric and/or geogrid over subsoil surface, lap edges and ends in accordance with manufacturer's recommendations in those areas that are shown on Construction Drawings or in those areas that need additional stabilization prior to placement of base course. Bridge lift sections may require the use of geotextile fabric and/or geogrid for stabilization prior to placement of fill.

B. Place geotextile fabric and/or geogrid in accordance with manufacturer's recommendations.

3.5 SOIL TREATMENT AND BACKFILLING

A. Lime Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with hydrated lime in accordance with state highway department specifications.

B. Cement Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with Portland cement in accordance with state highway department specifications.

C. Fly Ash Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with fly ash in accordance with state highway department specifications.

D. Bridge Lifts: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade by application of a bridge lift. Bridging over existing soils shall be acceptable only when approved in writing by the Owner. Place geotextile fabric or geogrid over existing soils to be bridged. The geotextile fabric or geogrid selected shall be appropriate for the bridge lift material being placed. Place bridge lift over geotextile fabric or geogrid. Surge stone and shot rock will be approved by the Owner's representative on a submittal basis. The Owner and the Owner's representative shall have sole discretion as to the acceptability of all submittals. Bridge lifts within the building pad area will not be accepted.

E. Backfill and compaction of treated subsoil shall be in accordance with Sections 02300.

F. Maintain optimum moisture of mixed materials to attain required stabilization and compaction.

G. Finish subgrade surface in accordance with Section 02300.

H. Remove surplus mix materials from site.

3.6 CURING

A. Immediately following compaction of mix, seal top surface with curing seal.

B. Do not permit traffic for 72 hours after sealing top surface.

3.7 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements.

B. END OF SECTION

Stormwater Pollution Prevention Plan (SWP3)

Authorization No. OKR10 34985

For Construction Activities At:

The Crossroads at NE Grand Blvd
2101 NE Grand Blvd
Oklahoma City, OK 73111
Project Site Telephone Number Not Yet Determined

SWP3 Prepared For:

Crossroads at NE Grand Blvd, LP
Ryan Hamilton
3556 S. Culpepper Circle, Suite 4
Springfield, MO 65804
(417) 882-1701

SWP3 Prepared By:

Carlson Consulting Engineers, Inc.
Mike Dedman
7068 Ledgestone Commons
Bartlett, TN 38133
(901) 384-0404

SWP3 Preparation Date:

12/21/2023

Estimated Project Dates:

Project Start Date: 03/01/2024

Project Completion Date: 03/01/2025

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Table of Contents

Section 1: Stormwater Team and Project/Site Information

1.1 Stormwater Team

Stormwater team members/operators are responsible for overseeing development of the SWP3, making any modifications to it, implementing and maintaining control measures, taking corrective actions when required, performing site inspection and monitoring, supervising pollution prevention and waste management activities, providing staff training, and communicating changes in the SWP3 to the people working on the site. The following personnel, along with their role and responsibility, will be part of the **stormwater team** for my construction site:

Team Lead #1 **Primary Operator**	**Roles & Responsibilities**
Name: Ryan Hamilton	Master Developer. Responsible for hiring design consultants/contractors.
Title: Manager	
Phone #: (412) 882-1701	

Team Lead #2 **Secondary Operator**	**Roles & Responsibilities**
Name:	
Title:	
Phone #:	

Team Lead #3 **(specify in Title)**	**Roles & Responsibilities**
Name: Mike Dedman	Civil Engineering Consultant. Responsible for preparing the SWP3 & making and modifications to it.
Title: Project Manager	
Phone #: (901) 384-0404	

Team Member #4 **(specify in Title)**	**Roles & Responsibilities**
Name:	
Title:	
Phone #:	

Team Member #5 **(Specify in Title)**	**Roles & Responsibilities**
Name:	
Title:	
Phone #:	

[Repeat as necessary]

1.2 Nature of Construction Activity and Project Information

Project/Site Name and Address	
Project/Site Name: The Crossroads at NE Grand Blvd	
Project/Site Street/Location: 2101 NE Grand Blvd	
City: Oklahoma City	**County**: Oklahoma
State: Oklahoma	**ZIP Code**: 73111

General Description of the Project/Site: This SWP3 is for the project to construct The Crossroads at NE Grand Blvd, an apartment complex in Oklahoma City. The project site is 4.84 ac in total, and lies at 2101 NE Grand Blvd. The site consists mostly of grass with a few trees on the perimeters. The existing soils on the project site are silty loams and sandy clays.

Estimated project start date: 3/1/2024	
Estimated project end date: 3/1/2025	
Total area of the construction site: 4.84	**(acres)**
Estimated area to be disturbed: 4.84	**(acres)**
Estimated current impervious area at the site: 0	**(acres)**
Estimated impervious area after construction: 2.95	**(acres)**
Pre-construction runoff coefficient of the site: 72	
Post-construction runoff coefficient of the site: 84	
Purpose of the Construction Project/Site: ☒ Residential ☐ Commercial ☐ Wind Farm ☐ Road/Bridge ☐ Other(s), please specify: Click here to enter text.	

Project Latitude/Longitude **(**Physical entrance **OR** for linear project, include latitude/longitude of **start and end points)**	
Latitude:	**Longitude:**
1. _ _ ° _ _ ' _ _._ _ '' N (degrees, minutes, seconds)	1. _ _ ° _ _ ' _ _._ _ '' W (degrees, minutes, seconds)
2. _ _ . _ _ _ _ ° N (decimal)	2. _ _ . _ _ _ _ ° W (decimal)
Latitude:	**Longitude:**
1. _ _ ° _ _ ' _ _._ _ '' N (degrees, minutes, seconds)	1. _ _ ° _ _ ' _ _._ _ '' W (degrees, minutes, seconds)
2. _ _ . _ _ _ _ ° N (decimal)	2. _ _ . _ _ _ _ ° W (decimal)
Method for determining latitude/longitude:	
☐ DEQ Flex-viewer ☐ EPA Website ☐ USGS topographic map ☒ GPS	

Description of soil type(s) and fill materials:
There are four soil types for the project site: Norge-Uban Land Complex (NoUC), Teller-Urban Land Complex (TlUD), Urban Land (URB), and Ashport Silt Loam (AstA). The Norge-Urban Complex has a slope of 1%-5%, the Teller-Urban Complex has a slope of 1%-8%, the Urban Land has a slope of 0% and the Ashport Silt Loam has a slope of 0%-1%.

Description of slopes (describe existing slopes and note any changes due to grading or fill activities):
The existing grade generally slopes 5% from east to west.

Description of drainage patterns (describe existing drainage patterns and note any changes dues to grading or fill activities): The stormwater drainage for this site flows via overland flow to a ditch on the adjacent property to the west. The stormwater pattern will be maintained post construction though a detention pond will be installed on west side of the property to control flowrate.

Description of existing or baseline vegetation on or immediately surrounding the project area:
This site consists of grass and a few tress on the perimeters.

Climate/Rainfall Patterns - check the box that applies:

☐ (0-20" annual rainfall) ☐ (20" -30" annual rainfall)

☒ (30"-40" annual rainfall) ☐ (40" -50" annual rainfall)

*(**Note:** Annual rainfall data can be found at the following link: https://www.mesonet.org/index.php/weather/category/rainfall)*

1.3 Operators and Contactor's Contact Information

Operator(s) Information:		
Name: The Crossroads at NE Grand Blvd, LP		
Address: 3556 S. Culpepper Circle, Suite 4		
City: Springfield	State: MO	Zip Code: 65804
Operator's Point of Contact: Ryan Hamilton		
Telephone Number: (417) 882-1701		
Email address: ryanhamilton@hamiltoncorporation.com	Fax number:	

(Repeat for multiple operators by copying and pasting the above rows)

Contractor's Information:		
Name:		
Address:		
City:	State:	Zip Code:
Telephone Number:		
Email address:	Fax number:	

(If owner is a separate entity)

Sub-Contractor's Information:		
Name:		
Address:		
City:	State:	Zip Code:
Telephone Number:		
Email address:	Fax number:	

(If owner is a separate entity)

SWP3 Contact(s):	
SWP3 Contact Name (Primary): Mike Dedman	
Telephone number: (901) 384-0404	
Email address: mikededman@carlsonconsulting.net	Fax number:
SWP3 Contact Name (Secondary): Joseph Parsley	
Telephone number: (901)-384-0404	
Email address: josephparsley@carlsonconsulting.net	Fax number:

1.4 Construction Support Activities (*if applicable*)

List of construction support activities that will be present at the construction project/site:

*(**Note-1: Locate** all the construction support activities on the site map (included in Section 2.2 in SWP3 template). **Appropriate/additional** controls & measures are required for construction support activities. Support activities should not be located within the watershed of an Outstanding Resource Water (ORW). See Addendum B of permit for ORW areas.*

***Note-2:** Include **Section 8** if you have Concrete Batch Plant and/or Asphalt Plant as construction support activities at your construction site. Exclude/delete Section 8 if you don't have Concrete Batch Plant and/or Asphalt Plant at your construction site.)*

Type of Construction Support Activities [1]	Will be Present at the Construction Site?
Equipment Staging Yards	☒ Yes ☐ No
Material Storage Areas	☒ Yes ☐ No
Excavated Material Disposal Areas	☐ Yes ☒ No
Borrow Areas	☐ Yes ☒ No
Concrete Batch Plant [2]	☐ Yes ☒ No
Asphalt Plant [2]	☐ Yes ☒ No

1.5 Sequence of Construction Activities

*(**Note:** You may edit sequence of construction activities in the following table to reflect your project's sequences along with estimated start date and duration. Make sure to update for all locations/operators involved.)*

No.	Sequence of Construction Activities	Estimated Start Date	Duration (in Days)
1.	INSTALL STONE CONSTRUCTION EXIT AND SWPPP INFORMATION SIGN.	**3/01/23**	**2**
2.	INSTALL SILT FENCE IN ALL AREAS SHOWN. BMP's MUST BE IN PLACE PRIOR TO SUBGRADE DISTURBING ACTIVITIES.	**3/01/23**	**2**
3.	PREPARE CONTRACTOR TEMPORARY STAGING AND STORAGE AREA.	**3/05/23**	**1**
4.	SEQUENCE GRADING ACTIVITIES TO MINIMIZE EXPOSED AREAS.	**3/08/23**	**1**
5.	CONSTRUCT DETENTION BASIN TO USE AS A SEDIMENT TRAP.	**3/08/23**	**10**
6.	BEGIN GRADING ACTIVITIES IN THE BUILDING AND PARKING AREAS.	**3/08/23**	**14**
7.	TEMPORARILY STABILIZE, THROUGHOUT CONSTRUCTION, DENUDED AREAS THAT WILL BE INACTIVE FOR 14 DAYS OR MORE. ALL AREAS AT FINAL GRADE MUST BE PAVED OR STABILIZED WITH SPECIFIED GROUNDCOVER PER LANDSCAPE PLAN WITHIN 14 DAYS AFTER COMPLETION OF WORK IN THESE AREAS.	**As Needed**	
8.	INSTALL, REPLACE, REPAIR, OR MAINTAIN SILT FENCE, STONE CONSTRUCTION EXIT, AND SWPPP INFORMATION SIGN AS NEEDED.	**As Needed**	
9.	MAINTAIN TEMPORARY STAGING AND STORAGE AREA AS NEEDED.	**AS Needed**	
10.	BEGIN INSTALLATION OF STORMWATER PIPES WITH INLET PROTECTION AS SOON AS POSSIBLE FOR USE AS SEDIMENT TRAPS.	**5/08/23**	**10**
11.	COMPLETE ALL GRADING ACTIVITIES AT THIS TIME.		
12.	IMMEDIATELY INSTALL PERMANENT GROUNDCOVER, FERTILIZE, MULCH, AND WATER AREAS IN ACCORDANCE WITH THE PLANTING PLAN AND SITEWORK SPECIFICATIONS.		
13.	CONTINUE INSPECTION REQUIREMENTS UNTIL FINAL STABILIZATION HAS BEEN OBTAINED AND THE NOTICE OF TERMINATION HAS BEEN FILED PER THE GENERAL PERMIT.		

1.6 Allowable Non-Stormwater Discharges

List of allowable non-stormwater discharges that will be present at the construction site:

*(**Note:** You are required to identify the likely locations of these allowable non-stormwater discharges on your **site maps**.)*

No.	Type of Allowable Non-Stormwater Discharge	Likely to be Present at Construction Site?
1.	Fire hydrant flushing	☐ Yes ☒ No
2.	Waters used to wash vehicles and equipment	☒ Yes ☐ No
3.	Water used to control dust	☒ Yes ☐ No
4.	Potable water including uncontaminated water line flushing	☒ Yes ☐ No
5.	Routine external building wash down	☒ Yes ☐ No
6.	Pavement washing waters	☒ Yes ☐ No
7.	Uncontaminated air conditioning or compressor condensate	☒ Yes ☐ No
8.	Uncontaminated, non-turbid discharges of ground water or spring water	☐ Yes ☒ No
9.	Foundation or footing drains	☐ Yes ☒ No
10.	Landscape Irrigation	☒ Yes ☐ No
11.	Discharges from emergency fire-fighting activities	☐ Yes ☒ No
12.	Uncontaminated construction dewatering water	☒ Yes ☐ No

Section 2: Site Description and Site Map

2.1 Receiving Waters/Discharge Information

Receiving Water body's Information: Stormwater discharges from this construction project will flow to the following receiving water body(ies).

No.	Name of the Receiving Waters	Is this surface water listed as impaired?	Cause of Impairment [1]	Has a TMDL [2] been completed?	TMDL Pollutant(s)
1.	North Canadian River	☒ Yes ☐ No	Enterococcus	☐ Yes ☒ No	
2.		☐ Yes ☐ No		☐ Yes ☐ No	
3.		☐ Yes ☐ No		☐ Yes ☐ No	
4.		☐ Yes ☐ No		☐ Yes ☐ No	
5.		☐ Yes ☐ No		☐ Yes ☐ No	

*(**Note:** Name of the receiving waters can be found at the DEQ website using the following link: https://gis.deq.ok.gov/maps. Cause of impairment and TMDL information can be found at the DEQ website using the following link: https://www.deq.ok.gov/water-quality-division/watershed-planning/integrated-report/)*

[1] *If you discharge to an impaired water that is impaired for **Sediment and/or Turbidity and located within 1 mile** (as described in Part 3.4 of OKR10 permit), you are required to comply with the additional requirements in Part 4.6.B of OKR10 permit.*

[2] *Total Maximum Daily Load (TMDL)*

Does the project/site discharge stormwater to an **Aquatic Resource of Concern (ARC)** or an **Outstanding Resource Water (ORW)**?

☐ Yes ☒ No, If yes, I must comply with specific buffer requirements (*see Table 4-1 and Part 4.6.B of OKR10 permit*) and stabilization deadline requirements (*see Parts 4.3.A and 4.6.B of OKR10 permit*).

*(**Note:** ARC maps can be found at the following link: https://www.deq.ok.gov/wp-content/uploads/water-division/OKR10-Sensative-Area.png ORW maps can be found in Addendum B of OKR10 permit)*

Does the project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)?

☐ Yes ☒ No

If yes, what is the name of the MS4 operator? _____

Note: *See Table C.7 in the MS4 Permit Factsheet, link: https://www.deq.ok.gov/wp-content/uploads/water-division/2021_OKR04_Factsheet.pdf .*

2.2 General Location Map

Provide a general location map (e.g., DEQ GIS Data Viewer or U.S. Geological Survey (USGS), link: https://gis.deq.ok.gov/maps/, quadrangle map or aerial image from the internet) with enough detail to identify the location of your facility and all receiving waters for your stormwater discharges within one mile of the construction site (*see Part 5.3.F of the OKR10 permit*).

☒ A **general location map** is included in **Attachment A** of this SWP3.

2.3 Site Map

SWP3 includes a legible site map or series of site maps/erosion and sediment control plans showing all the features (*see also Part 5.3.F of OKR10 permit*) listed below:

- Pre-construction topographic view including vegetation, showing the location of
  - ✓ all surface water bodies within one mile of the site (including wetlands); and
  - ✓ direction of stormwater flow across the construction site (i.e., use arrows to show which direction stormwater will flow);
- Boundaries of property and identify the location(s) of:
  - ✓ Earth-disturbing activities;
  - ✓ boundary lines of any natural buffers;
  - ✓ approximate slopes before and after major grading activities,
  - ✓ areas of steep slopes, surface water crossings, Structures and other impervious surfaces upon completion of construction
- Locations of all structural and nonstructural controls/BMPs identified in the plan including showing the location of:
  - ✓ construction entrance/exit,
  - ✓ concrete wash-out area,
  - ✓ construction support activity areas such as locations of off-site materials, waste, borrow area, or equipment storage area;
  - ✓ stockpiled materials (sediment, topsoil, etc.), and
  - ✓ locations of all potential pollutant-generating activities;
- Locations where stormwater and allowable non-stormwater will be discharged off-site (should be continuously updated); sampling locations if project is subject to numeric limitations due to presence of an asphalt batch plant;
- Location where stabilization practices are expected to occur; Areas where final stabilization will be accomplished and no further construction phase permit requirements apply.

☒ The **site map or series of maps** for this facility can be found in **Attachment B** of this SWP3 showing all the above-mentioned features in Part 2.3 of this SWP3.

Section 3: Construction Site Pollutants

3.1 Pollutant-Generating Activities

Potential sources of sediment to stormwater runoff:

Clearing and grubbing operations, grading and site excavation operations, vehicle tracking, topsoil stripping and stockpiling, landscaping operations

Potential sources of pollutants, other than sediment, to stormwater runoff:

- Combined Staging Area - small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.
- Materials Storage Area - general building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
- Construction Activity - paving, curb/gutter installation, concrete pouring/mortar/stucco, and building construction
- Concrete Washout Area

3.2 List of Potential Pollutants

List of Pollutants that can be present at the construction site:

*(**Note:** Check all the boxes applicable to your project site; include additional pollutants, if necessary, in the space below)*

Check	Materials/ Chemicals	Stormwater Pollutants	Location at the Site
☒	Dirt from land disturbed area	Sediment	
☒	Pesticides (insecticides, fungicides, herbicides, rodenticides)	Chlorinated hydrocarbons, organophosphates, carbonates, arsenic	
☒	Fertilizer and dirt/soil	Nitrogen, phosphorous	
☒	Plaster	Calcium sulphate, calcium carbonate, sulfuric acid	
☒	Cleaning solvents	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	
☒	Asphalt	Oil, petroleum distillates	
☒	Concrete	Limestone, sand, pH, chromium	
☒	Glue, adhesives	Polymers, epoxies	
☒	Paints	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic	
☒	Curing compounds	Naphtha	
☐	Wood preservatives	Stoddard solvent, petroleum distillates, arsenic, copper, chromium	
☒	Hydraulic oil/fluids	Mineral oil	
☒	Gasoline	Benzene, ethyl benzene, toluene, xylene, MTBE	
☒	Diesel Fuel	Petroleum distillate, oil & grease, naphthalene, xylenes	
☒	Antifreeze/coolant	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	
☒	Sanitary toilets	Bacteria, parasites, and viruses	
☐			
☐			

Section 4: Compliance with Federal and State Requirements

4.1 Endangered or Threatened Species Protection

Eligibility Criterion

Under which criterion listed in NOI is the construction project/site eligible for coverage under the OKR10 permit?

*(**Note:** ARC maps can be found at the following link: https://www.deq.ok.gov/wp-content/uploads/water-division/OKR10-Sensative-Area.png*

☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E**

For reference purposes, the eligibility criteria listed in Part 2.5.B.3 of OKR10 permit are as follows:

Criterion A. Criterion A requires that proposed construction site or land disturbing activity is not located within any of the corridors of the federal or state identified aquatic resource of concern ("ARC"), and further investigation is not required.

Criterion B. Criterion B requires that the proposed construction site or land disturbing activity is located within a corridor of a federal or state identified ARC. Operators must provide and implement measures to protect the endangered or threatened species or their critical habitat; these measures must be identified in the NOI and described in the facility's SWP3.

Criterion C. Criterion C requires that the applicant use Addendum D to evaluate alternatives of buffer requirements and select equivalent sediment controls or contact DEQ for further consultation if one of those eligibility criteria under Part 2.5.B.3.b, d, ore cannot be met.

Criterion D. Criterion D requires that the applicant's federally approved construction activities are authorized by the appropriate federal or state agency and that authorization addresses the Endangered Species Act Section 7 consultation for the storm water discharge or storm water discharge-related activities. Applicants selecting option d must include documentation from U.S. Fish and Wildlife Service ("USFWS") or a qualified biologist that demonstrates Section 7 consultation has been completed. The SWP3 must comply with and be updated to include any conditions resulting from that consultation.

Criterion E. Criterion E requires that the applicant's storm water discharges and storm water discharge-related activities are already addressed in another operator's certification of eligibility that includes the applicant's project area. By certifying eligibility under this part, the applicant agrees to comply with applicable measures or controls upon which the other operator's certification was based.

Note: For Criterion B, C, D, or E, you may subject to comply with additional requirements.

4.2 Federal, State, or Local Historic Preservation Laws

Will stormwater discharges or stormwater discharge-related activities (e.g., catch basin, pond, culver, etc.) affect a property that is protected by Federal, State, or local historic preservation laws? ☐ Yes ☒ No

If yes, describe any actions taken to mitigate those effects: Click here to enter text.

Describe how this determination was made: Click here to enter text.

4.3 TMDL Requirements

If a TMDL or watershed plan or local compliance plan has been approved for the waterbody, SWP3 must include all the applicable requirements in consistent with the TMDL or watershed plan or local compliance plan that are applicable to the stormwater discharges from the construction site.

Does the construction project/site discharge stormwater into a receiving stream that has an approved TMDL or watershed plan or local compliance plan?

☐ Yes ☒ No

If yes, is there any waste load allocations (WLAs) and/or the TMDL's associated implementation plan requirements applicable to stormwater discharges from the construction activity?

☐ Yes ☐ No

If yes, SWP3 must incorporate any limitations, conditions, or requirements applicable to permittee's discharges to ensure that the waste load allocations (WLAs) and/or the TMDL's associated implementation plan will be met within any timeframe established in the TMDL report or watershed plan. Monitoring and reporting of the discharges may also be required as appropriate to ensure compliance with the TMDL or watershed plan.

Note: *Approved TMDL reports or watershed plans can be downloaded from DEQ's website at* https://www.deq.ok.gov/water-quality-division/watershed-planning/tmdl/completed-tmdls/.

Does the construction project/site discharge stormwater to the **Lake Thunderbird watershed**?

☐ Yes ☒ No

If yes, the following control measures will be used to meet the Lake Thunderbird TMDL requirements:

- ☐ **Additional Pollutant Prevention or Discharge Monitoring** - You must comply with any additional requirements established by the local MS4 municipalities;
- ☐ **Sites of Five Acres or Larger** - You must submit a copy of SWP3 to DEQ for review;
- ☐ **Vegetated Buffer** - You must ensure that a vegetated buffer of at least 100 feet is retained or successfully established or planted between the area disturbed and all receiving streams. If the nature of the construction activity or the construction site makes a buffer impossible, you must provide equivalent controls. There are exceptions from this requirement for water crossings, limited water access, and stream restoration authorized under a CWA Section 404 permit;
- ☐ **Sediment Basins** - For all drainage locations serving 5 or more acres disturbed at one time, you must use a temporary or permanent sediment basin and/or sediment traps to minimize sediment discharges;
- ☐ **Site Inspection** - You must conduct site inspections once every 7 calendar days at a minimum, and within 24 hours of a storm event of 0.5 inches or greater and within 24 hours of a discharge caused by snowmelt;
- ☐ **Corrective Actions** - You must implement corrective actions (e.g., repair, modify, or replace any stormwater control used at the site, clean up and dispose of spills, releases, or other deposits, or remedy a permit violation) by no later than 7 calendar days from the time of discovery. If it is infeasible to complete the installation or repair within 7 calendar days, you must document in your records why it is infeasible to complete the installation or repair within the 7 calendar days timeframe and document your schedule for installing the stormwater controls and making them operational as soon as practicable after the 7 days timeframe;
- ☐ **Stabilization** - You must initiate stabilization measures immediately whenever earth-disturbing activities have permanently or temporary ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. You are required to complete the stabilization activities within 7 calendar days after the permanent or temporary cessation;
- ☐ **Soil Nutrient Testing** - You are required to conduct a soil nutrient test to determine actual nutrient needs before applying fertilizer on your site. Fertilizer application must be limited to that necessary to meet actual needs on the site.
- ☐ Describe any additional measures or controls you will implement to comply with the Lake Thunderbird TMDL requirements: Click here to enter text.

Section 5: Stormwater Control Measures

The purpose of the implementation of different stormwater pollution controls is to reduce pollutants in the stormwater and the volume of stormwater leaving the construction site. All pollution control measures will be selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices.

5.1 Stabilization Practices

Type of Site Stabilization Practice(s) that will be implementing at the construction project/site (select all that apply):

☒ Temporary ☒ Permanent ☒ Vegetative ☒ Non-Vegetative

Deadline to Initiate Stabilization: I shall initiate stabilization measures **immediately** whenever earth-disturbing activities have permanently or temporarily ceased on any portion of the site and will not resume for a period of 14 or more calendar days.

Deadline to Complete Stabilization:

☒ I shall complete stabilization measures **as soon as practicable** but no later than 14 calendar days after the initiation of soil stabilization.

☐ My project/site is located in ARC/discharge to ORW; I shall complete stabilization measures **as soon as practicable** but no later than 7 calendar days after the initiation of soil stabilization.
*(**Note:** ARC maps can be found at the following link:*
https://www.deq.ok.gov/wp-content/uploads/water-division/OKR10-Sensative-Area.png
ORW maps can be found in Addendum B of OKR10 permit)

Temporary Non-Vegetative Stabilization: The following **non-vegetative** controls/BMPs will be used to temporarily stabilize exposed portions of the construction site (*select all that apply*):

☐ **Rolled erosion control products such as geotextiles, blankets or plastic cover** ☐ **Soil binders**

☒ **Straw mulch** ☐ **Wood mulch** ☐ **Compost Blanket** ☐ **Other, _____**

If any of the above-referenced controls is used to temporarily protect areas that are being vegetative stabilized, one of the effective non-vegetative cover will be used to stabilize any such exposed portions of our site.

Temporary Vegetative Stabilization: The following **vegetative** controls will be used to temporarily stabilize the exposed portions of the construction site (*select all that apply*):

☒ **Hydroseeding with mulch** ☐ **Sod** ☐ **Other, _____**

Permanent Vegetative Stabilization: The following **vegetative** controls will be used to permanently stabilize the exposed portions of the construction site (*select all that apply*):

☒ **Hydroseeding with mulch** ☒ **Sod** ☐ **Planted vegetation** ☐ **Other, _____**

One of the following criteria will be used for vegetative cover:

- Provide a vegetative cover which covers 70% or more of the vegetation prior to commencing earth-disturbing activities and no large bare areas (10 square feet).
- Immediately after seeding, you must select, design, and install non-vegetative erosion controls that provide cover (such as ***straw mulch, jute matting, and straw blankets***) to the area while vegetation is being established.

Stabilization Practices Record: A record of the dates when grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be included with the plan. ☒ Yes ☐ No

If No, explain: _____

A record of the dates when grading activities occur will be documented using the Grading & Stabilization Activity logs in **Attachment-I** of this SWP3.

5.2 Natural Buffers and/or Equivalent Sediment Controls

Buffer Compliance Alternatives

Are there any **waters of the State** that are located within 50 feet (or 100 feet if the construction site is a high priority construction site (*see Part 3.4 of OKR10 permit*) or located in Lake Thunderbird Watershed) of your construction disturbances as measured from the top of the bank to the disturbed portions of your site?

☒ Yes ☒ No

*(**Note:** Waters of the State means all named/unnamed stream, creeks, rivers, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, storm sewers and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private located within the boundary of Oklahoma State.)*

If Yes, check the compliance alternative that you have chosen:

☐ I will provide and maintain a 50 feet (or **100 feet** if the construction site is a high priority construction site or located in Lake Thunderbird Watershed) undisturbed natural buffer.

*(**Note 1:** See Table 4-1 of OKR10 permit for exceptions to above buffer requirements.)*

*(**Note 2:** You must show the boundary line of the natural buffer on your site map.)*

*(**Note 3:** You must show on your site map how all discharges from your construction disturbances through the natural buffer area will first be treated by the site's erosion and sediment controls.)*

☐ I will provide and maintain an undisturbed natural buffer that is less than 50 feet (or **100 feet** if the construction site is located in ARC or ORW or Lake Thunderbird Watershed) and is supplemented by additional erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to required undisturbed natural buffer.

*(**Note 1:** See Table 4-1 of OKR10 permit for exceptions to above buffer requirements.)*

*(**Note 2:** You must show the boundary line of the natural buffer on your site map.)*

*(**Note 3:** You must show on your site map how all discharges from your construction disturbances through the natural buffer area will first be treated by the site's erosion and sediment controls.)*

i. Width of natural buffer to be retained: _____

ii. Method used to determine equivalent sediment load reduction:

☐ Addendum-I: Buffer Guidance in OKR10 permit

a. Soil Type: _____

b. Buffer Vegetation: _____

OR

☐ Site-specific calculation

a. Model or other tool used to estimate sediment load reductions:

_____

b. Results of calculations: _____

_____

c. Description of additional erosion and sediment controls used:

_____

_____

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size; therefore, I will implement erosion and sediment controls that will achieve the sediment load reduction equivalent to a 50 feet (or 100 feet if the construction site is located in ARC or ORW or Lake Thunderbird Watershed) undisturbed natural buffer.

i. Rationale for concluding that it is infeasible to provide and maintain a natural buffer of any size:

_____

_____

ii. Method used to determine equivalent sediment load reduction:

☐ Addendum-I: Buffer Guidance in OKR10 permit

a. Soil Type: _____

b. Buffer Vegetation: _____

OR

☐ Site-specific calculation

a. Model or other tool used to estimate sediment load reductions:

_____

b. Results of calculations: _____

_____

c. Description of additional erosion and sediment controls used:

_____

☐ I qualify for one of the following exceptions (*select one that applies to your project/site*):

☐ There is no discharge of stormwater to the surface water that is located 50 feet from my construction disturbances.

