E. Sleeve-type couplings shall be used for joining plain-end pipe sections. The coupling shall consist of one steel middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets. Underground bolts shall be high-strength type as specified above.

F. Guy Wires: Guy wires shall conform to Fed. Spec. RR-W-410 as follows:

5/32 inch diameter	Type V, Class 1
3/16 inch to 5/16 diameter	Type V, Class 2
1/4 inch to 5/8 diameter	Type I, Class 2

PART 3 – EXECUTION

3.1 SWAY BRACES

A. Sway braces shall be installed on piping and duct to preclude damage during seismic activity. All bracing shall conform to the arrangements shown. Provisions of this paragraph apply to all piping within a 5-foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze-type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group. No trapeze-type hanger shall be secured with less than two ½-inch bolts. Bracing rigidity attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.2 SWAY BRACES FOR PIPING

A. Transverse Sway Bracing: Transverse sway bracing shall be provided at intervals not to exceed those given in Appendix of this section except for cast iron soil pipe, which shall be braced at not more than 10-foot intervals.

B. Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 40-foot intervals.

C. Vertical Runs: Vertical runs of piping shall be braced at not more than 10-foot vertical intervals. For small tubing, bracing shall be provided at no more than 4-foot spacing.

D. Anchor Rods, Angles, and Bars: Anchor rods, angles and bars shall be bolted to either pipe clamps or pipe flanges at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified below. Anchor rods, angles, and bars shall not exceed lengths given in Appendix of this section.

E. Clamps on uninsulated pipes shall be applied directly to pipe. Insulated piping shall have clamps applied over insulation vapor barrier with high-density inserts and metal protection shields under each clamp.

F. Bolts: Bolts used for attachment of anchors to pipe and structure shall be not less than ½-inch diameter.

3.3 SWAY BRACES FOR DUCTS

A. Transverse Sway Bracing: Transverse sway bracing shall be provided at each horizontal turn of 45 degrees or more, at the end of each duct run, and otherwise at each 30-foot interval. Walls which ducts penetrate may be considered transverse braces.

B. Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 60-foot intervals. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if the bracing is installed within 4 feet of the intersection, and it is sized for the larger duct.

C. Bracing Angles: Bracing angles for rectangular ducts shall be in accordance with Appendix of this section.

3.4 SPREADERS

A. Spreaders shall be provided between racked or adjacent piping runs to prevent contact during seismic activity whenever pipe or insulated pipe surfaces are less than 4 inches apart or four times the maximum displacement due to seismic force. Spreaders to be applied at same interval as sway braces. Spreaders shall be applied to surface of bare or insulated hot pipe and over insulation utilizing high-density inserts and pipe protection shields where vapor-barrier-type insulation is employed.

3.5 FLEXIBLE COUPLINGS OR JOINTS

A. Building Piping: Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers larger than 3-1/2 inches in diameter, except thermal heat distribution piping.

B. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used. Flexible bell and spigot pipe joints using rubber gaskets or no-hub fittings may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to comply with these requirements.

C. Underground Piping: All underground piping and 4-inch or larger conduit, except thermal heat distribution system, shall have flexible couplings installed adjacent to building as shown. Additional flexible couplings shall be provided as follows:

1. On each side of the joints of demarkation between soils having widely differing degrees of consolidation.
2. At all points that can be constructed to act as anchors.
3. On every branch of a tee and each side of an elbow.

3.6 ANCHOR BOLTS

A. All floor or pad mounted equipment required by any Section of these specifications shall be rigidly fastened to the floor or pad by use of cast-in-place anchor bolts. Anchor bolts must conform to ASTM A 307. Anchor bolts shall have an embedded straight length equal to or at least 12 times nominal diameter of the bolt. If the size and number of the anchor bolts are not shown on the drawings then anchor bolts shall be ½" in diameter or the manufacturer's installation recommendations, whichever is the most stringent.

B. Four bolts per item shall be provided with a minimum embedment of 12 bolts diameters, a minimum bolt spacing of 16 bolts diameters and a minimum edge distance of 12 bolts diameters. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths.

C. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table.

3.7 RESILIENT VIBRATION ISOLATION DEVICES

A. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure as in paragraph ANCHOR BOLTS except that an equipment weight equal to five times the actual equipment weight shall be used.

1. Resilient and Spring-Type Vibration Devices: Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

3.8 EQUIPMENT SWAY BRACING

A. Equipment sway bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes arranged as shown and secured at both ends with not less than ½-inch bolts. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45 degrees directed up and radially away from equipment and oriented symmetrically in 90 degree intervals on the horizontal plane, bisecting the angles of each corner of the equipment, provided that supporting members are properly sized to support operating weight of equipment when hangers are inclined at a 45 degree angle.

3.9 LIGHTING FIXTURES IN BUILDINGS

A. In addition to the requirements of the preceding paragraphs, lighting fixtures and supports will conform to the following:

B. Materials and Construction:

1. Fixture supports shall be malleable iron.
2. Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant-supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.
3. Recessed fluorescent individual or continuous-row fixtures shall be supported by a seismic-resistant suspended ceiling support system and shall be provided with fixture support wires attached to the building structural members using two wires for individual fixtures and one wire per unit of continuous row fixtures.
4. A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 4-inch boxes, 3-inch plaster rings, and fixture studs.
5. Surface-mounted fluorescent individual or continuous-row fixtures shall be attached to a seismic-resistant ceiling support system. Fixture support devices for attaching to suspended ceilings shall be a locking-type scissor clamp or a full loop band that will securely attach to the ceiling support. Fixtures attached to underside of a structural slab shall be properly anchored to the slab at each corner of the fixture.
6. Each wall-mounted emergency light unit shall be secured in a manner to hold the unit in place during a seismic disturbance.

C. Tests: In lieu of the requirements for equipment supports, lighting fixtures and the complete fixture-supporting assembly may be tested as specified hereinafter. Such tests shall be conducted by an approved and independent testing laboratory, and the results of such tests shall specifically state whether or not the lighting fixture supports satisfy the requirements given herein.

1. Test Equipment: To simulate earthquake motion, fixtures and supports shall be attached to a carriage suspended on rollers from an overhead track. A gear motor and crank assembly shall be used to provide oscillatory motion of approximately one cycle per second. The exact number of cycles per second and the actual dimensions of the crank apparatus shall be adjusted to produce a minimum carriage acceleration of 0.14g. The actual fixture-mounting surface shall be on the underside of the carriage and shall provide capacity for orienting the fixture in a horizontal plane in various positions, ranging from parallel to perpendicular to the line of traverse.
2. Test Requirements: All tests shall be conducted with the maximum fixture weight so as to produce the most severe loading conditions. Fixtures having stems shall be tested with the actual stem lengths to be used. Tests shall be of 1-minute duration with the mounting surface in the line of traverse, at 45 degrees to the line of traverse, and at 90 degrees to the line of traverse. A total of two fixtures shall be tested in each of the above positions. After each of the six tests, the complete stem assemblies from fixtures having stem assemblies shall be subjected to a tensile strength test. The sample shall withstand, without failure, a force of not less than four times the weight it is intended to support.
3. Acceptance: No component of a fixture nor its support shall be accepted individually. For acceptance, the fixture and its supports shall exhibit no undue damage, and no component of the fixture shall fail or fall from the fixture during testing.

D. Design Criteria: In lieu of the above test requirements, lighting fixtures shall be designed to resist a lateral force of 56 percent of the fixture weight.

E. Lighting Fixtures and Air Diffuser Supports: Lighting fixture and air diffuser supports shall be designed and installed to meet the requirements of equipment supports in the preceding paragraphs of this specification with the following exceptions:

1. Recessed lighting fixtures not over 56 pounds in weight and suspended and pendent-hung fixtures not over 20 pounds in weight may be supported and attached directly to the ceiling system runners by a positive attachment such as screws or bolts.
2. Air diffusers that weigh not more than 20 pounds and that receive no tributary loading from ductwork may be positively attached to and supported by the ceiling runners.

3.10 SMOKE STACKS

A. Stack shall be mounted directly on boilers or heat producing appliances or on floor supporting such devices with side inlets to stacks. All stacks must be supported with steel guys attached to a point three-fourths of the stack height external to the building. Guy wires shall be 1/4" 6 x 19 cable, improved plow steel with fiber core, as noted, with galvanized coating.

3.11 MISCELLANEOUS EQUIPMENT

A. The following specific items of equipment to be furnished under this contract shall be constructed and assembled so as to be capable of withstanding the horizontal equivalent static force of 0.11 times the operating weight of the equipment, at vertical center of gravity of the equipment without causing permanent deformation, dislocations, separation of components, or other damage, which would render the equipment inoperative for significant periods of time following an earthquake.

3.12 MISCELLANEOUS EQUIPMENT

Boilers
Cooling Tower
Air-Handling Units
Transformers
Switchboards and Switchgears
Motor Control Centers
Free Standing Electric Motors

3.13 APPENDIX

A. The following are reproductions from SMACNA Seismic Restraint Manual Chapters 4, 7 and 8 and contain details for duct, pipe conduit and equipment seismic restraint and shall be used for determining the required restraint for this project. The building shall be categorized seismic hazard level "C".

END OF SECTION 26 0525

SECTION 26 0550 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (Reference Section 260500)

1.1 IDENTIFICATION OF WIRING AND EQUIPMENT

A. Provide identification and warning signs to wiring and equipment as listed in schedule. Signs and tags shall be as follows:

TYPE 1: Laminated phenolic plastic with black Gothic condensed lettering by Seton or Wilco.
TYPE 2: Self-sticking ½" wide plastic tape with high gloss surface and embossed lettering by Brady or Dymo.
TYPE 3: Self-sticking flexible vinyl with oil resistant adhesive for -20 degrees to 300 degrees F. temperatures by Brady or as approved.

B. Provide lighting and power panelboards with Type 1 sign minimum of 1-1/4" x 6" indicating panel designation and electrical characteristics. Mount inside of panel door on circuit breaker trim flange just below breakers.

C. Provide disconnect switches/motor starters with Type 1 sign 3/4" x 5" indicating equipment served and Brady No. AE-46125 danger sign.

D. Provide feeders and branch circuit home runs with Type 3 wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number. Provide label designating area and room number(s) served on inside of panelboard door for each circuit used.

E. Provide Type 2 tape at feeder terminal lugs to switchboards and panelboards. Tape shall indicate conduit size, conductor type and AWG size. Tape shall be located to be easily read with conductors installed.

F. All wires for branch circuit work shall be color coded as follows:

1. Provide continuous color coding for feeder, branch and control circuits. Insulation or identification tape color shall be same color for like circuits throughout. Where specified insulation colors are not available in larger wire sizes color code conductor at all accessible location with Scotch 35 all-weather color code tape.
2. Identify the same phase conductor with same color throughout.
3. Provide conductors with color coding in accordance with NEC. Where more than one standard voltage system is installed, provide same colored conductors with indicated tape or stripe to indicate system voltage.

Phase	208/120	480/277
A	BLACK	BROWN
B	RED	ORANGE
C	BLUE	YELLOW
NEUTRAL	WHITE	WHITE
GROUND	GREEN	GREEN

G. Use solid color coating for No. 6 and smaller branch circuit conductors and neutral conductors.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 26 0550

SECTION 26 0600 – EXISTING EQUIPMENT TO BE RELOCATED

PART 1 - GENERAL (Reference Section 230500)

1.1 GENERAL EXTENT OF WORK

A. It is the intent of this section of the specifications to identify existing equipment that is available for relocation and reuse in this current project.

B. An attempt has been made to identify all equipment in the Docking State Office Building (DSOB) that is available for reuse in the new State of Kansas – Energy and Service Center (KEC). If a bidding contractor locates or is aware of equipment in the DSOB that could be used in the new KEC, the Engineer shall be so informed in adequate time prior to the bid to allow for review and issuance in an addendum issued to bidding parties.

C. Where a particular piece of equipment is in a location that requires it to be disassembled in order for it to be removed and relocated and then reassembled in the new location, factory authorized technicians shall be engaged as required to complete the disassembly and the reassembly and to then certify that the reassembled equipment is in condition equal to that found prior to disassembly.

D. If any part or appurtenance is damaged during the disassembly, relocation, and / or reassembly, the part or appurtenance shall be replaced with factory certified new replacement parts.

1.2 SCHEDULE OF EXISTING EQUIPMENT AVAILABLE FOR REUSE

A. The following schedule identifies existing equipment that is available for reuse in the new State of Kansas – Energy and Service Center.

EXISTING ELECTRICAL EQUIPMENT			
DESCRIPTION	CURRENT LOCATION	NEW LOCATION	REMARKS
MAIN SWITCHBOARD	DOCKING STATE OFFICE BUILDING SUB BASEMENT MAIN ELECTRICAL ROOM	KANSAS ENERGY CENTER, ROOM 126	PROVIDE NEW CIRCUIT BREAKERS WITH FEATURES AND RATINGS SIMILAR TO EXISTING AS INDICATED ON PLANS AND IN ONE LINE DIAGRAM
GENERATOR SWITCHBOARD	DOCKING STATE OFFICE BUILDING SUB BASEMENT MAIN ELECTRICAL ROOM	KANSAS ENERGY CENTER, ROOM 126. SEE PLANS FOR RECONFIGURATION REQUIREMENTS	PROVIDE NEW CIRCUIT BREAKERS WITH FEATURES AND RATINGS SIMILAR TO EXISTING AS INDICATED ON PLANS AND IN ONE LINE DIAGRAM

EXISTING ELECTRICAL EQUIPMENT CONTINUED			
MAIN DISTRIBUTION PANEL MDP-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT	KANSAS ENERGY CENTER, ROOM 126	PROVIDE NEW CIRCUIT BREAKERS WITH FEATURES AND RATINGS SIMILAR TO EXISTING AS INDICATED ON PLANS AND IN ONE LINE DIAGRAM
MAIN DISTRIBUTION PANEL MDPL-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT	KANSAS ENERGY CENTER, ROOM 126	PROVIDE NEW CIRCUIT BREAKERS WITH FEATURES AND RATINGS SIMILAR TO EXISTING AS INDICATED ON PLANS AND IN ONE LINE DIAGRAM
TRANSFORMER TFX L-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT	KANSAS ENERGY CENTER, ROOM 126	
BUS DUCT	DOCKING STATE OFFICE BUILDING	KANSAS ENERGY CENTER	HARVEST BUS DUCT SECTIONS, FITTINGS ETC AND PROVIDE STRAIGHT SECTIONS, FITTINGS, TAP BOXES ETC AS REQUIRED TO RESULT IN A COMPLETE AND FULLY FUNCTIONAL SYSTEM AS INDICATED ON THE PLANS
ADAPTIVE MOTOR CONTROLLER FOR WCC-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
ADAPTIVE MOTOR CONTROLLER FOR WCC-2	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
ADAPTIVE MOTOR CONTROLLER FOR WCC-3	EISENHOWER STATE OFFICE BUILDING BASEMENT MECHANICAL ROOM	KANSAS ENERGY CENTER, ROOM 127	
VARIABLE SPEED MOTOR CONTROLLER FOR PRIMARY PUMP	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
VARIABLE SPEED MOTOR CONTROLLER FOR PCWP-1	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
VARIABLE SPEED MOTOR CONTROLLER FOR PCWP-2	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	

EXISTING ELECTRICAL EQUIPMENT CONTINUED			
VARIABLE SPEED MOTOR CONTROLLER FOR PCWP-3	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM	KANSAS ENERGY CENTER, ROOM 127	
VARIABLE SPEED MOTOR CONTROLLER FOR CONDENSER WATER PUMP CP-1, 30 HP 460 VAC 3 PHASE	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM, CURRENTLY SERVES DCHWP-3, 40 HP 460 VAC 3 PHASE	KANSAS ENERGY CENTER, ROOM 127	
VARIABLE SPEED MOTOR CONTROLLER FOR COOLING TOWER FAN CT-1, 25 HP 460 VAC 3 PHASE	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM, CURRENTLY SERVES PHRP-4, 25HP 460 VAC 3 PHASE	KANSAS ENERGY CENTER, ROOM 127	
VARIABLE SPEED MOTOR CONTROLLER FOR COOLING TOWER FAN CT-2, 25 HP 460 VAC 3 PHASE	DOCKING STATE OFFICE BUILDING SUB BASEMENT CHILLER ROOM, CURRENTLY SERVES PHRP-5, 25HP 460 VAC 3 PHASE	KANSAS ENERGY CENTER, ROOM 127	
DIESEL ENGINE DRIVEN GENERATOR	GROUNDS STORAGE YARD AT 4TH AND VAN BUREN, TOPEKA, KANSAS	KANSAS ENERGY CENTER SITE, SOUTH OF THE BUILDING	SEE PLANS FOR RECONFIGURATION REQUIREMENTS.

END OF SECTION 26 0600

SECTION 26 1100 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (Reference Section 260500)

PART 2 - PRODUCTS

2.1 STEEL CONDUIT

A. Galvanized rigid steel conduit: Conduit shall be hot dipped galvanized and shall bear a UL label. Conduit shall also meet Federal Specification W-WC-581 and ANSI C80.1.