☐ No natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for this project.

☐ Buffer disturbances are authorized under a CWA Section 404 permit.

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

5.3 Structural Controls/Best Management Practices (BMPs)

The table below listed Structural and Non-Structural Stormwater Controls/Best Management Practices (BMPs) that should be considered for every construction project/site to meet **the non-numeric technology-based effluent limitations, water-based effluent limitations and applicable numeric technology-based effluent limitations.**

The following BMPs will be used or implemented at the construction project/site (*select all that apply*):

	Erosion Controls		Sediment Controls
☐	Preservation of Existing Vegetation	☒	Silt Fence
☐	Vegetative Swales	☐	Silt Dikes
☒	Hydroseeding with Mulch	☐	Compost Sock
☐	Hydraulic Mulch	☐	Check Dam
☐	Wood Mulching	☐	Fiber Rolls
☒	Straw Mulching	☒	Storm Drain Inlet Protection
☐	Compost Blankets	☐	Outlet Protection/Velocity Dissipation Devices
☐	Soil Binders	☐	Earth Berms and Drainage Swales
☐	Geotextiles and Mats	☐	Sand Bag Barrier
☒	Soil Preparation/Roughening	☐	Gravel Bag Berm/Barrier
☐	Sod	☐	Sediment Basin
☐	Streambank Stabilization	☐	Sediment Trap
	Tracking Controls	☐	Rip-rap
☒	Stabilized Construction Entrance/Exit	☐	Gabions
☐	Stabilized Construction Roadway		**Non-Structural Controls**
☒	Entrance/Exit Tire Wash	☒	Phasing and Scheduling
☐	Street Sweeping and Vacuuming	☒	Dust Suppression
	Other Structural Controls	☒	Dust Suppression
☐	Vegetative Buffers	☐	Good Housekeeping
☐	Non-Vegetative Stabilization	☒	Preventive Maintenance
☒	Concrete Waste Management	☒	Preservation of Top Soil
☐	Dewatering Controls	☐	Minimizing Soil Compaction
☐		☐	Fertilizer Application Management
☐		☐	

Did you **include specifications** of all the selected structural BMPs with the SWP3?

☒ Yes ☐ No, if no, explain the reason: Click here to enter text.

5.3.1 Perimeter Control

Permit requirement: *You must install controls along the perimeter of your site that will receive stormwater from your construction activities. (Examples of perimeter controls include, but are not limited to, **silt fences, fiber rolls, filter berms**, and **temporary diversion dikes.**)*

To comply with Part 4.2.C of OKR10 permit, I shall use the following type of perimeter control(s) at my construction site:

Perimeter Control Description: This site will be lined by a silt fence in order to help control perimeter erosion.

Installation Date(s): 03/01/24

Maintenance Requirements: I shall remove sediment before it has accumulated to one-half of the above-ground height of any perimeter control. Silt fence will be inspected for rips or tears in the fabric, areas where the fence has been knocked down and areas where the fence has been undermined.

5.3.2 Sediment Track-Out

Permit requirement: *You must minimize the track-out of sediment onto off-site streets, other paved areas, and sidewalks from vehicles exiting your construction site. (**Note:** you may use most recent ODOT or OKC specifications for construction entrance/exit - use of aggregate stone with an underlying **geotextile or non-woven filter fabric, or turf mats.**)*

To comply with the Part 4.2.D of OKR10 permit, I shall use the following type of sediment track-out control at my construction site:

Track-Out Control/Construction Entrance/Exit Description: Stone Construction Entrance/Exit, if necessary, a wheel wash system will be implemented. Sediment laden water from the wash shall be treated at the exit sediment trap. An attendant stationed at the exit shall have the authority to prohibit traffic from exiting the site if it appears that vehicles exiting will cause track-out.

Installation Date(s): 3/1/24

Maintenance Requirements: I shall minimize the track-out of sediment onto off-site streets, other paved areas, and sidewalks from vehicles exiting our construction site.

Track-out Removal/Cleaning:

☒ I shall remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal.

☒ I shall remove the deposited sediment by the **end of the same work day** in which the track-out occurs or by the end of the next work day if track-out occurs on a non-work day where sediment has been tracked-out from my construction site onto the surface of off-site streets, other paved areas, and sidewalks.

☒ I am prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance (unless it is connected to a sediment basin, sediment trap, or similarly effective

control).

5.3.3 Stockpiled Sediment or Soil

Permit requirement: *You must control discharge of stormwater from Stockpiled Sediment or Soil.*

To comply with the Part 4.2.E of OKR10 permit, I shall use temporary perimeter sediment barrier such as ***berms, dikes, fiber rolls, silt fences, sandbag, or gravel bags*** to protect from contact with stormwater (including run-on).

I shall use appropriate cover or temporary stabilization such as ***mulching or hydro-mulching*** to avoid direct contact with precipitation or to minimize sediment discharge.

Installation Date(s): TBD

Maintenance Requirements: I shall not hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance (unless connected to a sediment basin, sediment trap, or similarly effective control), storm drain inlet, and/or surface water.

5.3.4 Minimize Dust

Permit requirement: *You must minimize the generation of dust to avoid pollutant discharges to the extent feasible through application of water or other dust suppression techniques.*

Dust Control Description: To comply with the permit requirement and to avoid any pollutants, particularly soil/sediment, from being discharged into surface waters, I shall apply/spray water using spray truck or sprinklers to minimize the generation of dust from my construction site.

5.3.5 Minimize the Disturbance of Steep Slopes

Permit requirement: *You must minimize the disturbance of steep slopes (i.e., slopes of 40% or greater).*

Steep Slope Control Description: N/A

Installation Date(s):

Maintenance Requirements: Click here to enter text.

5.3.6 Preserve Topsoil

Permit requirement: *You must preserve native topsoil on your site, unless infeasible; you must stockpile and reuse it in areas that will be stabilized with vegetation.*

Topsoil Control Description: I shall preserve native topsoil on our site as much as possible and practicable.

Maintenance Requirements: I shall stockpile and reuse preserved top soil in areas that will be stabilized with vegetation.

5.3.7 Minimize Soil Compaction

Permit requirement: *In areas of your site where final vegetative stabilization will occur or where infiltration practices will be installed, you must minimize soil compaction.*

Soil Compaction Control Description: In areas of your site where final vegetative stabilization will occur or where infiltration practices will be installed, I shall restrict vehicle and/or equipment use in these areas to avoid or minimize soil compaction.

5.3.8 Protection of Storm Drain Inlets

Permit requirement: *If you discharge to a storm drain inlet that you have access to, you must install protection measures that remove sediment from your stormwater discharge. (Examples of inlet protection measures include **fabric filters, sandbags, or gravel barriers** -- Install inlet protection measures that remove sediment from your discharge prior to entry into the storm drain inlet.)*

Storm Drain Inlet Control Description: Click here to enter text.

Installation Date(s): TBD

Maintenance Requirements: I shall clean, or remove and replace the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, I shall remove the deposited sediment by **the end of the same work day** in which it is found or by the end of the following work day if removal by the same work day is not feasible.

5.3.9 Constructed Stormwater Conveyance Channels

*(**Note:** Examples of velocity dissipation devices include **check dams, sediment traps, riprap, or grouted riprap at outlets**, include design specifications)*

Stormwater Conveyance Channel Control Description: Click here to enter text.

☐ If Silt dikes/Check dams are **used in series**, I shall space them at appropriate interval so that ***the base of the upstream dike is at the same elevation as the top of the next downstream dike***. Spacing of silt dikes/check dams is indicated on the site plans of SWP3.

Installation Date(s): N/A

Maintenance Requirements: all check dams/rip-rap will be inspected during facility inspection for erosion, undermining or breeches. Any damage will be repaired immediately.

5.3.10 Sediment Basins

Permit requirement*: For common drainage locations that serve an area of 10 or more acres disturbed at one time (or 5 acres if site is a high priority construction site), a temporary (or permanent) sediment basin shall be provided where attainable until final stabilization of the site.*

Are 10 or more (or 5 or more if site is a high priority construction site) acres draining to a common point?

☐ Yes ☒ No

Is a sediment basin included in the project? ☐ Yes ☒ No

If yes, what is the designed capacity for the storage?

☐ 3600 cubic feet per acre: _____

OR

☐ 2-year, 24 hour storm: _____

OR

☐ Other criteria were used to design basin: _____
_____

If no, explain why no sedimentation basin was included and describe required natural buffer areas and other controls implemented instead: _____
_____
_____

Maintenance Requirements: I shall keep the sediment basin in effective operating condition and remove accumulated sediment to maintain at least ½ of the design capacity of the sediment basin at all times.

5.3.11 Dewatering Practices

Permit requirement: *You are prohibited from discharging stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation associated with a construction activity, unless such waters are first effectively managed by appropriate controls.*

Dewatering Practice Description: Click here to enter text.

Installation Date(s): As needed throughout construction

Maintenance Requirements: Click here to enter text.

5.3.12 Other Stormwater Controls

Stormwater Control Practice # 1

Description: Click here to enter text.

Installation Date(s): _____

Maintenance Requirements: Click here to enter text.

Stormwater Control Practice # 2

Description: Click here to enter text.

Installation Date(s): _____

Maintenance Requirements: Click here to enter text.

Section 6: Pollution Prevention Controls

6.1 Spill Prevention and Responses

Spill Prevention

Is there an existing Spill Prevention Control and Countermeasure (SPCC) plan developed for the site?

☐ Yes ☒ No, if yes, keep a copy of the SPCC plan onsite with this SWP3.

If No, describe procedures for quickly stopping, containing, and cleaning up spills, leaks, and other releases:

All materials with hazardous properties will be stored in a secure location, under cover, and in appropriate tightly sealed containers while not in use. The minimum practical quantities of each hazardous material will be kept on site, in order to further minimize risk. Each product shall be stored in and used from the original container with the original label.

A spill control and containment kit will be kept on site and will be labeled with legible signage and shown on site maps. The kit supplies will be appropriate and of sufficient quantities, and will be inspected daily.

All products shall be used in strict compliance with instructions on the product label, and the disposal of products shall be in strict compliance with the label and regulations.

Emergency Spill Notification

In case of a toxic or hazardous material spill, notify:	Phone Numbers
Project Manager/Team Leader	(412) 882-1701
Emergency – Fire, Police	911
County Local Emergency Planning Committee (LEPC)	405-713-1360
DEQ Spill Reporting Hotline (24-hr)	800-522-0206
NRC (National Response Center)	800-424-8802

6.2 Waste Management Procedures

All wastes generated at the construction site, including, but not limited to, clearing and demolition debris, sediment removed from the site, construction and domestic waste, hazardous or toxic waste, and sanitary waste, shall be prevented from being discharged to Waters of the State. The following BMP measures will be used to handle trash disposal, hazardous or toxic waste, sanitary waste, recycling, and proper material handling:

☒ **Trash Dumpsters:** dumpsters will have a secure watertight lid, will be closed during precipitation or not in use, and will be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site will be deposited in the dumpster. No construction materials will be buried on site.

☒ **Hazardous Waste Containment:** hazardous waste materials will be stored in appropriate and clearly marked containers and segregated from other non-waste materials.

☒ **Portable Toilets:** portable toilets will be secured to prevent tipping, located away from stormwater inlets and conveyances. These toilets will be anchored with the ground to prevent any tipped or knocked over and/or sand bags around to ensure wastewater doesn't mix with the stormwater.

☒ **Recycling Bins/Dumpsters**: wood pallets, cardboard boxes, and other recyclable construction scraps will be disposed of in a designated dumpster for recycling. The dumpster will have a secure watertight lid, will be closed during precipitation or not in use, and will be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations.

☒ **Proper Material Handling:** containers will be tightly sealed when not in use, and excess paint shall be disposed of according to Oklahoma requirements and manufacturer's recommendations. Minimum amounts of fertilizer, as recommended by the manufacturer, will be used. Upon application the fertilizer will be worked into the soil to limit exposure to stormwater. Contents of partially used bags will be transferred to a sealable plastic bin, and then stored in a covered area.

☒ **Good housekeeping:** construction debris, trash, and other floatable material will be collected and prevented from becoming a pollutant source on the following schedule:
Click here to enter text.

☒ **Minimizing exposure:** construction products, materials, chemicals, and wastes will be stored in such a way that they are prevented from coming into contact with stormwater (e.g., plastic sheeting or temporary roofs).

☒ **Designated concrete washout:** all concrete washwater will be directed into a leak-proof container or pit. The container or pit will be designed so that no overflows can occur due to inadequate sizing or precipitation and located as far away as possible from surface waters and stormwater inlets or conveyances. I shall use ***compacted clay liner, 20 mil synthetic liners or similar equivalent liners*** to make the pit leak proof.

☐ Other: Click here to enter text.

6.3 Prohibited Discharges

The following discharges from the construction project/site are prohibited under the permit, and are considered a violation should any occur.

- Wastewater from the washout of concrete, unless managed by an appropriate control as described in Part 4.4.H of OKR10 permit;
- Wastewater from the washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials, unless managed by an appropriate control as described in Part 4.4.H of OKR10 permit;
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
- Soaps, detergents or solvents used in vehicle and equipment washing; and
- Toxic or hazardous substances from a spill or other release.

☒ In the event that one of these above-mentioned discharges occurs, I will take corrective action consistent with Part 7.4 of this SWP3.

Section 7: Procedures and Documentations

7.1 Maintenance and Repair

I shall ensure that all pollution prevention controls installed in accordance with the requirements of OPDES Construction General Permit OKR10 and remain in effective operating condition and are protected from activities that would reduce their effectiveness. All structural BMPs (i.e. all the Erosion & Sediment Controls) that require a repair of any kind (due to normal wear and tear, or as a result of damage) or require maintenance in order for the control to continue operating effectively shall be required/maintained in accordance with the OPDES Construction General Permit requirements. At a minimum, maintenance will be performed in the following specific instances:

- ☒ for perimeter controls, whenever sediment has accumulated to ½ or more the above-ground height of the control (*see Part 4.2.C of OKR10 permit*);
- ☒ where sediment has been tracked-out onto the surface of off-site streets or other paved areas (*see Part 4.2.D of OKR10 permit*);
- ☒ for inlet protection measures, when sediment accumulates, the filter becomes clogged, and/or performance is compromised (*see Part 4.2.J of OKR10 permit*); and
- ☒ for sediment basins, as necessary to maintain at least ½ of the design capacity of the basin (*see Part 4.2.L of OKR10 permit*).
- ☒ for all structural BMPs, repair of any kind (due to normal wear and tear, or as a result of damage) or maintenance will be performed in order for the BMPs to continue operating effectively.

7.2 Approval from Local Office

☒ I shall check/already checked local offices (city and county offices) to ensure SWP3 for my construction activities is consistent with requirements of the City and/or County Offices.

☒ I shall update the SWP3, if necessary, to make consistent with any changes applicable to protecting surface water resources in sediment erosion site plans or site permits, or stormwater management site plans or site permits approved by local officials for which I received written notice.

7.3 Inspections

*(**Note:** An inspector must be knowledgeable in the principles and practices of erosion and sediment controls and pollution prevention to assess conditions at the construction site that could impact stormwater quality, and the effectiveness of any stormwater controls.)*

Person Responsible for Inspections: Click here to enter text.

General Procedures: During each inspection, the following areas of the construction site will be inspected:

- Cleared, graded, or excavated areas of the site;
- Stormwater controls (e.g., perimeter controls, silt dykes, check dams, sediment basins, inlets, exit points etc.) and pollution prevention practices (e.g., pollution prevention practices for vehicle fueling/maintenance and washing, construction product storage, handling, and disposal, etc.) at the site;
- Material, waste, or borrow areas covered by the permit, and equipment storage and maintenance areas;
- Evidence of a spill, leak, or other type of pollutant discharge, or failure to have properly cleaned up a previous spill, leak, or other type of pollutant discharge;
- Areas where stormwater flows within the site, stormwater discharge points;
- Identify any other incidents of non-compliances observed; and
- Areas where stabilization has been implemented.

Inspection Frequency:

☐ **Once every 7 calendar days** and within 24 hours of the end of a storm event of 0.5 inches or greater, since my project is located in **ARC** or discharge to an impaired water.

☒ **Once every 14 calendar days** and within 24 hours of the end of a storm event of 0.5 inches or greater.

Reductions in Inspection Frequency (if applicable):

- For the reduction in inspections resulting from stabilization: **Once per month** for the portion of the site that was stabilized per Part 4.3 and 5.4 of OKR10 permit.

Rain Gauge to Measure Qualified Storm Event of 0.5 inches or greater:

Location of the Rain Gauge: Click here to enter text.

Inspection Report Forms:

Inspection Report Form has been prepared in accordance with the requirements of Part 5.4 of OKR10 permit. A copy of the Inspection Report Form that will be used during construction of this project included in **Attachment E** of this SWP3.
*(**Note:** Inspection report can be found under the **Construction Stormwater Templates and Additional Information** tab in the OKR10 link: https://www.deq.ok.gov/stormwater-permitting/okr10-construction-stormwater/.*

7.4 Corrective Action

General: Corrective actions are actions taken to modify, replace, or reinstall any stormwater control used at the site; clean up and dispose of spills, releases, or other deposits; or remedy a permit violation.

Corrective actions are triggered only for specific, more serious conditions (*see Part 5.5.A of OKR10 permit*). For any of the following conditions, a new or modified control shall be installed **no later than 7 calendar days** from the discovery:

- A required stormwater control was never installed or was installed incorrectly, or not in accordance with the corresponding OKR10 permit requirement;
- A stormwater control needs to be repaired or replaced (*beyond routine maintenance required in Part 5.3.L of OKR10 permit*);
- A stormwater control is not effective enough for the discharge to meet applicable water quality standards;
- A prohibited discharge (*see Parts 2.2, 4.2 and 4.4.B.2 of OKR10 permit*) is occurring or has occurred; or
- DEQ or MS4 Operator requires corrective action as a result of permit violations found during an inspection.

☒ I shall immediately take all reasonable steps to minimize or prevent the discharge of pollutants until a permanent solution is installed and made operational, including cleaning up any contaminated surfaces so that the material will not discharge in subsequent storm events. I shall conduct corrective action(s) for each of the above-mentioned triggering conditions should they occur at my construction site.

Person Responsible for Corrective Actions: Click here to enter text.

Corrective Action Schedule/Specific Action Frequency:

☒ I shall perform all Corrective Actions (modify, replace, or reinstall), if identified, **no later than 7 calendar days from** the time of discovery.

Corrective Action Forms:

Corrective Action Report Form has been prepared in accordance with the requirements of Part 5.5.B of OKR10 permit. A copy of the Corrective Action Report Form that will be used during construction of this project included in **Attachment F** of this SWP3.

7.5 Employee Training

Person Responsible for Staff Training

Name: _____ **Title:** _____

Staff Training Requirements

Prior to the start of earth-disturbing activities, personal with the following responsibilities shall be trained to understand all the requirements of this SWP3:

- Proper design, installation, and maintenance/repair of stormwater controls.
- The proper application and storage of chemicals.
- Proper Inspection and corrective actions.

At minimum, all Personnel must be trained to understand:

- The location of all stormwater controls and the maintenance requirements for each of the control.
- The pollution prevention requirements outlined in this SWP3.
- When and how to conduct inspections, record applicable findings and take necessary corrective actions.

Frequency/Schedule of Employee Training: _____

(***Note:*** *Employee training shall be conducted at least annually or more often if employee turnover is high*).

Employee training records and documentations shall be maintained using the **Employee Training Report** located in **Attachment G** of this SWP3.

7.6 Notification of Change of Ownership (NCO) for Individual Lots

☐ SWP3 will include documents if lots are sold and transfer to other new operator(s), (*see Part 3.1.B.5 and 3.7.I of OKR10 permit*). Documents will be included under **Attachment M** of this SWP3.

☒ NCO is not applicable to my project/site.

7.7 Sub-contractor Certifications

☒ Sub-contractor certification forms will not be used for this project.

☐ DEQ's sub-contractor certification form (**Attachment M**) will be used and kept onsite with the SWP3.

☐ A form other than DEQ's form will be used and kept onsite with the SWP3.

7.8 Record Keeping and Record Retention

☒ I shall retain copies of the SWP3 and all reports required by the 2022 OKR10 permit, and records of all data used to complete the NOI to be covered by this permit, for a **period of at least 3 years** from the date that the site is finally stabilized.

7.9 Posting a Notice

☒ I shall post a notice near the main entrance of the construction site with the following information:

- The OPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned;
- The name and telephone number of a local contact person;
- A brief description of the project; and
- Location of the SWP3

A **sample copy of the Notice** is included in **Attachment M** of this SWP3.

Section 8: Additional Monitoring (if applicable)

(Note: Only applicable if you have Concrete Batch Plant and/or Asphalt Plant that is covered under your OKR10 authorization; if not applicable delete this section)

8.1 Support Activity Covered by this Plan

☐ Concrete Batch Plant ☐ Asphalt Plant ☐ Both ☒ Not Applicable

8.2 Representative Outfall(s)

Are there substantially identical outfalls? ☐ Yes ☐ No

If yes, which outfalls are substantially identical? _____

Which outfall(s) will be sampled? _____

8.3 Structural & Non-Structural BMPs

Perimeter control and retention/detention pond will be installed. All exposed areas will be kept clean and orderly manner to minimize exposure. Structural controls will be maintained to keep these effective and operational.

8.4 Quarterly Visual Monitoring

In addition to routine site inspection, quarterly visual monitoring, qualified facility inspector will perform quarterly visual monitoring:

1. Quarterly visual monitoring assessments will be conducted using the form in **Attachment J** of this SWP3. Each drainage point will be visually inspected on a quarterly basis. If no qualifying storm event occurs during a monitoring quarter, this will be noted on the quarterly visual monitoring report for that quarter.

2. Samples will be collected from each outfall, will be examined and documented observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of stormwater pollution using the quarterly visual monitoring form and will occur during daylight hours (e.g., normal working hours).

3. Completed quarterly visual monitoring forms will be kept with the SWP3.

8.5 Comprehensive Site Compliance Evaluation

1. A comprehensive site compliance evaluation will be conducted at least once annually. If the project is less than one year, at least one inspection will be conducted, which will include all areas where industrial materials or activities are exposed to stormwater and areas where spills and leaks have occurred within the past **3 years**.

2. A report resulting from this inspection will be submitted to DEQ by **March 1** of the year following the monitoring period using the form in **Attachment K** of this SWP3.

8.6 Numeric Effluent Limitation Monitoring for Asphalt Plant

1. Stormwater discharges from asphalt plants must comply with the limitations and monitoring requirements listed below.

Parameter	Limitation	Monitoring Frequency	Sample Type
Total Suspended Solids	23 mg/L, daily max. 15 mg/L, monthly avg.	1/year	Grab
Oil and Grease	15 mg/L, daily max. 10 mg/L, monthly avg.	1/year	Grab
pH	6.5 - 9.0, min. and max.	1/year	Grab

2. Annual monitoring period is from **January 1 to December 31**. If the project is less than one year, at least one sample must be collected.

3. Laboratory analyses for the parameters specified above must be performed by a laboratory certified by DEQ for those parameters.

4. Monitoring will be performed on a storm event that results in an actual discharge from the construction site (at least **0.1 inch** of stormwater event defined as a **measurable storm event**) that follows the preceding measurable storm event by at least 72 hours (3 days).

5. A minimum of one grab sample will be collected within the first 30 minutes of the discharge resulting from a measurable storm event. If it is not practicable to take the sample during the first 30 minutes, the sample must be collected as soon as practicable after the first 30 minutes and document why it was not possible to take samples within 30 minutes.

6. Monitoring information will be submitted on a discharge monitoring report (DMR) form (see **Attachment L**) by **March 1** of the year following the monitoring period.

7. If an exceedance of a numeric effluent limit occurs, follow-up monitoring will be conducted within 30 calendar days, or during the next qualifying storm event, of implementing corrective actions.

Person(s) and positions of person(s) responsible for monitoring: Click here to enter text.

Sample location(s): Click here to enter text.

Monitoring Schedules: Click here to enter text.

8.7 Additional Procedures for Concrete Batch Plant

Is there a mobile batch plant associated with this construction project/site?

☐ No ☐ Yes, If yes, permit number: OKG11_____

How long will the batch plant be utilized?

☐ Less than 180 days

☐ Greater than 180 days

Will wastewater be used for dust suppression?

☐ No ☐ Yes, If yes, the following requirements must be met:

a. The wastewater to be land applied shall be free from visible sheen of oil or globules of oil or grease and shall have a pH of between 6.5 s.u. and 9.0 s.u.
b. The wastewater to be land applied for dust suppression shall be visually inspected prior to land application. An inspection log shall be maintained at the site and made available to DEQ personnel upon request.
c. There shall be no land application of wastewater in areas where the depth to maximum seasonal groundwater level is less than 2 feet in accordance with OAC 252:616-5-1(b)(2)(E).
d. There shall be no land application of wastewater during periods of precipitation or when soil is saturated or frozen.
e. There shall be no runoff of wastewater from the land application site(s).
f. The permittee shall keep a logbook which records the time and date, the source and the volume of wastewater used, and the area to which the wastewater .

Describe the liner used for any surface impoundments: Click here to enter text.

Is the bottom of all surface impoundments at least 15 feet above groundwater levels?

☐ No ☐ Yes

The following berm/dike slope requirement will be followed:

☐ For sites utilized less than 180 days, a 1:2 (1 vertical to 2 horizontal) slope

☐ For sites utilized more than 180 days, a 1:3 (1 vertical to 3 horizontal) slope

Section 9: SWP3 Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: J. Ryan Hamilton **Title:** Manager of its general partner

Signature:  **Date:** 12/22/2023

Section 10: SWP3 Modifications

I shall maintain records of modifications that will be made per Part 5.3.S of OKR10 permit, and other reasons in **Attachment H** of this SWP3:

Click here to enter text.

Section 11: SWP3 Attachments & Additional Documentation

The following documentations are attached to the SWP3:

Attachment A – General Location Map

A copy of general location map is included in Attachment A.

Attachment B – Site Map(s)

Copy of the site map(s) is/are included in Attachment B.

Attachment C – 2022 OKR10

Note: it is helpful to keep a printed-out copy of the 2022 OKR10 so that it is accessible to you for easy reference. However, you do not need to formally incorporate the entire 2022 OKR10 into your SWP3. As an alternative, you can include a reference to the permit and where it is kept at the site.

Attachment D – Notice of Intent (NOI)

A copy of your NOI is included in Attachment D.

Attachment E – Inspection Report

A copy of the Routine Facility Inspection Report Form is included in Attachment E.

Attachment F – Corrective Action Report

A copy of Corrective Action Report Form is included in Attachment F.

Attachment G – Employee Training Report

A copy of Employee Training Log is included in Attachment G.

Attachment H – SWP3 Modifications Log

A copy of Report on SWP3 Modifications/Amendments Log is included in Attachment H.

Attachment I – Site Stabilization Log

A copy of Site Stabilization Log is included in Attachment I.

Attachment J – Quarterly Visual Monitoring Report

A copy of Quarterly Visual Monitoring Report Form is included in Attachment J.

Attachment K – Annual Site Evaluation Report

A copy of Annual Comprehensive Site Compliance Evaluation Report (ACSCER) form is included in Attachment K.