B. EMT Conduit: Conduit shall be galvanized steel electrical metallic tubing and bear and Underwriters' Laboratory label. Conduit shall conform to Federal Specification WWC-563 and ANSI specification C80.3.

C. Contractor may use either rigid steel or EMT for all above grade main feeder circuits to switchboards and panelboards unless specifically indicated on plans.

D. Outside and Wet Location Flexible Conduit: Flexible conduit shall have a water resistant non-sleeving polyvinyl chloride jacket with a general temperature range of -40 degrees C to + 60 degrees C. Conduit shall bear a UL label.

E. MC Flexible Conduit: 3/8" may only be used from JB to lighting fixture as per NEC 330. A ground wire shall be run in the conduit assembly.

F. Liquid tight flexible metal conduit Type LFMC: Liquid tight flexible metal conduit shall be used for final connection to interior and exterior motors or equipment where vibration may be encountered. A maximum length of 6'-0" shall be used. A grounding conductor shall be installed in all conduits to include liquid tight flexible metal conduit. Transition from either EMT conduit or GRS conduit to liquid tight flexible metal conduit shall be made by use of a NEMA 3R junction box. Liquid tight flexible metal conduit shall be installed as indicated in NEC Article 350.

2.2 CONDUIT FITTINGS

A. Rigid Steel Conduit: Couplings shall be steel threaded type and box connectors shall be steel insulated bushings and malleable iron or steel locknuts. Unilets shall be malleable iron with blank cover.

B. EMT Conduit: Couplings and box connectors shall be die cast set screw type. Unilets shall be malleable iron with blank cover.

C. Flexible Conduit: Connectors shall be threaded type iron with insulated throat.

D. Where conduits cross building expansion joints provide O-Z expansion fittings type "AX", "TE", "EX", or "EXE" as required.

E. Provide grounding bushings where feeder conduit attaches to panelboard backbox. Bond grounding bushing to ground bus.

2.3 CONDUIT INSTALLATION

A. Align conduit terminations at panelboards, switchboards, motor control equipment, junction boxes, etc. and install true and plumb. Provide supports or templates to hold conduit alignment during rough-in stage of work.

B. Install conduit continuous between outlet boxes, cabinets and equipment. Make bends smooth and even without flattening or flaking conduit. Radius of bends shall not be shorter than radius listed table 346-10 (b) of NEC. Long radius elbows may be used where necessary.

C. Ream and clean conduit before installation and plug or cover openings and boxes to keep conduit clean during construction.

D. Install no conduits or other raceways sized smaller than permitted in applicable NEC Tables. Where conduit sizes shown on drawings are smaller than permitted by code, Contractor shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of Engineer. Fasten conduit securely in place with approved straps, hangers, and steel supports. Provide O-Z cable support to support conductors in vertical raceways as required by NEC Table 300-19 (a) of NEC.

E. Low voltage wiring including fire alarm, telephone, television, computer cabling and other low voltage wiring shall be installed in conduit unless noted otherwise.

2.4 INSERTS, HANGERS

A. Support vertical and horizontal conduit runs at intervals not greater than 10 feet, within 3 feet of any bend and at every outlet or junction box

B. Install multiple runs of conduits as follows:

1. Where a number of conduits are to be run exposed and parallel, group and support with trapeze hangers.
2. Fasten hanger rods to structural steel members with suitable beam clamps and to concrete structures with inserts set flush with surface. Install concrete inserts with reinforced rod through opening provided in inserts.
3. Inserts shall be Grinnell figure 279, 281, 282, or 285 or equivalent as required by load and concrete thickness.
4. Provide beam clamps suitable for structural members and conditions.
5. Provide 3/8" minimum diameter steel hangers rods galvanized or cadmium plated finish.
6. Trapeze hangers shall be Kindorf Series 900 channel with fittings and accessories as required.
7. Attach each conduit to trapeze hanger with Steel City No. C-105 clamps for rigid conduit and Steel City No. C-106 clamps for electrical metallic tubing. (EMT).

C. Install clamps for single conduit runs as follows:

1. Support individual runs by approved pipe straps, secured by toggle bolts on hollow masonry; expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction. Use of perforated strap not permitted.
2. Install exposed conduits in damp locations with clamp backs under each conduit clamp to prevent accumulation of moisture around conduits.
3. Provide inserts, hangers and accessories with finish as follows:

    a. Galvanized: Concrete inserts and pipe straps.
    b. Galvanized or Cadmium Plated: Steel bolts, nuts, washers and screws.
    c. Painted with Prime Coat: Individual hangers, trapeze hangers and rods.

D. Equivalent hangers and support systems by Binkley, Fee and Mason, Kin-Line or Unistrut.

2.5 BUSHINGS AND LOCKNUTS

A. Enter outlet boxes squarely and securely clamp conduit to outlet box with bushing on inside and locknut on outside.

2.6 SLEEVES

A. Provide proper type and size sleeves to General Contractor for electrical ducts, busses, conduits, etc. passing through building construction. Supervise installation to insure proper sleeve location. Unless indicated or approved install no sleeves in structural members.

B. Provide cast iron sleeves extending 1 inch above finished floor where sleeves pass through floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchen. Seal opening between pipe and sleeve with Thunderline Corp. Link Seal.

C. Unless specified otherwise provide 18 gauge galvanized sheet metal sleeves through floors and non-bearing walls. Where piping passes through exterior walls, equipment room walls, air plenum walls and walls between areas that must be isolated from occupied areas, seal space between sleeves and piping, air or water tight are required with Thunderline Corp. Link Seal.

D. Provide O-Z Electrical Manufacturing Co., Inc. Type "FSK" or "WSK" or equivalent thruwall and floor seals where conduits pass through concrete foundation walls below grade.

E. Provide Zurn Z-195 or equivalent flashing sleeve through walls and floors with waterproof membrane. Seal annular space between conduit and sleeve with Thunderline Link Seal or O-Z type CSM sealing bushing.

F. All holes or voids created by the electrical contractor to extend pipe through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

2.7 OUTLET BOXES

A. Provide electrical service outlets, including plug receptacles, lamp receptacles, lighting fixtures and switches with Steel City, Raco, or equivalent four inch code gauge steel knockout boxes galvanized or sheradized of required depth for service or device.

B. Provide code gauge galvanized steel raised covers on outlet boxes installed in plaster finish. Set to plaster grounds with outside edge of cover flush with plaster finish.

C. Provide 3/8" or larger fixture stud in each outlet box scheduled to receive lighting fixture. Select covers with proper opening for device installed in outlet box.

D. Use of utility of "Handy" boxes acceptable only where single gang flush outlet box in masonry is "dead-end" with only one conduit entering box from end or back.

E. Use no sectional outlet boxes.

F. Provide Appleton FS or FD unilets for surface mounted exterior work. Provide complete with proper device cover and gasket. Provide blank cover and gasket when used as junction box.

2.8 LOCATION OF OUTLET BOXES

A. Locate outlet boxes generally from column centers and finished wall lines. Install ceiling outlet boxes at suspended ceiling elevations.

B. Accurately locate lighting fixtures and appliance outlet boxes mounted in concrete or in plaster finish on concrete. Install outlet boxes in forms to dimensions taken from bench marks, columns, walls, or floors. Rough-in lighting fixtures and appliance outlet boxes to general locations before installation of walls and furring and reset to exact dimensions as walls and furring are constructed. Set outlet boxes true to horizontal and vertical finish lines of building.

C. Install outlet boxes accessible. Provide outlet boxes above piping or ductwork with extension stems or offsets as required to clear piping and ductwork.

D. Install bottom of switch outlet boxes 48" above floor unless otherwise called for or required by wainscot, counter, etc. Install bottom of receptacle outlet boxes 16" above floor unless otherwise called for on drawings. Adjust mounting heights to nearest masonry joint for minimum cutting in case of flush outlets.

2.9 PULL BOXES, WIREWAYS AND GUTTERS

A. Provide Alwalt, Keystone, Universal or equivalent code gauge pull boxes, wireways, and gutters indicated or required for installation, sized to conform with NEC rules. Provide complete with necessary fittings, interconnecting nipples, insulating bushings, conductor supports, covers, gaskets, partitions, etc. as required.

B. Special items may be fabricated locally, to same general design and specifications as those listed in specified manufacturer's catalogs. Provide free of burrs, sharp edges, unreamed holes, sharp pointed screws or bolts, and finished with one coat of suitable enamel inside and out, prior to mounting.

C. Provide sectional covers for easy removal.

END OF SECTION 26 1100

SECTION 26 1200 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (Reference Section 260500)

PART 2 - PRODUCTS

2.1 INSERTS, HANGERS

A. Support vertical and horizontal conduit runs at intervals not greater than 10 feet, within 3 feet of any bend and at every outlet or junction box. All junction boxes and device backboxes shall be supported independently of the connected conduit system.

B. Install multiple runs of conduits as follows:

1. Where a number of conduits are to be run exposed and parallel, group and support with trapeze hangers.
2. Fasten hanger rods to structural steel members with suitable beam clamps and to concrete structures with inserts set flush with surface. Install concrete inserts with reinforced rod through opening provided in inserts.
3. Inserts shall be Grinnell figure 279, 281, 282, or 285 or equivalent as required by load and concrete thickness.
4. Provide beam clamps suitable for structural members and conditions.
5. Provide 3/8" minimum diameter steel hangers rods galvanized or cadmium plated finish.
6. Trapeze hangers shall be Kindorf Series 900 channel with fittings and accessories as required.
7. Attach each conduit to trapeze hanger with Steel City No. C-105 clamps for rigid conduit and Steel City No. C-106 clamps for electrical metallic tubing. (EMT).

C. Install clamps for single conduit runs as follows:

1. Support individual runs by approved pipe straps, secured by toggle bolts on hollow masonry; expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction. Use of perforated strap not permitted.
2. Install exposed conduits in damp locations with clamp backs under each conduit clamp to prevent accumulation of moisture around conduits.
3. Provide inserts, hangers and accessories with finish as follows:

a. Galvanized: Concrete inserts and pipe straps.
b. Galvanized or Cadmium Plated: Steel bolts, nuts, washers and screws.
c. Painted with Prime Coat: Individual hangers, trapeze hangers and rods.

D. Equivalent hangers and support systems by Binkley, Fee and Mason, Kin-Line or Unistrut.

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 26 1200.

SECTION 26 2100 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL (Reference Section 260500)

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Unless noted otherwise conductors referred to are wires and cable. Provide code grade soft annealed copper conductors with specified insulation type in proper colors to conform with color coding specified. Provide conductors No. 8 gauge and larger stranded and conductors No. 10 gauge and smaller shall be solid.

B. Use no conductors smaller than No. 12 gauge unless specifically called for or approved by Engineer. Size wire for volt branch circuits for 3% maximum voltage drop. Size feeder circuits for 2% maximum voltage drop. Combined voltage drop of feeders and branch circuits shall not exceed 5% maximum.

C. Provide conductors for listed applications as follows:

1. Lighting and Receptacle Circuits: Type THWN, or THWN/THHN 600 volt, 75 degrees C (167^{o}F) thermoplastic insulated building conductor or better.
2. Lighting and Receptacles Circuits with No. 8 or larger conductors, motor circuits, power and feeder circuits and building service feeders: Type THHN/THWN 600 volts, 75 degrees C (167^{o}F) thermoplastic insulated building conductor.

D. Provide conductors by Essex, Capitol Southwire Rome, Senator or equivalent.

PART 3 - EXECUTION

3.1 CONDUCTOR INSTALLATION

A. Run conductors in conduit continuous between outlets and junction boxes with no splices or taps pulled into conduits.

B. Neatly route, tie and support conductors terminating at switchboards, motor control centers, panelboards, sound equipment, etc., with Thomas & Betts Ty-Rap cable ties and clamps or equivalent by Electrovert or Panduit.

C. Make circuit conductor splices with appropriately sized “wire nuts” Buchanan crimped-on solderless connectors and snap-on nylon insulators or equivalent.

D. Terminate solid conductors at equipment terminal strips and other similar terminal points with insulated solderless terminal connectors. Terminate all stranded conductor terminal points with insulated solderless terminal connectors. Provide Thomas & Betts Sta-Kon insulated terminals and connectors or equivalent by API/AMP, Blackburn, Buchanan or Scotchlok "Wire Nuts".

E. Where a total of six or more control and feeder conductors terminate in a multiple device panel or enclosure that has no built-in terminal blocks provide Buchanan 600 volt heavy duty Type HO sectional terminal blocks with mounting channel and No. 23 see-thru covers. Equivalent terminal blocks by General Electric, Square D or Westinghouse.

F. Wrap conductor taps and connections requiring additional insulation with a minimum of three overlapped layers of 3M scotch vinyl plastic electrical type No. 88 or equivalent.

G. Only one neutral may be used for each circuit. When additional circuits occur in conduit run, additional neutrals shall be installed. Contractors shall provide conduit/conductor sizes as required by Code for listed quantities of conductors.

3.2 CONDUCTOR COLOR CODING

A. Refer to 260553 "Identification for Electrical Systems."

3.3 CIRCUITING

A. Refer to 260553 "Identification for Electrical Systems."

END OF SECTION 26 2100

SECTION 26 2200 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (Reference Section 260500)

1.1 GENERAL REQUIREMENTS

A. Supplement grounded neutral of secondary distribution system with equipment grounding system, installed so that metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items operate continuously at ground potential and provide low impedance path for ground fault currents.

B. System shall comply with National Electrical Code.

PART 2 - PRODUCTS

2.1 GROUNDING CONNECTIONS

A. Equipment grounding conductors for branch circuit home runs shown on the drawings shall indicate an individual and separate ground conductor for that branch circuit which shall be terminated at the branch circuit panelboard, switchboard, or other distribution equipment. No sharing of equipment grounding conductors sized according to the size of the overcurrent device and NEC Table 250.122 shall be allowed.

B. Required equipment grounding conductors and straps shall be sized in compliance with N.E.C. Table 250.122. Equipment grounding conductors shall be provided with green type TW 600 volt insulation. Related feeder and branch circuit grounding conductors shall be connected to ground bus with approved pressure connectors. Provide feeder servicing several panelboards with a continuous grounding conductor connected to each related panelboard ground bus. Installation shall include necessary precautions regarding terminations with dissimilar metals.

C. Provide low voltage distribution system with a separate green insulated equipment grounding conductor for each raceway containing single or three-phase feeder. Single phase 120 volt branch circuits for lighting and power shall consist of phase and neutral conductors and a green ground conductor installed in common metallic conduit which shall serve as grounding conductor. Provide flexible metallic conduit utilized in conjunction with above single phase branch circuits with suitable green insulated grounding conductors connected to approved grounding terminals at each end of flexible conduit. Single phase branch circuit installed in nonmetallic conduits shall be provided with separate grounding conductor. Install grounding conductor in common conduit with related phase and/or neutral conductors.

D. Where parallel feeders are installed in more than one raceway, each raceway shall have a green insulated equipment grounding conductor.

E. Contractor shall determine number and size of pressure connectors to be provided on equipment grounding bars for termination of equipment grounding conductors in panelboards and other electrical equipment. In addition to active circuits, provide pressure connectors for panel spares and blank spaces.

F. Provide electrical expansion fitting with an external flexible copper ground securely bonded by approved grounding straps on each end of fitting except where UL approved built-in copper grounding device is provided.

G. Provide steel and aluminum conduits which terminate without mechanical connection to metallic housing of electrical equipment with ground bushing and connect each bushing with bare copper conductor to ground bus in electrical equipment. Electrically non-continuous metallic conduits containing ground wiring only shall be bonded to ground wire at both conduit entrance and exit.

H. Provide grounding bushings on all feeder conduits. Bond grounding bushing to ground bus in respective panelboard.

I. Grounding conductors shall be as shown on plans or if not specifically shown shall be no smaller than that required by the NEC.

END OF SECTION 26 2200

SECTION 26 3100 – DRY-TYPE TRANSFORMERS (600 V AND LESS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements specified in other Sections apply to this Section.

C. System commissioning is a part of the construction process. Documentation and testing of systems, as well as training of the Owner's operation and maintenance personnel, is required.

1.2 SUMMARY

A. This Section includes dry type transformers rated 600V and below.

B. Furnish and install single- and three-phase (Under 600 volts) dry type transformers as shown on the drawings and specified hereinafter.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for products specified in this Section. Include dimensions, ratings, and data on features and components.

C. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 1 and in Section 260500 – Basic Electrical Materials and Methods.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide transformers from manufacturers regularly engaged in the manufacture of equipment of the types and capacities indicated, with such products in satisfactory use in similar service for not less than 5 years.

B. Components and Installation: NFPA 70 "National Electrical Code."

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

D. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, and the pricing agreement established for this project, and with the State or Kansas Department of Facilities Management, the product shall be as manufactured by Square D Company, Schneider Electric.

2.2 DRY TYPE TRANSFORMERS

A. It is the responsibility of the Contractor to verify if the final equipment dimensions and if it will fit in the space provided. Design was based on Square D information during design. If manufacturer dimensions change, make any provisions as necessary to make the equipment fit within the allotted space.

B. These transformers to be designed, assembled, and tested in accordance with the applicable standards of NEMA, IEEE, U.L., ANSI. All transformers shall be energy efficient type designed and assembled in accordance with energy Act 2005. Transformers shall meet requirements of Table 4.2 in NEMA TP1 Standard.

C. These transformers to be KVA, primary and secondary voltage rated as shown on the drawings. Transformers 15 KVA and larger shall have a minimum quantity of 6, 2-1/2 percent full capacity primary taps (two above and four below). Exact voltages to be as designated on the plans or the transformers schedule.

D. Transformers 15 KVA and above to be 115 degrees C temperature rise above 40 degrees C ambient. All insulating materials to be in accordance with NEMA ST20 standards for a 220 degrees C UL component recognized insulation system.

E. Transformer coils to be of the continuous wound copper construction and to be impregnated with nonhygroscopic, thermosetting varnish.

F. Where the drawing or other specifications require a shielded transformer, the transformer is to have electrostatic shield between primary and secondary windings. The electrostatic shield to be grounded to the case.

G. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic Flux densities are to be kept well below the saturation point. The core lamination to be clamped together with structural steel angles. The completed core and oil is then to be bolted to the base of the enclosure but isolated therefrom by means of rubber, vibration-absorbing mounts. There is to be no metal-to-metal contact between the core and coil and the enclosure. On transformers 500 KVA and smaller, the vibration isolating system to be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices will not be acceptable.

H. Transformers 15 KVA and larger to be in a heavy gauge, sheet steel, ventilated enclosure. The ventilating openings to be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code standards for ventilated enclosures. Transformers through 75 KVA to be designed so they can be either floor or wall mounted. Above 75 KVA they are to be floor mounted design. Terminal compartment shall be suitable for 75 degrees C insulated wire.

I. The entire transformer enclosure to be degreased, cleaned, phosphatized, primed, and finished with a grey, baked enamel.

J. The maximum temperature of the top of the enclosure is not to exceed 50 degrees C rise above a 40 degrees C ambient.

K. The core of the transformer to be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, ANSI standards.

L. Sound levels to be guaranteed by the manufacturer not to exceed the following:

1. 15 to 50 KVA – 45DB.
2. 51 to 150 KVA – 50DB.
3. 151 to 300 KVA – 55DB.
4. 301 to 500 KVA – 60DB.

M. Impedance: The manufacturer published average impedance shall be as follows:

1. 15 KVA – 3.0%
2. 30 KVA – 3.5%
3. 45 KVA – 3.7%
4. 75 KVA – 3.2%
5. 112.5 KVA – 3.9%
6. 150 KVA – 4.7%
7. 225 KVA – 6.6%
8. 300 KVA – 3.7%
9. 500 KVA – 6.2%

N. Submit complete, guaranteed performance data and physical description for similar transformers. Data to be submitted for each size specified.

O. The transformer shall be listed by Underwriters' Laboratory for the specified temperature rise.

P. The equipment shall have adequate quantity of lugs to terminate the quantity and size of conductors as shown on the Drawings. Lugs shall be suitable for type of conductors to be used as shown on the Drawings and/or as specified elsewhere in these specifications.

Q. Enclosures: For individually mounted contactor and relay devices, comply with NEMA Standard 250, "Enclosures for Electrical Equipment (1,000 Volts Maximum)." Provide enclosures suitable for the environmental conditions at the controller location except as otherwise indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install independently mounted equipment in accordance with manufacturer's written instructions.

B. Location: Locate equipment as required unless otherwise indicated.

C. Install these transformers on a concrete base, (3-1/2-inch nominal thickness) or on a wall bracket as and where shown on the drawings, use neoprene vibration insulator pads under the transformers or neoprene hangers if suspended from above. Provide all mounting hardware necessary.

D. Secondary wire and conduit shall be run as shown on the drawings.

E. Primary wire and connections shall be as shown on the drawings.

F. Provide transformer ground as shown on the drawings, or as specified elsewhere herein.

G. Connections to be with flexible conduit.

3.2 IDENTIFICATION

A. Identify equipment in accordance with Section 16195 – Electrical Identification.

3.3 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, comply with tightening torques specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Visual and mechanical inspection: Include the following inspections and related work.

B. Inspect for defects and physical damage and nameplate compliance with contract documents.

C. Check tightness of electrical connections of devices with calibrated torque wrench. Use manufacturer's recommended torque values.

D. Verify proper fuse types and ratings in fusible devices.

E. Electrical Tests: Perform the following in accordance with manufacturer's instructions:

F. Test all transformers with a 500-volt megger. Minimum acceptable reading for 120-volt transformers windings, between windings and between winding and ground: 20 megohms. Dry out transformers or control equipment that test lower than the above minimum values by a method approved by the Engineer and retest.

1. Perform all tests as may be required by the equipment manufacturer to ensure full warranties.

3.5 ADJUSTMENTS

A. Adjustments or corrections shall be made immediately where equipment does not operate properly or where operation is outside of the parameters specified herein.

B. If the grounding electrode system resistance specified cannot be met, the Authorized Representative should be notified before taking corrective action.

C. Provide a written statement to the Architect that confirms all field quality control work has been performed and that all installations meet the requirements of the contract documents. Report documentation shall be provided to the Commissioning Consultant.

3.6 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.

END OF SECTION 26 3100

SECTION 26 4100 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements specified in other Division 16 Sections apply to this Section.

C. System commissioning is a part of the construction process. Documentation and testing of systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Commissioning Consultant. Final Completion is dependent on successful completion of all commissioning procedures, documentation, and issue closure. Refer to Commissioning Specification Section 01810 for detailed commissioning requirements.

1.2 SUMMARY

A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V or less.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type panelboard, accessory item, and component specified.

C. Shop drawings from manufacturers of panelboards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, features, accessories, current rating, and voltage rating. Include the following:

1. Enclosure type with details for types other than NEMA Type 1.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard and protective devices.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
5. Time-current data curves for protective devices.

D. Wiring diagrams detailing schematic diagram including control wiring, and differentiating between manufacturer-installed and field-installed wiring.

E. Panel schedules for installation in panelboards. Submit final versions after load balancing.

F. Maintenance data for panelboard components, for inclusion in Operating and Maintenance Manual specified in Division 1 and in Section 260500 – Basic Electrical Materials and Methods. Include instructions for testing circuit breakers.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms “listed” and “labeled” shall be defined as they are in the National Electrical Code, Article 100.

B. Electrical Component Standard: Components and installation shall comply with NFPA 70, “National Electrical Code.”

C. NEMA Standard: Comply with NEMA PB1, “Panelboards.”

D. UL Standards: Comply with UL 61, “Panelboards,” and UL 50, “Cabinets and Boxes.”

1.5 EXTRA MATERIALS

A. Keys: Furnish 10 spare keys for panelboard cabinet locks.

B. Touch-up Paint for surface-mounted panelboards: One half-pint container.

C. Obtain the Owner-signed receipt for all extra materials. Provide a copy of the receipt to the Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, and the pricing agreement established for this project, and with the State or Kansas Department of Facilities Management, the product shall be as manufactured by Square D Company, Schneider Electric.

B. Design is based on products as supplied by Square D.

2.2 PANELBOARDS, GENERAL REQUIREMENTS

A. Provide panelboards and auxiliary components of types, sizes, and ratings indicated and that comply with manufacturer’s standard materials, design, and construction in accordance with published product information, unless indicated otherwise. Series rated devices, equipment and assemblies shall not be provided. IEC rated devices, equipment and assemblies shall not be provided. All rated devices, equipment, and assemblies shall be NEMA rated. All buses shall be silver plated copper. All connections shall be tightly bolted. AIC shall be as indicated on the drawings or elsewhere herein.

B. Provide dead-front safety type circuit breaker panelboards as indicated, with bolt-on to bus molded case circuit breakers in quantities, ratings, types and arrangement indicated. Provide anti-turn solderless pressure type lug connectors approved for copper conductors on all circuit breakers and bus bars. All connectors shall be listed for 75 degrees C. All bus bars shall be hard drawn silver plated copper of 98 percent conductivity. Provide full size neutral bus. Where noted on the drawings, provide 200 percent neutral bus. Provide ground bus, additionally provide isolated ground bus for isolated ground type panelboards. Provide circuit breakers with toggle handles that indicate when tripped. Provide common trip on multiple pole circuit breakers so overload on one pole will trip all poles simultaneously. Provide 20 ampere, single-pole circuit breakers listed as type SWD. Provide circuit breakers listed as type HACR as required. Select enclosures and front trims fabricated by same manufacturer as panelboard and that mate properly with panelboards.

C. Provide panelboard enclosures fabricated of code-gauge, minimum 16-gauge thickness, galvanized sheet steel unless required to be of other type of material to meet NEMA type as indicated. Provide enclosures without knock-outs. Provide hinged cover front trims of door-in-

door design to allow access to interior of panelboard without total removal of cover and hinged door with flush key lock. All locks shall be keyed alike. Provide 10 extra keys. Provide front with interior circuit directory frame and directory card with clear plastic cover.

D. Locks shall be keyed the same.

E. The equipment shall have adequate quantity of lugs to terminate the quantity and size of conductors as shown on the Drawings. Lugs shall be suitable for type, size, and quantity of conductors to be used as shown on the Drawings and/or as specified elsewhere in these specifications.

F. If a panelboard of a manufacturer other than the base manufacturer is supplied, it must have the same available “space” for the addition of future breakers, equivalent to the “space” available in the base manufacturer. Any deviation from this requirement is only with the permission of the Owner’s representative.

G. It is the responsibility of the Contractor to verify if the final equipment dimensions and if it will fit in the space provided. Design was based on Square D information during design. If manufacturer dimensions change, make any provisions as necessary to make the equipment fit within the allotted space.

H. 480Y/277V branch circuit panelboards shall be Square D NF and fully rated at 14,000 AIC minimum, including all breakers, unless otherwise noted on the drawing or here-in.

I. 208Y/120V branch circuit panelboards shall be Square D NQOD and fully rated at 10,000 AIC minimum, including all breakers, unless otherwise noted on the drawing or here-in.

2.3 IDENTIFICATION

A. General: Refer to Section 260553 – Electrical Identification for labeling materials.

2.4 FUSES

A. General: Provide fuses in accordance with Section 262813 – Fuses.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1, “General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less” and manufacturer’s written installation instructions.

B. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices (as indicated) in accordance with installation guidelines of NEMA 289, “Application Guide for Ground Fault Circuit Interrupters.”

C. Mounting Heights: Top of box 6'-6" above finished floor, except as indicated.

D. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish. Mount surface panels on U-channels in accordance with Section 16050 – Basic Electrical Materials and Methods.

E. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval prior to typing and installing.

F. Install filler plates in unused spaces.

G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future. Stub four 1-inch empty conduits into raised floor space or below slab other than slabs on grade.

3.2 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs in accordance with Section 16195– Electrical Identification.

3.3 GROUNDING

A. Connections: Make equipment grounding connection(s) for panelboards unless indicated otherwise.

B. Provide ground continuity to main electrical ground bus(es) unless indicated otherwise.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerances: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

E. Test data documentation shall be provided to the Commissioning Consultant.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.7 DEMONSTRATION

A. Conduct a minimum 4 hours of training in operation and maintenance as specified under “Instructions to the Owner’s Employees” in Division 1. Include training relating to equipment operation and maintenance procedures.

B. Schedule training with at least 7 days advance written notification to the Owner.

END OF SECTION 26 4100

SECTION 26 5100 - WIRING DEVICES AND COVERPLATES

PART 1 - GENERAL

1.1 SWITCHES, RECEPTACLES AND COVER PLATES

A. Provide where shown on plans Leviton wiring devices. Part numbers shall be as listed for each device specified.

B. Equivalent devices by Bryant, Hubbell, General Electric, Arrow Hart, Pass & Seymour.

1.2 INDUSTRY REFERENCES

A. Underwriter's Laboratories (UL)

1. Switches (UL 20)
2. Receptacles, Plugs & Connectors (UL 498)
3. Pin & Sleeve Connectors (UL 1286)
4. Device Plates (UL 514)
5. GFCI's (UL 943)

B. National Electric Manufacturers Association (NEMA)

1. WD-1 (Devices, Plates, Colors)
2. WD-6

C. Federal Specifications

1. Fed Spec Switches (WS-896E)
2. Fed Spec Receptacles (WC-596F)
3. Fed Spec Device Plates (W-P-455)

PART 1 - PRODUCTS

2.1 GENERAL

A. Provide factory-fabricated wiring devices in types, colors, and electrical ratings for applications indicated. Wherever possible, devices shall be back and side wired. All switches and receptacles shall incorporate a metal mounting strap: non-metallic mounting straps are not acceptable. Switches shall be listed per UL 20 and certified by UL to Fed Spec. WS-596E. Receptacles shall be listed per UL 498 and certified by UL to Fed. Spec. WS-896E. Both switches and receptacles shall be visibly marked with the "UL-FS" mark to confirm certification. All devices shall be from the same manufacturer. Color of devices shall be Ivory.

2.2 SWITCHES

A. Pilot Light Switches: Shall have illuminated toggles in the ON position for visual load monitoring.

Leviton Part No. #12-1-PLR

B. Momentary contact switches: Shall be 20 ampere, double throw, three position, center off toggle switches mounted in matching wall plate.

Leviton #1257

C. Motion Sensor Switches

Hubbell H-Moss dual technology motion sensor switch in single or dual level light switching as required by plans. The switches shall be configured as “vacancy” operation requiring push of a button to illuminate the lighting system. The lighting system shall then be turned off after a predetermined time of inactivity.

Dual with (2) push buttons shall be AD1277I2 (Ivory)
Single with (1) push button shall be AD12771I (Ivory)

E. See Switch Schedule at end of section

2.3 RECEPTACLES

A. Receptacles: Standard receptacles shall be equipped with a 20 ampere simplex or duplex plug receptacles as shown on the plans except where otherwise noted. Receptacles shall be 3 wire grounding type NEMA No. 5-20R. Receptacle shall be constructed with Nylon face and base; .050 gauge brass backstrap with one-piece ground design; riveted self-grounding clip; and .040 gauge solid brass, triple-wipe contacts. Receptacles denoted as “Emergency” shall be red in color, and denoted as such with a device plate labeled with the word “EMERGENCY” in capital letters.

B. Isolated Ground Receptacles: IG receptacles shall be 3 wire grounding type NEMA No. 5-20R-IG. Receptacle shall be constructed with Nylon face and base; .050 gauge brass nickel-plated backstrap with isolated ground design; riveted self-grounding clip; and .040 gauge solid brass, nickel-plated, triple-wipe contacts. Receptacles shall be orange.

C. Weatherproof receptacles: Weatherproof receptacles shall be equipped with a ground fault interrupter receptacle which will automatically detect a ground fault current and will de-energize receptacle when fault current exceeds 5 milliamps. GFCI shall be certified Class A by Underwriter’s Laboratories.

Leviton #6898 with hinged cover #4987-GY

D. GFCI Receptacles: GFCI receptacles shall detect a ground fault current and shall automatically de-energize receptacle when fault current exceeds 5 milliamps. GFCI shall be certified Class A by Underwriter’s Laboratories, and listed under UL Standard 943. Receptacle shall be rated 20A. 120V. 2 pole, 3 wire grounding.

E. Combination 120/208 Volt Receptacles: Shall be 20 ampere duplex, NEMA 5-20R/6-20R.

Leviton #5844

F. Surge Suppression Receptacles: Surge Suppression receptacles shall be isolated ground, duplex receptacle design, rated 20 ampere, 120 Volts and shall contain surge suppression device to protect appliances served by the receptacle. Receptacles shall provide 13,000 Amps Maximum Surge Current Line to Neutral; 6,500 ampere Maximum Surge Current Line to Ground; and 6,500 ampere Max. Surge Current Neutral to Ground; each based on IEEE C62.41, * X 20 us waveform. Receptacle shall be certified by UL 1449 to have maximum clamping voltage of 500 Volts Peak Line to Neutral, Line to Ground, and Neutral to Ground based on Class B, 6KV, 3KA impulse, and shall be suitable for ANSI/IEEE C62.41-1980 installation categories A and B. Receptacles shall have a blue faceplate. Receptacle shall have an audible alarm.

Leviton #5380
Leviton #5380-IG (isolated ground)
Leviton #8380 (Hospital Grade)
Leviton #8380-IG (Hospital Grade w/ isolated ground)

G. Corrosion-Resistant Receptacles: Corrosion-Resistant receptacles shall be provided with a 20 ampere, 125 Volt duplex receptacle, NEMA 5-20R configuration. It shall be constructed with Nylon face and base; .050 gauge brass nickel-plated backstrap with one-piece ground design; riveted self-grounding clip; and .040 gauge solid brass, nickel-plated, triple-wipe contacts. Face shall be yellow in color. Device shall surpass ASTMB-17-13, 500 Hour salt spray and fog test requirements with no visible corrosion.