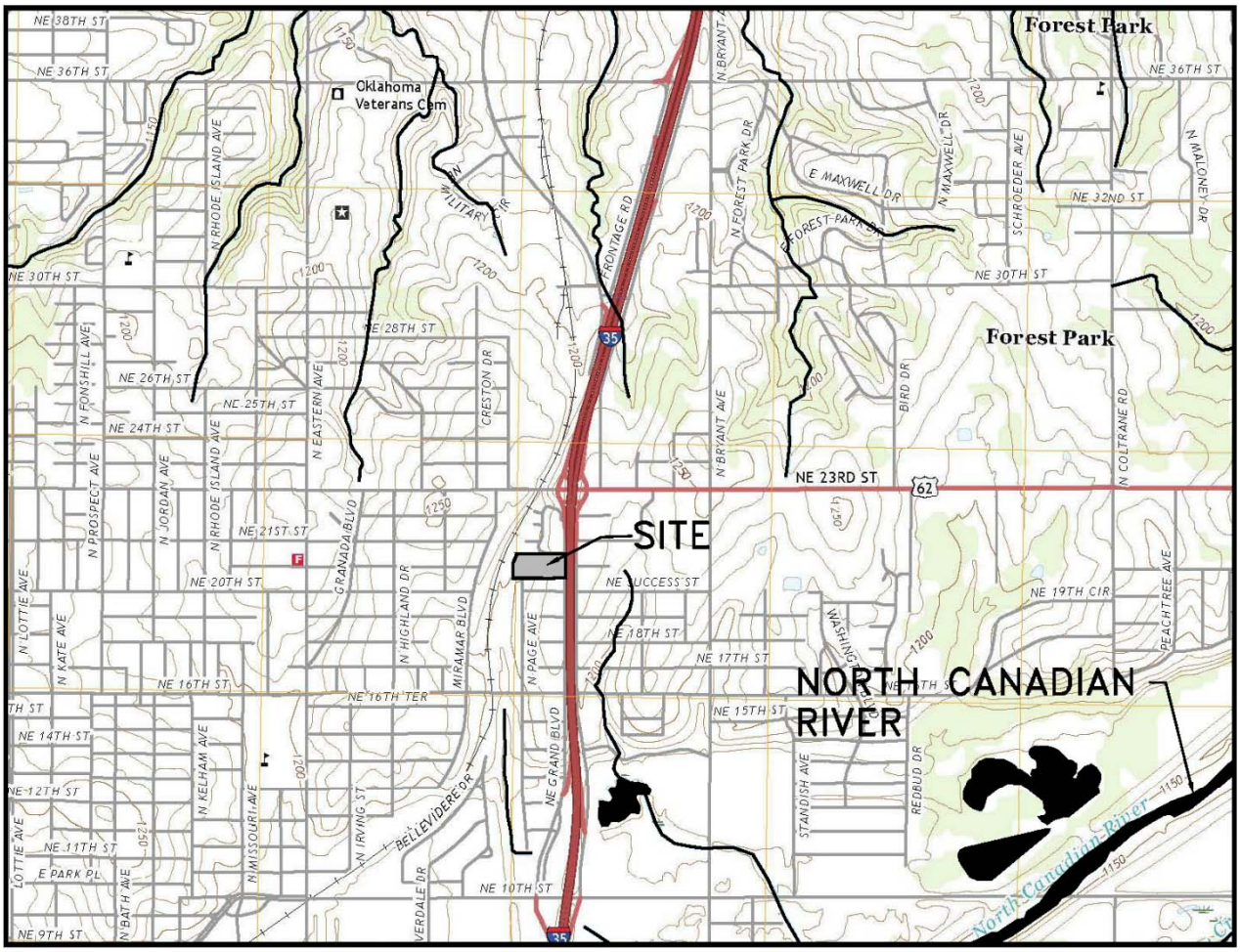
Attachment L – Discharge Monitoring Report (DMR)

A copy of Discharge Monitoring Report (DMR) is included in Attachment L.

Attachment M – NCOs and Other Documentations

Any other Documentation required by this Permit is included in Attachment M.

Attachment A – General Location Map



USGS QUADRANGLE MAP

Attachment B – Site Maps

Site Maps can be found at this location:
https://www.dropbox.com/scl/fo/s2n7e78rjh47jtxqrobt0/h?rlkey=16nux0dy6am6x9efb4kzq9tmh&dl=0

Attachment C – 2022 OKR10

The OKR10 General Permit can be found online at:

https://www.dropbox.com/scl/fo/pqy2h4rd23wsbyr0jakf2/h?rlkey=rzx27pexqi87ak79veezp8twm&dl=0

Attachment D – Notice of Intent

NOI for Construction Stormwater Discharges under OKR10

version 1.5

(Submission #: HPZ-7NVN-ZY2C1, version 1)

Details

Originally Started By	Micheal Dedman
Submitted	11/30/2023 (0 days ago) by Joseph Ryan Hamilton
Alternate Identifier	CROSSROADS AT NE GRAND BLVD., LP - New
Submission ID	HPZ-7NVN-ZY2C1
Status	In Review

Fees

Fee	$447.71
Payments/Adjustments	($447.71)
Balance Due	$0.00 (Paid)

Form Input

Operator

Authorization Number
NONE PROVIDED

Application Type
New

Operator Name
CROSSROADS AT NE GRAND BLVD., LP

Operator Details

Operator

Phone Type	Number	Extension
Business	417.882.1701	

Mailing Address

3556 S CULPEPPER CIR
STE 4
SPRINGFIELD, MO 65804

Responsible Official

First Name	Last Name
Joseph Ryan	*Hamilton*

Title
Manager

Phone Type	Number	Extension
Business	417.882.1701	

Email
ryanhamilton@hamiltoncorporation.com

Is the Responsible Official also the regular Operator Contact
Yes

Consultant

First Name	Last Name
Mike	*Dedman*

Title
Lead Project Manager

Consultant Business Name
Carlson Consulting Engineers

Phone Type	Number	Extension
Business	901 384-0404	123

Email
mikededman@carlsonconsulting.net

Registered and in good standing with Secretary of State?
Yes

For more information visit the Oklahoma Secretary of State website
Oklahoma Secretary of State - Home

Operator control over
Plans and specifications

Are there other operators associated with this site/project?
No

Fee
447.71

Site / Project Information

Site / Project Details

Site / Project Name
Crossroads at NE Grand Apartments

Site/Project Address
.06 mi northwest of
Intersection of NE Grand Blvd and NE Success Street
Oklahoma City, OK 73111

County
Oklahoma (55)

SIC Code
1522-Residential Construction

Is the site contact the same as the operator contact?
No

Site / Project Contact

First Name	Last Name
Mike	*Dedman*

Title
NONE PROVIDED

Phone Type	Number	Extension
Business	901 384-0404	123

Email
mikededman@carlsonconsulting.net

Description of activity (short)
56 unit apartment complex

Site Location
35.49043632746744,-97.46619062885185

Site Map
Northeast Grand Blvd. OKC ALTA.pdf - 11/17/2023 03:13 PM
Comment
NONE PROVIDED

Estimated Construction Start Date	Estimated Construction End Date
03/31/2024	03/31/2025

Type of Site Ownership
Privately Owned Facility

Acreage Affected

Total Area (Acres)	Disturbed (Acres)	Current Impervious (Acres)	Post Impervious (Acres)
4.84	4.84	0.00	2.95

Post-construction runoff coefficient of the site
0.54

Stormwater Runoff Coefficients of the OKR10 General Permit at provides a table of typical coefficients
Stormwater Runoff Coefficients

Soil and Fill Description
Site will be partial import. Onsite soils consist of Ashport Silt Loam, Norge-Urban Land Complex, Teller-Urban Land Complex, Urban Land

Common plan of development or sales?
NONE PROVIDED

Discharges to an MS4?
Yes

MS4 Operator Name (New)
Oklahoma City MS4

Endangered Species Eligibility
a. My site is NOT located within any of the corridors of Federal and State Areas of Concern (ARC).

Discharge Information (New) (1 of 1)

~~**Beaver River (North Canadian)**~~

Canadian River, North
UN trib

Receiving Waterbody
Beaver River (North Canadian)

Unknown Tributary
The receiving waters is an unknown tributary to the above referenced Waterbody

Pollution Prevention Plan

SWP3 Prepared and Available
Yes

Support Activities
No

Proposed BMP to control pollution in stormwater discharges
Construction Entrances
Construction Sequencing
Inlet Protection
Silt Fence
Spill Prevention/Cleanup
Vegetated Buffer
Waste Management
Employee Training
Mulching/Seeding/Sodding
Riprap
Site Inspection
Vehicle/Concrete Washout
Sediment Basin/Trap

Post construction BMP for construction activities
Grassed Swales
Wet/Dry Pond

Attachments

Date	Attachment Name	Context	User
11/17/2023 3:13 PM	Northeast Grand Blvd, OKC ALTA.pdf	Attachment	Micheal Dedman

Agreements and Signature(s)

SUBMISSION AGREEMENTS

- ☑ I am the owner of the account used to perform the electronic submission and signature.
- ☑ I have the authority to submit the data on behalf of the facility I am representing.
- ☑ I agree that providing the account credentials to sign the submission document constitutes an electronic signature equivalent to my written signature.
- ☑ I have reviewed the electronic form being submitted in its entirety, and agree to the validity and accuracy of the information contained within it to the best of my knowledge.

I certify under penalty of lawthat this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted.

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed By Joseph Ryan Hamilton on 11/30/2023 at 11:37 AM

Attachment E – Inspection Report

Field Inspection Report

Inspection Date: _____

General Information (OKR10 Part 4.5.13.E)	
Name of Project:	**DEQ Permit No.:**
Inspector Name:	**Inspector Title:**
Inspector's Contact Information:	
Inspection Location: (if multiple inspections are required)	
Inspection Frequency: **Standard Frequency**: ☐ Weekly ☐ Every 14 days and within 24 hours of a 0.50" rain **Reduced Frequency**: ☐ Once per month (for stabilized areas)	
Weather at the time of this inspection: _____ **Was this inspection after a 0.50" storm event?** ☐Yes ☐ No, **Total rainfall that triggered the inspection** (in inches)**:**	
Are there any discharges at the time of inspection? ☐ Yes ☐ No	

List all areas where soil stabilization is required to begin because construction work in that area has permanently stopped or temporarily stopped and all areas where stabilization has been implemented:

Stabilization of Exposed Soil (OKR10 Part 4.5.13.D)			
Stabilization Area	**Stabilization Method**	**Have You Initiated Stabilization?**	**Notes**
		☐ Yes ☐ No If yes, provide date:	
		☐ Yes ☐ No If yes, provide date:	
		☐ Yes ☐ No If yes, provide date:	
		☐ Yes ☐ No If yes, provide date:	
		☐ Yes ☐ No If yes, provide date:	

(Notes: *For each area where stabilization has been initiated, describe the progress that has been made, and what additional actions are necessary to complete stabilization. Note the effectiveness of stabilization in preventing erosion. If stabilization has been initiated but not completed, make a note of the date it is to be completed. If stabilization has been completed, make a note of the date it was completed. If stabilization has not yet been initiated, make a note of the date it is to be initiated, and the date it is to be completed.)*

Provide a list/description of all structural and non-structural BMPs that your SWP3 indicates will be installed and implemented at your site. You must separately identify the **location** of each control. During Inspection, identify whether they are **installed and operating properly**, or any **corrective action** is necessary. Provide the **date** on which the condition that triggered the need for maintenance or corrective action was first identified. In the notes section you must describe the **specifics about the problem** you observed.

DEQ's Template on Routine facility Inspection

Condition and Effectiveness of BMP Controls & Pollution Prevention (OKR10 Part 3.3, 4 & 5)					
Sl. No.	**BMP Description & Location**	**Is BMP Installed & Operating Properly?**	**Corrective Action (CA) Required?**	**Date on Which Maintenance or CA First Identified?**	**Notes**
1.	Silt Fence/Fiber Rolls/Berm/Wattles Location:	☐ Yes ☐ No	☐ Yes ☐ No		
2.	Silt Dykes/Check Dam/Rock Dams Location:	☐ Yes ☐ No	☐ Yes ☐ No		
3.	Stabilized Construction Entrance /Exit Location:	☐ Yes ☐ No	☐ Yes ☐ No		
4.	Inlet Protection on all storm drain Location:	☐ Yes ☐ No	☐ Yes ☐ No		
5.	Sand Bag Barrier/Gravel Bag Barrier Location:	☐ Yes ☐ No	☐ Yes ☐ No		
6.	Vegetated Swales Location:	☐ Yes ☐ No	☐ Yes ☐ No		
7.	Compost Blankets/Geotextiles & Mats Location:	☐ Yes ☐ No	☐ Yes ☐ No		
8.	Vegetative Buffers Location:	☐ Yes ☐ No	☐ Yes ☐ No		
9.	Sediment Trap/ Sediment Basin Location:	☐ Yes ☐ No	☐ Yes ☐ No		
10.	Concrete Washout Pit Location:	☐ Yes ☐ No	☐ Yes ☐ No		
11.	Dust Control/Prevention	☐ Yes ☐ No	☐ Yes ☐ No		
12.		☐ Yes ☐ No	☐ Yes ☐ No		
13.		☐ Yes ☐ No	☐ Yes ☐ No		
14.		☐ Yes ☐ No	☐ Yes ☐ No		
15.		☐ Yes ☐ No	☐ Yes ☐ No		
16.		☐ Yes ☐ No	☐ Yes ☐ No		

(**Note:** *The permit differentiates between conditions requiring repairs and maintenance, and those requiring corrective action. The permit requires maintenance in order to keep controls in effective operating condition and requires repairs if controls are not operating as intended. Corrective actions are triggered only for specific, more serious conditions – whether a required stormwater control was never installed, or was installed incorrectly, or not installed in accordance with the requirements of OKR10*)

Pollution Prevention and Waste Management (OKR10 Part 3.3.3)		
Items of Inspection	**Response & Reason**	**Action(s) Needed**
Is the site free of floatables, litter, and construction debris?	☐ Yes ☐ No If no, reason:	
Are material storage and handling areas, including fueling areas, free of spills and leaks?	☐ Yes ☐ No If no, reason:	
Are spill kits available where spills and leaks are likely to occur?	☐ Yes ☐ No If no, reason:	
Are dumpsters and waste receptacles covered when not in use?	☐ Yes ☐ No If no, reason:	
Has preventative maintenance been conducted on equipment and machinery?	☐ Yes ☐ No If no, reason:	
Are material stockpiles sufficiently contained?	☐ Yes ☐ No If no, reason:	
Has there been any sediment tracked-out from the site onto the surface of paved street, sidewalks or other paved areas outside of the site?	☐ Yes ☐ No If no, reason:	
Is the project free from visible erosion and/or sedimentation?	☐ Yes ☐ No If no, reason:	

Complete the following section if a discharge is occurring at the time of the inspection:

Description of Discharges (OKR10 Part 4.5.13.D.2.f)	
Was a stormwater discharge or other discharge occurring from any part of your site at the time of the inspection? ☐ Yes ☐ No, **If yes, provide the following information for each point of discharge:**	
Specify Discharge Location	**Observations (Visual Quality of the Discharge)**
1.	Describe the discharge (color, odor, floating, settled/suspended solids, foam, & oil sheen): Are there any visible signs of erosion and/or sediment accumulation that can be attributed to your discharge? ☐ Yes ☐ No, If yes, describe what you see, specify the location(s) where these conditions were found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue:
2.	Describe the discharge (color, odor, floating, settled/suspended solids, foam, & oil sheen): Are there any visible signs of erosion and/or sediment accumulation that can be attributed to your discharge? ☐ Yes ☐ No, If yes, describe what you see, specify the location(s) where these conditions were found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue:

Contractor or Subcontractor Certification and Signature:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:_____ **Date:** _____

Print Name: _____ **Affiliation:** _____

Attachment F – Corrective Action Report

Corrective Action Report Form

DEQ Authorization No. OKR10_____

You are only required to fill out this form if any of the corrective action triggering conditions occurs on your site. Routine maintenance and repairs are generally not considered to be a corrective action triggering condition.

Section A – Initial Report (Part 4.5.15.C.1 of OKR10) (Complete this section within **24 hours** of discovering the condition that triggered corrective action)	
Name of Project:	**Today's Date:**
Date Problem First Discovered:	**Time Problem First Discovered:**
Name & Contact Information of the Individual:	
What site conditions triggered the requirement to conduct corrective action *(check the box that applies)*: ☐ A required stormwater control was never installed or was installed incorrectly, or not in accordance with the corresponding OKR10 permit requirement ☐ A stormwater control is not effective enough for the discharge to meet applicable water quality standards ☐ A prohibited discharge (OKR10 Parts 3.1 and 3.3.3.A) is occurring or has occurred. ☐ DEQ requires corrective action as a result of permit violations found during an DEQ inspection	
Provide a description of the problem:	
Deadline for completing corrective action:	***no more than 7 calendar days after the date you discovered the problem***

Section B – Corrective Action Progress (Part 4.5.15.C.2 of OKR10) (Complete this section no later than **7 calendar days** after discovering the condition that triggered corrective action)	
Section B.1 – Why the Problem Occurred	
Cause(s) of Problem	**How It Was Determined & Date of Determining the Cause**
1.	1.
2.	2.

Section B.2 – Stormwater Control Modifications to be Implemented to Correct the Problem			
List of Stormwater Control Modification(s) Needed to Correct Problem	**Date of Completion**	**SWP3 Update Necessary?**	**Notes**
1.		☐Yes ☐No, If yes, provide date SWPPP modified:	
2.		☐Yes ☐No, If yes, provide date SWPPP modified:	

Section C – Certification and Signature by Permittee

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Permittee or
Duly Authorized Representative: _____ **Date:**_____

Printed Name and Title: _____

Attachment G – Employee Training Report

SWP3 Employee Training Log

Facility Name: _____ DEQ Authorization No. OKR05_____

Instructor's Name:_____ Instructor's Title:_____

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ☐ Overview of SWP3
- ☐ Controls Measures/BMPs Design & Installation
- ☐ Controls Measures/BMPs Repair & Maintenance
- ☐ Spill Prevention and Response
- ☐ Minimize Overall Exposure to Stormwater
- ☐ Good Housekeeping
- ☐ Inspections and Corrective Actions
- ☐ Emergency Procedures

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Signature of the Attendees	Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Attachment H – SWP3 Change Log

SWP3 Amendment Log

Sl. No.	Description of the Amendment	Date of Amendment	Amendment Prepared by (Name and Title)	Signature by Designated Corporate Official
1			:	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Attachment I – Site Stabilization Log

Grading and Stabilization Activities Log

Date Grading Initiated	**Description of Grading Activity**	**Description of Stabilization Measure and Location**	**Date Grading Activity Ceased** (Temporary or Permanent)	**Date When Stabilization Initiated**

Attachment J – Quarterly Visual Monitoring Report

Quarterly Visual Monitoring Report

(Complete a separate form for each outfall you assess)

Facility Name:		**DEQ Authorization No.**
Outfall Id.:	**Substantially Identical Outfall?** ☐ No ☐ Yes	
Date & Time Discharge Began:	**Date & Time Sample Collected:**	**Date & Time Sample Examined:**
Substitute Sample? ☐ No	☐ Yes	
Person's Name/Title collecting sample:		
Person's Name/Title examining sample:		
Nature of Discharge: ☐ Rainfall, if rainfall: **Rainfall Amount:** inches	☐ Snowmelt	

Parameters & Observation Results

Parameter	Method	Results
Color	Visual	☐ Clear ☐ Green ☐ Yellow ☐ Brown ☐ Red ☐ Black ☐ Blue ☐ Milky ☐ Other (Describe)_____
Odor	Smell	☐ None ☐ Musky ☐ Earthy ☐ Rotten Eggs ☐ Sewage ☐ Petroleum ☐ Other (Describe)_____
Clarity or Turbidity	Visual (try to see through clear container)	☐ Can't see through bottle, ☐ Can see through but can't read newsprint, ☐ Can see through and read newsprint, ☐ Clear, but not as clear as bottled water, ☐ As clear as bottled water
Floating Solids	Visual (top of water in container)	☐ Yes (Describe) _____ ☐ No
Settled Solids	Visual (bottom of container)	☐ ____ Tablespoons, or ☐ ____ Cups of solids on bottom after 24-hr.
Suspended Solids	Visual (look through container)	Describe Observations. _____ _____
Foam	Visual	☐ No ☐ Yes, if yes, Thickness _____ Color _____
Oil Sheen	Visual	☐ No ☐ Yes, if yes, Color _____ Extent _____
Other Obvious Indicators of Stormwater Pollution	Indicate what you observed	Describe:_____ _____
Probable Sources of any Observed Stormwater Contamination: _____ _____		

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Name: _____ Title: _____

Signature: _____ Date: _____

Attachment K – Annual Site Evaluation Report

DEQ Form
606-005B
Sep 27, 2022

Oklahoma Department of Environmental Quality

Annual Comprehensive Site Compliance Evaluation Report (ACSCER) for Stormwater Discharges Associated with Construction Support Activities Under the OPDES General Permit OKR10

Submission of this ACSCER form is required for construction support activities for concrete and asphalt batch plants. All requested information must be provided on this form. See instructions on Page 4 of this form.

DEQ Authorization Number: OKR10_____

Part A: Operator Information and Certification

Section I. Operator Information

Operator Name: _____

Mailing Address: _____ City: _____

County: _____ State: _____ Zip Code: _____

Operator's Point of Contact : _____ Title: _____

Phone: _____ Email: _____

Section II. Facility Information

Facility Name: _____ Phone: _____

Address: _____

City: _____ County: _____ State: _____ Zip Code: _____

Latitude: _____ Longitude: _____

Facility's Point of Contact : _____ Title: _____

Phone: _____ E-mail: _____

Section III. Certification

I certify under penalty of law that I have read and understand the requirements for filing this Annual Comprehensive Site Compliance Evaluation Report. This report is also to be retained as part of the Stormwater Pollution Prevention Plan (SWP3) for at least three (3) years from the date permit coverage expires or is terminated and will be made available to any state or federal inspector visiting this facility. All records of actions taken in accordance with this permit as part of the SWP3 will be retained for at least three (3) years from the date permit coverage expires or is terminated. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly involved in gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name: _____ Title: _____

Signature: _____ Date: _____

Part B: Annual Comprehensive Site Compliance Evaluation (ACSCER)

Reporting period: _____ through _____

1.	Number of routine facility inspections you performed during the reporting period: _____	
2.	Dates of the inspections performed: _____	
3.	During your routine facility inspections, were all your BMPs effective in controlling the pollutant source for which they were designed?	☐ Yes ☐ No
4.	If you found one or more ineffective BMPs, have they all been replaced with an alternative or modified BMP?	☐ Yes ☐ No ☐ All BMPs were effective
5.	Were all the BMPs you indicated you would be using in your SWP3, actually being implemented at the time of the ACSCER?	☐ Yes ☐ No
6.	If one or more BMP(s) was not being implemented, were corrective actions taken after the first inspection to eliminate the problem?	☐ Yes ☐ No ☐ All BMPs were effective
7.	Was/were the same failure(s) to implement a BMP deficiency(ies) noted in more than one inspection?	☐ Yes ☐ No ☐ No deficiencies noted in any inspection
8.	Were there additional BMPs needed to address any conditions requiring corrective action?	☐ Yes ☐ No

9. Document any deficiencies identified and any corrective actions implemented to remove the original violation below. Use additional sheets if necessary.

DATE	DEFICIENCIES	CORRECTED	DATE OF CORRECTION
		☐ Yes ☐ No	
		☐ Yes ☐ No	
		☐ Yes ☐ No	
		☐ Yes ☐ No	

10.	What must you do to correct the deficiencies that remain uncorrected? _____ _____ _____	
11.	Did any conditions require SWP3 review and revision to eliminate design, selection, installation, and/or implementation problems during the past year? If yes, describe the conditions in brief: _____ _____ _____	☐ Yes ☐ No
12.	At any time during the reporting period, did you discover any previously unidentified unauthorized non-stormwater discharges from your facility or previously unidentified pollutants in the existing discharges?	☐ Yes ☐ No
13.	Have all unauthorized non-stormwater discharges (including any discovered in previous years) been eliminated or permitted?	☐ No ☐ Discharge has been eliminated ☐ Permit applied for ☐ No unauthorized discharges
14.	Have any significant spills or leaks occurred at your facility during the reporting period?	☐ Yes ☐ No
15.	If any significant spills or leaks occurred, did they result in either a dry weather discharge or an actual discharge of the spilled or leaked material commingled with stormwater (as opposed to the spilled material being washed away by stormwater?)	☐ Yes ☐ No ☐ No spills or leaks occurred

16.	If any significant spills or leaks occurred, did they result in more than the minimum amounts of material being discharged in stormwater? Base your answer on your knowledge of the material you spilled or that leaked. The minimum amounts could vary with the nature (toxicity, oxygen demand, pH, etc.) of the spilled or leaked material from amounts left after normal "sweeping" type cleanup to the point at which even trace amounts left after cleanup could cause an environmental problem.	☐ Yes ☐ No ☐ No spills or leaks occurred
17.	Have all known spills or leaks been cleaned up or otherwise prevented from contaminating stormwater that would be discharged under the authority of this permit?	☐ Yes ☐ No ☐ No spills or leaks occurred
18.	How many times did you visually monitor all of your stormwater discharges at all the outfalls during the reporting year?	_____
19.	Would the results of your visual monitoring indicate that there are pollutants in your stormwater discharges that are not adequately controlled by your current BMPs?	☐ Yes ☐ No
20.	If the results of your visual monitoring indicated a potential problem, was it due to one or more of the following? ☐ New pollutant source (including exposure of previously unexposed material) ☐ Failure to implement or maintain an existing BMP ☐ Less than expected performance from a BMP ☐ No BMP was selected to deal with that problem ☐ N/A (No problems identified)	
21.	If your visual monitoring indicated a potential problem, what have you done to resolve the problem? ☐ Eliminated exposure or pollutant source ☐ Modified existing BMPs ☐ Added a new BMP ☐ Plan to address problem by end of current reporting year ☐ Nothing planned ☐ N/A (No problems identified)	
22.	Did any monitoring results exceed a numeric effluent limitation contained in Parts 3.4.1 and F.7.B during the past discharge monitoring period?	☐ Yes ☐ No

23. If your answer to the previous question was **Yes**, list the dates, name of the pollutants and the test results that exceeded numeric effluent limitations. Use additional sheets if necessary.

DATE	POLLUTANT(S)	TEST RESULTS

24.	Were there any incidents of noncompliance in the past year or any noncompliance that is currently ongoing?	☐ Yes ☐ No
25.	Were there any required revisions to the SWP3 resulting from the inspection and/or monitoring?	☐ Yes ☐ No

26. If your answer to the previous question was **Yes**, list the dates, reason for revision and brief description of the revision. Use additional sheets if necessary.

DATE	REASON FOR REVISION	DESCRIPTION OF REVISION

Instructions for Completing the Annual Comprehensive Site Compliance Evaluation Report (ACSCER) Form 606-005B for Stormwater Discharges Associated with Construction Support Activities for Concrete or Asphalt Batch Plants

When to File an ACSCER Form

Permittees who are presently covered under OPDES construction general permit OKR10 for stormwater discharges associated with construction support activities for concrete or asphalt batch plants must submit an Annual Comprehensive Site Compliance Evaluation Report (ACSCER) form to DEQ by March 1 of each year. If your authorization becomes effective less than one month from the end of the yearly monitoring period, your first monitoring period starts with the next annual monitoring period.

Completing the Form

To complete this form, type or print in the appropriate areas only.

Permit Information

Enter the existing DEQ Authorization assigned to the facility identified in Section I for stormwater discharges from construction support activities for concrete or asphalt batch plants.

Part A: Operator Information and Certification

Section I. Operator Information

Provide the legal name of the person, firm, public organization or any other commercial entity that owns or operates the facility described in this application. The name of the operator may or may not be the same name as the facility. An operator is the legal entity that controls the facility's operation, rather than the plant or site manager. Provide complete mailing address including city, county, state, and ZIP code. Include operator's point of contact name, title, telephone number and a valid email address.

Section II. Facility Information:

Enter the facility's official or legal name and complete physical address including city, county, state, and ZIP code. Include facility's point of contact name, telephone number and email address. Indicate the latitude and longitude of the facility to the nearest 15 seconds. . Include facility's point of contact name, title, telephone number and a valid email address.

Section III. Certification

The ACSCER form must be signed by a responsible party.

For a corporation: by a responsible corporate officer, which means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental law and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents had been assigned or delegated to the manager in accordance with corporate procedures;

For a limited liability company (LLC): by a member, managing or otherwise;

For a partnership: by a general partner;

For a sole proprietorship: by the proprietor (owner);

For a municipality, state, federal, or other public facility: by either a principal executive or ranking elected official.

Part B: Annual Comprehensive Site Compliance Evaluation Report

1. A summary of your past year's routine facility inspection documentation such as control measures' maintenance, repair and/or replacement, any additional control measures needed to comply with the permits;
2. The location(s) of discharges of pollutants from the site, evidence of pollutants discharging to receiving waters at all facility outfall(s), and the condition of and around the outfall(s);
3. A summary of your past year's corrective action documentation;
4. A summary of your past year's quarterly visual monitoring documentation;
5. A summary of your past year's effluent limitation violations, if applicable; and
6. A description of any incidents of noncompliance in the past year or currently ongoing, or if none, provide a statement that you are in compliance with the permit.

Note: *Please see Addendum C of the OKR10 permit for detailed scope of ACSCER.*

Completed ACSCER form must be submitted to DEQ by March 1 of each year following the permit effective date.
If you need any assistance or have any question, contact the Stormwater Unit of Environmental Complaints and Local Services (ECLS) of DEQ at (405) 702-6100 or email to: ecls-stormwaterpermitting@deq.ok.gov

Where to file an ACSCER Form

Completed ACSCER form must be submitted to the following address:

Stormwater Unit of ECLS
Oklahoma DEQ
P.O. Box 1677
Oklahoma City, OK 73101-1677

or fax it to: (405)702-6226

or email it to: ecls-stormwaterpermitting@deq.ok.gov

Attachment L – Discharge Monitoring Report

Attachment M – Other Documentations

SECTION 02375 – STONE PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rip-rap, bedding, and filter fabric for stone slope protection.

B. Related Requirements:
   1. Section 02300 – Earthwork: Geotextile fabric

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rip-Rap: Stone for rip-rap shall consist of field stone or rough unhewn quarry stone as nearly uniform in section as is practical. Stones shall be dense, resistant to action of air and water, and suitable for purpose intended. Unless otherwise specified, stones shall weigh between 50 and 150 pounds each, and at least 60 percent of stones shall weigh more than 100 pounds each.

B. Bedding Stone: Quarried and crushed angular limestone, 6-inches in depth, and with the following gradation:

Sieve Designation	% By Weight Passing Square Mesh Sieves
3”	100
No. 4	20-65
No. 200	0-10

C. Filter Fabric: Geotextile fabric shall be as specified in Section 02340 and as detailed on Construction Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.