Leviton #53CM-62

2.4 SWITCH AND RECEPTACLE FLUSH WALL PLATES

A. Wall plates for all flush outlets shall be satin stainless steel Type 302. All plates shall be listed per UL 514 and shall be of the same manufacturer as the devices furnished. Plates for surface mounted device outlets shall be drawn galvanized steel for steel boxes and cast for cast boxes.

B. Provide projecting mounted wiring devices with standard stainless steel wall plates with satin finish conforming to U.S. Bureau of Standards finish #32D.

C. Provide matching blank wall plates to cover outlet or junction boxes intended for future devices.

D. Provide matching blank wall plates with round knock out at all telephone outlet locations.

E. Provide factory engraved wall plates where indicated. Where engraved text is not outlined submit two copies of proposed text to A/E for review.

F. Where wall plates for special devices are available only from manufacturer of device, provide designs and finishes equivalent to above specification.

G. Multiple switch plates shall be engraved to indicate what they control.

PART 3 - EXECUTION

3.1 GENERAL

A. Install wiring devices to manufacturer’s recommendations and in strict accordance with applicable sections of NEC.

B. Wall plates shall not support wiring devices. Provide wiring device with accessories as required to properly install devices and wall plates.

C. Provide tamper proof screws for all device coverplates. Refer to Section 08710.

Equivalent Device Manufacturers and Model Numbers

TOGGLE SWITCHES						
TYPE	GE	AH	BRYANT	HUBBELL	LEVITON	P&S
Single Pole	GE5951-2G	1991I	4901-GI	HBL1221I	1221-2I	20AC1-I
Double Pole	GE5952-2G	1992I	4902-I	HBL1222I	1222-2I	20AC2-I
3-Way	GE5953-2G	1993I	4903-I	HBL1223I	1223-2I	20AC3-I
4-Way	GE5954-2G	1994I	4904-GI	HBL1224I	1224-2I	20AC4-I
SP Key Op	GE5951-OLG	1991L	4901-L	HBL1221L	1221-2L	20AC1-L
3-W Key Op	GE5953-OLG	1993L	4903-L	HBL1223L	1223-L	20AC3-L

RECEPTACLES							
TYPE	GE	AH	BRYANT	HUBBELL	LEVITON	EAGLE	P&S
Duplex	GE5362-2	5362I	5362-I	5352I	5352-I	5362V	5362-I
Simplex	GE4102-2	5361I	5361-I	5351I	5351-I	5361V	5361-I
Isolated Ground	GE5362-IG2	IG5362I	5362-IGI	IG5352I	5352-IGI	IG5362V	IG600-I
GFCI	GE5342-2G	GF5342I	GFR53FT-I	GF5352-IA	6898-I	647-2V	2091-IS
Weather-proof				GF5352-GYA	6898		
TVSS w/IG				IG5362S	5380-IG		

END OF SECTION 26 5100

SECTION 26 6100 - DISCONNECT AND SAFETY SWITCHES

PART 1 - GENERAL

1.1 DISCONNECT SWITCHES

A. Provide heavy duty horsepower rated Safety Switches rated in accordance with NEMA enclosed Switch Standard KS 1-1969 and L98 Standard.

B. Enclosure shall be NEMA type required by switch location and environment. Enclosure door shall latch with means for padlocking and cover interlock with defeater to prevent opening door when switch is energized or closing switch with door open. Switch shall have an embossed nameplate permanently attached to door front with switch rating, short circuit interrupting capacity and application information.

C. Line terminals shall be permanently marked and shielded. Contact shall be tin plated, equipped with arch chutes and have moving contacts visible in off position with door open. Wiring terminals shall be pressure type suitable for copper or aluminum wire. Switching mechanism shall be quick-make, quick-break spring driven anti-tease mechanism and shall be integral part of box. All current carrying parts shall be plated.

D. Fuse holders shall be high pressure suitable for use with dual element fuses or rejection type current limiting fuses where required. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.

E. All fuse holders for rejection type current limiting fuses shall have rejection clips installed.

1.2 INSTALLATION

A. All disconnect switches as specified shall be installed in strict accordance with rules set forth by NEC.

B. Approved disconnect switches shall include G.E., Cutler Hammer, or I.T.E. Siemens, Square D.

END OF SECTION 26 6100

SECTION 26 6150 – FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements specified in other Division 26 Sections apply to this Section.

1.2 SUMMARY

A. This Section includes fuses rated 600 V and below and accessory items. Types of products in this Section include the following:

1. Cartridge Fuses.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:

B. Product Data for fuses. Include descriptive data and time-current curves for all fuses and let-through current curves for those with current limiting characteristics.

1.4 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 “National Electrical Code.”

B. UL Listing and Labeling: Items provided under this Section shall be listed and labeled by UL.

1.5 EXTRA MATERIALS

A. Maintenance Stock, Fuses: For types and ratings required, furnish spare fuses, amounting to one unit for every 10 installed units, but not less than one set of 3 of each kind.

B. Obtain Authorized Representative signed receipt for all extra materials. Provide a copy of the receipt to the Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bussmann Div., Cooper Industries, Incorporated.
2. Gould, Incorporated.
3. Littelfuse, Incorporated.

2.2 FUSES, GENERAL

A. General: Provide fuses of types, classes, and current ratings as indicated; where not indicated provide current rating to meet NEC requirements and circuit ampacity. Voltage ratings shall be consistent with the circuits on which used.

B. Fuses for Direct Current Circuits: Marked for such use by the manufacturer on the fuse label.

2.3 CARTRIDGE FUSES

A. General: Comply with ANSI/IEEE Standard FU1, “Low Voltage Cartridge Fuses.” Provide nonrenewable-cartridge-type fuses except as indicated.

1. Class L Fuses: Comply with UL 198C, “High-Interrupting Capacity Fuses,” Time-Delay Current-Limiting Type.
2. Class RK1 & RK5 Dual Element Time Delay Current Limiting Fuses: Comply with UL 198E, “Class R Fuses.”

PART 3 - EXECUTION

3.1 APPLICATION OF FUSES

A. General: All fuses, 600 volt and below, shall be by the same manufacturer.

B. Apply fuses as indicated:

1. 600 Ampere or less: Class RK1 time-delay current limiting fuse with minimum 200,000 RMS symmetrical AIC rating. Fuses to be Bussmann type #LPN-RK Gould type #A2D-R, Littelfuse type #LLN-RK for 250 volt application, Bussmann type #LPS-RK, Gould type #A6D-R, Littelfuse type #LLS-RK for 600 volt application, or equal.
2. 601-6000 Ampere: Class L time-delay current limiting fuse with minimum 200,000 RMS symmetrical AIC rating. Fuses to be Bussmann Type #KRP-C, Gould type #A4BQ, Littelfuse type #KLP-C.
3. Fuse sizes shown on drawings for motor circuit protection are sized be Bussmann’s recommendation for “running back-up overload protection.” If an approved equal manufacturer is used. The sizing must be check and changed if necessary per that manufacturer’s recommendation.
4. Rejection clips shall be provided in any fuse clip that is scheduled to receive an “R” class fuse.

3.2 INSTALLATION

A. Install fuses in fusible devices.

B. Supply a minimum of 10% spare fuses of each size and type or a minimum of 3 which ever is greater.

C. Coordination Study: Where coordination study recommends changes in types, classes, features, or ratings of fuses or fusible devices from those indicated, and those changes are approved, make them with no change to the contract price or time of completion.

3.3 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 6150

SECTION 26 7100 – MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. Product Data: For products specified in this Section. Include dimensions, ratings, and data on features and components.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

C. Maintenance Data: For products to include in the maintenance manuals specified in Division 1.

D. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide full voltage, reduced-voltage, solid-state, and variable-speed controllers from manufacturers regularly engaged in the manufacture of equipment of the types and capacities indicated, with such products in satisfactory use in similar service for not less than 5 years.

B. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer.

C. Comply with NFPA 70.

D. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.

E. NEMA Compliance: NEMA ICS 2, “Industrial Control Devices, Controllers and Assemblies.”

F. UL Compliance: UL 508, “Electric Industrial Control Equipment.”

1.4 COORDINATION

A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Spare Fuses and Incandescent Indicating Lamps: Furnish 1 spare for every 5 installed units, but not less than 1 set of 3 of each kind.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, and the pricing agreement established for this project, and with the State or Kansas Department of Facilities Management, the product shall be as manufactured by Square D Company, Schneider Electric.

2.2 MOTOR CONTROLLERS, GENERAL

A. Coordinate the features of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, the duty cycle of the motor, drive, and load, and the pilot device, and control circuit affecting controller functions. Provide controllers that are horsepower rated to suit the motor controlled. Provide auxiliary devices as indicated; where not indicated as required for a complete operation system as intended. All connectors shall be listed for 75 degrees C. Controllers shall be only NEMA listed/rated. Series rated devices, equipment and assemblies shall not be provided. IEC rated devices, equipment and assemblies shall not be provided. All rated devices, equipment, and assemblies shall be NEMA rated.

B. Contacts shall open each ungrounded connection to the motor.

C. Overload Relays: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of the specific motor to which connected with appropriate adjustment for duty cycle. Overloads to be NEMA Class 20 Type.

D. Enclosures: For individually mounted motor controllers and control devices, comply with NEMA Standard 250, “Enclosures for Electrical Equipment (1,000 Volts Maximum).” Provide enclosures suitable for the environmental conditions at the controller location except as otherwise indicated.

2.3 MANUAL MOTOR CONTROLLERS

A. Description: Provide NEMA ICS 2, general purpose, quick-make, quick-break toggle action controller as indicated; where not indicated, as required to make a complete operational system as intended. Controller to be Allen-Bradley Bulletin #600 Series with neon pilot light except incandescent pilot light for NEMA 4, 7, and 9, or equal.

2.4 MAGNETIC MOTOR CONTROLLERS

A. Full Voltage: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated. Where not indicated, as required to make a complete operation system as intended. Controller shall be Allen-Bradley Bulletin #509 Series or equal.

B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise indicated. Include a control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory-assembled combination controller and disconnect switch with or without overcurrent protection as indicated.

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type Type RK-1 fuse clips rated for fuses indicated. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by a Nationally Recognized Testing Laboratory.
2. Nonfusible Disconnect: NEMA KS 1, heavy-duty, nonfusible switch.
3. Circuit-Breaker Disconnect: NEMA AB 1, motor-circuit protector with field-adjustable short-circuit trip coordinated with motor locked-rotor amperes.
4. Interlock switch with unit cover or door. Controller shall be Allen-Bradley Bulletin #512, #506, #522, #532, #542 Series or equal. Provide fuses as required to meet NEC and the actual motor load full load amperage.

D. Overload Relay: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect, and with appropriate adjustment for duty cycle.

E. Multi-Speed Motor Controller: Match controller to motor type, application, and number of speeds (constant horsepower/constant torque/variable torque, two-speed-separate-winding/two-speed-consequent pole): Where not indicated, as required to make a complete operational system as intended. Controller shall be Allen-Bradley Bulletin #520 Series or equal. Include the following accessories:

1. Compelling relay ensures motor will start only at low speed.
2. Accelerating relay ensures properly timed acceleration through speeds lower than that selected.
3. Decelerating relay ensures automatically timed deceleration through each speed.

2.5 ENCLOSURES

A. Description: Flush or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

2.6 ACCESSORIES

A. Devices are factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights (Transformer Type), and Selector Switches: NEMA ICS 2, heavy-duty type. Heavy-duty type, Allen Bradley Bulletin #800T Series or equal.

C. Stop and Lockout Push-Button Station: Momentary-break push-button station with a factory-applied hasp arranged so a padlock can be used to lock push button in depressed position with control circuit open. Heavy-duty type, Allen Bradley Bulletin #800T Series or equal.

D. Control Relays: Auxiliary and adjustable time-delay relays as indicated; where not indicated, as required to make a complete operational system as intended. Relays shall be Allen-Bradley Bulletin #700N, #700RT and #700RTA Series or equal.

E. Current-Sensing, Phase-Failure Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase-failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage. Provide adjustable response delay.

F. Transient Voltage Surge Suppressers: IEEE C62.41, selected to meet requirements for a low-exposure category.

G. Impulse sparkover voltage coordinated with system circuit voltage.

H. Factory mounted with Nationally Recognized Testing Laboratory listed and labeled mounting device.

PART 3 - EXECUTION

3.1 APPLICATION

A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Use fractional-horsepower manual controllers for single-phase motors, unless otherwise indicated.

D. Push-Button Stations: In covers of magnetic controllers for manually started motors where indicated, start contact connected in parallel with sealing auxiliary contact for low-voltage protection shall be provided.

E. Hand-Off-Automatic Selector Switches: Provide in covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install independently mounted motor-control devices according to manufacturer's written instructions.

B. Manufacturer's Field Services: For reduced voltage and solid state controllers, provide services of a factory-authorized service representative to supervise the field assembly and connection of components, including the pretesting and adjustment of solid-state controllers.

C. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.

D. Mounting: For control equipment at walls, bolt units to structural steel U-channels securely fastened to the wall. For controllers not at walls, provide freestanding racks fabricated of structural steel members and structural steel U-channels. Use feet consisting of 3/8-inch thick steel plates, 6 inches square, bolted to the floor. Use feet for welded attachment of 1-1/2-inch by 1-1/2-inch by 1/4-inch vertical angle posts not over 3 feet on centers. Connect the posts with welded horizontal steel U-channels and bolt the control equipment to the channels.

1. Mount manual controllers at same height as snap switches per Section 16143 – Wiring Devices unless indicated otherwise.
2. Mount top of magnetic, solid state, and variable frequency drive controllers at 6'-0" AFF unless indicated otherwise.

E. Install freestanding equipment on concrete housekeeping bases conforming to Section 03300 – Cast-In-Place Concrete.

F. Motor-Controller Fuses: Install indicated fuses in each fusible switch conforming to requirements of Section 262813 – Fuses.

3.3 IDENTIFICATION

A. Identify motor control components and control wiring in accordance with Section 16195 – Electrical Identification.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor-control devices according to Section 16120– Wire and Cables.

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic control devices where available.

1. Connect selector switches to bypass only the manual and automatic control devices that have no safety functions when switch is in the hand position.
2. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

D. Provide wiring between fire alarm system and controllers.

E. Provide wiring between DDC temperature control panels and magnetic motor controllers that are not part of a package unit.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.
2. Remove and replace malfunctioning units with new units, and retest.

B. Visual and mechanical inspection: Include the following inspections and related work.

C. Motor-Control Device Ratings and Settings: Verify that ratings and settings, as installed, are appropriate for final loads and final system arrangement and parameters. Recommend final protective-device ratings and settings where differences are found. Use accepted revised ratings or settings to make the final system adjustments. Prepare and submit for review the load current and overload relay heater list.

D. Inspect for defects and physical damage, and nameplate compliance with current project drawings.

E. Exercise and perform operational tests of mechanical components and other operable devices.

F. Check tightness of electrical connections of devices with calibrated torque wrench. Use manufacturer's recommended torque values.

G. Clean devices using manufacturer's approved methods and materials.

H. Verify proper fuse types and ratings in fusible devices.

I. Electrical Tests: Perform the following in accordance with manufacturer's instructions:

1. Test controllers with 1000 VDC megger. Follow manufacturer's instructions and remove all control wires and devices as necessary to avoid damage to sensitive components. Test each phase conductor to each phase conductor and ground, record data on test forms. Provide test data, as requested by the Architect, for review by the Architect. Any equipment failing to meet minimum standards as determined by the Architect shall be replaced or repaired at Contractor's expense.
2. Test auxiliary protective features such as but not limited to loss of phase, phase unbalance and undervoltage to verify operation.
3. Check for improper voltages at terminals in controllers that have external control wiring when controller disconnect is opened.
4. Provide written notice of test date/time to owner's representative a minimum of 48 hours prior to the test date or as noted in Section01810.
5. Test data documentation shall be provided to the Commissioning Consultant.

J. Correct deficiencies and retest motor control devices. Verify by the system tests that specified requirements are met.

K. Provide a written statement to the Architect that confirms all field quality control work has been performed and that all installations meet the requirements of the contract documents. Report documentation shall be provided to the Commissioning Consultant.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials as recommended by manufacturer.

3.8 DEMONSTRATION

A. Training: Engage a factory-authorized service representative to demonstrate solid-state and variable-speed controllers and train Owner's maintenance personnel.

1. Conduct a minimum of 4 hours of training in operation and maintenance as specified in Division 1. Include training relating to equipment operation and maintenance procedures.
2. Schedule training with at least 7 days' advance notice.

END OF SECTION 26 7100

SECTION 26 7200 – VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes solid-state, PWM, VFDs for speed control of three-phase, squirrel-cage induction motors.

1.2 DEFINITIONS

A. DDC: Direct digital control

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFD: Variable frequency drive.

1.3 SUBMITTALS

A. Product Data: For each type of VFD, provide dimensions; mounting arrangements; location for conduit entries; shipping and operating weights; and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.

B. Shop Drawings: For each VFD.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.

C. Wiring Diagrams: Power, signal, and control wiring for VFD. Provide schematic wiring diagram for each type of VFD.

D. Field Test Reports: Written reports specified in Part 3.

E. Operation and Maintenance Data: For VFDs, all installed devices, and components to include in emergency, operation, and maintenance manuals. Include the following:

1. Routine maintenance requirements for VFDs and all installed components.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain, within 100 miles (160 km) of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Source Limitations: Obtain VFDs of a single type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, minimum clearances between VFDs, and adjacent surfaces and other items. Comply with indicated dimensions and clearances.

E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store VFDs indoors in clean, dry space with uniform temperature to prevent condensation. Protect VFWs from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.6 COORDINATION

A. Coordinate layout and installation of VFWs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

C. Coordinate features of VFDs installed units, and accessory devices with pilot devices and control circuits to which they connect.

D. Coordinate features, accessories, and functions of each VFD and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spare Fuses: Furnish one set of three of each type and rating.
2. Indicating Lights: Two of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, and the pricing agreement established for this project, and with the State or Kansas Department of Facilities Management, the product shall be as manufactured by Square D Company, Schneider Electric.

2.2 VARIABLE FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, IGBT, PWM, VFD; listed and labeled as a complete unit and arranged to provide variable speed of a NEMA MG 1, Design B, 3-phase, premium-efficiency induction motor by adjusting output voltage and frequency.

B. Design and Rating: Match load type, in this case, pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

C. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.

D. Unit Operating Requirements:

1. Input ac voltage tolerance of 380 to 500 V, plus or minus 10 percent.
2. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
3. Capable of driving full load, under the following conditions, without derating:

   a. Ambient Temperature: 0 to 40 deg C.
   b. Humidity: Less than 90 percent (non-condensing).
   c. Altitude: 500 feet.

4. Minimum Efficiency: 96 percent at 60 Hz full load.
5. Minimum Displacement Primary-Side Power Factor: 96 percent.
6. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
7. Starting Torque: 100 percent of rated torque or as indicated.
8. Speed Regulation: Plus or minus 1 percent.
9. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.

E. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 2 to a minimum of 22 seconds.
4. Deceleration: 2 to a minimum of 22 seconds.
5. Current Limit: 50 to a minimum of 110 percent of maximum rating.

F. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors.
2. Snubber networks to protect against malfunction due to system voltage transients.
3. Under- and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
4. Motor Overload Relay: Adjustable and capable of NEMA 250 performance.
5. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
6. Instantaneous line-to-line and line-to-ground overcurrent trips.
7. Loss-of-phase protection.
8. Reverse-phase protection.
9. Short-circuit protection.
10. Motor overtemperature fault.

G. Automatic Reset and Restart: To attempt three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bi-directional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.

H. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.

I. Torque Boost: Automatically vary starting and continuous torque to at least 1.5 times the minimum torque to insure high-starting torque and increased torque at slow speeds.

J. Motor Temperature Compensation at Slow Speeds: Adjustable current fallback based on output frequency for temperature protection of self-cooled fan-ventilated motors at slow speeds.

K. Input Line Conditioning: AC Line Reactors, 3% minimum impedance as well as a DC link choke.

L. Status Lights: Door-mounted LED indicators shall indicate the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

M. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

N. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, and fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (VDC).
9. Set-point frequency (Hz).
10. Output voltage (V).

O. Control Signal Interface: As required for Temperature Control system interface, provide VFDs with the following:

1. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 ma) and 6 programmable digital inputs.
2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems:

a. 0 to 10-V dc.
b. 0-20 or 4-20 ma.
c. Potentiometer using up/down digital inputs.
d. Fixed frequencies using digital inputs.

e. RS485.
f. Keypad display for local hand operation.

3. Output Signal Interface:

a. A minimum of 1 analog output signal (0/4-20 ma), which can be programmed to any of the following:
Output frequency (Hz).
Output current (load).
DC-link voltage (VDC).
Motor torque (percent).
Motor speed (rpm).
Set-point frequency (Hz).

4. Remote Indication Interface: A minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.
b. Set-point speed reached.
c. Fault and warning indication (overtemperature or overcurrent).
d. PID high or low speed limits reached.

P. Communications: Provide an RS485 interface allowing VFD to be used with an external system within a multi-drop LAN configuration. Interface shall allow all parameter settings of VFD to be programmed via BMS control. Provide capability for VFD to retain these settings within the nonvolatile memory. The serial interface shall be capable of communicating via ModBus and or Johnson Metasys N2 protocols.

Q. Integral Disconnecting Means: NEMA AB 1, instantaneous-trip circuit breaker with lockable handle.

2.3 ENCLOSURES

A. NEMA 1 enclosure with ventilating openings as required.

2.4 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Control Relays: Auxiliary and adjustable time-delay relays.

D. Standard Displays:

1. Output frequency (Hz).
2. Set-point frequency (Hz).
3. Motor current (amperes).
4. DC-link voltage (VDC).
5. Motor torque (percent).
6. Motor speed (rpm).
7. Motor output voltage (V).

E. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

F. Current-Sensing, Phase-Failure Relays for Bypass Controller: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

G. Isolation process control interface shall enable VFD to follow 4-20 MA or 0-10 volt signal from process device.

H. Line Reactors:

1. Reactors shall be mounted in NEMA 1 enclosures and shall be constructed with Class H insulation.

2.5 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested VFDs before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Select rating of controllers to suit the motor controlled.

3.3 INSTALLATION

A. Anchor each VFD assembly to steel-channel sills arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with VFD mounting surface.

B. Controller Fuses: Install fuses in each fusible switch.

3.4 IDENTIFICATION

A. Identify VFDs, components, and control wiring to match what is used in the building.

B. Operating Instructions: Laminate printed operating instructions for VFDs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFD units.

3.5 CONTROL WIRING INSTALLATION

A. Bundle, train, and support wiring in enclosures.

B. Connect hand-off-automatic switch and other automatic-control devices where available.

1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
2. Connect selector switches with control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.7 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including pretesting and adjusting VFDs.

3.8 STARTUP SERVICE

A. Verify that electrical wiring installation complies with manufacturer's submittal and the NEC.

B. Complete installation and startup checks according to manufacturer's written instructions.

3.9 ADJUSTING

A. Set field-adjustable switches and circuit breaker trip ranges.

3.10 CLEANING

A. Clean VFDs internally, on completion of installation, according to manufacturer's written instructions. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain VFDs.

END OF SECTION 26 7200

SECTION 26 8100 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide lighting fixtures complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed fixtures with trim flush to ceilings, free of gaps or cracks.

B. Coordinate mounting of ceiling mounted lighting fixtures with General Contractor. Where additional fixture supports are required due to lighting fixture location or weight, supports shall be provided by electrical contractor, unless otherwise specified under ceiling specifications. Recessed lighting luminaires that are installed in a grid type ceiling shall be supported independent of the ceiling grid using proper tie wires at diagonal corners.

C. Consult architectural plans for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories.

D. Lighting fixtures submitted must meet or exceed specified lighting fixture in performance and construction and appearance.

E. Provide lighting fixtures at each location shown on drawings. Lighting fixtures shall be in accordance with type designation on drawings.

F. Lighting fixture supports shall comply with the latest edition of the NEC Sections 410-15 and 410-16. Provide lighting fixture securing clips as required.

G. See lighting fixture schedule on plans for fixture types.

1.2 INSPECTION

A. Prior to installation of luminaires Electrical Contractor shall inspect luminaire and verify unit meets or exceeds specifications, is new and unused without damage or defect and is suitable for the intended service.

B. See architectural and electrical plans for luminaire locations, coordinate installation with other trades.

C. At the completion of the project all luminaires shall be aligned, level and cleaned to the satisfaction of the A/E.

1.3 MANUFACTURERS

A. Provide luminaires by the following manufacturers:

Downlights: Halo, Lithonia, Marko, Prescolite
Flourescents: Columbia, Lithonia, Metalux, Williams
HID: Holophane, Hubbell, Kim, Lithonia
Track Lighting: Halo, Lithonia, Marko, Prescolite
Emergency Fixtures: Exitronix, Fail-Safe, Hubbell, Lithonia
Security Fixtures: Holcor

END OF SECTION 26 8100

SECTION 26 9100 - DIESEL ENGINE GENERATOR

PART 1 - GENERAL (Reference Section 260500)

1.1 GENERAL REQUIREMENTS

A. Provide all labor, materials and equipment to required to install and place in operation the existing Emergency/Standby power generation system in accordance with the contract documents and manufacturer's drawings and installation instructions. The generator is in storage in a State of Kansas owned facility in Topeka, Kansas.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 CONTRACT COMPLETION

A. Production Tests

1. The system manufacturer shall perform production tests on the complete generator set subsequent to installation. These tests and controls shall include but not be limited to:

Operation at rated kW
Transient and steady state governing
Transient and steady state voltage regulation
Operation of all alarm and shutdown devices
Single step load pickup of rated kW

B. Installation/on Site Testing

1. The installation shall be complete and shall be performed in accordance with shop drawings (provided to the Contractor by the Owner), specifications and the manufacturer's instructions; and shall comply with applicable state and local codes.
2. The generator set shall be tested as defined below by the manufacturers authorized dealer to show it is free of any defects and will start automatically and carry full load. This testing may be performed at the facility of the system manufacturer's authorized local dealer or at the jobsite. Testing shall be completed in the presence of the owner's engineer or his appointed representative.
3. All consumables necessary for testing shall be furnished by the bidder. Any defects which become evident during the test shall be immediately indicated to the Owner and Engineer.

C. Proper operation of the following shall be demonstrated:

1. All auxiliary equipment supplied to this specification
2. Starting and charging system components
3. All controls, engine shutdowns and safety devices
4. Cold start test:

a. The unit shall demonstrate the ability to start from a "cold" standby condition with operational jacketwater heaters.

5. Load Test:

a. The unit shall be operated at 80% of full load rating for one hour followed by two hours operation at 100% full load. After the first half-hour stabilization period at full load, the following shall be recorded at fifteen minute intervals:

Voltage and amperage (3 phase), frequency
Fuel pressure, oil pressure and water temperature
Exhaust gas temperature at engine exhaust outlet
Ambient temperature

6. Should these tests indicate that the equipment does not meet the specified performance requirements, National Electric Code and Local codes, the Contractor shall immediately inform the Owner's representative and Engineer.

3.2 EXTENDED STORAGE AT JOBSITE

A. The bidder shall take measures to facilitate extended outdoor storage at the jobsite for up to one year. The bidder shall also include provision for placing the unit into a start-up ready condition at the end of the storage period.

3.3 SERVICE MANUALS AND PARTS BOOKS

A. The system manufacturer's authorized local dealer shall furnish three copies of each of the manuals and books listed below for the unit installed under this contract:

1. Operating Instructions
2. Spare Parts
3. Preventive Maintenance Instructions
4. Routine Test Procedures
5. Troubleshooting Chart
6. Recommended Spare Parts List
7. Wiring Diagrams and schematics

3.4 INSTALLATION

A. The generator and all associated equipment shall be completely piped and wired so that a complete and operational system is provided to the owner.

3.5 OWNER TRAINING

A. The contractor shall provide a minimum of (4) hours of owner training in operation and maintenance of the system.

B. All owner training shall be professionally video recorded using digital format. Training videos shall become the property of the Owner and shall be included in the Operating and Maintenance manuals.

END OF SECTION 26 9100

SECTION 26 9200 – UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide a continuous-duty three-phase, solid-state, scalable (field-upgradable) uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment.

1.2 STANDARDS

A. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

1. UL Standard 1778
2. CSA 22.2, No. 107.3, 4th edition
3. FCC Part 15, Class A
4. IEC 61000-3-4,4-4,4-2,4-3,4-6,2-2
5. National Electrical Code (NFPA-70)
6. NEMA PE-1
7. ISTA_1H
8. ANSI C62.41, Categories A3 and B3
9. The UPS shall be UL and cUL listed per UL Standard 1778.

1.3 SUBMITTALS

A. Submittals with the proposal shall include:

1. System configuration with single-line diagrams
2. Functional relationship of equipment including weights, dimensions and heat dissipation
3. Descriptions of equipment to be furnished, including deviations from these specifications
4. Size and weight of shipping units to be handled by installing contractor
5. Detailed layouts of customer power and control connections
6. Detailed installation drawings including all terminal locations

1.4 UPS DELIVERY SUBMITTALS

A. Submittals upon UPS delivery shall include a complete set of submittal drawings and one (1) set of instruction manuals that shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.5 WARRANTY

A. UPS Module

1. The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 12 months after initial startup or 18 months after ship date, whichever period expires first.

B. Battery

1. The battery manufacturer's standard warranty shall be passed through to the end user.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. A minimum of 20 years' experience in the design, manufacture and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001:2000 certified.

2. Acceptable Manufacturers:
Liebert Corporation
Delta
Uninterruptible Power Supplies

3. Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Design Requirements - UPS Module

1. Input/output voltage specifications of the UPS shall be:
Input: 480 volts, three-phase, 3-wire-plus-ground
Output: 208 volts, three-phase, 4-wire-plus-ground

2. Specified output load capacity of the UPS shall be 30 kVA/30kW at unity power factor. UPS shall have redundant power module for 30kVA N+1 internal redundancy operation.

3. UPS rated output capacity will be scalable by Emerson Network Power Liebert Services. Models will be available in two different frames:

a) 45kVA Frame - Scalable in 15kVA increments with Liebert FlexPower™ modules: 15, 30 and 45kVA
b) Current Sharing: When multiple UPS modules are connected in parallel and powering a common load, each UPS module output current will not differ by more than 5% of the rated full load current of one UPS module.

B. Design Requirements - Battery Cells: Valve-regulated, lead acid batteries.

1. Reserve Time: 12 minutes at 30 kVA, unity power factor, with ambient temperature of 77°F (25°C). Unit shall provide terminal for connection of external batteries.

2. Recharge Time: to 95% capacity within ten (10) times discharge time.

2.2 MODES OF OPERATION

A. The UPS shall be designed to operate as an on-line, double-conversion, reverse-transfer system with the following operating modes:

3. Normal - The critical AC load is continuously supplied by the UPS inverter. The rectifier/charger derives power from an AC source and supplies DC power to the inverter while simultaneously float-charging the reserve battery.
4. Emergency - Upon failure of utility AC power, the critical AC load is supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.
5. Recharge - Upon restoration of utility AC power after a utility AC power outage, the rectifier/charger shall automatically restart, gradually ramp up output voltage and assume the inverter and battery recharge loads.
6. Bypass - If the UPS must be taken out of service for maintenance or repair or if the inverter overload capacity is exceeded, the static transfer switch shall perform a reverse transfer of the load from the inverter to the bypass source with no interruption in power to the critical AC load.

2.3 PERFORMANCE REQUIREMENTS

A. AC Input to UPS

1. Voltage Configuration: 480V, three-phase, three-wire plus ground
2. Voltage Range: +15%, -20% of nominal without derating
3. Frequency: 40-70Hz
4. Power Factor: 0.99 full load, 0.98 half load
5. Inrush Current: UPS inrush current not to exceed 1.5 times rated input current. Maintenance bypass and distribution cabinet inrush current not to exceed 8 times rated input current.
6. Current Limit: 140% of nominal AC input current maximum
7. Current Distortion: <3% reflected THD maximum at full load
8. Surge Protection: Sustains input surges without damage per criteria listed in IEC 1000-4-5

B. AC Output, UPS Inverter

1. Voltage Configuration: three-phase, 4-wire plus ground
2. Voltage Regulation:
   ±1% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

   ±5% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

3. Frequency: ±0.1% (single Liebert FlexPower assembly)
   ±0.25% (six Liebert FlexPower assemblies)
4. Frequency Slew Rate: Selectable from 0.1Hz/sec to 3.0Hz/sec maximum for single unit
5. Phase Balance:
   120 degrees ±1 degree for balanced load
   120 grees ±1.5 degrees for 100% unbalanced load
6. Voltage Distortion:
   <1% total harmonic distortion (THD) for linear loads
   <5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating
7. Load Power Factor Range: 0.7 lagging to 0.9 leading without derating
8. Output Power Rating: 0.99 full load. 0.98 half load
9. Overload Capability:
   110% for 60 minutes

125% for 10 minutes
150% for 60 seconds

10. Voltage Transient Response: 100% load step, ±5.0%
11. Transient Recovery Time: to within 5% of steady state output voltage within half a cycle
12. Voltage Unbalance: 100% unbalanced load, ±5%

2.4 ENVIRONMENTAL CONDITIONS

A. The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:
   1. Operating Ambient Temperature
      UPS Module: 32°F to 104°F (0°C to 40°C)
      Battery: 77°F ±9°F (25°C ±5°C)
   2. Storage/Transport Ambient Temperature
      UPS Module: -4°F to 158°F (-20°C to 70°C)
      Battery: -4°F to 86°F (-20°C to 30°C)
   3. Relative Humidity
      0 to 95%, non-condensing
   4. Altitude
      Operating: 3300 ft. (1000m) above sea level; derate power by 1% per 330 ft. 100m) between 3300 and 6000 ft (1000m and 2000m).
      Storage/Transport: to 40,000 ft. (12,200m) above mean sea level.
   5. Audible Noise
      56 dB (45kW/kVA models)
      60 B (90kW/kVA models)

2.5 FABRICATION

A. All materials of the UPS shall be new, of current manufacture and high grade and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All power semi-conductors shall be sealed. Control logic and fuses shall be physically isolated from power train components to ensure operator safety and protection from heat. All electronic components shall be accessible from the front without removing sub-assemblies for service access.

B. Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code, OSHA and applicable local codes and standards. All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections shall be torqued to the required value and marked with a visual indicator.

C. Provisions shall be made in the cabinets to permit installation of input, output and external control cabling, using raceway or conduit. Provision shall be made for top and bottom access to input, output, bypass and DC connections. In conformance with NEC, connection cabinets shall provide for adequate wire bend radius. All copper busbars for customer power connections shall be tin plated for connection integrity.

D. The UPS shall be in NEMA Type 1 enclosures, designed for floor mounting. The UPS shall be structurally adequate and have provisions for hoisting, jacking and forklift handling. Maximum cabinet height shall be 78.7 in. (2000mm).

E. Cooling of the UPS shall be by forced air using a redundant fan configuration. Fan power shall be provided by the UPS. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet

temperatures are exceeded. Air filters shall be located at the point of air inlet and be changeable.

F. Access shall be:
Liebert APM UPS: Front and top access
Liebert APM maintenance bypass cabinet: Front and top access

2.6 COMPONENTS

A. Rectifier/Charger. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert AC to regulated DC for input to the inverter and for charging the battery.

B. AC Input Current Limiting. The rectifier/charger unit shall be provided with AC input current limiting whereby the maximum input current shall be limited to 140% of the full input current rating.

C. DC Filter. The rectifier/charger shall have an output filter to minimize ripple current into the battery. The AC ripple voltage of the rectifier DC output shall not exceed 1% RMS of the float voltage. The filter shall be adequate to ensure that the DC output of the rectifier/charger will meet the input requirements of the inverter without the battery connected.

D. Automatic Rectifier Restart. Upon restoration of utility AC power, after a utility AC power outage and prior to a UPS automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart, walk-in and gradually assume the inverter and battery recharge loads.

E. Battery Recharge. In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

F. Overvoltage Protection. There shall be DC overvoltage protection so that if the DC voltage rises to the preset limit, the UPS will shut down automatically and initiate an uninterrupted load transfer to the static bypass line.

G. Inverter. The term inverter shall denote the equipment and controls to convert DC from the rectifier/charger or battery to precise AC to power the load. The inverter shall be solid-state, capable of providing rated output power, and for increased performance the inverter shall be a pulse-width-modulated design and utilize insulated gate bipolar transistors (IGBTs). The inverter shall be capable of supplying current and voltage for overloads exceeding 100%. The inverter is to provide 150% of full load for 60 seconds, 125% of full load for 10 minutes and 110% of full load for 60 minutes. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded. The inverter shall be capable of supplying an overload current of 150% of its full-load rating for one minute. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The critical load will be transferred to the static bypass automatically and uninterrupted. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

2.7 STEP LOAD RESPONSE

A. Voltage Distortion
Total harmonic distortion in the output voltage will not exceed 1% for 0% to 100% linear loads.
Total harmonic distortion in the output voltage will not exceed 4% for 0% to 100% non-linear loads.

Total harmonic distortion in the output voltage will not exceed 5% for 0% to 100% non-linear, unbalanced loads.

B. Phase Balance
Electronic controls shall be provided to regulate each phase so that an unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance or phase displacement. With 100% load on one phase (and 0% load on the other two phases) or 100% load on two phases (and 0% load on the other phase), the voltage balance is to be within 5% and the phase displacement is to be 120 degrees within a range of ±1.5 degrees.

2.8 INVERTER SHUTDOWN

A. For rapid removal of the inverter from the critical load, the inverter control electronics shall instantaneously turn off the inverter transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.

2.9 INVERTER DC PROTECTION

The inverter shall be protected by the following disconnect levels:
DC Overvoltage Shutdown
DC Undervoltage Warning (Low Battery Reserve)—pre-warning time is adjustable
DC Undervoltage Shutdown (End of Discharge)

2.10 OUTPUT FREQUENCY

A. The output frequency of the inverter shall be controlled by a high-speed DSP capable of holding the inverter output frequency to within ±0.1% for a single Liebert FlexPower assembly or ±0.25% for six Liebert FlexPower assemblies during steady state and transient conditions. Total deviation from the rated frequency, including short time fluctuations and drift, shall not exceed 0.1% for a single Liebert FlexPower assembly or 0.25% for six Liebert FlexPower assemblies

2.11 DISPLAY

A. The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. A graphical liquid crystal display (LCD) shall be used to show a single-line diagram of the UPS and shall be provided as part of the monitoring and controls sections of the UPS. All operator controls and monitors shall be located on the front of the UPS cabinet. Monitoring functions such as metering, status and alarms shall be displayed on the graphical LCD. Additional features of the monitoring system shall include:

Menu-driven display with pushbutton navigation
Real-time clock (time and date)
Alarm history with time and date stamp
Memory with battery backup

B. Metering
The following parameters shall be displayed:
Input AC voltage line-to-line
Input AC current for each phase
Input frequency
Battery voltage
Battery charge/discharge current
Output AC voltage line-to-line
Output AC current for each phase
Output frequency
Apparent power
Active power
Battery time left during battery operation

C. Alarm Messages
The following alarm messages shall be displayed:
Mains Voltage Abnormal
Mains Undervoltage
Mains Freq. Abnormal
Charger Fault
Battery Reversed
No Battery
Control Power 1 Fail
Parallel Comm. Fail
Bypass Unable To Track
Bypass Abnormal
Inverter Asynchronous
Fan Fault
Control Power 2 Fail
Unit Over Load
System Over Load
Bypass Phase Reversed
Transfer Time-Out
Load Sharing Fault
Bypass Over Current
Output Ground Fault

D. Status Messages
The following UPS status messages shall be displayed:
Rectifier (Off / Soft Start / Main Input On / Battery Input On)
Input Supply (Normal Mode / Battery Mode / All Off)
Battery Self Test (True / False)
Input Disconnect (Open / Closed)
EPO (True / False)
Charger (On / Off)
Output Disconnect (Open / Closed)
Maint. Disconnect (Open / Closed)
Bypass Disconnect (Open / Closed)
Inverter (Off / Soft Start / On)
Bypass (Normal / Unable To Trace / Abnormal)
Output Supply (All Off / Bypass Mode / Inverter Mode / Output Disable)
Inverter On (Enable / Disable)

2.12 CONTROLS

A. UPS startup, shutdown and static bypass operations shall be accomplished through pushbutton controls on the front panel. Menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms. A mimic screen shall be available on the LCD to depict a single-line diagram of the UPS with switch positions and power flow.

B. The UPS shall be provided with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode.

2.13 STATIC TRANSFER SWITCH

A. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating to clear a 20-ampere load branch circuit breaker.

B. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS or to bypass the UPS for maintenance.

2.14 UNINTERRUPTED TRANSFER

A. The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:

Inverter overload capacity exceeded
Critical AC load overvoltage or undervoltage
UPS fault condition

B. The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:

C.

Bypass frequency out of limits
Bypass out-of-synchronization range with inverter output

2.15 UNINTERRUPTED RETRANSFER

A. Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

Bypass out of synchronization range with inverter output
Inverter/bypass voltage difference exceeding preset limits
condition exists in excess of inverter full load rating
UPS fault condition present

2.16 BATTERY POWER PACK

A. The battery power pack shall include valve-regulated, lead-acid battery cells housed inside the UPS cabinet. Battery cells shall be mounted on slide-out trays for ease of maintenance. A battery disconnect circuit breaker shall be included for isolation of the battery pack from the UPS module.

2.17 ACCESSORIES

A. Liebert IntelliSlot® IS-UNITY-DP Web Card Provides communication outputs to indicate a change of status of the UPS. Outputs are provided for:

SNMP
HTML - Web page
Allow use of Liebert Nform™ and or network management systems
One (1) Year of LIFE factory remote support included (if enabled)

2.18 MATCHING MAINTENANCE BYPASS AND DISTRIBUTION CABINET

A. A make-before-break maintenance bypass with Solenoid Key Release Unit (SKRU) interlock shall be available in a cabinet that matches and may be bolted up to the right side of the UPS. Installation of the cabinet shall not affect the cooling ability of the UPS. Thermal-magnetic breakers shall be provided for bypass and maintenance isolation. Bypass cabinet shall also include isolation step-down transformer, 225Amp 54 pole integral panelbaord and (4) 100AT, 3-pole, Sq-D, 10kAIC bolt-in branch breakers.

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

A. The following inspections and test procedures shall be performed by factory-trained field service personnel during the UPS startup.

1. Visual Inspection
   Inspect equipment for signs of damage.
   Verify installation per drawings.
   Inspect cabinets for foreign objects.
   Verify neutral and ground conductors are properly sized and configured.
   Inspect battery cases.
   Inspect battery for proper polarity.
   Verify all printed circuit boards are configured properly.

2. Mechanical Inspection
   Check all control wiring connections for tightness.
   Check all power wiring connections for tightness.
   Check all terminal screws, nuts and/or spade lugs for tightness.

3. Electrical Inspection
   Check all fuses for continuity.
   Confirm input voltage and phase rotation is correct.
   Assure connection and voltage of the battery string(s).

4. Site Testing

    a. Scope: includes verification with manufacturer provided resistive load bank of proper operation in all UPS operational modes (on inverter, on bypass, on battery, etc.) and proper transfer to and from each mode. Testing will be done at the time of start-up (during normal business hours) under load as is allowable by onsite electrical distribution system, so as to not overload any upstream breakers/switches.
    b. Time duration in each mode shall be: 30 minutes. Load Bank and load bank cables are to be provided by manufacturer. Load bank cables are to be landed/removed by installing contractor. Written report of testing will be provided.

5. Infrared Testing

    a. Scope: scanning using manufacturer provided IR camera, FLIR TCAM T400 or equal, to verify proper wire terminations. Scans will be performed within the UPS system cabinets. Full report shall be provided.

3.2 MANUFACTURER'S FIELD SERVICE

A. Service Personnel
    1. The UPS manufacturer shall directly employ a nationwide service organization consisting of factory-trained field service personnel dedicated to the startup and maintenance of UPS and power equipment.
    2. The manufacturer shall provide a national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours/day, 7 days/week, 365 days/year. If emergency service is required, on-site response time shall be guaranteed for four hours or less.
    3. Two local customer engineers shall be assigned to the site with a regional office as a backup. Escalation procedures shall be in place to notify Power Technical Support if a site is not functioning within 24 hours.

3.3 REPLACEMENT PARTS STOCKING

A. Parts shall be available through an extensive network to ensure round-the-clock parts availability throughout the country.

B. Spare parts shall be stocked by local field service personnel with backup available from national parts center and the manufacturing location. A national parts center Customer Support Parts Coordinator shall be on call 24 hours a day, 7 days a week, 365 days a year for immediate parts availability.

3.4 MAINTENANCE CONTRACTS

A. A complete offering of preventive and full-service maintenance contracts for both the UPS system and battery system shall be available.

3.5 AUTOMATED SITE MONITORING

A. The UPS manufacturer shall provide as an option an automated site-monitoring service. This service shall be staffed by a qualified support person 24 hours/day, 7 days/week, 365 days/year. At the detection of an alarm within the UPS, the controls shall initiate communications with the monitoring service. The monitoring service shall be capable of interpreting the communicated alarms to allow dispatch of a service engineer.

B. Prior to installation of luminaires Electrical Contractor shall inspect luminaire and verify unit meets or exceeds specifications, is new and unused without damage or defect and is suitable for the intended service.

C. See architectural and electrical plans for luminaire locations, coordinate installation with other trades.

D. At the completion of the project all luminaires shall be aligned, level and cleaned to the satisfaction of the A/E.

3.6 MANUFACTURERS

A. Provide luminaires by the following manufacturers:

Downlights: Halo, Lithonia, Marko, Prescolite
Flourescents: Columbia, Lithonia, Metalux, Williams
HID: Holophane, Hubbell, Kim, Lithonia
Track Lighting: Halo, Lithonia, Marko, Prescolite
Emergency Fixtures: Exitronix, Fail-Safe, Hubbell, Lithonia
Security Fixtures: Holcor

END OF SECTION 26 9200

SECTION 28 3111– FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this Section consists of furnishing all labor, materials, tools, equipment, services, coordination, and supervision required to install, test, and place in service a complete networked microprocessor addressable fire alarm system, including network connection to the existing State of Kansas Capital Complex fire alarm network.

B. All work performed and all materials furnished shall meet the requirements of the applicable current standards of the National Fire Protection Association (NFPA): Standards 70-2011, and 72-2013; Underwriters' Laboratories, Inc. (UL); Americans with Disabilities Act and other federal, state, and local codes and ordinances except as otherwise indicated on the drawings or specified herein.

C. After entering into the contract, the Contractor shall be held responsible for the completion of all work necessary for a complete and approved installation without extra expense to the Owner or Engineer.

D. The Contractor shall prepare any supplementary detailed diagrams or drawings, which may be required by the state authority or local Authority Having Jurisdiction (AHJ).

E. Any deviations from the requirements of this specification must be acknowledged in writing with the supplier’s bid offer.

1.2 APPLICABLE REFERENCES

A. National Fire Protection Association (NFPA):

1. No. 70, National Electric Code (NEC)
2. No. 72, National Fire Alarm Code
3. No. 170 , Fire Safety Symbols

B. Underwriters Laboratories Inc. (UL):

1. No. 50 - Cabinets and Boxes
2. No. 268 - Smoke Detectors for Fire Protective Signaling Systems
3. No. 864 - Control Units for Fire Protective Signaling Systems
4. No. 268A - Smoke Detectors for Duct Applications.
5. No. 521 - Heat Detectors for Fire Protective Signaling Systems.
6. No. 464 - Audible Signaling Appliances.
7. No. 38 - Manually Actuated Signaling Boxes.
8. No. 1481 - Power supplies for Fire Protective Signaling Systems.
9. No. 1971 - Visual Notification Appliances.

1.3 SYSTEM DESCRIPTION

A. Complete, integrated, and operating networked fire alarm, detection, control, and monitoring systems shall be installed in the State of Kansas Energy and service Center as specified herein and as shown on the drawings.

B. System(s) shall include, but not be limited to: dedicated network annunciator panel(s), fire alarm control panel(s), annunciator panels, alarm notification appliances and alarm initiating devices, relays, monitor and control modules, network connections, conduit, wire, and all accessories required to furnish complete operational system(s), including complete network integration.

C. All work shall be performed as indicated on the drawings and as specified herein.

D. Audible Alarm Indication: Horns (Temporal Tone per NFPA 72)

E. System Wiring: System wiring shall be Style B for initiating circuits, Style 4 for signaling line circuits and Style Y for notification appliance circuits. New Network Circuits shall be Class A, Style 6, fiberoptic. Separation of incoming and outgoing legs is not required.

F. Means of lightning suppression shall be provided at all locations where fire alarm circuits leave protected buildings exterior walls, including on the network signaling line circuits.

G. The sequence of operation for the fire alarm systems shall be as described on the drawings.

H. Spare Capacity: All Signaling Line Circuits (SLC's), Initiating Device Circuits (IDC's) and Notification Appliance Circuits (NAC) shall be sized and configured to accommodate the proposed system plus a minimum 25 percent expansion capability.

1.4 SUBMITTALS

A. A Submittals and shop drawings shall be approved by the Engineer prior to ordering equipment or commencing system installation.

B. Operation and Maintenance manuals and as-built drawings at the completion of the project.

C. Complete and comprehensive submittals in full accordance with NFPA 72 and these specifications.

D. Partial submittals shall not be acceptable.

E. Approval of submittals shall not relieve Contractor of conformance with the contract drawings, specifications, and applicable codes and standards. The following are required submittals:

1. Shop Drawings: The shop drawings shall, as a minimum, include the equipment layout, device arrangement, output ratings of the audible and visual devices, complete point to point (device to device) wiring diagrams as intended for installation, conduit/wiring layouts, complete riser diagrams, battery calculations, voltage drop calculations, sequence of operations, typical wiring diagrams and internal panel diagrams showing all field wiring terminations and circuit labels.
2. Testing Report/Address Description List: Provide in hardcopy and Excel format a complete spreadsheet indicating the proposed address labels and address descriptions for all proposed system addresses. This shall include all devices. The spreadsheet shall also include a pass/fail notation column and a notes column for each item to be tested as required by NFPA 72 and these specifications. Shall be submitted with shop drawings.