B. Notify Owner of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.

C. Dress slopes and other areas to be protected to line and grade shown on Construction Drawings prior to placing of rip-rap. Undercut areas to receive rip-rap to elevation equal to final elevation less total depth of rip-rap to be placed before placing rip-rap.

D. Correct areas over-excavated in accordance with Section 02300.

E. Remove excess excavated material from site.

3.2 PLACEMENT

A. Place rip-rap in areas where indicated on Construction Drawings.

B. Install filter fabric and bedding stone prior to placement of rip-rap.

C. Place stones so that greater portion of weight is carried by earth and not by adjacent stones. Place stones in single layer with close joints. Upright areas of stone shall make angle of approximately 90 degrees with embankment slope. Place courses from bottom of embankment upward, with larger stones being placed in lower courses. Fill open joints with spalls. Embed stones in embankment as necessary to present uniform top surface such that variation between tops of adjacent stones shall not exceed 3 inches.

3.3 GEOTEXTILE FABRIC AND/OR GEOGRID

A. Place geotextile fabric over subsoil surface, lap edges and ends in accordance with manufacturer's recommendations and as shown on the Drawings.

END OF SECTION

SECTION 02510 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Site water piping and fittings including domestic potable waterline and fire protection system supply waterline, valves, and fire hydrants.
2. All materials shall be in accordance with the specifications listed herein and the requirements of the City of Oklahoma City. In the event of a conflict, the City's standards shall govern. The contractor shall ensure that only manufacturers acceptable to the City of Oklahoma City are used.

B. Related Requirements:
1. Section 02300 – Earthwork: Trenching, backfill, and compaction for utilities.

1.2 REFERENCES

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

B. American Society of Mechanical Engineers (ASME):
1. ASME B 16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. ASTM International (ASTM):
1. ASTM B88 - Seamless Copper Water Tube.
2. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
3. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).
4. ASTM D2564 - Poly (Vinyl Chloride) (PVC) Solvent Cement.
5. ASTM D2672 - Poly (Vinyl Chloride) (PVC) Integrally Molded Bell Ends For Solvent - Cemented Pipe Joints.
6. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
7. ASTM F477 - Elastomeric Gaskets And Lubricant.
8. ASTM F656 - Poly (Vinyl Chloride) (PVC) Cement Primer.

D. American Water Works Association (AWWA):
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and other Liquids.
3. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water supply Service.
4. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
5. AWWA C153 - Ductile-Iron Compact Fittings for Water Service.
6. AWWA C504 - Rubber-Seated Butterfly Valves.
7. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
8. AWWA C550 - Protective Interior Coatings for Valves And Hydrants.
9. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
10. AWWA C605 - Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
11. AWWA C651 - Disinfecting Water Mains.
12. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water Distribution.

E. National Fire Protection Association (NFPA):
1. NFPA 24 – Installation of Private Fire Service Mains and Their Appurtenances

1.3 SUBMITTALS

A. Furnish 1 copy of results of meter test and hydrostatic pressure test to Owner, Engineer, and utility company upon completion of water distribution backfilling operations.

B. Project Record Documents:

1. Disinfection report: Record the following:
   a. Type and form of disinfectant used.
   b. Date and time disinfectant injection start and time of completion.
   c. Test locations.
   d. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   e. Date and time of flushing start and completion.
   f. Disinfectant residual after flushing in ppm for each outlet tested.
2. Bacteriological report: Record the following:
   a. Date issued, project name, testing laboratory name, address, and telephone number.
   b. Time and date of water sample collection.
   c. Name of person collecting samples.
   d. Test locations.
   e. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   f. Coliform bacteria test results for each outlet tested.
   g. Certification that water conforms, or fails to conform, to bacterial standards.
   h. Bacteriologist’s signature and authority.
3. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.
4. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

PART 2 - PRODUCTS

2.1 PIPE

A. Pipe sizes 3-inches and smaller for installation below grade and outside building shall comply with one or combination of following:
1. Seamless Copper Tubing (less than 1”): Type "K" soft copper.
2. Seamless Copper Tubing (1.5” – 2”): Type “L” hard copper.
   a. Fittings: Wrought copper (95-5 Tin Antimony solder joint), ASME B 16.22.
3. Polyvinyl Chloride (PVC) Water Pipe: Pipe, ASTM D 2241, with SDR 21 rating, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D1784 material classification.
   a. Pipe joints: Integrally molded bell ends, ASTM D2672.
   b. Cement primer: ASTM F656.
   c. Solvent cement: ASTM D2564.

B. Pipe sizes 4 to 16 inches for installation below grade and outside building shall comply with one or combination of following:
1. Polyvinyl Chloride (PVC) Water Pipe: Pipe, AWWA C900, rated DR 18 (Class 235), continually marked as required.
   a. Elastomeric gaskets and lubricant: ASTM F477 for smaller pipes.
   b. Pipe joints: Integrally molded bell ends, ASTM D3139.
2.

2.2 VALVES

A. Gate Valves, 2-Inches and Larger:
1. Manufacturer and Model: Mueller, American Darling, M&H, Clow R/S - Resilient Wedge Gate Valves or approved equal.

2. AWWA C509 R/S “550 Coated Epoxy”, iron body, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

B. Ball Valves, 2-Inches and Smaller:
1. Manufacturer and Model: Mueller Oriseal or approved equal.
2. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

C. Butterfly Valves, From 2-Inch to 24-Inch: AWWA C504, Iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

D. Check Valves, Post Indicator Valves, And Backflow Preventers: Refer to - Fire Suppression Drawings.

E. Tapping Sleeve & Valves:
1. Manufactures: Smith Blair, JCM, Ford, Romac – Epoxy coated, stainless steel nuts and bolts or all stainless steel.

F. Mark manufacturer's name and pressure rating on valve body.

2.3 FIRE HYDRANTS

A. Fire Hydrants: Type as required by utility company/Local Fire Department (Mueler A-423, American Darling B84Btc, Clow Medallion).

B. Hydrant Extensions: Fabricate in multiples of 6-inches with rod and coupling to increase barrel length.

C. Hose and Steamer Connections: Match sizes with utility company, with two hose nozzles, one pumper nozzle.

D. Finish: Apply primer and 2 coats of enamel or special coating to color as required by utility company.

2.4 ACCESSORIES

A. Thrust Blocking: Place 3,000 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 pounds per square foot when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS (UNLESS NOTED OTHERWISE ON SITE DEVELOPMENT PLANS)

Pipe Diameter	Sq. Ft	Tees	Sc
3"		1.0	
4"		1.0	
6"		1.5	
8"		2.5	
10"		4.0	
12"		6.0	
14"		8.0	
16"		10.0	
18"		21.0	

B. Locked mechanical joint fittings shall be installed where vertical changes in direction are required and, if approved by Owner and governing authority, can be installed in lieu of above thrust blocking requirements.

C. Polyethylene Encasement: Single layer of two ply cross-laminated high density polyethylene encasement per AWWA C105, Section 4.1.2, Type III, Class C (Black), Grade 33, tensile strength 5,000 psi minimum, elongation 100 percent, thickness nominal 0.004 inch (4 mil).

D. Trace Wire: Magnetic detectable conductor, (THHN 14) brightly colored plastic covering imprinted with "Water Service" in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

A. Ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe for connections to equipment with flanges or unions.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 TRENCHING AND BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02300.

3.4 INSTALLATION – GENERAL

A. Perform installation in accordance with utility company or municipality requirements which shall take precedence over requirements stated herein when difference exists.

3.5 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes.

B. Install ductile iron pipe and fittings in accordance with AWWA C600.

C. Install PVC pipe and fittings in accordance with AWWA C605.

D. Ductile iron pipe and fittings shall be installed with polyethylene encasement around the pipe for the entire length of the project except where water main is within steel casing or is concrete encased. Install polyethylene encasement in accordance with AWWA C105, Method A.

E. Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.

F. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

G. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions with least interference with operation of existing pipeline and in compliance with local utility company.

H. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.

I. Place pipe to depth in accordance with Section 02300.

J. Backfill trench in accordance with Section 02300.

K. Install trace wire continuous over top of non-metal pipe. Bury a minimum of 6 inches below finish grade, and above pipeline.

3.6 INSTALLATION - VALVES AND HYDRANTS

A. Install gate valves as indicated on Construction Drawings. Support valve on concrete pads with valve stem vertical and plumb. Install valve boxes in manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

B. Install fire hydrant assemblies as indicated on Construction Drawings in vertical and plumb position with steamer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to street, roadway, or parking lot drive or toward protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly brace on side opposite inlet pipe against undisturbed soil and concrete blocking. Place minimum of 6-cubic feet of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Maintain vertical position of hydrant backfilling and compacting.

3.7 FLUSHING OF PIPING

A. Thoroughly flush underground piping from the water supply to the system riser, and lead-in connections to the system riser, before the connection is made to downstream fire protection system piping. Continue flushing for sufficient time to ensure through cleaning.

B. The minimum rate of flow shall be not less than one of the following:
1. 1,560 GPM for 8 in. piping; 2,440 GPM for 10 in. piping; and 3,520 GPM for 12 in. piping.
2. Maximum flow rate available to the system under fire conditions.
3. When supply cannot produce stipulated flow rates, obtain maximum available.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Perform disinfection of potable lines in accordance with AWWA C651.

B. Disinfect distribution system with chlorine before acceptance for domestic operation. Chlorine dosage shall be not less than 50 parts per million. Flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours. Flush with clean water after contact period until residual chlorine content is not greater than 1.0 part per million. Flush water discharged from water supply lines or hydrants shall not be allowed to discharge directly onto exposed soil or turf which could result in erosion of soil. If potential for erosion exists at discharge point, measures shall be taken to prevent erosion. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriological test in accordance with AWWA C651. Do not place distribution system in service until approval is obtained from local governing authorities.

C. Provide a means of neutralizing the super-chlorinated water before releasing into the environment acceptable to federal, state, and local codes. Direct release to open ground shall not be allowed, unless contained within an on-site detention facility with 6" permanent storage. In this case, the Contractor shall time the release to assure that

no rainstorms are imminent. The intent of this condition is to allow the majority of the chlorine to evaporate into the atmosphere before a rainstorm has the opportunity to wash the residual downstream. Contractor shall not release super-chlorinated water directly into the sanitary sewer system, private or public, nor any storm drain system not directly discharging into the detention facility.

3.9 SERVICE CONNECTIONS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventer (if required) and water meter with by-pass valves and sand strainer.

3.10 FIELD QUALITY CONTROL

A. Test water distribution system pipe installed below grade and outside building in accordance with the following procedures:
   1. Perform testing of pipe materials, joints, and other materials incorporated into construction of water mains and force mains to determine leakage and water tightness. In the event state or local code requires more stringent test, more stringent test shall take precedence.
   2. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water. Hydrostatically test at 200 psi, or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure at +/- 5 psi for 2 hours. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage shall be 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
   3. Provide the completed Contractor's Material And Test Certificate For Underground Piping included at the end of this Section.

B. Prepare reports of testing activities.
   1. Contractor shall complete Material and Test Certificate for Underground Piping included at the end of this Section. Additionally, contractor shall ensure minimum requirements of applicable AHJs are also performed and recorded.
   2. Report shall include photographs taken by the contractor during testing.

C.

END SECTION

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING

<table>
<tr><td colspan="2">Project Number:
City, ST:</td><td colspan="2">Date:</td></tr>
<tr><td colspan="2">Pipe Type and Class:</td><td colspan="2">Type Joint :</td></tr>
<tr><td rowspan="2">Underground Pipes And Joints</td><td colspan="3">Pipe conforms to NFPA 13/24:
Fittings conform to NFPA 13/ 24:
If no explain :</td></tr>
<tr><td colspan="3">Joints anchored clamped, strapped, or blocked in accordance with NFPA 13/24:
If no, explain:</td></tr>
<tr><td>Test Description</td><td colspan="3"><u>Flushing</u>: Flow the required rate until water is clear and indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm for 4 in. pipe, 880 gpm for 6 in. pipe, 1560 gpm for 8 in. pipe, 2440 gpm for 10 in. pipe, and 3520 gpm for 12 in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available.
<u>Hydrostatic</u>: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure ± 5 psi for 2 hours.
<u>Hydrostatic Testing Allowance</u>: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the equation in the Leakage Test section.</td></tr>
<tr><td rowspan="2">Flushing Test</td><td colspan="3">New underground piping and lead in flushed according to NFPA 13/24:
If no, explain :</td></tr>
<tr><td colspan="2">How flushing flow was obtained:
Public water □
Tank or Reservoir
Fire pump □</td><td>Through what type opening:
Hydrant butt □
Open pipe □</td></tr>
<tr><td>Hydrostatic Test</td><td colspan="2">All new underground piping hydrostatically tested at _____ psi for _____ hours.
If no, explain:</td><td>Joints Covered: □ Yes</td></tr>
<tr><td>Leakage Test</td><td colspan="2">$L = \frac{SD\sqrt{P}}{148,000}$

L= testing allowance, gal per hr
S= length of pipe, ft
D= nominal diameter of pipe, in.
P= Avg test pressure during hydrostatic test, psi</td><td>$L = \frac{(\_\_\_\_\_\ ft)\times(\_\_\_\_\_\ in)\times\sqrt{(\_\_\_\_\_)}}{148{,}000}\ psi$

L= Allowable leakage:
Leakage measured:
Leakage actual< leakage allowed?
□ Yes</td></tr>
<tr><td rowspan="3">Hydrants</td><td>Number installed:</td><td>Manufacturer & Model:</td><td>All operate satisfactorily:
□ Yes</td></tr>
<tr><td colspan="3">Water control valves left wide open:
If no, explain:</td></tr>
<tr><td colspan="3">Hose threads of fire department connections and hydrants compatible with AHJ:</td></tr>
<tr><td rowspan="4">Signatures</td><td colspan="3">Contractor Firm & Contact Name:</td></tr>
<tr><td colspan="3">Signature: Title:</td></tr>
<tr><td colspan="3">AHJ Witness: Representing:</td></tr>
<tr><td colspan="3">Signature: Title:</td></tr>
</table>

END OF FORM

SECTION 02535 - SANITARY SEWAGE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewer drainage piping, fittings, accessories, cleanouts, and bedding.
2. Connection of site sanitary sewer system to municipal sanitary sewer systems.

B. Related Requirements:
1. Section 02300 – Earthwork: Trenching, backfill, and compaction for utilities
2. Section 02536 - Sewer Manholes, Frames, and Covers

1.2 REFERENCES

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

B. ASTM International (ASTM):
1. ASTM A74 - Cast Iron Soil Pipe and Fittings
2. ASTM A746 - Ductile Iron Gravity Sewer Pipe
3. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings
4. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings
5. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
6. ASTM D2241 - Poly (vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
7. ASTM D2657 - Heat-Joining Polyolefin pipe and Fittings
8. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
9. ASTM D3035 - Polyethylene (PE) Plastic Pipe Using Flexible Elastomeric Seals
10. ASTM D3139 - Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals
11. ASTM D3212 – Integrally Molded Bell Fittings
12. ASTM D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings For Polyethylene Plastic Pipe And Tubing
13. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
14. ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

C. American Water Works Association (AWWA):
1. AWWA C111 - Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
2. AWWA C600 - Ductile-Iron Water Mains And Their Appurtenances
3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In, For Water Distribution
4. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing And Fittings 1/2 Inch Through 3 Inches, For Water Distribution
5. AWWA C906 - Polyethylene (PE) Pressure Pipe And Fittings, 4 Inch Through 63 Inch, For Water Distribution

1.3 SUBMITTALS

A. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.
3. Testing Reports for all testing as described herein.

1.4 PROJECT CONDITIONS

A. Coordinate work with termination of sanitary sewer connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.1 SEWER PIPE, FITTINGS, AND JOINTS

A. Polyvinyl Chloride Pipe (PVC): ASTM D 2665; ASTM F891; ASTM F1488; CSA B181.2, Schedule 40, rated DR 22 (PS 200) or DR 24 (PS 140) unless otherwise specified by the utility company. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.

1. Pipe joints: Integrally molded bell ends, ASTM D3212, with factory supplied elastomeric gaskets and lubricant.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

2.3 CLEANOUTS AND MANHOLES

A. Manholes shall conform to Section 02536.

B. Lid and Frame: Provide in accordance with Section 02536. Provide traffic grade and rated covers and frames where cleanouts and manholes are within pavement, with the letters “SSCO” or “SANITARY SEWER” respectively cast into the cover.

C. Shaft Construction: Cast iron shaft of internal diameter as specified on Construction Drawings with 2500 psi concrete collar for cleanouts.

2.4 APPURTENANCES

A. Trace Wire: Magnetic detectable conductor (#12 copper), brightly colored plastic covering, imprinted with “Sanitary Sewer Service” in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with bedding material.

B. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate trench and place bedding material in accordance with Section 02300.

3.4 INSTALLATION - PIPE

A. Install type and class of pipe as shown on the drawings. Pipes shall be laid and maintained to the required line and grade with necessary fittings, bends, manhole risers, cleanouts and other appurtenances placed at the required locations. The pipe shall be installed with uniform bearing under the full length of the barrel of the pipe. The pipe shall be inspected for defects and cracks before being lowered into the trench. Defective, damaged or unsound

pipe, or pipe that has had its grade disturbed after laying shall be taken up and replaced. Commence installation at lowest point with the bell end upgrade.

B. No pipe shall be laid in water or when trench conditions are unsuitable for work.

C. Pipe connecting to manholes or other structures shall terminate flush inside of the structure wall.

D. Joints for PVC and CISP shall be thoroughly lubricated with an approved lubricant before pipe sections are slipped together. Open ends shall be fully protected with a stopper to prevent earth or other material from entering the pipe during construction. Carefully free interior of the pipe from dirt, cement and other deleterious material as the work progresses.

E. Maintain separation of potable water main from sewer piping at crossings a minimum of 9 feet horizontal and 24 inches vertical.

F. Install HDPE piping and fittings to AWWA C901 and C906. Butt fusion welded per ASTM D3261.

G. Route pipe in straight line parallel to roads, buildings and adjacent utilities and as shown on the drawings.

H. Establish elevations of buried piping with sufficient cover as recommended by pipe manufacturer to ensure not less than 3 feet of cover, except as noted on drawings.

I. Backfill trench in accordance with Section 02300.

J. Install trace wire continuous over top of non-metal pipe. Bury 6 inches minimum below finish grade, above pipeline.

K. In accordance with OAC 252:656-5-4(c), sanitary sewers located in the street right-of-way shall be located on opposite sides of the streets from potable water lines and shall comply with the following:

1. Sanitary sewers shall be at least:
    a) 50 feet from petroleum product tanks unless constructed of ductile iron pipe which shall be no closer than 10 feet (joint material shall be resistant to petroleum products);
    b) 300 feet from a public water supply well;
    c) 50 feet from a private water well;
    d) 10 feet from any existing or proposed water main; and
    e) 5 feet from electrical lines and petroleum lines.

2. Sanitary sewers and sewer service lines shall cross at least 24 inches above or below water mains, and the crossing section centered so that the joints well be as far as possible from the water lines.
3. When it is impossible to obtain proper horizontal and vertical separation as stipulated in (1) and (2) of this subsection, design and construct the other line equal to water pipe, and pressure test it to assure water tightness of joints and adjacent to the water line prior to backfilling.

3.5 INSTALLATION – CLEANOUTS AND MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. For cleanouts, form and place cast-in-place concrete base pad with provision for sanitary sewer pipe to be installed to proper elevations.

C. For manholes, construct inverts according to the following guidelines:

1. Invert channel shall be smooth and accurately shaped to a semicircular bottom to match with the inside of the adjacent sewer section.
2. Invert channels and structure bottoms shall be shaped with mortar and lean concrete.
3. Changes in size and grade of invert shall be made gradually and evenly.

4. Changes in the direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

D. For manholes, provide manhole rings, frame, and cover as shown on the construction drawings.

3.6 FIELD QUALITY CONTROL

A. Field quality control shall be conducted by the Contractor as needed to confirm that work is in accordance with contract documents. At a minimum, the contractor will complete the testing as outlined below.

B. Pipes and joints shall not be completely backfilled until after inspection, testing, and approval by the Owner and local jurisdiction.

C. Prior to testing for leakage, the pipe trench shall be backfilled to at least the spring line of the pipe. If required to prevent pipe movement during testing, additional backfill shall be added leaving the pipe joints uncovered to permit inspection.

D. Air Pressure Exfiltration Test: Gravity systems shall be air tested between manholes at 3.5 psi for 5 minutes per ASTM F1417 for plastic pipes.
1. Each section of sewer line between successive manholes shall be tested by plugging the upper and lower ends of the line using pneumatic plugs.
2. The sewer line shall be filled to an air pressure of 4 psi and held for two minutes to allow for stabilization of the air pressure meter. After meter stabilization, the pressure shall be reduced to 3.5 psi and held for 5 minutes per ASTM F-1417 for plastic pipe.
3. The allowable net pressure drop will be 0.5 psi
4. An example Air Pressure Exfiltration Test Report is included in Appendix A. This form contains the minimum air pressure exfiltration testing and reporting standards to meet owner requirements. Contractor shall ensure minimum requirements of applicable AHJs are also performed and recorded.
5. Report shall include photographs taken by the contractor during testing.

E. Deflection Test:
1. Deflection tests shall be conducted on all plastic pipe using a mandrel with a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.
2. Allowable Deflection: Maximum allowable pipe deflection shall not exceed 5 percent of nominal inside diameter.
3. Mandrel: Mandrel, go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. Contact length of mandrel's arms shall equal or exceed nominal inside diameter of sewer to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01-inch maximum. Contractor shall provide mandrel and necessary equipment for mandrel test.
4. Procedure: Mandrel shall be hand-pulled through flexible pipe sewer lines no earlier than 30 days after trench has been completely backfilled. Sections of sewer not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to satisfaction of Owner or governing agency. Repaired section shall be retested.
5. An example Deflection Test Report is included in Appendix A. This form contains the minimum deflection testing and reporting standards to meet owner requirements. Contractor shall ensure minimum requirements of applicable AHJs are also performed and recorded.
6. Report shall include photographs taken by the contractor during testing

F. Hydrostatic Test: Force main piping shall be hydrostatically tested at 150 psi in accordance with AWWA C 605. Tests must use a 2-foot test head and leakage inward or outward shall not exceed 10 gallons per inch of pipe diameter per mile per day.

G. Provide measuring devices, meters, water, materials, and labor for making the required tests.

H. Tests shall be conducted in the presence of the Owner or his designee. Test data shall be submitted to the Engineer for review and approval.

I. All testing shall be completed prior to placing any line in service. The contractor shall be responsible for the safety of all participates and shall follow all OSHA mandated guidelines, including those for Confined Space Entries.

END OF SECTION

APPENDIX A

TESTING REPORT
SANITARY SEWER PIPE
AIR PRESSURE EXFILTRATION TEST

PROJECT NAME: _____

PROJECT NUMBER: _____

INSPECTOR:

DATE OF TESTING:

MANHOLE # _____ to MAN

PIPE SIZE: _____ PIP

TESTING TIME (MIN): _____ BE

ENDING PRESSURE (PSI): _____ AT

NET PRESSURE DROP: _____

MANHOLE # _____ to MAN

PIPE SIZE: _____ PIP

TESTING TIME (MIN): _____ BE

ENDING PRESSURE (PSI): _____ AT

NET PRESSURE DROP: _____

COMMENTS:

SIGNATURE: _____

TESTING REPORT SHEET _____ OF ___

TESTING REPORT
SANITARY SEWER PIPE
DEFLECTION TEST

PROJECT NAME: _____

PROJECT NUMBER: _____

INSPECTOR:

DATE OF TESTING:

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

MANHOLE # _____ to MAN

COMMENTS:

SIGNATURE: _____

TESTING REPORT SHEET _____ OF ___

SECTION 02536 - SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes:
1. Modular precast concrete manhole assemblies.

1.3 Related Requirements:
1. Section 02300 - Earthwork. Excavation, backfill, and compaction.
2. Section 02535- Sanitary Sewer Systems.
3. Section 02630 - Storm Drainage.

1.4 REFERENCES

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

B. ASTM International (ASTM):
1. ASTM A48 - Gray Iron Castings.
2. ASTM C55 - Concrete Building Brick.
3. ASTM C94 - Ready Mixed Concrete.
4. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
5. ASTM C990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
6. ASTM D2412 - Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

C. International Masonry Industry All-Weather Council (IMIAC):
1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

D. Occupational Safety and Health Administration (OSHA):
1. OSHA 01926.1153 Respirable Crystalline Silica.

E. Texas Department of Transportation (ODOT):
1. Standard Specifications for Highway Construction, 2019 Edition.

1.5 SUBMITTALS

A. Shop Drawings: Indicate reference to Construction Drawings of manhole locations, elevations, piping with sizes, locations, and elevations of penetrations.

B. Sanitary Sewer Manhole Vacuum Test Report

PART 2 - PRODUCTS

2.1 MANHOLES

A. Precast Concrete: Reinforced precast concrete barrel.
1. Manhole Sections: ASTM C478.
2. Joints and Joint Sealant: Joint between manhole barrel sections shall conform to ASTM C990 using preformed flexible joint sealant.

3. Pipe Connection Sealant: Joint material between manhole barrel and adjoining pipe shall be as shown on the drawings.
4. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated.

B. Concrete Brick: ASTM C55, Grade N Type I-moisture controlled, normal weight, of same grade, type and weight as block units, nominal modular size of 3 5/8-inches x 7 5/8-inches x 2 1/4-inches.

C. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than 2-inches deep shall be repaired using Class "D" mortar.

D. Brick Transition Reinforcement: Formed steel 8-gauge wire with galvanized finish.

E. Configuration:
1. Barrel Construction: Concentric with eccentric cone top section.
2. Shape: Cylindrical.
3. Clear Inside Dimensions: 48-inches diameter minimum or as indicated on Construction Drawings.
4. Design Depth: As indicated on Construction Drawings.
5. Clear Lid Opening: 24-inches minimum for storm sewer structures, and 30 inches minimum for sanitary sewer structures.
6. Pipe Entry: Provide openings as indicated on Construction Drawings.
7. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with nonshrinking grout.

F. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float.

2.2 COMPONENTS

A. Lid and Frame:
1. Manufacturer: One of the following:
a. Bass & Hays Foundry.
b. Serampore
c. Star
d. Sigma
e. EJIW
2. ASTM A48, Class 30B minimum, heavy duty cast iron construction, machined flat bearing surface.
3. Removable lid, closed or open as indicated on Construction Drawings, with sealing gasket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items specified by other Sections are properly sized and located.

B. Verify that built-in items are in proper location and ready for roughing into work.

C. Verify that the excavation for manholes is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves as indicated on Construction Drawings.

3.3 PRECAST MANHOLE CONSTRUCTION

A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
   1. After completion of slab foundation, lower first joint of manhole barrel into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert. Pour invert immediately after setting of first section of manhole barrel.
   2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer's recommendations. Place joint sealant on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

C. Set cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

3.4 FIELD QUALITY CONTROL

A. Field quality control shall be conducted by the Contractor as needed to confirm that work is in accordance with contract documents. At a minimum, the contractor will complete the testing as outlined below.

B. Vacuum Test: All manholes shall be vacuum tested in accordance with ASTM C1244-93, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.
   1. Plug all manhole entrances and exits other than the manhole top access using suitably sized pneumatic or mechanical pipeline plugs and follow all manufacturer's recommendations and warnings for proper and safe installation of such plugs. Plugs should be inserted a minimum of 6" beyond manhole wall.
   2. Install the vacuum tester head assembly at the top access of manhole. (If using a "plate" style manhole tester, position the plate on the manhole ring assembly.)
   3. Attach the vacuum pump assembly to the proper connection on the test head assembly. Make sure the vacuum inlet/outlet valve is in the closed position.
   4. Following safety precautions and manufacturer's instructions, inflate sealing element to the recommended maximum inflation pressure.
   5. Start the vacuum pump and allow pre-set RPM to stabilize.
   6. Open the inlet/outlet ball valve and evacuate the manhole to 10" Hg. (approximately negative 5 psig, 0.3 bar).
   7. Close vacuum inlet/outlet ball valve and monitor vacuum for specified test period (see table). If vacuum does not drop in excess of 1" Hg., manhole is considered acceptable and the manhole passes the test. If manhole fails the test, complete necessary repairs and repeat test procedures until satisfactory results are obtained.
   8. Manholes in asphalted areas cannot be tested until subbase for asphalt has been stabilized.
   9. An example Vacuum Test Report is included in Appendix A. This form contains the minimum vacuum testing and reporting standards to meet owner requirements. Contractor shall ensure minimum requirements of applicable AHJs are also performed and recorded.
   10. Report shall include photographs taken by the contractor during testing.
   11.

Depth (ft.)	Diameter (in.)								
	30	33	36	42	48	54	60	66	72
	Times (s)								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	65	74	87	98	108	121

C. Tests shall be conducted in the presence of the Owner or his designee. Test data shall be submitted to the Engineer for review and approval.

END OF SECTION

APPENDIX A

TESTING REPORT
SANITARY SEWER MANHOLE
VACUUM TEST

PROJECT NAME: _____

PROJECT NUMBER: _____

INSPECTOR:

DATE OF TESTING:

MANHOLE # _____

MANHOLE DIAMETER: _____ MANHO

INITIAL VACUUM: _____ ENI

PASS or FAIL (circle one)

MANHOLE # _____

MANHOLE DIAMETER: _____ MANHO

INITIAL VACUUM: _____ ENI

PASS or FAIL (circle one)

MANHOLE # _____

MANHOLE DIAMETER: _____ MANHO

INITIAL VACUUM: _____ ENI

PASS or FAIL (circle one)

COMMENTS:

SIGNATURE: _____

TESTING REPORT SHEET _____ OF _

SECTION 02630 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Storm sewer drainage piping, fittings, and accessories.
2. Storm drainage structures.