3. Product Certifications: Provide technical data sheets by the manufacturers of all fire alarm and electrical equipment proposed for installation. Certifications shall clearly indicate products comply with the referenced standards and these specifications. All fire alarm equipment shall be submitted. As a minimum, the following electrical equipment shall be submitted: wire and cables; raceway, i.e. D-Rings, conduit and wiremold; back boxes for devices; pull/junction boxes; automatic label maker; terminal blocks used for splices; and conduit connectors. All Certifications shall be clearly indexed and marked to indicate the proposed items of equipment to be furnished. Item shall be submitted with the Shop Drawings.
4. Written Fire Alarm System Test Procedure: A written procedure for completing the fire alarm system testing shall be prepared by the Contractor. The procedure shall be coordinated with the Owner and shall describe the means of testing each device, verifying the operation of each notification appliance and verifying all fire alarm system functions. Shall be submitted with shop drawings.
5. Operation & Maintenance Manuals: Preliminary Submittal to be submitted with Shop Drawings. Final Submittal to be submitted with Record/As-Built Drawings.
6. Record/As-Built Drawings: Accurate As-Built drawings reflecting the as-built conditions shall be provided to the Engineer prior to acceptance testing. As-Built drawings shall be furnished to the Engineer on electronic media in AutoCAD R14 compatible format and also a complete set of reproducible tracings to 1/8” scale (minimum) showing the as built layout of all conduit systems and/or wire routing and all fire alarm equipment, complete riser diagrams showing all devices and EOL’s, and accurate panel diagrams showing all field wiring terminations and labels.

1.5 QUALITY ASSURANCE

A. All equipment furnished shall be new and the latest state-of-the-art products of a single manufacturer engaged in the manufacturing and sale of fire detection devices for five years.

1. The Contractor shall contract with a single source for supplying job materials, services, and programming, including final inspection/test services for the fire alarm system.

B. The development of the fire alarm system design, calculations, and shop drawings shall be coordinated with and supervised by the Engineer. The design efforts performed by the Contractor shall be performed by a NICET Level II or greater technician certified in fire alarm technology.

C. Installer Qualifications: Contractor shall complete the following:

1. Demonstrate in writing for advance approval by the Engineer, 5 years of fire alarm installation experience and five years of substantial experience in similar microprocessor-based fire alarm system installation projects.
2. Provide in writing for advance consideration at least five local references for similar microprocessor-based fire alarm system installation projects.
3. Engage an experienced factory-authorized service representative to oversee the work of this Section and the testing of the system. The factory-authorized service representative shall be available during the entire construction phase, including testing. The Contractor shall provide a copy of the factory certificate of the factory-authorized service representative for this project.
4. The installing company shall employ NICET (minimum Level III Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

D. All materials and equipment furnished and installed under this Section shall be new and currently listed by UL, Inc., or approved by FM Engineering Corporation, except as otherwise specified herein.

1.6 WARRANTY

A. All work performed, all material and equipment furnished and all programming completed under this contract shall be free from defects and shall remain so for a period of at least two (2) years from the date of formal acceptance. The full cost of all service/diagnostics, maintenance, labor and materials, reprogramming, retesting, pickup and delivery required to correct any defect during the one year period shall be included in the bid submittal. Replacement parts shall be the original manufacturer's replacement parts, components, and supplies.

B. The Warranty shall also include all service, maintenance and testing as required by NFPA 72, Chapter 14 for this two year period after the date of formal system acceptance.

C. Warranty service shall be performed within 24 hours of notification during normal working hours (Monday through Friday, 8:00 a.m. to 5:00 p.m., excluding holidays) and within 48 hours of notification during all other times.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. INITIATING DEVICES

1. Manual Pull Stations, Standard: Double-action type, fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color. Stations requiring the breaking of glass are not acceptable. Manual pull stations shall be fully addressable, having self contained monitor modules.

   a. Station Reset: Key-operated. Stations shall have screw terminals for connections.

2. Smoke Detectors: Smoke sensors shall be addressable and shall be of the photoelectric type and shall communicate actual smoke chamber values to the system control panel. The smoke detectors shall comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems" and shall include the following features:

   a. Factory Nameplate: Serial number and type identification.
   b. Operating Voltage: 24 VDC, nominal.
   c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   d. Plug-In Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring. The sensors shall be listed for both ceiling and wall mount applications.
   e. Visual Indicator: Each sensor base shall contain an LED that will flash as an indication of proper sensor operation. When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors that do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.
   f. Addressability: Detectors shall include a communication transmitter and receiver having a unique identification and capability for status reporting to the FACP.

      1) Each sensor shall communicate with the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

2) The sensor's electronics shall be immune from false alarms caused by Electro Magnetic Interference and Radio Frequency Interference.

3. Duct Detector: For duct mounted applications provide detector housing with auxiliary relay and sampling tubes as required.

   a. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
   b. To minimize false alarms, voltage and RF suppression techniques shall be employed as-well-as a smoke signal verification circuit and an insect screen.
   c. Auxiliary SPDT relays and/or remote LED alarm indicators and key operated test stations shall be installed where indicated.

4. Heat Detectors: Rate-compensated/fixed-temperature type with plug-in base and alarm indication lamp. Detectors have a communication transmitter and receiver with unique identification and capability for status-reporting to the fire alarm control panel.

5. Addressable Monitor Module

   a. An addressable monitor module shall be used to connect conventional initiating devices (waterflow switch or alarm pressure switch) to the addressable initiating circuits and to supervise the suppression systems (tamper switches).
   b. The module shall mount in an electrical box and shall be capable of Class B supervised wiring to the initiating device. The monitor module shall provide address, which the control panel shall use to identify the location and type of device. The monitor module shall contain an integral LED that flashes each time the monitor module is polled.

6. Addressable Control Module

   a. An addressable control module shall be used to connect and supervise conventional initiating devices that require an external power supply, such as door holders.
   b. The module shall mount in an electrical box and shall be capable of Class B supervised wiring to the indicating or control device. The control module shall contain an integral LED that shall flash each time the module is polled. The control module shall provide address, which the control panel shall use to identify the control module.

B. FIRE ALARM AUDIBLE/VISUALS AND VISUALS AND AUDIBLES ONLY

1. General: Visual and audio/visual indicating appliances shall be comprised of a Xenon flashtube and be entirely solid state. These devices shall be UL listed and shall be 15 cd, 30 cd, 75 cd or 110 cd as a minimum as indicated on the drawings. The visual appliance shall have a 1 HZ flash rate. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN.
2. All visual appliances shall be in compliance with ADA and as indicated on the drawings.
3. Audible appliances shall provide a minimum 90 dBA sound level at 10 feet with a 1kHz signal.

C. FIRE ALARM CONTROL PANEL (FACP)

1. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."
2. Cabinet: Lockable steel enclosure. Arrange panels so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for field wiring. Identify individual components and modules within the cabinets with permanent labels.
3. Signaling line circuit boards shall consist of plug-in cards.
4. Each initiating device shall be identified by the FACP with a unique address. No single notification circuit shall serve more than a single floor.
5. As a minimum each FACP:

    a. Shall sound the trouble signal indicating loss of primary power at the FACP. An emergency power light shall be illuminated when the system is operating on an alternate power supply.
    b. Shall provide a plain-language description of alarms, trouble signals, supervisory signals, monitoring actions, system and component status, and system commands. The display shall have minimum 80 characters.
    c. Shall provide power, annunciation, supervision, and control for the complete detection, alarm, monitoring, and control system.
    d. Shall remain 100 percent operational and capable of responding to an alarm condition while in the routine maintenance mode.
    e. Shall be provided with internal battery backup.
    f. Shall be analog intelligent device addressable, low voltage, and modular in full compliance with all applicable codes and standards.
    g. Shall include the manufacturer's latest version of all required operating modules, components, devices, and accessories.
    h. Shall have capability to test the sensitivity of the initiating devices for compliance with NFPA 72 testing requirements.
    i. Shall have a minimum 200-event history log. All events shall be recorded with a time and date stamp.
    j. Shall be suitable to connect to additional panels.

6. Priority of Signals: Accomplish automatic response functions by the first device initiated. Alarm functions resulting from initiation of the first device shall not be altered by subsequent alarms. The highest priority is an alarm signal. Supervisory and trouble signals have second- and third-level priority. Signals of a higher level priority take precedence over signals of lower priority even though the lower priority condition occurred first. All alarm signals shall be annunciated regardless of priority or order received.
7. Silencing at the FACP: Provide switches for acknowledgment of alarm, supervisory, trouble, and other specified signals at the FACP and provide the capability to silence the local audible signal and light a light-emitting diode (LED). Subsequent alarms cause the audible signal to sound again until silenced in turn by switch operation. Operation of the system silence button shall silence audible appliances only and not individual strobes.
8. Ground fault detection shall be provided for all initiating and audible circuits. Lamp test capability shall be provided to test visual panel indicators. The control panel shall be equipped with a silence before reset feature, designed to prevent accidental system reset during an alarm condition.
9. Instructions: Typewritten instruction card mounted behind a lean plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a location observable from the FACP. Include interpretation and appropriate response for displays and signals, and briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

D. LCD ALPHANUMERIC DISPLAY ANNUNCIATOR:

1. The alphanumeric display annunciator shall be a supervised back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm, trouble and supervisory conditions in the system.
3. LCD display annunciators shall mimic the main control panel 80 character display and shall not require special programming.
4. The LCD annunciator shall have switches which may be programmed for System control such as Global Acknowledge, Global Signal Silence and Reset. These switch inputs shall be capable of being disabled permanently by a key lockout function on the front plate.

E. FIRE ALARM SYSTEM NETWORK

1. The fire alarm network shall meet all of the following:

   a. UL Listed Proprietary Fire Alarm Network;
   b. Based on peer to peer, token passing and/or master/slave technology communications and signal regeneration for signal amplification;
   c. Capable of communicating via wire or fiber optic medium;
   d. Capable of using wire and fiber optic medium in the same network;
   e. Fail safe, such that failure of any node does not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations;
   f. Suitable for connection with twenty network annunciators;
   g. Suitable for connection with at least four network Graphic User Interfaces;
   h. Capable of network connection to at least 50 network nodes (fire alarm control panels). Each network node address shall be software assignable at each node;
   i. Network shall have 25,000 point capacity;
   j. Capable of displaying all network activity.

F. NETWORK ALPHANUMERIC ANNUNCIATOR:

1. The alphanumeric display annunciator shall be a supervised back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
2. The annunciator shall display all alarm, trouble and supervisory conditions in all systems connected to the network.
3. Display annunciators shall be able to mimic the main control panel(s) and include building names.
4. System History Recording and Reporting: The annunciator shall have a history buffer capable of storing 200 events in non volatile memory.
5. Annunciator having switches which may be programmed for control of network nodes shall also have the capability of being permanently locked out (non-operational). If a keyed lockout function is provided the key shall not be keyed the same as all other keys.

G. EMERGENCY POWER SUPPLY

1. The fire alarm panel shall have emergency power supply components, which shall include sealed-lead acid or nickel cadmium type batteries, a battery charger, and an automatic transfer switch. Battery nominal life expectancy shall be a minimum of 5 years.
2. Battery capacity shall be adequate to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. At the end of this period, the battery shall have sufficient capacity to operate the system, including all alarm-indicating devices in alarm mode for a period of 5 minutes.

3. The battery charger shall be solid-state, fully automatic, variable charging rate type. Emergency backup power shall be with a float or equalizer type charging system. In the event that the batteries are discharged to the point where the system will not operate, the charger shall recharge the batteries fully within 24 hours. Charger output shall be supervised as part of system power supply supervision.
4. The automatic transfer switch shall transfer the load to the battery without loss of signals or status indications when normal power fails.

H. FIRE ALARM SYSTEM ELECTRICAL IDENTIFICATION

1. Initiating Device Labels: Plastic typed labels created by Automatic Label Maker. 3/32 inch font minimum.
2. Circuit Identification Labels: Plastic typed labels created by Automatic Label Maker. 3/32 inch font minimum.
3. Laminate Signs: Engraving stock melamine plastic laminate, 1/16 inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Engraved legend in white letters on red face and punched for mechanical fasteners.

I. WIRE

1. Solid copper conductors shall be used. Stranded wire shall not be allowed.
2. Wire shall be in strict accordance with manufacturer's published installation recommendations, Article 760 of NFPA 70, the drawings, and these specifications.
3. The outer jacket of all wiring shall be red in color and provided with the appropriate markings to indicate the type and gauge of the wire and that the wire is UL Listed for fire alarm systems.

PART 3 - EXECUTION

A. GENERAL INSTALLATION

1. System installation shall be in full accordance with the Project Drawings, these Specifications, NFPA Standards, and the manufacturer's published recommendations.
2. All equipment and products furnished shall be UL listed or FM approved and labeled, and connection shall comply with NEMA construction standards.

B. EQUIPMENT INSTALLATION

1. All FCPs shall be surface mounted with the top of the cabinet not more than six feet above the finished floor. Control, Power Supply and other panels shall be mounted with sufficient clearance for observation and testing.
2. All penetrations through walls, barriers and floor slabs shall be firestopped.
3. Smoke Detectors shall be installed no closer than 3 feet from air registers.

C. WIRING INSTALLATION

1. Application: All wiring shall be installed in EMT conduit, flex or rigid metallic conduit in accordance with NFPA 70. Wiremolding shall not be permitted. All raceway shall be concealed in finished spaces.
2. Minimum wiring size shall be as follows:

    a. Initiating circuits shall be a minimum of AWG No. 18.
    b. Indicating and control circuits shall be AWG No. 14 or larger.
    c. Line voltage circuits shall be AWG No. 14 or larger.

3. Wiring Method:

a. Wiring installed in metal raceway shall be in accordance with NFPA 72 and Article 760 of NFPA 70. Raceways for fire alarm circuits shall be a minimum of ¾ inch, except, ½ inch shall be permitted for drops to individual devices.
b. System drain wires and conduit grounding shall be properly installed in accordance with the manufacturer's published recommendations.
c. Wiring splices shall be held to an absolute minimum and avoided to the extent possible. If needed, they shall be made only in junction or outlet boxes and shall be connected on terminal blocks or with crimp-type connectors.
d. Wire nut-type connections are not acceptable for use except on manufacturer provided pig-tails where specifically permitted.

4. Wiring Within Enclosures:

a. Install conductors parallel with, or at right angles to, the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Panels shall be completely dressed.
b. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system.
c. Separate all wiring for initiating devices from all other wiring in FCP enclosure.

5. Grounding shall be provided and connected in strict accordance with manufacturer's installation recommendations.

a. FACP shall be grounded in accordance with NFPA 70. Raceway ground shall not be acceptable.
b. Raceways shall be earth grounded throughout the system.

6. Before any of the devices are connected, each circuit/conductor shall be megger tested except the circuits/conductors intentionally and permanently grounded. Test for resistance to ground. Report readings less than 1 megaohm for evaluation. The megger testing shall be documented and available for review by the Engineer.

7. Protection, Cleaning, and Adjustment

a. Protection from damage and contamination shall be provided for all system components, devices, and equipment during the entire installation and until acceptance testing.
b. Damaged or contaminated devices and/or components shall be replaced before final testing.
c. Final system adjustment, including detector sensitivity, shall be provided before final acceptance testing.

D. WIRES AND CABLE

1. Splice only in accessible junction or outlet boxes.
2 Splices and Taps for #8 and smaller shall be made only in junction boxes and shall be connected on terminal blocks or with crimp type connectors. Wire nut type connections shall not be used. Ground conduits, panels, and devices with green wire.

E. CIRCUIT AND EQUIPMENT IDENTIFICAION:

1. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated on the approved drawings and address list as applicable.

2. All Primary Power Circuit Breakers shall be provided with Laminate Signs indicating breaker designation as fire alarm and shall include reference to which fire alarm equipment served.
3. Equipment Identification: Securely fasten Laminate Signs to all fire alarm control panels, remote power supplies, etc. Signs shall indicate general equipment name, device label and location of fire alarm primary power breaker.
4. Circuit Identification: Securely fasten Circuit Identification Labels to circuits at all initiating devices, notification appliances, terminal connections and all other splices. Identification markings must correspond with the approved shop drawing circuit designations. Labels must be applied to be legible without moving equipment, labels, circuits, etc.
5. Initiating Device Identification: Where initiating devices are located on walls or on ceilings less than 14 feet in height, securely fasten Initiating Device Labels to the surface of the Initiating Device base so the label may be viewed from the floor. Where ceilings are over 14 feet in height a schematic diagram of the “high ceiling area” with all Initiating Devices and respective addresses shall be provided. Schematic shall be 8 ½ X 11, framed behind clear plastic and located where directed by the Owner
6. Install identification products in accordance with the manufacturer's written instructions and requirements of NFPA 70.
7. Junction and pull boxes containing EOL’s shall be so marked. Where EOL’s are concealed behind fire alarm devices there presence shall be marked.
8. All fire alarm junction box cover plates shall be painted red.