1.2 Related Requirements:
1. Section 02300 – Earthwork: Excavation, trenching, backfill, and compaction.
2. Section 02370 – Erosion and Sedimentation Control (Including SWPPP).
3. Section 02536 - Sewer Manholes, Frames, and Covers.

1.3 REFERENCES

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

B. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO M 170 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
2. AASHTO M 190 - Bituminous Coated Corrugated Metal Culvert Pipe and Arches.
3. AASHTO M 252 - Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter.
4. AASHTO M 294 - Corrugated Polyethylene Drainage Tubing, 12 to 60 Inch Diameter.
5. AASHTO M 306 - Drainage, Sewer, Utility, and Related Casting
6. AASHTO M 330 - Polypropylene Pipe, 300- to 1500-mm (12- to 60-in) Diameter

C. ASTM International (ASTM):
1. ASTM A 74 - Cast Iron Soil Pipe and Fittings.
2. ASTM A 185 - Steel welded Wire Fabric, Plain, for Concrete Reinforcement.
3. ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM A 674 – Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
5. ASTM A 760 - Corrugated Steel Pipe, Metallic-Coated For Sewers And Drains.
6. ASTM A 796 - Structural Design Of Corrugated Steel Pipe, Pipe-Arches, And Arches For Storm And Sanitary Sewers And Other Buried Applications.
7. ASTM A 798 - Factory-Made Corrugated Steel Pipe For Sewers And Other Applications.
8. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
9. ASTM C 150 - Portland Cement.
10. ASTM C 206 - Finished Hydrated Lime.
11. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
12. ASTM C 564 - Rubber Gasket for Cast Iron Soil Pipe and Fittings.
13. ASTM C 924 - Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
14. ASTM C 969 - Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
15. ASTM C 990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
16. ASTM C 1628 – Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets.
17. ASTM D 2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
18. ASTM D 3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
19. ASTM D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
20. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
21. ASTM F 949 - Poly (Vinyl Chloride)(PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.
22. ASTM F 1417 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

23. ASTM F 2306 - 12 to 60 Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
24. ASTM F 2487 – Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines.
25. ASTM F 2736 - 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe.
26. ASTM F 2764 - 30 to 60 in. Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications.
27. ASTM F 2881 - 12 to 60 in. Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

D. American Concrete Institute (ACI):
1. ACI 301 - Structural Concrete for Buildings.

E. UNI-Bell PVC Pipe Association:
1. UNI-B-6 – Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 SUBMITTALS

A. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 PROJECT CONDITIONS

A. Coordinate work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe and joint materials specified below for storm drainage shall be strictly limited to the extent shown or allowed on the drawings or as specified in Part 3 hereinafter.

B. Reinforced Concrete Pipe (RCP): ASTM C 76, Class III unless noted otherwise on Drawings.
1. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
a. Rubber O-ring Gasket: ASTM C 443, ASTM C 1628.
b. Bitumen or Butyl-Rubber Sealant: ASTM C990.
2. Flared End Sections: ASTM C 76 or, for sections with toe wall, AASHTO M 170.

C. High Density Polyethylene Pipe (HDPE): AASHTO M 252 Type S or SP, M 294 Type S or SP, or ASTM F 2306 smooth interior/annular exterior. Use only where specifically indicated on Drawings.
1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
a. Rubber Gasket: ASTM F477
b. Rubber Gasket Joints: ASTM 3212.
c. Corrugated Coupling Bands: As recommended by manufacturer.

D. Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, rated SDR 35, or ASTM F 949 for Profile Pipe, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D3034 classification. Only permitted when specifically indicated on Drawings. PVC is only permitted in pipes 15” in diameter or less.
1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
a. Rubber Gasket: ASTM F477
b. Rubber Gasket Joints: ASTM 3212.

E. Spiral Rib Metal Pipe: ASTM A760 Type 1R or Type IIR. Coatings shall meet requirements of ASTM A 929 and shall be galvanized, aluminized, or bituminous coated as specified on Drawings. Use only where specifically indicated on Drawings.
   1. Pipe gauge shall be as specified on construction drawings or if no gauge is given then the minimum gauges are as follows: 15" to 42" diameter round pipe – 16 gauge (0.064"), 48" to 60" round pipe – 14 gauge (0.079"), 66" to 78" round pipe – 12 gauge (0.109"), 15" to 30" pipe arch – 16 gauge (0.064"), 36" to 42" pipe arch – 14 gauge (0.079"), and 48" to 78" pipe arch – 12 gauge (0.109"). Gauges for larger diameters shall be indicated on the drawings. Standard corrugated steel pipe (CMP or CSP) shall not be substituted for Spiral Rib Metal Pipe.
   2. Acceptable manufacturers: Provide the following:
      a. Ultra Flo or Ultra Flo II by Contech, Inc.
      b. Max Flow by Southeast Culvert, Inc.
      c. Max Flow by St. Regis Culvert, Inc.
      d. Max Flow by Thompson Culvert, Inc.
   3. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
      a. Semi-corrugated "Hugger" type bands and "O" ring gaskets.

F. Subdrains: Perforated, PVC or flexible corrugated HDPE pipe as specified herein of the size indicated on the drawings.

2.2 ACCESSORIES

A. Encasement for Piping: ASTM A 674. Where required for corrosion protection for underground iron pipe and fittings.
   1. Material: High-density, crosslaminated polyethylene (PE) film of 0.004-inch (0.10-mm) minimum thickness.
   2. Form: Sheet or tube.
   3. Color: Black.

2.3 DRAINAGE STRUCTURES

A. Manholes: Conform to Section 02536.

B. Grates and Frames: Provide in accordance with details shown on Drawings or approved equivalent by one of the following acceptable manufacturers. Project needs vary depending on geographic region. To be connected with the best suited supplier, contact the manufacturer whose territory is nearest Project location.
   1. Acceptable Manufacturers:
      a. US Foundry (An Eagle Manufacturing Co.).
      b. EJ Infrastructure Access Solutions d/b/a. East Jordan Iron Works.
      c. D&L Foundry and Supply
      d. Deeter Foundry.
      e. Neenah Foundry.
   2. Standard Grates and Frames: Heavy duty grates, AASHTO M 306 load rating of H-20.

C. Cement Mortar used for paving inverts, filling lift holes, joints, patching and anchoring castings shall consist of one part Portland cement, type I, ASTM C 150, 1/4 part hydrated lime, ASTM C 206 and 2-1/2 parts clean, well-graded sand and water free of suspended matter, alkali, and containing no industrial or domestic waste.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with bedding material.

B. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 INSTALLATION – PIPE

A. Install type of pipe shown on the drawings. Where type of pipe material is not shown or restricted on the drawings, provide only RCP. Installation provisions herein shall apply to the extent as applicable to the pipe and joints allowed.

B. Inspect pipe for defects and cracks before being lowered into the trench, piece by piece. Remove and replace defective, damaged or unsound pipe or pipe that has had its grade disturbed after laying. Protect open ends with a stopper to prevent earth or other material from entering the pipe during construction. Remove dirt, excess water, and other foreign materials from the interior of the pipe during the pipe laying progress.

C. Excavate pipe trench and place bedding material in accordance with Section 02300.

D. All pipes that penetrate levees, including permanent outlet control devices and temporary discharge pipes from sedimentation basins, shall be constructed in conjunction with fill placement to ensure these drainage devices are properly placed and the surrounding backfill is adequately tied into the basin levee. Trenching of levees is not permitted. All materials in the levee, including bedding materials for the discharge devices, shall be low permeability, cohesive soils. Soil exhibiting high shrink/swell potential or containing greater than 5% organics shall not be used.

E. Install pipe in accordance with manufacturer’s written recommendations.

F. Thermoplastic Pipe: Install pipe in accordance with pipe manufacturer’s installation instructions and ASTM D 2321 and as indicated on the drawings.

G. Spiral Rib Metal Pipe: Install as indicated on the drawings, as recommended by the manufacturer, and in accordance with ASTM A 798 and A 796 as they apply.

H. HDPE Pipe: Install pipe in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications and as indicated on the drawings.

I. Install polyethylene corrosion-protection encasement around iron piping as indicated on the drawings, as recommended by the manufacturer, and in accordance with ASTM A 674.

J. Commence installation at the lowest point for each segment of the route. Lay RCP with the groove or bell end upstream.

K. Lay pipe to the required line and slope gradients with the necessary fittings, bends, manhole, risers and other appurtenances placed at the required location as noted on Drawings.

L. Do not displace or damage pipe when compacting.

M. Do not place pipe in water or when trench conditions are unsuitable for such work.

N. Joints: Construct joints as described herein and in accordance with manufacturer’s installation instructions. Provide pipe joint type for silttight or watertight only joint performance in accordance with the following table. Rubber gasketed joints shall conform to ASTM D 3212. The table applies only to the extent as applicable to the pipe and joint type and the joint performance as shown or specified.

Pipe and Joint Type	Joint Performance		
	Watertight	Silttight	Soiltight
RCP			
Rubber O-Ring Gasket	x	x	x
HDPE			
Rubber Gasket	x	x	x
PVC			
Rubber Gasket	x	x	x
Spiral Rib Aluminum Pipe			
Hugger Band w/ O Ring Rubber Gasket		x	x

3.4 INSTALLATION – MANHOLES, CATCH BASINS, INLETS, AND JUNCTION BOXES

A. Construct drainage structures in accordance with details shown on Drawings and in accordance with Section 02536 as applicable.

B. Precast Sections:
1. Install precast section with bases in accordance with Section 02300 and 02536 or as shown on drawings.
2. Align pipe openings to that of the pipe entering and leaving the manhole, etc. Properly Pipe with connections to manholes, etc. as shown on the drawings.

C. Invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Shape invert channels and structure bottoms with cement mortar. Changes in size and grade of invert shall be made gradually and evenly. Changes in direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

D. Frames and Covers:
1. Set frames and covers to the proper elevation. Firmly embed frames in mortar approximately 1 inch thick and align to fit the top section of the structure.
2. Limit bricks set in mortar and used to adjust the frame to finished grade to no more than four courses.
3. Adjustment rings used to make adjustments in grade shall be made with the initial ring embedded in mortar and the exterior of the rings pargeted with mortar not less than 1/2 inch thick. No adjustment made in this manner shall exceed 8 inches.

E. Construct concrete cradles as shown on the drawings and in accordance with the strength requirements of Section 03311 as needed when crossing over and under sewer pipe or utility lines.

3.5 SUBDRAINS

A. Install subdrains in accordance with the details and at the locations shown on the drawings.

3.6 INSPECTION AND TESTING

A. General:
1. Clean, inspect, and test Strom sewer systems and culverts, upon completion or at such time as directed. The system or culvert shall have a true grade and line. Actual elevations shall be within 0.08 feet of the elevations given on the drawings.

2. After completion of the Work, or any part thereof, the job shall be tested to determine that it has been installed in accordance with the drawings and specifications. In general, the Work shall prove to be in good condition, installed in accordance with the drawings and specifications and ready for use.

B. Cleaning and Testing:
   1. Visibly inspect and remove all debris and obstructions from storm pipe.
   2. Test watertight joints in accordance with the requirements of jurisdictional authorities, UNI-B-6 and the following:
      a. Option: Test plastic piping according to ASTM F 1417 or ASTM F 2487.
      b. Option: Test concrete piping according to ASTM C 924 or ASTM C 969.

C. Alignment Test: After backfill has been placed and compacted to a depth not less than one foot above top of pipe, a visual inspection shall be made by flashing a light between manholes. Correct displacement or misalignment of invert.

END OF SECTION

SECTION 02715 - BASE COURSE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate base for asphaltic concrete including sand/shell base and hot-mix sand asphalt base.

B. Related Requirements:
   1. Section 02300 – Earthwork: Excavation, Backfill, and Compaction for Pavement subgrade.

1.2 REFERENCES

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

B. ASTM International (ASTM):
   1. ASTM D698 – Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbs/ft³ (600 kN-m/m³)).
   2. ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,700 kN-m/m³)).

C. Asphalt Institute.

D. Oklahoma Department of Transportation (ODOT):
   1. Standard Specifications for Highway Construction, 2019 Edition.

1.3 SUBMITTALS

A. Submit materials certificate to the Owner's Civil Engineering Consultant and the Owner's Construction Testing Laboratory, signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein or on the Construction Drawings.

B. Submit certification of base course materials and placement as specified in Parts 2 and 3 hereinafter.

1.4 WEATHER LIMITATIONS

A. Do not place aggregate when base surface temperature is less than 40 degrees F, nor when air temperature is below 45 degrees F. Do not place aggregate when surface is wet or frozen. Do not place aggregate when weather conditions are unfavorable otherwise.

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL

A. Aggregate Base Course: Aggregate base course shall consist of a well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction. Base course may consist of a granular base (crushed slag, stone, or gravel, etc), sand/shell base material, or a hot-mix sand asphalt base.

B. Base course shall be as shown on the drawings, or when not shown, shall be as specified herein.

C. Aggregate base material requirements from State or other local highway agency specifications may be used for aggregate base course for roads, streets, or similar use pavements if the following conditions are met:
   1. Percentage of material by weight passing the No. 200 sieve will not exceed 10.

2. Portion of the material passing the No. 40 sieve must have a liquid limit not greater than 25 and a plasticity index not greater than 5.

D. Aggregate shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, angular sand, or other approved material. Aggregate shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.
   1. Coarse aggregates shall be angular particles of uniform density.
   2. Fine aggregates shall be angular particles of uniform density. Fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

E. Gradation: Gradation shall be in conformance with the paving section information shown on the construction drawings.

F. Hot-mix Sand Asphalt Bases: Asphalt Institute Type VI, VII, or VIII Mixes for Hot-mix Sand Asphalt Bases. Hot-Mix base shall be used only under asphaltic concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall verify to the Owner in writing that the subgrade has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with Section 02300.

3.2 CONSTRUCTION

A. Perform base course construction in accordance with the applicable State standard specifications or as shown or specified.

B. Perform base course construction in a manner that will drain the surface properly and prevent runoff from adjacent areas from draining onto base course construction.

C. Compact base material to not less than 95 percent of optimum density, as determined by ASTM D1557 unless otherwise indicated on the Drawings.

D. Construct to thickness indicated on Construction Drawings. The minimum base thickness as shown on drawings shall be achieved throughout all pavement areas.
   1. Granular Base: Apply in lifts or layers not exceeding 8-inches, measured loose.
   2. Hot-mix Sand Asphalt Bases: Apply in lifts or layers not exceeding 3-inches, measured loose.

3.3 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I shall not be considered a substitute for the Contractor’s responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

B. Mandatory Testing and Inspection:
   1. Measure base course tolerances no more than 25 ft. on center with a rod and level or stringline.
   2. Certify in writing to the Owner that base course placement is in accordance with Contract Document requirements prior to subsequent work thereon.

END OF SECTION

SECTION 02740 - ASPHALT CONCRETE PAVING

GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphalt concrete binder and surface course.

B. Related Requirements:
   1. Section 02300 - Earthwork.
   2. Section 02715 - Base Course.
   3. Section 02765 - Pavement Markings.
   4. Section 02770 - Curbs and Sidewalks.

1.2 REFERENCES

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

B. The Asphalt Institute (AI):
   1. MS-2 - Mix Design Methods For Asphalt Concrete And Other Hot-Mix Types.

C. Oklahoma Department of Transportation (ODOT):
   1. Standard Specifications for Highway Construction, 2019 Edition.

D. ASTM International (ASTM):
   1. ASTM D1188 - Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
   2. ASTM D2041 - Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
   3. ASTM D2950 - Density of Bituminous Concrete in Place by the Nuclear Methods.
   4. ASTM D2726 - Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixture.
   5. ASTM D5444 - Mechanical Size Analysis of Extracted Aggregate.

E. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO M017 - Mineral Filler for Bituminous Paving Mixtures.
   2. AASHTO M140 - Emulsified Asphalt.
   3. AASHTO M208 - Cationic Emulsified Asphalt.
   4. AASHTO M320 - Performance-Graded Asphalt Binder
   5. AASHTO M323 - Superpave Volumetric Mix Design
   6. AASHTO T164 - Quantitative Extraction of Asphalt Binder from Hot-Mix Asphalt (HMA)
   7. AASHTO T166 - Bulk Specific Gravity of Compacted Hot-Mix Asphalt Mixtures Using Saturated Surface-Dry Specimens
   8. AASHTO T209 – Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt (HMA)
   9. AASHTO T245 - Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
   10. AASHTO T275 - Bulk Specific Gravity of Compacted Hot-Mix Asphalt Mixtures Using Paraffin-Coated Specimens
   11. AASHTO T308 - Asphalt Content of Hot-Mix Asphalt (HMA) by the Ignition Method.
   12. AASHTOT312 - Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor.
   13. AASHTO T331 - Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

F. National Asphalt Pavement Association (NAPA):
   1. IS 123 – Recycling Hot-Mix Asphalt Pavements
   2. IS 128 - HMA Pavement Mix Type Selection Guide

G. Occupational Safety and Health Administration (OSHA):
   1. OSHA 01926.1153 Respirable Crystalline Silica.

1.3 QUALITY ASSURANCE

A. Pre-installation Meeting: Convene a pre-installation meeting at the site at least two weeks prior to commencing work of this Section. Require attendance of parties directly affecting work of this Section, including, but not limited to, the Owner's representative, CTL's representative and inspector, Contractor, paving sub-contractor and job foreman.
   1. Contact Owner three weeks prior to pre-installation conference to confirm schedule.
   2. Record discussions of meeting and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to paving work, including the following:
      a. Review preparation and installation procedures and coordinating and scheduling required with related work.
      b. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
      c. Tour, inspect and discuss condition of subgrade, drainage structures, and other preparatory work.
      d. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
      e. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      f. Review paving requirements (drawings, specifications and other contract documents).
      g. Review required submittals, both completed and yet to be completed.
      h. Review required inspections, testing procedures.
      i. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
      j. Review safety precautions relating to placement of paving.

1.4 SUBMITTALS

A. Submit mix designs to the Civil Engineering Consultant of Record at least 30 days prior to beginning asphalt paving operations. Mix designs over one year old will not be accepted by Owner. Mix design submittal shall follow the format as recommended by Asphalt Institutes Manual MS-2 and include the following:
   1. Type and Name of mix.
   2. Gradation Analysis.
   3. Optimum asphalt content.
   4. Grade of asphalt binder.
   5. Volumetric properties.
   6. References to local State Highway Department Specification for each material when applicable.

B. Submit approved mix designs and laboratory test results to CTL signed by the materials producer and Contractor certifying materials and mix ratios conform to the requirements specified herein.

C. Submit certification of asphalt placement as specified in Field Quality Control.

1.5 PROJECT CONDITIONS

A. Weather Limitations:
   1. Apply tack coat when ambient or base surface temperature is above 40 F, and when temperature has been above 35 F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, during rain, or when frozen.
   2. Construct asphalt concrete paving when ambient temperature is above 40 F.

B. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PRODUCTS

2.1 MATERIALS

A. Aggregate: Use locally available materials and gradations that meet local State Highway Department Specifications and exhibit satisfactory records of previous installations. All aggregate requirements, including those for quality, shall meet those in AASHTO M323 for the specified traffic level.

B. Asphalt Binder: Asphalt binder shall be a performance-graded (PG) binder, meeting the requirements of M320, which is appropriate for the climate and traffic-loading conditions at the site of the paving project and in compliance with the local State Highway Department Specifications for that location, or as specified by the contract documents.
   1. Design reliability shall be 85% for the high- and low-temperature performance.
   2. The minimum required PG binder shall be that which satisfies the required design reliability using the pavement temperature data determined.

C. Tack Coat: Emulsified asphalt; AASHTO M140 or AASHTO M208, SS-1h, CSS-1, or CSS-1h, may be diluted with up to 1 part water to 1 part asphalt.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M17, if recommended by local State Highway Department Specifications.

E. Reclaimed Asphalt Pavement (RAP): RAP may be used in amounts not to exceed 20% by wt. The mix design shall contain the percentage of RAP that is to be used in the production. Production procedures using RAP material shall conform to NAPA IS 123. Additional RAP provisions shall be as follows:
   1. Material-handling machinery shall not drive on the RAP stockpiles.
   2. RAP maximum top size aggregate introduced into the mix shall be 1-1/2 inches.
   3. Dust (fines) in the RAP, when added to the virgin aggregate, shall not exceed the requirements of the virgin mix design.
   4. Moisture content shall be monitored to assure that the material can be thoroughly dried as it is processed.
   5. Stockpiles shall be left uncovered or stored under the roof of an open-sided building.
   6. Material handling front-end loader operators shall be experienced in handing RAP materials.
   7. RAP shall be loaded in the cold feed bins in small consistent quantities without causing the material to compact in the bin.
   8. RAP shall not be held in the bin for extended periods of time, especially on hot, humid days.
   9. During production, RAP material shall not be allowed to contact open flame.

2.2 AGGREGATE SIZE REQUIREMENTS

A. Aggregate gradation shall be as specified by ODOT Standard Specifications.

2.3 ASPHALT-AGGREGATE MIXTURE

A. Mix Design:
   1. The initial, design, and maximum number of gyrations shall conform to the ODOT design standards.
   2. The design, when compacted the relative density, VMA, VFA, and dust-to-binder ratio requirements specified..
   3. Pavement design values, tolerances, and properties not specified within this specification shall be in accordance with the ODOT Standard Specifications. In the case of a conflict, the more stringent requirements shall apply.

EXECUTION

3.1 EXAMINATION

A. Verify that the prepared base material has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with Section 02715.

3.2 PREPARATION

A. Proof roll prepared base material surface to check for unstable areas in accordance with Section 02300 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.

B. Establish and maintain required lines and elevations.

C. Cover the surfaces of curbs, gutters, manholes and other structures on which the asphalt concrete mixture will be placed, with a thin, uniform coat of liquid asphalt. Where the asphalt concrete mixture will be placed against the vertical face of an existing pavement, clean the vertical face to remove foreign substances and apply a coating of liquid asphalt at a rate of approximately 0.25 gallons per square yard.

D. Density Control Strips.
1. Prior to beginning placement of asphalt, construct asphalt concrete density control strips.
2. Source and type of material, material requirements, and laydown and compaction equipment used for compaction shall be the same as that to be used in the project.
3. The subgrade or pavement layer upon which the control strip is constructed shall tested prior to construction of the control strip.
4. The control strip shall be a minimum of 250 linear feet long and one paver width wide unless approved in writing by the Engineer.
5. Rolling the control strip shall continue until no appreciable increase in density is obtained by additional coverages.
6. Upon completion of rolling, the Contractor shall use a nuclear testing device to establish the mean density of the control strip. The mean density will be based on 10 tests taken at randomly selected sites within the control strip area. The nuclear gauge will be calibrated with the average of 3 cores taken from the same area. The average of the cores shall meet the specified density requirements with no individual test less than 91 percent. The calibration factor between the average nuclear density and average core density shall be applied to the Contractor's nuclear gauge for Contractor's density monitoring.

E. Equipment:
1. Equipment necessary for the paving of asphalt concrete shall be on the project prior to beginning paving operations.
2. Maintain equipment in satisfactory operating condition and correct breakdowns in manner that will not delay or be detrimental to the schedule of paving operations.

3.3 APPLICATION

A. Tack Coat:
1. Apply to contact surfaces of previously constructed asphalt concrete base courses or Portland cement concrete and surfaces abutting or projecting into asphalt concrete or into asphalt concrete pavement.
2. Apply tack coat to asphalt concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat between each lift or layer of full depth asphalt concrete and sand asphalt bases and on surface of bases where asphalt concrete paving will be constructed.
3. Apply at rate which produces a residual of asphalt cement between 0.04 and 0.06 gal per sq. yd of surface.
4. Allow drying until at proper condition to receive paving.

3.4 ASPHALT CONCRETE PLACEMENT

A. Place asphalt concrete mixture on completed, compacted underlying surface, spread, and strike off. Spread mixture at the minimum ambient temperature that will allow the required density to be achieved.

B. Whenever possible, spread pavement by finishing machine; however, inaccessible or irregular areas may be placed by hand methods. Spread hot mixture uniformly to required depth with hot shovels and rakes. After spreading,

carefully smooth hot mixture to remove segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be type designed for use on asphalt mixtures. Do not dump loads faster that they can be properly spread. Workers shall not stand on loose mixture while spreading.

C. Placement and routing of hauling and placing equipment shall be conducted in a manner to avoid tire tracking of bituminous material onto existing paved surfaces.

D. Paving Machine Placement: Apply successive lifts of asphalt concrete in transverse directions except when placing within small areas, parallel lifts may be placed when considered more practical. Joints of successive parallel lifts shall be offset a minimum of 2 feet. Place surface course parallel to flow of traffic. Place asphalt paving in typical strips not less than 10'-0" wide. Asphalt concrete pavement, including base and surface course, shall be placed in two or more lifts as indicated on drawings. Pavement thicknesses shall be thickness shown on the drawings for each course but not less than 1-1/2 inch nor more than 3 inches for each lift.

3.5 ROLLING AND COMPACTION

A. After being spread, mixture shall be compacted by rolling as soon as it will bear the weight of rollers without undue displacement. Number, weight, types of rollers, and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in workable condition.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Perform breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling with hot material.

D. Intermediate Rolling: Follow breakdown rolling as soon as possible while mixture is hot. Continue second rolling until mixture has been thoroughly compacted as follows:
   1. Minimum Average Density: 93 percent of theoretical maximum density according to AASHTO T209 or ASTM D2041, with no individual test less than 91 percent nor greater than 97 percent.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked. Any masked or marred finish surfaces shall be repaired or smoothed.

H. Compaction at Unsupported Edges of Pavements: Start the first roller pass 12-15 inches from the unsupported edge. Allow the uncompacted asphalt to act as a dike to hold the mat in place. The final pass over the uncompacted dike should not slough off if the roller is supported on the compacted mat.

3.6 JOINTS

A. General: Place each asphalt paving layer as continuous as possible to keep the number of joints to a minimum. Create joints between old and new pavement, between successive days work, and where the mixture has become cold (less than 140 degrees F). Make these joints in such a manner as to create a continuous bond between the old and new pavement construction courses.

B. Construction joints shall have same texture, density, and smoothness as other sections of asphalt concrete course.

C. Transverse Joints: If placing of material is discontinued or if material in place becomes cold, make a joint running perpendicular to the direction traveled by the paver. Before placement continues, trim the edge of the previously placed pavement to a straight line perpendicular to the paver and cut back to expose an even vertical surface for the full thickness of the course. When placement continues, position the paver on the transverse joint so that suffi-

cient hot mixture will be spread in order to create a joint after rolling that conforms to the required smoothness. If the temperature of the previously placed pavement material drops below 140 degrees F before paving is resumed, give the exposed vertical face a thin coat of liquid asphalt just before paving is continued.

D. Longitudinal Joints: Coat longitudinal joints that are not completed before the previously laid mixture has cooled to a temperature below 140 degrees F, with liquid asphalt just before paving is continued.

3.7 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I shall not be considered a substitute for the Contractor's responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

B. Mandatory Contractor Testing:
   1. Pavement Thickness: Measure pavement thickness behind the paver at the beginning of and during pavement placing operations to assure proper thickness.
   2. Field Density Test For In-Place Materials: In-place density tests by nuclear method in accordance with ASTM D2950. Nuclear density shall be correlated with ASTM D1188 or D2726 or AASHTO T166, T275, T331 as applicable.
      a. Density tests on subgrades and aggregate base courses to be overlaid by pavements shall be performed within 48 hours prior to placement of the pavement lift. If inclement weather occurs after testing, retest prior to placement of next lift. Testing frequencies shall be as specified in Sections 02300 and 02715 respectively.

C. Coring holes remaining from cores taken by the CTL shall be immediately filled by the Contractor with full depth, hot-mix asphalt concrete or non-shrink grout tinted to match the surrounding pavement.

D. Obtain test samples for volumetric testing from the truck at the asphalt plant. Mixture samples shall be taken at least 2 times for every 8 hour day. Deliver samples to the CTL for testing by the CTL:

E. Areas of deficient paving, including compaction, smoothness, thickness, and asphalt mixture, shall be delineated, removed, and replaced in compliance with specifications requirements. Alternative remedial or corrective measures for repair of deficient paving may be allowed provided a plan of corrective action is submitted in the form of a Request For Information (RFI) and the plan is approved by the Engineer.

F. Provide certification in writing that asphalt placement is in accordance with specification requirements.

G. Provide documentation to the CTL of proof rolling and of subgrade and aggregate base compaction testing prior to pavement placement each day in the areas to be paved including the density control strip.

END OF SECTION

SECTION 02751 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation and placement of Portland cement concrete parking areas.
2. Preparation and placement of Portland cement concrete roads and entrances.
3. Aggregate base below slab.

B. Related Requirements:
1. Section 01330 - Submittal Procedures:
2. Section 02300 - Earthwork: Excavation, backfill, compaction for subgrades.
3. Section 02765 - Pavement Markings.

1.2 REFERENCES

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

B. American Concrete Institute (ACI):
1. ACI 117 - Tolerances for Concrete Construction and Materials and Commentary.
2. ACI 301 - Structural Concrete.
3. ACI 305.1- Hot Weather Concreting.
4. ACI 306.1- Cold Weather Concreting.
5. ACI 308.1 - Curing Concrete.
6. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

C. American Society for Testing and Materials (ASTM):
1. ASTM A 36 - Structural Steel.
2. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
3. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
4. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
5. ASTM C33 - Concrete Aggregates.
6. ASTM C 39 - Comprehensive Strength of Cylindrical Concrete Specimens.
7. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
8. ASTM C94 - Ready-Mixed Concrete.
9. ASTM C138 - Unit Weight, Yield, and Air Content (Gravemetric) of Concrete.
10. ASTM C143 - Slump of Hydraulic Cement Concrete.
11. ASTM C150 - Portland Cement.
12. ASTM C172 - Sampling Freshly Mixed Concrete.
13. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
14. ASTM C260 - Air-Entraining Admixtures for Concrete.
15. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C403 - Time of Setting of Concrete Mixtures by Penetration Resistance
17. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
18. ASTM C920 - Elastomeric Joint Sealants.
19. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
21. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
22. ASTM C1602 - Mixing Water used in the Production of Hydraulic Cement Concrete.
23. ASTM D98 - Calcium Chloride
24. ASTM D 698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.49 Kg) Hammerand 12-in (305 mm) Drop.
25. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
26. ASTM D1241 - Materials for Soil-Aggregate Subbase, Base and Surface Courses

27. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Re
28. ASTM D1752: Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
30. ASTM D3575: Standard Test Methods for Flexible Cellular Materials Made From Olefin Polymers.

D. Federal Specifications (FS):
1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

E. International Code Council, Inc.:
1. International Building Code (IBC).

F. Oklahoma Department of Transportation (ODOT):
1. Standard Specifications for Highway Construction, 2019 Edition.

G. National Ready-Mixed Concrete Association:
1. NRMCA Inspection Standards

1.3 SUBMITTALS

A. Obtain Engineer's approval for Mix Design and Pavement Joint and Placement Plan prior to commencement of work.

B. Submit submittal items required within this section in a single submittal.

C. Sieve Analysis for Aggregate Base: Submit current sieve analysis report, sampled and tested within the last 60 days of submittal date, for aggregate base and choker material.

D. Concrete Batch Plant Certifications: Submit name and address of the concrete supplier's batch plant and plant certification(s) by National Ready-Mix Concrete Association and/or State Department of Transportation.

E. Mix Design:
1. Fill out and submit attached Concrete Mix Design Submittal Form.
2. Submit three copies of each proposed mix.
3. Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute.
4. Submit mix design to the Civil Engineering Consultant of Record and the Owner's Construction Testing Laboratory.
5. Include applicable information shown on the Mix Design Submittal Form and the following:
   a. Proportions of cementitious materials, fine and coarse aggregate, and water.
   b. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
   c. Type of cement, fly ash, slag and aggregate.
   d. Aggregate gradation.
   e. Type and dosage of admixtures.
   f. Special requirements for pumping.
   g. Range of ambient temperature and humidity for which design is valid.
   h. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
6. Materials and methods for curing concrete.

F. Attachments to Concrete Mix Design: Submit the following as attachments to be included with the Concrete Mix Design:
1. Cementitious materials mill test reports for the following:
   a. Portland cement
   b. Fly ash
   c. Slag
2. Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials.
3. Sieve Analysis Reports: Provide separate sieve analysis of percentages passing for coarse and fine aggregate. Show values for each sieve size shown on the mix design form. Do not leave any line blank. Sieve

analysis sampling and testing for each aggregate source shall be conducted within 60 days of concrete submittal date.

4. Aggregate Supplier Statement:
   a. Stating if aggregate is possibly alkali-reactive based on tests or past service.
   b. Stating if aggregate can possibly cause pop-outs, "D" cracking, or other disruptions due to moisture gain, freezing, or other mechanisms, based on tests or past service.
5. Product data for the following concrete materials admixtures:
   a. Water reducing
   b. Set retarding
   c. Set accelerating
   d. Data indicating chloride ion content information for each admixture
6. Concrete compressive strength data as required by ACI 318.
7. Concrete supplier approval of mix design.
8. Chloride-Ion Content: Measured water-soluble chloride-ion content (percent by weight of cementitious materials) in accordance with ASTM C1218.
9. Time of Initial Setting: Initial setting time in accordance with ASTM C403.

G. Product Data: Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Submit to the Civil Engineering Consultant of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.

1. Portland cement concrete mix design(s)
2. Type and source of Portland cement, fly ash, and slag
3. Aggregate gradations
4. Joint back-up material
5. Soft preformed joint filler
6. Pavement joint sealant
7. Dowel bars
8. Tie bars
9. Reinforcing steel bars
10. Welded wire fabric
11. Air entraining admixtures
12. Water-reducing, set-retarding, and set-accelerating admixtures (if used)

H. Pavement Joint and Placement Plan: For projects with all-concrete parking lots, provide a placement plan identifying the items listed below.

1. Concrete truck access location.
2. Extent of placements including width, length, slab placement area and volume.
3. Locations of construction joints.
4. Location of sawn contraction joints if different from those shown on the civil drawings.

I. Pre-Slab Installation Meeting:

1. Provide record of notification of pre-slab meeting including company name, persons contacted, and date and method of contact.
2. Provide meeting minutes to all participants.

J. Delivery Tickets:

1. Copies of delivery tickets for each load of concrete delivered to site.
2. Indicate information required by ASTM C 94 on each ticket including additional information required for slabs.
3. Information on ticket shall include quantities of material batched including the amount of free water in the aggregate and the quantity of water that can be added at the site without exceeding the maximum water cementitious ratio of the approved mix design. Aggregate moisture corrections shall be based on ASTM definitions of aggregate moisture content and absorption.
4. Mix identification number on ticket shall match number on submitted and approved mix design.
5. Submit copies to Owner's Testing Laboratory with each concrete delivery.

K. Installation Certification: Submit certification in writing that final placement is in accordance with specification requirements.

L. Statement of Approval of Concrete Supplier: Submit statement with information specified in Quality Assurance paragraph below.

1.4 QUALITY ASSURANCE

A. Concrete Truck Inspection:
1. Conform to ASTM C94, NRMCA, and Department of Transportation standards in state where project is located.
2. Perform inspections immediately before starting concreting operations.
3. Record acceptable truck numbers.
4. Record the identification numbers of those trucks found to be acceptable on the basis of inspections.
5. Do not bring on site for concreting operations, any truck whose identification numbers are not recorded as acceptable. Notify Owner's Testing Lab if non-conforming trucks are used to deliver concrete for slabs and pavements.

B. Tolerances:
1. Conform to most stringent requirements of ACI 117 and ACI 301 except as specified herein.
2. Thickness Tolerance- The concrete pavement thickness shall meet or exceed the design thickness. All sections not meeting the minimum design thickness (0" minus tolerance) will be unacceptable and shall be removed and replaced at no additional cost to the Owner.
3. Compressive Strength – The specified concrete pavement compressive strength is a minimum requirement. All paving not meeting the minimum compressive strength requirements will be unacceptable and shall be removed and replaced at no additional cost to the Owner.

C. Concrete Supplier Approval:
1. The concrete supplier shall be fully approved and acceptable by the concrete subcontractor as the producer of concrete for which the subcontractor is to place and finish. Prepare Statement of Approval of Concrete Supplier stating project name, name of concrete supplier, along with the statement of approval and the signatures of the Contractor and concrete pavement subcontractor.

D. Pre-installation Meeting: Convene a pre-installation meeting at the site at least two weeks prior to commencing work of this Section. Require attendance of parties directly affecting work of this Section, including, but not limited to, the Owner's representative, CTL's representative and inspector, Contractor, concrete sub-contractor and job foreman, concrete supplier, and base fine grading contractor.
1. Contact Owner Thirty days prior to pre-installation conference to confirm schedule.
2. Record discussions of meeting and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to paving work, including the following:
3. CTL's testing and inspection procedures.
4. Concrete finishes and finishing.
5. Cold- and hot-weather concreting procedures.
6. Curing procedures.
7. Concrete design mixture and examine procedures for ensuring quality of concrete materials.
8. Proposed sources of concrete materials, including capabilities and location of plant that will manufacture concrete.
9. Tour, inspect and discuss condition of subgrade, drainage structures, and other preparatory work.
10. Requirements for protecting concrete work, including restriction of traffic during installation period and for remainder of construction period.
11. Review and finalize construction schedule and verify availability of materials.
12. Concrete paving requirements (drawings, specifications and other contract documents).
13. Required submittals, both completed and yet to be completed.
14. Weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
15. Safety precautions relating to placement of concrete.
16. Changes to the contract documents from recommendations or discussions at the Pre-Construction meeting shall be approved in writing by the Owner prior to implementation.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Concreting in Hot, Dry, or Windy Weather:

1. Employ precautions to avoid cracking when the concrete rate of evaporation exceeds 0.1 pounds per square foot per hour or when any combination of concrete materials and weather conditions are favorable for the formation of plastic shrinkage cracks.
2. Maintain an accurate reading thermometer at the job site to check temperature of concrete.
3. Reject concrete if more than one slump adjustment, as defined in ASTM C 94, is required.
4. Do not place concrete when forms, subgrade, aggregate base, or reinforcing bars are more than 120 F or the temperature differential between the forms, aggregate base, or reinforcing bars and concrete will create conditions favorable for settlement cracks or thermal cracking.

B. Concreting in Cold Weather:
1. Conform to ACI 306.1 when temperature and other environmental conditions are as noted therein.
2. Subgrade shall be thawed to depth of 12 inches immediately before placing concrete.
3. Measure and record concrete temperature during protection period in each placement at regular time intervals, but not less than 3 times per 24 hour period.
4. Do not place slabs on subgrade or base that is more than 20°F cooler than concrete. Warm subgrade or base to decrease temperature differential to 20 F or less

1.6 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Aggregate Base and Choker Materials:
1. Aggregate Base Material:
a. Gradation: Conform to gradation shown on the Civil Drawings.

2. Aggregate Choker Material: Clean granular fill with less than 3% clay and/or friable particles. Use one of the following gradations:
a. ASTM 448 No. 10 with 6% to 12% passing No. 200 sieve.
b. Material meeting the following gradation:

Std. Sieve Size	% Passing
No. 4	85-100
No. 8	75-95
No. 16	55-75
No. 50	22-45
No. 100	10-30
No. 200	6-12

C. Reinforcement:
1. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.
2. Reinforcing Bars: Deformed steel bars, ASTM A615, Grade 60.
3. Joint Dowel Bars: ASTM A615, grade 40 minimum, smooth round plain steel bars, or ASTM A36, smooth round or square plain steel bars, cut bars true to length with ends square and free of burrs.

D. Cementitious Materials:
1. Portland Cement: ASTM C150, Type I, Use only one brand throughout project.
2. Fly Ash: ASTM C 618, Class C or F. Use only one type and source throughout project.
3. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.

E. Pavement Joint Materials:
   1. Joint Back-up Material: Polyethylene foam, 100% closed cell
   2. Soft Preformed Joint Filler: Flexible closed-cell non-extruding synthetic foam expansion joint strips.
      a. Ceramar Flexibe Foam Expansion Joint, by W.R. Meadows.
      b. Deck-O-Foam Expansion Joint Filler, by W.R. Meadows
   3. Sealant:
      a. Dow 888, by Dow Corning.
      b. 301 NS by Pecora.
      c. Spectrum 800 by Tremco.

F. Concrete Aggregate:
   1. Conform to ASTM C33.
   2. Aggregate shall contain no coal or lignite in concrete that will not be covered by soil.
   3. Fine Aggregate:
      a. Conform to fine aggregate grading requirements as defined in section 6.1 of ASTM C 33 unless approved by the Civil Engineer.
      b. If manufactured sand is used, blend with minimum 25% natural sand unless otherwise approved by Civil Engineer.
   4. Coarse Aggregate:
      a. Nominal maximum coarse aggregate size shall be 1 inch for slabs ≤ 5-1/2 inch thick.
      b. The nominal maximum size of an aggregate is the smallest sieve size through which the major portion of the aggregate must pass, with a minimal amount retained on the maximum sieve size. Maximum 4% shall be retained on the nominal maximum size sieve.
   5. Adjust proportions of combined coarse, intermediate, and fine aggregates to provide the following particle size distribution characteristics, unless otherwise approved:
      a. Coarseness Factor of 60 to 75%.
         1) The Coarseness Factor (CF) is the percent of combined aggregate retained on the #8 sieve that is also retained on the 3/8" sieve.
         2) The Coarseness Factor is calculated as follows:
            a) CF = Aggregate retained on 3/8" sieve / Aggregate retained on #8 sieve.
      b. Adjusted Workability Factor
         1) The Workability Factor (WF) is the percent of combined aggregate that passes the #8 sieve.
         2) The Adjusted Workability Factor (Adj-WF) is calculated as follows:
            a) Adj-WF = WF+[(Cementitious Material -564 lbs.)/37.6]
         3) The range of accepted Adj-WF for a given CF is as follows:
            a) Adj-WF = [(11.25 - .15 CF) + 33] ± 2.5
         4) Combined percent retained on any given sieve size shall not exceed 24%.
      c. Gradation requirement of ASTM C33 may be waived in order to meet ranges specified.

G. Water: ASTM C 1602.

H. Air Entrainment: ASTM C260.
   1. Air-Mix or AEA-92, by Euclid.
   2. MasterAir VR 10, MasterAir AE 90, or MasterAir E 200 by BASF Admixtures.
   3. Daravair or Darex Series, by W.R. Grace.
   4. Equivalent approved products.

I. Evaporation Retardant: Water-based polymer, sprayable.
   1. Euco-Bar, by Euclid
   2. MasterKure ER 50 by BASF Admixtures
   3. Aquafilm, by Dayton Superior.

J. Liquid Membrane Curing and Sealing Compound: ASTM C 1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
   1. Water Based, VOC less than 350 g/l:
      a. Super Aqua Cure, by Euclid Chemical Corp.
      b. MasterKure CC 1315WB by BASF Admixtures.

K. Dissipating Curing Compound (For use below 40F): ASTM C 309 Type 1, Class A or B.

1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIX

A. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures, and water to produce specified requirements.

B. Geographical Weather Exposure Classification: Geographical exposure classification shall be Moderate F2 exposure.

C. Concrete Site Pavement
1. ACI Exposure Category and classification:
   a. Moderate exposure: F2
2. Compressive Strength: Strength at 28 days, unless otherwise indicated on the Drawings:
   a. Moderate and severe exposure classification: 4,000 psi.
3. Maximum Water-Cementitious Material Ratio (Cement Quantity Includes Fly Ash or slag):
   a. Moderate and severe exposure classification: 0.45 by wt.
4. Slump Range: Slump at the point of placement shall be 2 to 4 inches for hand placed concrete, 1-1/14 to 3 inches for machine placed (slip form) concrete. Maximum slump variance shall be 2 inches.
5. Air Content: As shown in the table below.

D. Air Entrainment as shown below:

E.

Nominal Maximum Size Aggregate (Inch)	Average Air Content (%) +/- 1.5% By Exposure Category	
	Negligible - F0	Moderate or Severe – F2 & F3
3/8	4.5	7.5
1/2	4.0	7.0
3/4	3.5	6.0
1	3.0	6.0
1-1/2	2.5	5.5

F. Supplementary Cementitious Materials (SCM):
1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
2. Fly Ash: Substitute fly ash for Portland cement at 20% of the total cementitious content.
   a. If used to mitigate potential aggregate reactivity, up to 30% fly ash substitution of Portland cement is allowed. Only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 30% replacement is used, up to 10.0% CaO is permitted.
3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 25% of the total cementitious content.
   a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% GGBFS substitution of Portland cement is allowed.
4. Maintain air-entrainment at specified levels.

G. Calcium Chloride:
1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.
2. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.

3. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
4. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
   a. concrete containing embedded dissimilar metals or aluminum
   b. slabs supported on permanent galvanized steel forms
   c. concrete exposed to deicing chemicals
   d. prestressed or post-tension concrete
   e. concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
   f. concrete exposed to soil or water containing sulfates.
5. Use calcium chloride in accordance with manufacturer's recommendation.
6. Chloride-ion Concentration: Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of M

Prestressed concrete
Reinforced concrete exposed to chloride in service
Reinforced concrete that will be dry or protected from moisture in service
Other reinforced concrete construction

7. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cement) per ASTM C 1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.

2.3 MIXING

A. Mix concrete and deliver in accordance with ASTM C 94.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proofroll prepared base material surface to check for unstable areas in accordance with Section 02300 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 AGGREGATE BASE PLACEMENT

A. Unless otherwise specified on the Drawings, place aggregate base as specified herein.

B. Aggregate Base:
1. Install aggregate base where shown on Drawings.
2. Compact to final thickness shown in layers not exceeding 6 inches with minimum of 2 passes per layer with vibratory compactor.
3. Compact fill to 95 percent of optimum density, as determined by ASTM D1557.
4. Leave base up to 2 inches low until just prior to concrete placement.

C. Aggregate Base Fine Grading:
1. Compact to final thickness shown with 2 passes minimum vibratory compactor to produce smooth, flat, dense surface.
2. Do not allow excess moisture in or on base at time of placing concrete.
3. Level off aggregate base top surface with a maximum 3/4" thick aggregate choker material to achieve the following:
   a. To reduce surface friction and to meet specified fine grade tolerances specified below.

b. To level areas exposed to rain, traffic, or excavations for buried utilities.
c. At areas where aggregate base material does not have sufficient fine particles to produce a surface that is free of exposed aggregate or surface voids greater than 3/8" in size at time of slab installation.

4. Owner's Construction Testing Laboratory shall verify adequate fines at surface immediately prior to concrete slab placement.
5. Provide dry, smooth, flat, dense surface
6. Proof-roll 48 hrs. maximum prior to concrete placement. Depression under a fully loaded ready mix truck shall not exceed 1/2 inch.

D. Pavement Aggregate Base Fine Grade Tolerance: +0 inch, -3/4 inch with transition no greater than 3/4 inch vertically to 8 inches horizontally.

3.3 INSTALLATION

A. Form Construction
1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
a. Top of forms not more than 1/8-inch in 10'-0".
b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement
1. Mix and place concrete when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305.1 (hot weather) and 306.1 (cold weather).
2. Do not place concrete until base material and forms have been checked for alignment and grade. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.
3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

D. Contraction and Construction Joints: Construct contraction and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.
1. Contraction Joints: Provide joints at spacing of 12'-0" on centers, maximum each way. Construct control joints for depth equal to at least 1/4 of the concrete thickness, as follows:
a. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
b. Sawed Contraction Joints:
1) Use saws, blades, skid plates, and accessories by Soff-Cut International, Inc. or approved equal.
2) Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent raveling or dislodging of aggregates. This will typically be from 1 hour in hot weather to 4 hours in cold weather after completing finishing of slab in that joint location.
3) Provide at least two "Soff-Cut" saws on site with blades capable of achieving the required depth of saw cut.
4) Extend sawed joint to the slab boundaries and abutments, including columns, drains, and other penetrations in the path of a defined joint. Implement methods and timing of the saw cut beyond the limits of the Soff-Cut saw reach to provide a consistent depth of cut with minimal raveling of joint edges.

2. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour. Construct joints in accordance with details shown.

E. Isolation and Fixed Object Joints: Construct joint at locations and in accordance with details shown.

F. Pavement Joint Materials: Place joint fillers, back-up material, and sealants at locations shown and in accordance with manufacturer's instructions.
1. Soft Preformed Joint Fillers: Extend preformed joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface. Furnish preformed joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip preformed joint filler sections together in a single plane.

3.4 CONCRETE FINISHING

A. After initial striking off and consolidating of concrete paving, smooth surface using either a magnesium channel float or magnesium bull float.

B. Round edges of slabs and formed joints to 1/2-inch radius with edging tool. Eliminate tool marks on concrete surface.

C. After completion of straightedge / floating and when excess moisture or surface sheen has disappeared, uniformly finish surface to provide a coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic so as to produce regular corrugations not over 1/16 of an inch deep. Initial nonslip finishing shall be approved by the Owner.

D. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner.

3.5 CURING AND PROTECTION

A. Protect and cure finished concrete paving using curing compound. Cure for a period not less than 7 days.

B. Use solvent based curing compound when compound is applied below 40 F.

3.6 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with Section 01452. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I shall not be considered a substitute for the Contractor's responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

B. Responsibilities and Duties Relative to Owner Testing and Inspection:
1. Notify Owner's CTL in advance of concrete placements to allow sufficient time to prepare for a site visit.
2. Assist Owner's agency in securing field specimens.
3. Provide and maintain for sole use of CTL, facilities for safe storage and proper curing of concrete test cylinders at project site as required by ASTM C31 and acceptable to Owner's Testing Laboratory.

C. Correction of Deficient Work:
   1. When directed by the Owner, remove and replace or repair concrete and related Work which does not conform to specified requirements including strength, tolerances, and finishes.
   2. Bear cost of corrections or delays to other work affected by, or resulting from, corrections to concrete Work.
   3. If results of compressive strength tests reveal deficiencies in concrete, meet requirements of ACI 318 and ACI 301.

END OF SECTION

CONCRETE MIX DESIGN SUBMITTAL FORM
(Section 02751 – Concrete Pavement) Date

SITE INFORMATION

ADDRESS _____
CITY, ST _____
GENERAL CONTRACTOR
COMPANY _____
JOBSITE PHONE _____

A. CONCRETE INFORMATION

Supplier Mix Design # _____
Design Strength (f'c) _____ psi
Water / Cementitious Ratio _____
Total Air Content _____ %
Total Est. Volume of Concrete _____ CY

Mix Developed From:
☐ Trial Mix Test Data (*attach test data*)
☐ Field Experience

Density
Wet _____ pcf Dry _____ pcf

Slump
" _____ (± 1") **WITHOUT** WR Admixture
" _____ (± 1") **WITH** WR Admixture

LEAVE BLANK FOR STAMP OF APPROVAL BY CONCRETE SUPPLIER AND ENGINEER OF RECORD

B. ADMIXTURE INFORMATION

	ASTM Designation	Product (Manufacturer/Brand)	Dosage (ounces) oz / cy	oz / cwt
Water Reducing				
Accelerating				
Retarding				
Air-Entraining				

C. MIX DESIGN

Mix Proportions (per cubic yard)

	Identification (Type, size, source, etc.)	Weight (pounds)	Density (SSD)	**Volume** (cubic feet)	% Aggregate Absorption
Cement					

Fly Ash					
Slag					
Coarse Aggregate #1					
#2					
#3					
Fine Aggregate #1					
#2					
Water					
Air Content					
	TOTALS				

Coarse & Fine Aggregate Gradation Information

Sieve Size	**% Passing Each Sieve** (All Sieve Sizes must be entered)					Combined % Passing	Combined % Retained	
	Coarse Agg. # 1	Coarse Agg. # 2	Coarse Agg. # 3	Fine Agg. # 1	Fine Agg. # 2		Cumulative	Individual
% of Vol								

Aggregate Ratios

Coarseness Factor =	$\frac{\text{Combined \% cumulative retained 3/8" sieve}}{\text{Combined \% cumulative retained \#8 sieve}}$	=		
Workability Factor =	Combined % passing #8 sieve	=		
Adj-Workability Factor =	WF + [(Cementitious Material - 564) ÷ 37.6]	=		
Allowable Adj-WF=	Adj-WF = [(11.25 - .15 CF) + 33] ± 2.5	=	Low	High

D. **ATTACHMENTS:** Include the following with this Mix Design Report.

- ☐ Portland Cement mill test reports
- ☐ Fly ash mill test reports
- ☐ Slag mill test reports
- ☐ Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials
- ☐ Separate aggregate gradation reports including all required sieve sizes
  - All gradation sieve report tests dated within 60 days of this report
  - Report for each coarse and fine aggregate material in mix
- ☐ Statement if possible reactivity of aggregate, based on tests or past service
- ☐ Statement if possible aggregate pop-outs or their disruptions, based on tests or past service
- ☐ Product data for the following admixtures:
  - Chloride ion data and related calculations
  - Water reducing, set retarding, set accelerating, etc.
- ☐ Measured water-soluble chloride ion content in concrete (percent by weight of cement).
- ☐ Concrete compressive strength data used for standard deviation calculations

E. CONCRETE SUPPLIER INFORMATION

Company Name	_____	Tel. #	( ) _____
Address	_____		
City, ST Zip	_____		
Technical Contact	_____	Cell #	( ) _____
		e-mail	_____
Sales Contact	_____	Cell #	( ) _____

	PRIMARY PLANT	SECONDARY PLANT
Plant Location:	_____	_____
Miles from Site:	_____	_____
Travel Time to Site:	_____	_____
NRMCA Certified:	☐ YES ☐ NO	☐ YES ☐ NO
State DOT Certified:	☐ YES ☐ NO	☐ YES ☐ NO
Batch Mixing Type:	☐ DRY ☐ CENTRAL MIX	☐ DRY ☐ CENTRAL MIX

SECTION 02765 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Painting and marking of pavements, curbs, guard posts, and light pole bases.

1.2 REFERENCES

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

B. American Association of State Highway and Transportation (AASHTO):
   1. AASHTO M247 - Glass Beads Used in Traffic Paints
   2. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints

C. Master Painter's Institute (MPI):
   1. MPI 32 – Traffic Marking Paint, Solvent Based.
   2. MPI 97 – Traffic Marking Paint, Latex.

D. ASTM International (ASTM):
   1. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.

E. Federal Specifications (FS):
   1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
   2. FS TT-P-1952 - Paint, Traffic And Airfield Marking, Waterborne

1.3 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

B. Waterborne Paint: Paints shall conform to FS TT-P-1952 and have MPI 97 approval.

C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248 and have MPI 32 approval. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacturer's instructions before application for colors White, Yellow, Blue, and Red.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, a motorized abrasive device shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic. Within public rights-of-way, appropriate governing authority shall approve method of marking removal.

C. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 CLEANING EXISTING PAVEMENT MARKINGS

A. Remove existing pavement markings which are in good condition but interfere or conflict with the newly applied marking patterns. Deteriorated or obscured markings that are not misleading or confusing or do not interfere with the adhesion of the new marking material do not require removal. Conduct grinding, scraping, sandblasting or other operations in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. Use dust collection system when pavement preparation includes grinding, scraping or sandblasting of existing pavement markings.

3.4 APPLICATION

A. Apply two coats of same color of paint as specified below, at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.

B. Install pavement markings according to manufacturer's recommended procedures for the specified material.

C. Following items shall be painted with colors noted below:
1. Pedestrian Crosswalks: White
2. Exterior Sidewalk Curbs and Guard posts: Yellow
3. Exterior Light Pole Bases: Yellow (unless otherwise noted on Construction Detail).
4. Fire Lanes: Red or per local code.
5. Lane Striping where separating traffic moving in opposite directions: Yellow.
6. Lane Striping where separating traffic moving in the same direction: White.
7. ADA Symbols: Blue or per local code.
8. ADA parking space markings as shown on the drawings.
9. Parking Stall Striping: White, unless otherwise noted on Construction Drawings.

3.5 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements.

3.6 CLEANING

A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION

SECTION 02770 - CURBS AND SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Portland cement concrete curbs, gutters, and sidewalks except sidewalks adjacent to building.

B. Related Requirements:
1. Section 02300 - Earthwork: Preparation of subgrades.
2. Section 03310 - Structural Concrete and Exterior Concrete Slabs: Exterior sidewalks adjacent to building.

1.2 REFERENCES

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

B. American Concrete Institute (ACI):
1. ACI 305R - Hot Weather Concreting
2. ACI 306R - Cold Weather Concreting
3. ACI 306.1 - – Standard Specifications for Cold Weather Concreting.
4. ACI 308 - – Standard Specifications for Curing Concrete

C. ASTM International (ASTM):
1. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
2. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
3. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
4. ASTM C39 - Comprehensive Strength of Cylindrical Concrete Specimens.
5. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
6. ASTM C94 - Ready-Mixed Concrete.
7. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content (Gravemetric) of Concrete.
8. ASTM C143 - Slump of Hydraulic Cement Concrete.
9. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
10. ASTM C172 - Sampling Freshly Mixed Concrete.
11. ASTM C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C260 - Air-Entraining Admixtures for Concrete.
13. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
14. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
15. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
16. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
17. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
18. ASTM D98 - Calcium Chloride.
19. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
20. ASTM D1190 - Concrete Joint Sealer, Hot Poured, Elastic Type.
21. ASTM D1751 - Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
22. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

D. Federal Specifications (FS):
1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

E. Oklahoma Department of Transportation (ODOT):
1. Standard Specifications for Highway Construction, 2019 Edition.

F.

1.3 SUBMITTALS

A. Mix Design:
   1. Fill out and submit attached Concrete Mix Design Submittal Form.
   2. Submit three copies of each proposed mix.
   3. Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute.
   4. Submit mix design to the Civil Engineering Consultant of Record and the Owner's Construction Testing Laboratory.
   5. Include applicable information shown on the Mix Design Submittal Form and the following:
      a. Proportions of cementitious materials, fine and coarse aggregate, and water.
      b. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
      c. Type of cement, fly ash, slag and aggregate.
      d. Aggregate gradation.
      e. Type and dosage of admixtures.
      f. Special requirements for pumping.
      g. Range of ambient temperature and humidity for which design is valid.
      h. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
      i. Materials and methods for curing concrete.

B. Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Submit to the Engineering Consultant of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.
   1. Concrete mix design(s)
   2. Type and source of Portland cement, fly ash, and slag
   3. Aggregate gradations
   4. Preformed expansion joint filler
   5. Field molded/poured sealant
   6. Dowel bars
   7. Expansion sleeves
   8. Tie bars
   9. Reinforcing steel bars
   10. Welded wire fabric
   11. Air entraining admixtures
   12. Water-reducing, set-retarding and set-accelerating admixtures (if used)

C. Test Reports: Submit field quality control test reports.

1.4 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.

C. Reinforcing Steel: Deformed steel bars, ASTM A615, Grade 60.

D. Portland Cement: Shall conform to ASTM C150, Type I.

E. Fly Ash: ASTM C618, Class C or F. Use only one type and source throughout project.

F. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.

G. Exterior Pavement Joint Materials
1. Joint Back-up Material: Polyethylene foam, 100% closed cell.
2. Sealant:
   a. Dow 888, by Dow Corning.
   b. 301 NS by Pecora.
   c. Spectrum 800 or 900 by Tremco.

H. Aggregate: ASTM C33.

I. Water: Clean and potable

J. Dowel Bars: ASTM A615, grade 60, and plain steel bars.

K. Air Entrainment: ASTM C260. .
1. Air-Mix or AEA-92, by Euclid Chemical Corp.
2. MasterAir VR 10, MasterAir AE 90, or MasterAir E 200 by BASF Admixtures.
3. Daravair or Darex Series, by W.R. Grace.
4. Equivalent approved products.

L. Liquid Membrane Curing and Sealing Compound: ASTM C1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
1. Water Based, VOC less than 350 g/l:
   a. Super Aqua Cure, by Euclid Chemical Corp.
   b. MasterKure CC 1315WB by BASF Admixtures.

M. Dissipating Curing Compound: ASTM C309 Type 1, Class A or B.
1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIXING

A. Mix concrete and deliver in accordance with ASTM C94. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures and water to produce the following:
1. Compressive Strength: 4,000 psi minimum at 28 days unless otherwise indicated on the Drawings.
2. Slump Range: 2”-4” for hand placed concrete, 1-1/4” to 3” for machine placed (slipform) concrete.
3. Air Entrainment: 5 to 8 percent.

B. Supplementary Cementitous Materials (SCM):
1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
2. Fly Ash: Substitute fly ash for Portland cement at 15% of the total cementitious content.
   a. If used to mitigate potential aggregate reactivity, only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 25% replacement is used, up to 10.0% CaO is permitted.
3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 20% of the total cementitious content.
   a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% substitution of Portland cement is allowed.
4. Maintain air-entrainment at specified levels.

C. Calcium chloride:
1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.

a. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.
b. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
c. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
1) concrete containing embedded dissimilar metals or aluminum
2) slabs supported on permanent galvanized steel forms
3) concrete exposed to deicing chemicals
4) prestressed or post-tension concrete
5) concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
6) concrete exposed to soil or water containing sulfates.

2. Use calcium chloride in accordance with manufacturer's recommendation.
3. Chloride-ion Concentration:
a. Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious material, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of Member	Maximum water-soluble chloride ion (Cl-) content in concrete (percent by weight of cement)
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	0.30

14. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cementitious materials) per ASTM C1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.

PART 3 - EXECUTION

3.1 PREPARATION

A. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction
1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
a. Top of forms not more than 1/8-inch in 10'-0".
b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement

1. Concrete shall be mixed and placed when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305R (hot weather) and 306.1 and 306R (cold weather).Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.
2. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.

D. Joint Construction
1. Contraction Joints: Construct concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, in uniform sections of approximately 10 feet in length. Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with 3/4-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold its shape, but shall be removed while forms are still in place.
2. Longitudinal Construction Joints: Tie concrete curb or combination concrete curb and gutter, to concrete pavement with 1/2-inch round deformed reinforcement bars 2 feet in length and 5 feet on center.
3. Transverse Expansion Joints: Concrete curb, combination concrete curb and gutter, or concrete sidewalk shall have filler cut to exact cross section of curb, gutter, or sidewalk. Joints shall be spaced at approximately 100 feet on center and shall be similar to the type of expansion joint used in concrete pavement areas.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

F. Joint Sealants: Install in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of sidewalks, gutters, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
1. Curbs, gutters, and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to flow of traffic. Repeat operation as necessary to produce fine line texture.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects as directed Owner.

D. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

3.4 CURING AND PROTECTION

A. Protect and cure finished concrete paving using with curing compound or with acceptable moist-curing methods in accordance with "water-curing" section of ACI 308. Cure for a period not less than 7 days.

B. Use solvent based curing compound when compound is applied below 40 F.

3.5 BACKFILL

A. After concrete has set sufficiently, spaces on either side of concrete curb, combination concrete curb and gutter, or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with Section 02300.

3.6 CLEANING AND PROTECTION

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements.

END OF SECTION

CONCRETE MIX DESIGN SUBMITTAL FORM
(Section 02770 – Curbs and Sidewalks)

Date

SITE INFORMATION

ADDRESS _____

CITY, ST _____

GENERAL CONTRACTOR

COMPANY _____

JOBSITE PHONE _____

A. CONCRETE INFORMATION

Supplier Mix Design # _____

Design Strength (f'c) _____ psi

Water / Cementitious Ratio _____

Total Air Content _____ %

Total Est. Volume of Concrete _____ CY

Mix Developed From:
☐ Trial Mix Test Data (*attach test data*)
☐ Field Experience

Density

Wet _____ pcf Dry _____ pcf

Slump

"_____ (± 1") **WITHOUT** WR Admixture

"_____ (± 1") **WITH** WR Admixture

LEAVE BLANK FOR ENGINEER'S STAMP

B. ADMIXTURE INFORMATION

	ASTM Designation	Product	Dosage (ounces)	
		(Manufacturer/Brand)	oz / cy	oz / cwt
Water Reducing				
Accelerating				
Retarding				

C. MIX DESIGN

Mix Proportions (per cubic yard)

	Identification (Type, size, source, etc.)	Weight (pounds)	Density (SSD)	**Volume** (cubic feet)	% Aggregate Absorption
Cement					
Fly Ash					
Slag					
Coarse Aggregate #1					
#2					
#3					
Fine Aggregate #1					
#2					
Water					
Air Content					
	TOTALS				

Coarse & Fine Aggregate Gradation Information

Sieve Size	**% Passing Each Sieve** (All Sieve Sizes must be entered)					Combined % Passing	Combined % Retained	
	Coarse Agg. # 1	Coarse Agg. # 2	Coarse Agg. # 3	Fine Agg. # 1	Fine Agg. # 2		Cumulative	Individual
% of Vol								

Aggregate Ratios

Coarseness Factor =	$\frac{\text{Combined \% cumulative retained 3/8" sieve}}{\text{Combined \% cumulative retained \#8 sieve}}$	=		
Workability Factor =	Combined % passing #8 sieve	=		
Adj-Workability Factor =	WF + [(Cementitious Material - 564) ÷ 37.6]	=		
Allowable Adj-WF=	Adj-WF = [(11.25 - .15 CF) + 34.5] ± 2.5	=	Low	High

D. **ATTACHMENTS:** Include the following with this Mix Design Report.

- ☐ Portland Cement mill test reports
- ☐ Fly ash mill test reports
- ☐ Slag mill test reports

☐ Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials

☐ Separate aggregate gradation reports including all required sieve sizes

- All gradation sieve report tests dated within 60 days of this report
- Report for each coarse and fine aggregate material in mix

☐ Statement if possible reactivity of aggregate, based on tests or past service

☐ Statement if possible aggregate pop-outs or their disruptions, based on tests or past service

☐ Product data for the following admixtures:

- Chloride ion data and related calculations
- Water reducing, set retarding, set accelerating, etc.

☐ Measured water-soluble chloride ion content in concrete (percent by weight of cement)

☐ Concrete compressive strength data used for standard deviation calculations

E. CONCRETE SUPPLIER INFORMATION

Company Name	_____	Tel. #	( ) _____
Address	_____		
City, ST Zip	_____		
Technical Contact	_____	Cell #	( ) _____
		e-mail	_____
Sales Contact	_____	Cell #	( ) _____

	PRIMARY PLANT	SECONDARY PLANT
Plant Location:		
Miles from Site:		
Travel Time to Site:		
NRMCA Certified:	☐ YES ☐ NO	☐ YES ☐ NO
State DOT Certified:	☐ YES ☐ NO	☐ YES ☐ NO
Batch Mixing Type:	☐ DRY ☐ CENTRAL MIX	☐ DRY ☐ CENTRAL MIX

SECTION 02812 – SITE IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Underground, automatically controlled lawn and shrub bed irrigation system including electrical connections, water main connections, and accessories.

B. Related Requirements
1. Section 02300 - Earthwork. Trenching, backfill, and compaction for utilities.
2. Section 02510 - Water Distribution Systems.
3. Section 02900 - Planting. Extended Maintenance Service for Site Irrigation System.
4. Section 02370 - Erosion Control

1.2 REFERENCES

A. ASTM International (ASTM)
1. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
2. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).
3. ASTM D2564 - Solvent Cement for poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
4. ASTM D2609 - Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
5. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

B. National Fire Protection Agency (NFPA)
1. NFPA 70 - National Electrical Code (NEC).

C. American Society of Safety Engineers
1. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
2. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies.

1.3 SUBMITTALS

A. Submittal process: Submit in accordance Section 01330 - Submittal Procedures. Submit required submittals within 30 days after contract award.

B. Test Reports
1. Pressure Tests: Contractor shall submit the following pressure tests performed by the Contractor:
a. Pre-Installation Static Pressure Test: Perform static pressure test at the irrigation system's water source to verify available pressure for system operation.
b. Hydrostatic Test of Installed Irrigation Main Line: Perform hydrostatic test of installed irrigation main line in conformance with ASTM to verify system is free of any leaks prior to proceeding with the installation of the system.

C. Closeout Submittals:
1. As-Built Drawings: Furnish two sets, noting exact locations of elements and changes to Construction Drawings.
2. Operation Manual: Furnish two copies, bound in 1 inch diameter three ring binders, indexed and tabbed for easy reference, and labeled on spine and cover. Manual shall include following:
a. Approved submittals as specified herein.
b. Installation instructions including mounting details for control valves.
c. Operating Instructions:
1) Winterization procedures.

2) Recommended operation sequence, frequency, and length of operation cycle, as per relationship to estimate

d. Maintenance Instructions:

1) Manufacturers' product data, installation, and maintenance instructions.

2) Copies of completed warranty information. Contractor to complete and mail necessary warranty registratio

3. Controller Chart: Prepare color coded chart reduced in size, mounted on the inside of the controller cabinet, containing same plan information as as-built drawings, and laminated in plastic on both sides, with following specific information:

a. Note routing of main line, control wires, and controller location.

b. Identify valves as to size, station number shown on controller, and type of irrigation head (e.g. micro spray head, r

c. Delineate each station's limits of coverage by color-coding, with each station having different color showing its zo

d. Size, type, and location of water source.

4. Meetings and Inspections Log.

5. Certification of Conformance: Provide certificate of satisfactory performance of irrigation system installation signed by the Contractor.

1.4 PROJECT CONDITIONS

A. Visit site and become familiar with nature and location of work, existing conditions, and conditions that will exist during installation.

PART 2 - PRODUCTS

2.1 PIPE

A. Polyvinyl Chloride (PVC): Pipe over 1 inch diameter shall conform to ASTM D224, SDR 21, and Class 200.

B. Polyvinyl Chloride (PVC): Pipe 1 inch diameter and under shall conform to ASTM D2241, SDR 13.5, and Class 315.

C. Flexible Polyethylene (PE): Pipe shall conform to ASTM D2239, SDR 11.5, PE23, rated at 100 PSI, National Sanitation Foundation (NSF) approved. Subject to approval of Owner, PE shall be used for laterals in areas where ground is subject to freezing for extended periods of time each year.

D. Joints:

1. Pipe sizes 2 1/2 inch or smaller shall have bell and socket joints.

2. Pipe sizes larger than 2 1/2 inch shall have snap connections with rubber gasket joints. Thrust blocking shall be required in accordance with Section 02510.

E. Pipe used for reclaimed water shall be appropriate color and marked as designated for such use.

F. Fittings:

1. Polyvinyl Chloride (PVC) Fittings: Fittings shall conform to ASTM D2241, Schedule 40, and Molded.

2. Flexible Polyethylene (PE) Lateral Line Fittings: Fittings shall conform to ASTM D2609, Type 1 PVC insert fittings designed for used with this type of pipe. Pipe and fittings shall be joined with stainless steel pinch clamps or worm gear clamps, including stainless steel screw.

G. Risers above finished grade shall be black in color or receive 2 coats of black exterior semi-gloss enamel paint if a color other than black.

2.2 ACCESSORIES

A. Sleeves: Sleeves for pipes passing beneath paving shall conform to ASTM D2241, Schedule 40. Minimum diameter of 2 inch or 2 sizes larger than pipe scheduled to pass through them.

B. PVC Solvent Cement: Cement shall conform to ASTM D2564.

C. Swing Joint Connections: Connections between heads and laterals shall be thick wall, flexible, polyethylene pipe, with fittings that have male barbs on one end and either male or female screw ends opposite. Glue fittings and female barb adapters are not allowed.

2.3 RECLAIMED WATER PRODUCTS AND MATERIALS

A. Irrigation products used with reclaimed water shall be the appropriate color and marked as designated for such use.

2.4 CUTOFF OR ISOLATION VALVES

A. 3 inches or Smaller: Provide full port brass ball valves with 600 WOG rating as manufactured by Red-White Valve Corporation, Carson, CA.

B. Larger than 3 inches: Provide cast iron and bronze mechanical joint valves, fusion bonded epoxy coated exterior and interior, Resilient Wedge Valve as manufactured by Clow Valve Co., Oskaloosa, IA.

C. Provide a valve key and cast iron cylindrical valve box with top with each valve.

2.5 QUICK COUPLER VALVES

A. Provide one of following if shown on the plans:
1. Rain Bird model 44NP Valve with model 44K Key.
2. Hunter model HQ-44LRC with model HK-44 Key.
3. Toro model 100-SLVLC 470 Series Valve and 100-SLK Coupler Key.

B. Provide each valve with key having 3/4 inch male top pipe threads for hose connection.

2.6 ELECTRIC CONTROL VALVES

A. Provide one of the following:
1. Hunter ICV Series electric remote control valves and ICZ Drip Zone Control Kit.
2. Rain Bird PEB Series electric remote control valves and XCZ Drip Control Zone Kit.
3. Netafim Control Valve Kit.
4. Toro P220 Series plastic valves and DZK Drip Zone Valve Kit.

B. Provide 3M DBY watertight connectors.

2.7 SPRINKLER HEADS

A. Full or Part Circle Pop-Up Fixed Spray Sprinkler:
1. Acceptable Products:
   a. Hunter PRS40 with MP Rotators and check valve (CV) feature.
   b. Rain Bird 1800 Series Sprinklers with Rotary Nozzles including PRS and SAM features.
   c. Toro 570Z PRX Series with MPR Precision Series Spray Nozzles.

B. Full or Part Circle Pop-up Gear Driven Rotor Sprinkler:
1. Acceptable Products:
   a. Rain Bird Rotor, 5000 Series plus MPR rotor nozzle with Seal-A-Matic (SAM) check valve.
   b. Toro Super T5P-COM, with check valve or Toro TR-XTP Series with factory installed check valve, trajectory adjustment, and X Flow Device.
   c. Hunter PGP and PGJ series pop-up rotors, with check valve.

C. Pressure Compensating Micro-Spray Nozzles:
1. Acceptable Products:
   a. Rain Bird Micro Spray.
   b. Hunter Micro Spray.
   c. Toro Stream Spray and Stream Bubbler Nozzles with PC.

2.8 LOW VOLUME AND DRIPLINE IRRIGATION

A. Rain Bird XT-700 distribution tubing

B. Rain Bird Xeri-Bug Emitters XB-05-PC, XB-10-PC, XB-20-PC (refer to plans for specific volumes)

C. Hunter Professional Landscape Dripline with 0.4, 0.6, or 1.0 GPH built-in emitters.

D. Netafim Techline with 0.4, 0.6, or 0.9 GPH dripper.

E. Toro Drip-In PC drip tubing with 0.5 or 1.0 GPH emitter. Use only in groundcover and shrub beds with mulch.

F. Rain Bird XFD (surface installation) or XFS (subsurface installation) drip tubing and components with 0.6 or 0.9 GPH emitter.

2.9 VALVE BOX

A. Valve boxes shall be manufactured by Ametek, Plymouth Products Division, Sheboygan WI., RainBird Corporation or equal by acceptable manufacturer. No irrigation valve box shall be placed in pavement areas unless otherwise shown on the Drawings.
1. When used with single valve, provide Economy Turf Box or Rain Bird model VB-RND with green colored snap fit cover labeled "Valve Box".
2. When used with 2 or more valves, provide Jumbo Box or Rain Bird model VB-STD with 20 inch x 14 inch cover opening with cover labeled "Control Valve".

2.10 MANUAL DRAIN VALVES

A. Manual drain valves shall be provided by acceptable manufacturers specified above.

2.11 CONTROL WIRE

A. Number 14-size minimum copper wire, U. L. approved for underground direct burial.
1. Colored wire shall have same color-coding as shown on controller.
2. All power and control wiring shall be in PVC conduit as shown in the irrigation detail sheets.
3. Provide single wire from controller to each valve.
4. Provide common neutral from controller to each valve.
5. Provide a minimum of two extra sets of wire, 2 control and 1 neutral, to each end of the main for future use.
   a. Loop Systems: Provide two spare control wires in each direction to halfway point of loop.

2.12 BACKFLOW PREVENTER

A. General Contractor to coordinate location of backflow preventer with Architectural / Plumbing drawings.

B. Comply with requirements and codes of local governing authority regarding backflow prevention.

C. Provide the necessary materials, insulation/draining capabilities, and insulated fiberglass enclosure, dark green in color.

D. Backflow preventers shall be type suitable for use in high hazard cross connection to potable water system as manufactured by one of the following manufacturer's: Watts Regulator Company, Febco, or Wilkins.
1. Reduced pressure backflow preventers shall be ASSE # 1013 and labeled accordingly.
2. Double check valve assembly backflow preventers shall be ASSE # 1015 and labeled accordingly.
3. In absence of local codes or requirements, provide double check assembly backflow preventer installed in strict accordance with manufacturer's written instructions.

2.13 METER

A. Meter and meter box shall conform to requirements of local utility company.

2.14 AUTOMATIC CONTROLLER

A. Hunter XC-200i

B. RainBird ESP-4Mi

PART 3 - EXECUTION

3.1 PREPARATION

A. Pressure/Flow Test: Perform calculations according to the Irrigation Association's 3-Step Method. Provide written calculations to the Owner's CEC including the following site information:
1. Static or residual pressure at the POC.
2. Calculation of pressure for "worst case" sprinkler head.
3. Calculation of GPM per zone.

B. Prior to installation, receive approval from General Contractor to proceed with construction.

C. Contractor shall field verify all aboveground and underground utilities prior to start of work.

3.2 EXCAVATION

A. Trenching and Backfilling:
1. Irrigation mainline installation shall conform to same requirements as waterline installation.
2. Trenching and backfilling shall conform to Section 02300 and 02370.
3. Excavate trench to proper depth as shown or specified.
4. Minimum trench width shall be 3 1/2 inches.
5. Over excavate trenches deeper than required in soils containing rock or other hard material that might damage pipe and backfill to proper depth with selected fine earth or sand.
6. Backfill and hand tamp over excavation prior to installing piping.
7. Keep trenches free of obstructions and debris that would damage pipe.
8. Irrigation piping shall not be installed in same trench as heating duct, electric ducts, storm and sanitary sewer lines, water and gas mains.

B. Do not cut sidewalks, paved areas, or curb and gutter when trenching for piping unless otherwise noted on the Drawings.
1. Provide sleeves as specified in Part 2 above under paving prior to installation of paving.
2. Auger, bore, or tunnel under existing paving without disturbing pavement. Damaged pavement shall be removed and replaced in accordance with Section 02740 or 02751.

3.3 WATER METER

A. Provide water meter box for irrigation system if required or shown on the Drawings.

3.4 PIPING INSTALLATION

A. Minimum cover from top of piping to finished grade shall be provided as follows:
1. Lawn and planting areas:
   a. Mains and Control Valves: 18 inches.
   b. Laterals: 12 inches.
2. Drives or parking areas: 24 inches.

B. Clearances: Maintain 3 inch minimum horizontal clearance between parallel lines in same trench or vertical clearance between lines crossing at angles.

C. Special Requirements - PVC and PE pipe:
   1. Snake pipe in trench at least 1 foot per 100 feet of pipe to allow for thermal expansion.
   2. Pipe laterals shall be laid to drain to low point drains located at lowest elevations of each zone.

D. Rest full length of pipe section on bed of trench, excavating recesses to accommodate joints. Do not lay pipe on unstable material or blocking, or when in opinion of Owner conditions are unsuitable.

E. Threaded Plastic Pipe Jointing:
   1. Do not use solvent cement on threaded joints.
   2. Wrap joints with Teflon tape or use virgin Teflon lubricant.

F. Bell and Socket Plastic Pipe Jointing: Cement joints in accordance with ASTM D2855.

3.5 QUICK COUPLER AND AUTOMATIC LOW POINT DRAIN VALVES

A. Provide quick coupler valves as shown on the drawings to accommodate winterization.

B. Provide automatic low point drain valves on all zones. Provide two valves at lowest point of each zone with each drain installed above a 12 inch by 12 inch by 12 inch deep area of coarse washed gravel.

3.6 SLEEVING

A. Provide sleeves for both piping and control wiring where either passes under paved surfaces.
   1. Depths of sleeves shall be same as that required for piping at each location or condition.
   2. Extend sleeves 12 inches beyond paving at each end.
   3. Install permanent benchmark at top of curbs for reference to sleeve locations.

3.7 VALVES

A. Do not locate beneath paved surfaces.

B. Do not locate any valve within 5’-0” of any curb.

C. Install plumb to within 1/16 inch.

D. Locate within valve box with 6 inch deep layer of coarse gravel beneath bottom of valve. Valve boxes shall not be located within 5’-0” of any curb.

E. Top of quick coupler valves shall be 6 inches to top of valve box. Top of gravel layer shall be 3 inches below top of valve.

F. Master Valve (if required on the Drawings):
   1. Locate immediately behind backflow preventer.
   2. Valve shall be energized by master valve circuit on automatic controller.

3.8 SPRINKLERS

A. Install plumb to within 1/16 inch with top collar, not nozzle, flush with finish grade.

B. Provide swing joint with each sprinkler except where entire head is raised above grade and/or where rigid riser piping is required.

C. Heads adjacent to paving and curb: Locate between 6 and 12 inches from edge of paving or back of curb to prevent car overhang to conflict with a fully extended sprinkler.

3.9 ELECTRICAL CONNECTIONS AND CONTROL WIRE

A. Conform to the National Electrical Code (NEC) and local electrical codes.

B. Provide electrical connection to system as designated on the Drawings and as specified herein.

C. Wire Placement:
1. Do not run control and power supply wiring in same conduit.
2. Provide continuous runs of wire between controller and valves. Splices shall be made with one of following:
   a. Watertight below ground electrical junction boxes.
   b. Water-tight connectors, such as utilized for valves, and located within valve box for ease of locating.
   c. The location of electrical splices shall be shown on the As-Built drawings.
3. Bury control wire beside pipe in same trench. Bundle and tape together at not more than 10 ft intervals.

D. Expansion Loops: Construct by wrapping wire around 1/2 inch diameter pipe to create coil. A 3 foot section of wire shall be used to create 12 inch coil with 6 foot section being used to create 24 inch coil.
1. Provide 12 inch coils at each wire splice, not including valves, and at each change of wire direction.
2. Provide 24 inch coils at each control valve and where each valve enters conduit for automatic controller.

3.10 BACKFILLING

A. Sand or fine-grained soils shall be used for initial backfill to sufficient depth to prevent damage to pipe from rocks or other debris during compaction of subsequent backfill.

B. Fill trench to within 3 inches of finish grade with excavated soil and compact in accordance with Section 02300.

C. Fill top 3 inches with existing topsoil in planting or turf areas and wheel roll until compaction of backfill is same as surrounding soil.

D. Grade backfilled trench uniform with surrounding grades.

3.11 BACKFLOW PREVENTER

A. Comply with local codes for installation of backflow preventer. In absence of local codes, install in accordance with manufacturer's written instructions.

3.12 RAINFALL / FREEZE SENSOR

A. Location and installation shall be as shown on the Drawings and per manufacturer’s written recommendations.

3.13 AUTOMATIC CONTROLLER

A. Location and installation shall be as shown on the Drawings and approved by Owner prior to installation.

B. Install rigid conduits for both power supply and control wiring.
1. Control wire conduit shall extend to 18 inches below grade.
2. Pull spare wires for future valves and extend to area outside paved surfaces.

C. Install electrical grounding for controller in accordance with manufacturer's written instructions.

3.14 FIELD QUALITY CONTROL

A. Irrigation Inspections: Conduct the following inspections during the course of the work:
1. Mainline Inspection: Inspect the installed main line, electronic control valves, wiring prior to backfilling main line.
2. Substantial Completion Inspection: Inspect all completed irrigation work.
3. Final Inspection: Within 30 days of project substantial completion date and subsequent to correction of punch list deficiencies, convene a final inspection of all irrigation work.

B. Inspection and Adjustments: Following installation and prior to Substantial Completion Inspection, make final adjustments to site irrigation including but not limited to the following:
   1. Flush system completely, with nozzles and screens removed and drip lines ends open to extract debris.
   2. Verify sprinkler operation and alignment for direction of throw. Correct as necessary.
   3. Check pop-up rotor/rotator nozzling for proper arc of spray with no overthrow onto pavement. Adjust nozzles as necessary for proper throw and matched precipitation rate.
   4. Ensure uniform distribution exists.
   5. Ensure proper irrigation head operational after landscaping and/or sod installation.

C. Main Line Inspection and Hydrostatic Tests:
   1. Center load piping with small amount of backfill to prevent arching or slipping under pressure.
   2. Install risers and caps on mainline and sub-main lines. Apply continuous and static water pressure of 75 psi for a minimum of 3 hours when welded plastic joints have cured at least 3 hours.
   3. Allowable Leakage:
      a. Utilize the following formula to calculate the allowable leakage for O-ring gasket pipe.
         1) $L=SD(P)^{0.5}$
         2) 133,200
         3) In which: L=Allowable leakage in gallons per hour
         4) S=Length of pipe tested in feet
         5) D=Pipe diameter in inches
         6) P=Average test pressure in PSI gauge
      b. No allowable leakage shall be acceptable with solvent based mainline system.
   4. Repair leaks and retest.

3.15 CLOSEOUT ACTIVITIES.

A. Demonstration: Following final adjustment, operate entire irrigation installation to demonstrate complete and successful operation of equipment.

END OF SECTION

SECTION 02890 - TRAFFIC SIGNS AND SIGNALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Traffic control signs.

1.2 REFERENCES

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

B. ASTM International (ASTM):
1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
2. ASTM C94 - Ready Mix Concrete
3. ASTM D4956 - Retroreflective Sheeting for Traffic Control.

C. US Department of Transportation, Federal Highway Administration:
1. Manual on Uniform Traffic Control Devices (MUTCD).

PART 2 - PRODUCTS

2.1 SIGNS

A. Conform to US Department of Transportation MUTCD. Sign classification, type, size, and color shall be as shown on the drawings

B. Retroreflectivity: Microprismatic type sheeting conforming to ASTM D 4956, Type VIII, IX, or XI.

2.2 POSTS

A. Square Post: Square tubular steel sign post, galvanized, 12 ga, perforated full-length with 7/16 inch holes on four sides. Post size shall be as shown on the Drawings.

B. Steel Pipe: ASTM A 53, Type E (electric-resistance welded) or Type S (seamless), Grade B, Schedule 40, size as shown on the Drawings.

2.3 CONCRETE

A. Mix concrete and deliver in accordance with ASTM C 94.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
1. Compressive Strength: 3,500 psi, minimum at 28 days, unless otherwise indicated on the Drawings.
2. Slump Range: 1 to 3-inches at time of placement
3. Air Entrainment: 5 to 8 percent

PART 3 - EXECUTION

3.1 PREPARATION

A. Field verify underground utilities prior to sign installation. Primary utilities of concern of shallow depths are lawn sprinkler systems, electric, telephone, fiber optic, cable and gas.

B. Cost related to repair of damaged surface and subsurface facilities shall be paid by the Contractor at no additional expense to the Owner.

3.2 INSTALLATION

A. Install signs as shown on the Drawings and in accordance with MUTCD and manufacturer's instructions.

B. Install signs of the type and at locations shown on the Drawings.

C. Install posts of the type as shown on the drawing.

D. Where shown as painted, field paint steel pipe posts in accordance with Section 09900.

END OF SECTION

SECTION 02900 – PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Planting of trees, shrubs, sod, seed, groundcover, and associated materials.

B. Related Requirements:
   1. Section 02300 - Earthwork.
   2. Section 02370 - Erosion and Sedimentation Control.
   3. Section 02812 - Site Irrigation System.

1.2 REFERENCES

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

B. American National Standards Institute (ANSI):
   1. ANSI Z60.1 - American Standard for Nursery Stock.

C. ASTM International (ASTM):
   1. ASTM D5268 - Topsoil used for Landscaping Purposes.
   2. ASTM C602 - Agricultural Liming Materials.

D. Erosion Control Technology Council (ECTC):
   1. Standard Specification for Rolled Erosion Control Products.

1.3 SUBMITTALS

A. Grower / Nursery Information: Submit name, address, phone number and contact person for each Grower / Nursery 30 days prior to plant material selection.

B. Materials Test Reports: Submit topsoil test reports to Owner's Civil Engineering Consultant (CEC) minimum 6 weeks prior to placement of topsoil.
   1. Provide location of topsoil borrow area if topsoil is to be imported.
   2. Provide name of independent soil testing laboratory.
   3. Provide date of sampling and testing.

C. Product Data:
   1. Submit certification tags from trees, shrubs, sod, and seed verifying type and purity to Owner's CEC.

1.4 QUALITY ASSURANCE

A. Plant Material Selection:
   1. Trees: The contractor is responsible for verifying the availability of the specified trees and securing a block prior to delivery. Trees delivered to the site shall be similar in size and quality to an approved photographed sample.
   2. Shrubs: Deliver representative samples of each shrub variety and size to the Project site for verification of specification compliance. Mark shrubs with size, genus, species, cultivar, and variety.
   3. Tagging and observation will be based on compliance with requirements for genus, species, variety, cultivar, size, and quality.
   4. Remove rejected trees or shrubs immediately from Project site.

B. Plant Measurements: Measure according to ANSI Z60.1. Spread, height, or container sizes shown on the drawings are minimum acceptable sizes. Do not prune to obtain required sizes. If range of sizes is given, no plant shall be less than minimum size, and at least 50 percent of plants shall be as large as upper half of range specified. All minimum sizes shall be met.
   1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread. Do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
   2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

C. Soil-Testing Laboratory Qualifications:
   1. Topsoil Analysis: Independent soil testing laboratory employing a landscape or soil agronomist familiar with the final use of the material and construction practices for large earthwork sites.

D. Quality Assurance Inspections: Conduct the following inspections during the course of the work:
   1. Island Inspection: Inspect parking islands for excavation depth and soil conditions prior to installation of planting or irrigation. Obtain sample of planting soil mix.
   2. Substantial Completion Inspection: Convene a substantial completion inspection to observe completed work.
   3. Final Inspection: Within 30 days of substantial completion date, convene a final inspection to observe that all work is completed as specified and shown on the drawings.

1.5 PROJECT CONDITIONS

A. Perform work only during weather conditions favorable to landscape construction and to health and welfare of plants. Owner shall determine suitability of such weather conditions.

PART 2 - PRODUCT

2.1 WOODY PLANT MATERIALS

A. Furnish nursery-grown trees and shrubs complying with ANSI Z60.1 and the following requirements:
   1. Provide plants with healthy root systems developed by transplanting or root pruning.
   2. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as disfiguring knots, sun scald, injuries, abrasions, and disfigurement.
   3. Provide selected specimen quality plants being exceptionally heavy, symmetrical, tight knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry.
   4. Do not prune plants before delivery.
   5. Trees with fresh cuts of limbs over 1 1/4-inch, which have not completely calloused, shall be rejected.
   6. Provide plants typical of their species or variety and exhibiting a normal habit of growth and be legibly tagged with proper name. Provide plants grown under climatic conditions similar to those of site or have been acclimated to such condition for at least 2 years.
   7. Root system of each plant shall be well-provided with fibrous roots. Parts shall be sound, healthy, vigorous, well-branched, and densely foliated when in leaf.
   8. Plants designated ball and burlap shall be moved with root systems as solid units with balls of earth firmly wrapped with burlap and comply with the following:
      a. Diameter and depth of balls of earth shall comply with the American Standards for Nursery Stock and be sufficient to encompass fibrous root feeding systems necessary for healthy development of plant.
      b. No plant shall be accepted when ball of earth surrounding its roots has been cracked or broken preparatory to or during process of planting. Balls shall remain intact during all operations.
      c. Heel-in plants that cannot be planted immediately by setting in ground and covering balls with soil or mulch and then watering.

d. Hemp burlap and twine is preferable to treated. If hemp burlap is used, twine is to be cut from around the base of the trunk and the upper 1/3 of the burlap is to be pulled down around the root ball and completely buried. If treated burlap is used, twine shall be cut from around trunk and burlap shall be removed. Any balled and burlapped tree that has not had the twine cut from around the base of the trunk and removed will be rejected.

9. Provide single trunk trees growing from single unmutilated crown of roots. No part of trunk shall be conspicuously crooked as compared with normal trees of same variety.
10. Provide shrubs with thickness corresponding to trade classification "No.1". Single-stemmed or thin plants shall not be accepted. Side branches shall be generous, well-twigged, and plant as whole well-branched to ground. Plants shall be in moist condition, free from dead wood, bruises, or other root or branch injuries.

2.2 LAWN SEED

A. Provide fresh, clean, new crop lawn seed mixture. Furnish to Owner dealers guaranteed statement of composition of mixture and percentage of purity and germination of each variety.

B. Seed Mixture: Provide seed of grass species and varieties, proportions by weight and minimum percentages of purity, germination, and maximum percentage of weed seed. Seed mixtures vary by region and season and shall comply with State DOT and Local Soil Conservation Service Standards for lawn turf or as specified on the construction drawings.

2.3 SOD

A. Provide sod species suitable as lawn turf for the region. Sod shall be strongly rooted, weed, disease, pest free and uniform in thickness.

2.4 TOPSOIL

A. ASTM D5268, natural, friable, fertile, fine loamy soil possessing characteristics of representative topsoil in the vicinity that produces heavy growth. Topsoil shall be free from subsoil, objectionable weeds, litter, sods, stiff clay, stones larger than 1-inch in diameter, stumps, roots, trash, herbicides, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations. Top soil shall contain:
1. A pH range of 5.5 to 7.4 percent
2. A Sand component range of twenty to sixty percent (20% - 60%)
3. A Silt and Clay component range of thirty-five to seventy percent (35% - 70%)
4. A maximum of five percent (5%) deleterious material
5. A minimum of five percent (5%) organic material.

B. Topsoil shall be tested in accordance with part 3 below.

C. Salvaged or Existing Topsoil: Reuse suitable topsoil stockpiled on-site or existing topsoil undisturbed by grading or excavation operations. Clean topsoil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

D. Verify amount of suitable topsoil stockpiled if any, and supply additional imported topsoil as needed.

E. Imported Topsoil: Supplement salvaged topsoil with imported topsoil from off-site sources when existing quantities are insufficient.
1. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs, or marshes.
2. Verify borrow and disposal sites are permitted as required by state and local regulations. Obtain written confirmation that permits are current and active.
3. Obtain permits required by state and local regulations for transporting topsoil. Permits shall be current and active.

F. Amend existing and imported topsoil as indicated in part 3 below.

2.5 ORGANIC SOIL AMENDMENTS

A. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

B. Back to Nature Cotton Burr Compost or approved equivalent.

C. Compost: Decomposed organic material including leaf litter, manure, sawdust, plant trimmings and/or hay, mixed with soil.

D. Pecan Hulls: Composted pecan hulls for local source.

E. Biosolids: Use Grade 1 containing lower pathogen levels.

F. Worm Castings: Earthworms.

2.6 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, Class O agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent with a minimum of 95 percent passing No. 8 sieve and minimum of 55 percent passing No. 60 sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing No. 6 sieve and a maximum of 10 percent passing No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.7 PLANTING ACCESSORIES

A. Non Selective Herbicide: Roundup-Pro, Finale or equivalent.

B. Selective Post Emergent Herbicide: EPA registered and approved, of type recommended by manufacturer for application.

C. Selective Pre-Emergent Herbicide: EPA registered and approved, of type recommended by manufacturer for application.

2.8 PLANTING SOIL MIX

A. Planting medium containing 75 percent specified topsoil mixed with 15 percent organic soil amendments and 10 percent sharp washed sand unless otherwise specified on the drawings.

2.9 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
   1. Composition: Nitrogen, phosphorous, and potassium in amount required to remedy deficiencies identified in the topsoil.

B. Slow-Release Fertilizer: Use one of the following:
   1. Osmocote Standard Granular fertilizer by Scotts Company composed of 13 percent nitrogen, 13 percent phosphorous, and 13 percent potassium, by weight.

2. Multi-Cote All Purpose by Schultz composed of 17 percent nitrogen, 17 percent phosphorous, and 17 percent potassium, by weight.

C. Deliver fertilizer, mixed as specified, in original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear manufacturer's guaranteed statement of analysis, or manufacturer's certificate of compliance covering analysis shall be furnished to Owner. Store fertilizer in such manner that it shall be kept dry.

2.10 MULCH

A. Straw Mulch: Straw mulch shall not be used for seeding or to stabilize disturbed areas.

B. Wood Mulch: Wood mulch shall be shredded hardwood bark mulch obtained from a local source harvested in a sustainable manner and salt free and free from deleterious materials and suitable as a top dressing of trees and shrubs. Mulch shall have the characteristics of retaining moisture, forming a mat not susceptible to spreading by wind or rain, and providing a suitable growth medium for plants and shall be free of soil, rocks, weeds, sawdust, dirt, garbage, or other debris.
1. Hardwood Mulch: Shredded hardwood mulch shall consist of long fibrous interlocking strands.
2. Color: Natural.

C. Mineral Mulch: Mineral mulch shall consist of decomposed granite, crushed rock, or gravel. Mulch shall be hard, durable stone, washed free of loam, sand, clay, and other foreign substances.
1. Where wood mulch is shown or specified, mineral mulch shall be used where regionally appropriate or where wood mulch is not readily available.
2. Size Range: 3/4 inch maximum 1/4 inch minimum**.**
3. Color: Readily available natural gravel color range.
4. Pea Gravel: Not allowed.

D. Stone Mulch: Stone mulch shall consist of smooth or tumbled rock, uniform in size. Mulch shall be hard, durable stone, washed free of loam, sand, clay, and other foreign substances.
1. Size range: 3/4 inch minimum, 3 inch maximum.
2. Depth: 4 inches minimum for 3/4 inch to 2 inch stone size, 6 inches minimum for 2.25 inch to 3 inch stone size.
3. Color: As specified on the plans.

E. Softwood Bark Mulch or Pine Needle Mulch is not allowed.

F. Hydro-mulch: Hydra CM Bonded Fiber Matrix shall be used in all hydro-seeding applications. Refer to construction drawings for application rates in various areas.

2.11 TREE STAKING

A. Tree Frog Below Ground Root Ball Tree Staking System by Tree Frog Environmental Products, LLC. (325) 735-7411.
1. RBK40pt for trees 4 inches caliper or smaller.
2. RBK60pt for trees 4” – 6 inches caliper.

2.12 WATER

A. Potable water, hose, and other watering equipment.

2.13 WEED MAT

A. 4.1 oz., woven polypropylene, needle-punched fabric, weed barrier.

2.14 STEEL EDGING

A. 1/8-inch x 4-inch interlocking steel edging, staked with metal stakes sufficiently to hold in place and where specifically indicated on the drawings.

2.15 EROSION CONTROL BLANKET

A. Rolled Erosion Control Products shall have current QDOR™ (Quality Data Oversight and Review) status issued by the Erosion Control Technology Council and shall meet state or agency specific requirements. Evidence of QDOR™ approval shall accompany the product shipped to the job site for ready identification by the contractor or an agency inspector.

PART 3 - EXECUTION

3.1 PREPARATION

A. If project completion date prohibits in-season planting, prepare for out-of-season seeding or sodding so that lawns shall be completed and ready for acceptance at time of project completion.

B. Unsuitable Subsoils: Locations containing unsuitable subsoil shall be treated by one or more of the following:
1. Where unsuitability is deemed by Owner to be due to excessive compaction caused by heavy equipment and where natural subsoil is other than AASHTO classification of A6 or A7, loosen such areas with spikes, discing, or other means to loosen soil to condition acceptable to Owner. Loosen soil to minimum depth of 12 inches with additional loosening as required to obtain adequate drainage. Contractor may introduce peat moss, sand, or organic matter into the subsoil to obtain adequate drainage. Such remedial measures shall be considered as incidental, without additional cost to Owner.
2. Where unsuitability is deemed by Owner to be due to presence of boards, mortar, concrete, or other construction materials in sub-grade and where natural subsoil is other than AASHTO classification of A6 or A7, remove debris and objectionable material. Such remedial measures shall be considered as incidental, without additional cost to Owner.
3. Where unsuitability is deemed by Owner to be because natural subsoil falls into AASHTO classification of A6 or A7 and contains moisture in excess of 30 percent, then installation of sub-drainage system or other means described elsewhere in Specifications shall be used. Where such conditions have not been known or revealed prior to planting time and they have not been recognized in preparation of The Drawings and Specifications, then Owner shall issue pricing order to install proper remedial measures.

C. Unsuitable Topsoil: Locations containing unsuitable topsoil shall be treated by one or more of the following:
1. Where unsuitability is deemed by Owner to be because of presence of objectionable weeds; litter; sods; stiff clay; toxic substances; herbicides or other material which may be harmful to plant growth, then topsoil shall be removed from the site and disposed of in a legal manner.
2. Where unsuitability is deemed by Owner to be because of presence of the stumps, roots; stones larger than 1 inch in diameter; less than 3 percent organic material; low or high pH range, remove objectionable material and amend topsoil to meet the requirements specified in part 2 above. Such remedial measures shall be considered as incidental, without additional cost to Owner.

D. Perform planting operations at steady rate of work unless weather conditions make it impossible to work. No plant material shall be planted in frozen ground.

E. Tree and Shrub Preparation
1. Dig bare-rooted shrubs with adequate fibrous roots. Cover roots with uniformly thick coating of mud by being puddled immediately after they are dug, or packed in moist mulch or moss.
2. Dig ball and burlap plants with firm natural balls of earth of diameter and depth to include fibrous roots.
3. Protect roots or balls of plants at all times from sun and drying winds.
4. Ball and burlap plants which cannot be planted immediately upon delivery shall be set on ground and protected with soil, wet moss, or other acceptable material. Heel-in bare rooted plants that cannot be planted immediately upon delivery. All shall be kept moist.
5. Open and separate bundles of plants before roots are covered. Prevent air pockets among roots. During planting operations, cover bare roots with canvas, hay, or other suitable material. Plants shall not be bound with wire or rope which will result in damage to bark or branches.

F. Sod and Seed Bed Preparation
   1. Newly Graded Subgrades:
      a. Do not place topsoil until subgrade has been approved in accordance with Section 02300.
      b. Before placing topsoil, rake subsoil surface clear of stones, debris, and roots. Disk, drag, harrow, or hand rake subgrade to depth of 4 inches and remove stones larger than 1-1/2 inches to provide bond for topsoil.
      c. Spread topsoil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Adjust depth of topsoil in areas adjacent to paved surfaces or curbs to allow for the placement of sod or seed.
   2. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface as follows:
      a. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
      b. Disk, drag, or harrow surface soil to a depth of at least 6 inches.
      c. Remove stones larger that 1-1/2 inch in any dimension and sticks, roots, trash, and other extraneous matter.
      d. Legally dispose of waste material, including grass, vegetation, and turf.
      e. Adjust depth of topsoil in areas adjacent to paved surfaces or curbs to allow for the placement of sod or seed.
   3. Incorporate soil amendments and commercial fertilizer into the top 4 inches of topsoil to achieve the specified topsoil requirements. Till soil to a homogenous mixture of fine texture.
   4. Grade areas to finish grades, filling as needed or removing surplus topsoil. Float areas to smooth, uniform grade as indicated on the Drawings. Lawn areas shall slope to drain.
   5. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls, such as walks, curbs, catch basin, steps, or buildings. Roll, scarify, rake, and level as necessary to obtain true, even lawn surfaces. Finish grades shall meet approval of Owner.
   6. Sod and seed beds shall be firmed by rolling before seeding begins.

G. Groundcover Bed Preparation:
   1. Grade areas to finish grades, filling as needed or removing surplus topsoil. Float areas to smooth, uniform grade as indicated on the Drawings.
   2. Set out and space groundcover 12 inches apart maximum or as otherwise indicated on the Drawings.
   3. Dig holes large enough to allow spreading of roots, and backfill with planting soil.
   4. Remove groundcover from pots.
   5. Work soil around roots to eliminate air pockets and leave a slight saucer indention around plants to hold water.
   6. Water thoroughly after planting taking care not to cover plant crowns with wet soil.
   7. Protect plants from hot sun and wind; remove protection when plants show evidence of recovery from transplanting shock.

H. Island Preparation:
   1. Excavate compacted soil to a depth of 24 inches or as otherwise indicated on the Drawings.
   2. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
   3. Scarify sides of excavation pit smeared or smoothed during excavation.
   4. Subsoil or topsoil removed from islands shall not be used in planting soil mix.
   5. Notify Owner's CEC if subsoil conditions evidence unexpected water seepage or retention within excavation area.
   6. Backfill islands in 8 inch lifts with planting soil mix specified herein. Tamp each lift lightly to prevent settling.
   7. Grade areas to finish grades, filling as indicated on the Drawings. Float areas to a smooth, uniform grade as indicated on the Drawings.

I. Raised Planter Preparation:
   1. Excavate compacted soil and construction debris within raised planter to minimum 12 inches below finish grade of adjacent sidewalk.
   2. Notify Owner's CEC if subsoil conditions evidence unexpected water seepage or retention with the excavation area.

3. Scarify bottom of excavation and provide positive drainage to drainage pipe.
4. Install drainage pipe as shown in the drawings and stone/gravel as shown in the Drawings
5. Install separator fabric between stone/gravel and planting soil mix as shown in the Drawings..
6. Backfill raised planter in 9 inch lifts with specified planting soil mix to within 1 inch of bottom edge of wall cap. Tamp each lift lightly to prevent settling. If settling occurs prior to planting add additional planting soil mix.
7. Grade areas to finish grades, filling as indicated on the construction Drawings to allow positive drainage. Float areas to a smooth, uniform grade as indicated on the Drawings.

3.2 PROTECTION

A. Topsoil which must be transported across finished sidewalks shall be delivered in such manner that no damage will be done to sidewalks.

B. Before commencing work, trees and shrubs that are to be saved shall be protected from damage by placement of fencing flagged for visibility or some other suitable protective procedure approved by Owner and as shown in the construction Drawings or as required by local code.

C. Trucks or other equipment shall not be driven or parked within drip line of any tree unless tree overspreads paved area.

D. Use precautionary measures when performing work around trees, sidewalks, pavements, utilities, and other features either existing or previously installed.

E. Adjust depth of earthwork and topsoil when working immediately adjacent to aforementioned features in order to prevent disturbing tree roots, undermining sidewalks and pavements, and damage in general to other features either existing or previously installed.

F. Cover plants transported to project in open vehicles with tarpaulins or other suitable covers securely fastened to body of vehicle to prevent injury to plants. Closed vehicles shall be adequately ventilated to prevent overheating of plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. Plants shall be kept moist, fresh, and protected. Such protection shall encompass entire period during which plants are in transit, being handled, or are in temporary storage.

G. Plants shall not be delivered to the site more than seven days prior to planting. Plants not planted within 48 hours of delivery, shall be healed in (covered with sawdust, soil or mulch), and the containers or balls protected from wind and temperature and kept moist until planting.

H. Where excavation, fill, or grading is required within drip line of trees that are to remain, work shall be in accordance with the tree preservation plans and details within the Drawings or as follows. If any discrepancy occurs, detailed Drawings shall take precedents over general specifications::
1. Trenching: When trenching occurs around trees to remain, tree roots shall not be cut but trench shall be tunneled under or around roots by careful hand digging without injury to roots.
2. Raising Grades:
    a. Where fill not exceeding 16 inches is required, clean, washed gravel graded from 1 inch to 2 inches in size shall be placed directly around tree trunk. Extend gravel out from trunk on all sides minimum of 18 inches and finish approximately 2 inches above finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with trunks of trees requiring fill.
    b. Where fill exceeding 16 inches is required, construct dry-laid tree well around trunk of tree. Tree well shall extend out from trunk on all sides minimum of 3 feet (horizontal) and to 3 inches (vertical) above finish grade. Place coarse-graded rock directly around tree well extending out to drip line of tree. Place clean, washed gravel graded from 1 inch to 2 inches in size directly over coarse rock to depth of 3 inches. Place approved backfill material directly over washed gravel to desired finish grade.

3. Lowering Grades: Existing trees in areas where new finish grade is to be lowered shall have regrading work done by hand to elevation indicated on The Drawings. Roots as required shall be cut cleanly 3 inches below finished grade and scars covered with tree paint.
4. Trees marked for preservation that are more than 6 inches above proposed grades shall stand on broad rounded mounds and graded smoothly into lower level. Trees located more than 16 inches above proposed grades shall have dry-laid stone wall or other retaining structure as detailed on The Drawings constructed minimum of 5 feet from trunk. Exposed or broken roots shall be cut clean and covered with topsoil.

3.3 PLANTING BED ESTABLISHMENT

A. Prior to preparing planting beds, the area shall conform to the lines and grades shown on the plans and the condition of the subsoil shall be approved by the Owner.

B. Contractor shall verify the location of any underground utilities on site.

C. Planting beds where existing subsoil is determined by Owner to be unsuitable for plant growth in accordance paragraph Unsuitable Subsoil herein shall be excavated to a depth of 24 inches or as needed to provide adequate drainage. Replace excavated soil with planting soil mix.

D. Planting beds where existing subsoil is acceptable by Owner shall be prepared as follows:
1. Seven days prior to commencing establishment of the planting areas, apply non selective herbicide. Remove dead vegetation.
2. Loosen subsoil to a depth of 12 inches. Remove stones larger than 1 inch in any dimension, sticks, roots, rubbish, and other extraneous matter and legally dispose of them off site.
3. Spread 3 inches of soil conditioner over the surface of the planting area and incorporate into the top 12 inches of the soil. Prior to spreading soil conditioner, add or remove topsoil as needed to accommodate addition of soil conditioner and to achieve finish grade.
4. Till planting soil mix to a homogenous mixture of fine texture.
5. Float areas to smooth, uniform grade providing positive drainage out of planting beds and away from structures or as indicated on the Drawings.

E. Apply slow release fertilizer at a rate of 1-1/2 pounds per 100 square feet for beds areas or per recommendations shown on the Drawings or by local agronomist and incorporate into the top 8 inches.

3.4 TREATMENT OF EXISTING TREES

A. Prune or remove existing trees as indicated on the planting plan.

3.5 TREE AND SHRUB PLANTING

A. Plants too large for 2 persons to lift in and out of holes shall be placed with sling. Do not rock trees in holes to raise.

B. If rock or other underground obstruction is encountered, Owner may require plant pits to be relocated, pits enlarged, or plants deleted from project.

C. Make adjustments in locations as directed. In event that pits or areas for planting are prepared and backfilled with planting soil mix or topsoil to grade prior to commencement of lawn operations, they shall be so marked that when planting proceeds, they can be readily located. In case underground obstructions such as ledges or utilities are encountered, change location under direction of Owner without charge.

D. All excavations, drainage improvements, and soil replacement in parking islands shall be completed prior to the installation of any trees and shrubs.

E. Holes for trees shall be at least 2 times the diameter of the root ball and at least 6 inches deeper than root ball or as shown on the Drawings. Holes for shrubs shall be at least 2 times the diameter of the root ball and at least 6 inches

deeper than the root ball (minimum) or as shown on the Drawings. Holes for vines shall be at least 12 inches greater in diameter than the spread of root ball at least 12 inches deep.

F. Remove the top half of wire baskets, the sides of any boxes, or other root ball holding device along the side of the root ball.

G. Backfill tree holes and shrub beds with planting soil mix. Apply slow release fertilizer at a rate of 1/4 pounds per caliper inch for trees. Incorporate fertilizer into the planting soil mix.

H. Plants shall be planted at same depth as they had previously grown or as shown on the drawings. Backfill planting soil mix in layers of not more than 8 inches and each layer watered sufficiently to settle before next layer is placed. Tamp planting soil mix under edges of balled plants. Use enough planting soil mix to bring surfaces to finish grade when settled.
1. Provide saucer around each plant as shown on the Drawings.
2. Soak plants with water twice within first 24 hours after time of planting. Apply water with low pressure so as to soak in thoroughly without dislodging topsoil.

I. Tree Staking: Install " T-Post, 8' ht" Tree Staking or as specified on the drawings. In windy conditions, additional staking may be required.

3.6 MISCELLANEOUS INSTALLATIONS

A. Weed Mat: Place weed mat under planting areas that will not be seeded and in any other locations as shown on the Drawings. Cover weed mat with 4 inches of mulch and secure in place with soil staples. NOTE: Weed mat NOT to be installed in areas with spreading ground cover plantings.

B. Mulch: Place 4 inches of mulch as a top dressing in planting beds. Mulch single trees or shrubs to outside edge of saucer. Type of mulch to be as specified on the drawings and specifications.

C. Peg sodded slopes between 4:1 and 3:1 to hold in place. Sodded slopes greater than 3:1 are to be reinforced as shown on the drawings.

D. Areas to be covered with erosion control blankets shall be properly prepared, fertilized, and seeded before blanket is applied. When blanket is unrolled, netting shall be on top and fibers in contact with soil. In ditches, apply blanket in direction of flow of water. On slopes, apply blankets vertically on slope. Overlap ends and sides 6 inches and staple per manufacturer's written instructions.

3.7 SEEDING

A. Do not perform seeding in windy conditions.

B. Seeding shall be dispersed in 2 directions at right angles to each other.

C. Permanently seed and mulch cut and fill slopes as construction proceeds to extent considered desirable and practical. In the event it is not practical to seed areas, slopes shall be stabilized with hydro-mulch and tackifier, netting, blankets or other means to reduce the erosive potential of the area.

D. Slopes that are specified to receive seeding are to be hydro-seeded at the recommended seeding rate prior to installation of the erosion control blanket. After installation of erosion control blankets, the slopes are to have sand spread over the blanket to fill all voids, and then hydro-seeded a second time at the same specified seeding rate.

E. Surface layer of soil for seeded areas shall be kept moist during germination period. Water seeded areas twice first week to minimum depth of 6 inches with fine spray and once per week thereafter as necessary to supplement natural rain to equivalent of 6 inches depth.

3.8 SODDING

A. Cut and lay sod on same day. Only healthy vigorous growing sod shall be laid.

B. Lay sod across slope and tightly together to result in solid coverage free of gaps. All seams in sod are to be sanded to provide a smooth uniform growing surface.

C. Sodded slopes between 4:1 and 3:1 are to be pegged to hold sod in place.

D. Roll or firmly but lightly tamp new sod with suitable wooden or metal tamper sufficiently to set or press sod into underlying soil.

E. All finished sodding shall be smooth and free of lumps and depressions.

F. After sodding has been completed, clean up and thoroughly water newly-sodded areas.

3.9 MAINTENANCE DURING CONSTRUCTION

A. Begin maintenance operations immediately after each plant is planted and continue as required until acceptance. Water, mulch, weed, prune, spray, fertilize, cultivate, and otherwise maintain and protect plants. Reset settled plants to proper grade and position, restore planting saucers, and remove dead, diseased, or unhealthy plant material. Tighten and repair stakes and wires. Correct defective work as soon as possible after it becomes apparent and weather and season permit.

B. Upon completion of the planting operations, clean up landscaped areas to be free of stones, containers, trash, and other waste and debris to leave area in a neat and well-groomed appearance.

C. Maintain all plant material in a healthy, vigorous growing condition.

D. Make weekly inspections to determine moisture content of soil and adjust watering schedule established by irrigation system installer to fit conditions.

E. After grass growth has started, reseed or sod areas that fail to show uniform stand of grass in accordance with The Drawings and as specified herein. Continue Reseeding and sodding such areas repeatedly until areas are covered with satisfactory growth of grass. Perform removal and replacement or topsoil conditioning if required to facilitate establishment of grass.

F. Water in such manner and as frequently as is deemed necessary by Owner to assure continued growth of healthy grass. Water areas of site in such a manner as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to finished surface due to watering equipment.

G. Provide water for execution and maintenance at no expense to Owner. Furnish portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport water from available outlets and apply it to seeded areas in approved manner.

H. Remove heavy cuttings to prevent destruction of underlying turf. If weeds or other undesirable vegetation threaten to smother planted species, such vegetation shall be mowed or, in case of rank growths, shall be uprooted, raked and removed from area by methods approved by Owner.

I. Remove weeds and other undesirable vegetation by applying herbicides as recommended by the manufacturer or by uprooting. Rake and remove uprooted vegetation from area by methods approved by Owner.

J. Protect seeded area from pedestrian or vehicular trespassing while grass is germinating. Provide fences, signs, barriers, or other necessary temporary protective devices. Repair damage resulting from trespass, erosion, washout, settlement, or other causes.

K. Remove fences, signs, barriers, or other temporary protective devices after final acceptance.

L. Remove and replace diseased, distressed, dead, or rejected plants prior to Substantial Completion Date.

M. Replacements shall be plants of same variety and size specified on The Drawings. Furnish and plant as specified herein. Replacements resulting from removal, loss, or damage due to occupancy of project in any part, vandalism, physical damage by animals, vehicles, etc., and losses due to curtailment of water by local authorities will be approved and paid for by Owner.

N. Grassed areas damaged during process of work shall be restored or repaired to condition satisfactory to the Owner. Fill, grade, re-fertilize, replant, or mulch as required to restore to contract requirements.

3.10 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor as necessary to assure compliance with Contract requirements.

B. Contractor shall retain an independent soil testing laboratory to sample and test topsoil. The testing lab for the Multiresidue Herbicide/Pesticide Screen shall be NELAC certified.
   1. Topsoil Analysis: Collect 5 random samples from the topsoil areas. Combine samples and test as a composite for percentages of organic matter; percentage of sand, silt, and clay content; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
   2. Submit topsoil test reports to Owner's Civil Engineering Consultant (CEC) minimum 6 weeks prior to placement of topsoil.

END OF SECTION