F. FIELD QUALITY CONTROL

1. Pre-testing: Upon completing installation of each system, align, adjust, and balance the system and perform complete pre-testing. Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new equipment, and retest until satisfactory performance and conditions are achieved. Pre-testing shall include all fire alarm appliances and devices and all fire alarm system operations.
2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses. All circuits shall be tested for shorts and/or leakage with a “megger” (meg-ohm meter). Provide all testing information in a documented report with all values of the testing and the signature of the testing personnel.
3. Report of Pretesting: After pretesting is complete, provide a letter and all test reports to the Engineer to certify that the installation is complete and fully operable. Include the names and titles of the witnesses to the preliminary tests.
4. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

G. TESTING

1. All test equipment, instruments, tools and labor required to conduct the system tests shall be provided by the Contractor. As a minimum for conducting the tests, ladders; multimeter; laptop computer with programming software; two-way radios; flashlights; smoke generation devices and supplies; printer to print test report and spare printer paper and decibel meter shall be available.
2. All addressable devices shall be tested and logged for correct address and sensitivity using test equipment specifically designed for that purpose.
3. Presence of a manufacturer's authorized technical representative shall be required at all acceptance tests and retests.
4. Acceptance testing shall be in accordance with the procedures outlined in NFPA 72, the manufacturer's recommendations, and the direction of the Engineer and AHJ.

5. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:

   a. Open, shorted and grounded addressable signaling circuit.
   b. Open, shorted and grounded circuits.
   c. Open, shorted and grounded horn circuits.
   d. Addressable device removal.
   e. Primary power or battery disconnected.
   f. Incorrect device at address.

6. System evacuation alarm indicating appliances shall be demonstrated as follows:

   a. All alarm notification appliances operate as programmed.
   b. The ambient sound level of each room shall be recorded and the sound level of the audible devices in each room shall be recorded to verify the performance of the system.

7. System indications shall be demonstrated as follows:

   a. Correct message display for each alarm input at the control panel, network workstations and remote alpha-numeric display.

8. Secondary power capabilities shall be demonstrated as follows:

   a. System primary power shall be disconnected for a period of 24 hours. At the end of that period, an alarm condition shall be created and the system shall perform as specified for 5 minutes.
   b. System primary power shall be restored for 24 hours and system charging current shall be normal trickle charge for a fully charged battery bank.
   c. System battery voltages and charging currents shall be checked at the fire alarm control panel using the codes and display on the LCD.

H. FORMAL ACCEPTANCE TESTING

1. Formal acceptance testing shall be held in the presence of the Engineer, DOAS and Owner, and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost to the Owner.

2. Final Test Notice: Provide a 10 – working day minimum notice in writing when the system is ready for final acceptance testing.

3. Report of Pretesting and Acceptance test: After pretesting is complete, provide a letter and all test reports to the Engineer to certify that the installation is complete and fully operable. Include the following:

   a. Names and titles of the witnesses to the preliminary tests.
   b. Written certification confirming the full compliance with these specifications, the manufacturer’s latest recommendations and NFPA 72 (2013 Edition).
   c. Written certification confirming the system is free of ground faults, short circuits, and the absence of unwanted voltages between circuit conductors and ground in accordance with the manufacturer's recommendations and NFPA 72 and adequately megger tested.
   d. Written certification and test results of the complete system checkout procedure in accordance with the manufacturer's published installation recommendations and NFPA 72.

4. The Engineer shall be provided with two preliminary copies of the record drawings for use during the testing procedure to verify operation as programmed.
5. In the event of system failure to perform as specified and programmed during the testing procedure, at the discretion of the Owner, or Engineer, the test shall be terminated and rescheduled after the Contractor has made corrections and repeated the pre-testing procedure.
6. The Owner, or Engineer may elect to require the complete test procedure be performed again if, in their opinion, modifications to the system hardware or software warrant complete retesting.
7. Operational Test: Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90 day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) or necessary equipment and begin another 90 day test period.

I. WRITTEN CERTIFICATIONS AND/OR TEST REPORTS

1. The following four written certifications and/or test reports shall be submitted by the installation Contractor before final and formal acceptance will be scheduled:

   a. Written certification and test results confirming full compliance with these specifications, the manufacturer's latest recommendations, and NFPA 72 (2013 Edition).
   b. Written certification and test results confirming the system is free of ground faults, short circuits, and the absence of unwanted voltages between circuit conductors and ground in accordance with the manufacturer's recommendations and NFPA 72 and adequately megger tested.
   c. Written report on final system programming configuration.
   d. Written certification and test results of the complete system checkout procedure in accordance with the manufacturer's published installation recommendations and NFPA 72 including:

      1) A complete list of equipment installation and wiring.
      2) Indication that all equipment is properly installed and functioning, and conforms with these Specifications.
      3) Technician's name, certification number, and data.
      4) After completion of all the tests and adjustments listed above, the Contractor shall submit the following information to the Engineer.

   e. Record Drawings

      1) Detailed catalog data on all installed system components.
      2) Copy of the test report.
      3) UL Certificates and/or listing documentation to verify that all equipment is UL Listed for its intended use.
      4) Final test and inspection shall be held in the presence of the Engineer and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.
      5) Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90 day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin another 90 day test period. As required by the Engineer, the Contractor shall recheck the devices using the fire test after each readjustment or replacement of devices.

6) If the requirements provided in the paragraph above are not completed within one year after beginning the tests described therein, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Engineer without additional costs.
7) Before final acceptance of the work and the release of the retainage, the Contractor shall deliver three copies of the complete Operating and Maintenance Manual and Record Drawings to the Engineer in hard copy (3 complete sets) and electronic copy in AutoCad, Version 14 or greater.

J. CLEANING AND ADJUSTING

1. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean units internally using methods and materials recommended by manufacturer.
2. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits at eight hours a piece to the site for this purpose.

K. TRAINING

1. Provide the services of a factory-authorized service representative to demonstrate the system and train the Owner's personnel as specified below upon completion of the field installation.
2. Train personnel in the procedures and schedules involved in operation, troubleshooting, service, and preventive maintenance of the system. Provide a minimum of sixteen hours of on-site training.
3. Schedule the on-site training with the Owner at least seven days in advance of the training.
4. Owner Training shall be professionally video recorded using digital format. All training videos shall become the property of the owner and shall be included in the project Operating and Maintenance manuals.

END OF SECTION 28 3111

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Geotechnical Engineering Report: “Geotechnical Engineering Report, Proposed Kansas Energy and Service Center”, GeoSource Proj. No. D14G1399, December 31, 2015.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Protecting “No Build” Zones

B. Related Sections include the following:

1. Geotechnical Engineering Report – If discrepancies occur between this specification and the Geotechnical Engineering Report, the Geotechnical Engineering Report shall govern.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

A. Except for topsoil and other materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS (No Requirements)

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.

C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

2. Protect “No Build Zones” from damage with silt fence around the perimeter of the designated areas. No construction activity shall occur within the “No Build Zone” boundaries.

3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   a. No construction activity shall occur within the designated “No Build Zones”.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with approved soil material, unless further excavation or earthwork is indicated. (As specified in Section 312000 – Earth Moving)

1. Place fill material and compact as specified in Section 312000 – Earth Moving.

3.4 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water.
1. Do not stockpile topsoil within drip line of remaining trees.
2. Stockpile surplus topsoil and allow for re-spreading deeper topsoil.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

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SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Kansas Department of Transportation (KDOT) “Standard Specifications for State Road and Bridge Construction”, latest edition.

C. Geotechnical Engineering Report: “Geotechnical Engineering Report, Proposed Kansas Energy and Service Center”, GeoSource Proj. No. D14G1399, December 31, 2015.

1.2 SUMMARY

A. This Section includes the following:
1. Excavating and backfilling for buildings and inlet structures.
2. Excavating and backfilling trenches for utility trenches.
3. Preparing subgrades for slabs-on-grade
4.

B. This Section does not include the following:
1. Excavating and backfilling for reinforced concrete box structures.

C. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities and support facilities.
2. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below grade improvements and utilities.
3. Divisions 31, 32 and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
4. Geotechnical Engineering Report – If discrepancies occur between this specification and the Geotechnical Engineering Report, the Geotechnical Engineering Report shall govern.

1.3 DEFINITIONS

A. Backfill: Job excavated material free from debris, organic material, and large stones.

1. Initial Backfill: Backfill placed on top of the haunching material in the trench from the spring line to 12” above the top of pipe.

2. Final Backfill or trench backfill: Backfill placed over initial backfill/embedment to fill a trench.

B. Bedding Course: Material placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site location for use as fill or backfill.

D. Embedment: Backfill placed around the pipe in the trench consisting of the bedding, haunching, and the initial backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Architect. Authorized additional excavation and replacement material will be paid for according to contract provisions for changes in the Work.

F. Fill: Soil materials used to raise existing grades.

G. Foundation: Subgrade below bedding material. Typically undisturbed earth unless soil is unsuitable, soft, or mucky.

H. Haunching: Material placed on top of the bedding material in the trench from the flow line of the pipe to the spring line of the pipe including material to support the sides of pipe.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subgrade (aka: Final Subgrade or Rough Grade): Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated.

L. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.

2. Controlled low-strength material, including design mixture.

B. Material Test Reports:From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or off-site borrow soil material proposed for fill and backfill.

2. Laboratory compaction curve (Standard Proctor) according to ASTM D 698 (AASHTO T99) for each on-site or off-site borrow soil material proposed for fill and backfill.

C. Submit all purchased items that will be left on site and become the owner's property after construction.
1. Gradation for Granular bedding material.
2.

3. Warning tape

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
1. Geotechnical Testing Agency will be retained and paid for by the Owner.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory (suitable) Soils: As approved by the Geotechnical Engineer and free of rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory (unsuitable) Soils: As identified by the Geotechnical Engineer or not meeting satisfactory soil conditions.

1. Unsatisfactory soils also include satisfactory soils not maintained within the specified moisture content at time of compaction.
2.

D. Backfill and Fill: Satisfactory soil materials.
3.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural of crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2 inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural of crushed sand; ASTM D 2940; except with 100 percent passing a 1 inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
4.

H. Low Volume Change (LVC) or Structural Fill Material: (See Geotechnical Report) Low plasticity cohesive soil - as defined below, granular material – as defined in the Geotechnical Report and as approved by the Geotechnical engineer; or treated soil as defined in the Geotechnical Report and as approved by the Geotechnical engineer.
5.
1. Low Plasticity Cohesive Soil: Low Plasticity Cohesive Soil is that which exhibits a liquid limit of less than 45 percent and a plasticity index less than 25 percent.
6. KDOT AB-3 (or approved equal) may be used as LVC materials.
7.

I. Borrow Areas: Borrow areas provided by the contractor shall be approved by the Engineer as to suitability of material and location. Special care shall be taken in this approval to minimize the increase of siltation and turbidity of streams, lakes, and reservoirs and to avoid interference with the movement of migratory fish. Areas which, in the opinion of the engineer, leave an unsightly appearance to the Project will not be approved. All borrow sites must also be approved by the Kansas Department of Health and Environment.

J. Topsoil: Topsoil material, if any, shall be stripped (see Geotechnical Report boring logs for topsoil depth) and stockpiled for use in final grading of the project. Any additional Topsoil needed for final grading of the project shall be previously stripped from the site or provided by the contractor at no additional cost.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low Strength Material: Low-Density, self-compacting, flowable concrete material as follows:

1. Portland Cement: ASTM C 150, Type I or II.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal Weight Aggregate: FA-A Fine Aggregate as defined in the Kansas Department of Transportation Standard Specifications for State Road and Bridge Construction, 1990 edition, Section 1100, Subsection 1102.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air Entraining Admixture: ASTM C 260.
7.

B. Produce low density, controlled low-strength material with the following physical properties:
8.
1. As-Cast unit Weight: 120 lb./cu/ft. maximum at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive strength: 80 psi, when tested according to ASTM C 495.

2.3 ACCESSORIES

A. Silt Fence Fabric: Fine mesh material specifically designed to retain soil run-off, while maintaining surface drainage; comply with KDOT specs for materials to be used.

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric
2. Yellow: Gas, oil, steam, and dangerous materials.

3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems/Force mains

PART 2 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades on all pipe lines that will transmit fluid by gravity flow with a slope less than one percent (1.00%).

C. Maintain grade alignment of other pipelines using string line parallel with grade line and vertically above centerline of pipe.

1. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
2. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route.

3.2 PREPARATION

A. Verify field measurements prior to fabrication.

B. Call Local Utility Line Information service not less than five working days before performing Work.
9.
1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Identify required lines, levels, contours, and datum locations.

D. Protect plant life, lawns, and other features remaining as portion of final landscaping.

E. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Maintain and protect above and below grade utilities indicated to remain.

G. Establish temporary traffic control and/or detours when trenching across roadways or streets. Relocate controls and reroute traffic as required during progress of Work.

H. Protect existing structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

I. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions and deleterious materials from ground surface is specified in Division 31 Section “Site Clearing.”

J. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

K. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

L. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
1. Temporary Erosion Control methods and materials shall be accordance with the drawings in the construction documents.

M. Vegetation, topsoil, fill, existing structures and other loose, soft or otherwise unsuitable material should be removed from the planned paved areas at the on-set of construction. The procedures and recommendations in the Geotechnical Engineering Report shall be used. In addition to undercutting and moisture conditioning the existing site soils or replacing unsuitable existing soils (as required), all materials within the upper 12 inches of building floor slab subgrade level (below the slab and leveling course) shall consist of low volume change material.

N. Strip all material classified as topsoil and miscellaneous fill in all disturbed areas; stripping shall be through the topsoil vegetation.
1. See boring logs in Geotechnical Report.

O. Stockpile topsoil on-site for future use for finish grading.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.7 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required grades to leave solid base to receive other work.
2. Pile Foundations:Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and disturbed material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins and Mechanical or Electrical Utility Structures:
   a. Excavate to elevations and dimensions indicated within a tolerance of plus or minimum 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Remove all fill material from within and at least 10 feet beyond the building footprint. Additionally, removal shall extend a minimum of 2 feet beyond the pavement edges.

C. Once the topsoil is removed, the insitu soil that is within 24” of the floor slab and leveling course shall be removed. The contractor shall have the geotechnical engineer test the bottom of the excavation to determine if satisfactory soils exist. If satisfactory soils are not present, the contractor shall remove additional material as instructed by the geotechnical engineer.
   1. The contractor shall scarify the top 8” below the 24” LVC layer, moisture condition the soil as noted in the geotechnical report (0 to +4% above the optimum moisture content as determined by the standard proctor compaction procedure.
      a. Proof roll the re-compacted subgrade before placement of fill to detect and compact any localized soft areas at the surface of the site.
      b. Soft or unsuitable materials should be removed and replaced with low volume change material.
   2. Within the mechanical room floor slab that houses the boilers, a minimum of 12” of crushed limestone aggregate shall be placed below the building floor slab and leveling course. This 12” layer shall be placed in 6” lifts and compacted to a minimum of 95% of the material’s maximum dry density as determined by ASTM 698.
      a. The 12” aggregate shall be substituted for 18” of the low volume change material (select fill). therefore, there is an additional 6” of low volume change material below the 12” layer for a total of 18” low volume change materials. This is different from the 24” LVC layer to be constructed in the other areas of the building.
      b. This area consists of the Mechanical Room of the building.
      c. The layer shall extend a minimum of 5’ beyond the building footprint.
      d. Crushed limestone shall be KDOT AB-3.
   3.

D. Once the topsoil is removed within the parking and drive areas, the insitu soil that is within 8” of the finished surface elevations shall be tested by the geotechnical engineer to determine if satisfactory soils exist. If satisfactory soils are not present, the contractor shall remove materials until satisfactory soils are found. The contractors shall replace with satisfactory soils to the required elevations in no more than 9” layers (loose lift thickness) with adequate moisture control and compaction.
   4.
   1. The over-excavation shall extend a minimum of 10’ beyond the proposed building perimeter to the north, east and south, 5’ beyond the proposed building perimeter to the west and 2’ beyond the backs of curbs and pavement edges.
   2. Should the insitu soils be satisfactory at the subgrade elevations, the contractor shall scarify the top 8”, moisture condition and re-compact in accordance with the geotechnical report.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Stockpiled soils shall be temporarily seeded if untouched for more than 14 calendar days.

3.9 EXCAVATION FOR UTILITY TRENCHES

A. TRENCHING EXCAVATION: The trench shall be excavated, true to line and grade as shown on the Plans or established by the Engineer. The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the Plans or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid over-loading and to prevent slides or cave-ins. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and to maintain the flow of water in natural watercourses on or adjacent to the site. Any water accumulating in trenches or other excavations shall be removed by pumping or by other approved methods as specified elsewhere. Unless otherwise indicated or authorized, excavation shall be by open cut.

3.

1. Do not interfere with 45 degree bearing splay of foundations
2. All excavated materials not required or suitable for backfill shall be removed and disposed of off the site, by and at the expense of the Contractor.
3. The Contractor shall not open more trench in advance of pipe laying than is necessary. Four hundred (400) feet will be the maximum length of open trench allowed on any line under construction. All open trenches shall be adequately protected.
4. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. TRENCH BOTTOMS: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade. Excavate to allow for bedding material where required.

C. LIMITING TRENCH WIDTHS AND PIPE CLEARANCES: Trenches shall be excavated to a width that will provide adequate working space and pipe clearances for proper pipe installation, jointing, bedding, and initial backfill operations. In order to protect the pipe from external loads in excess of those used in the design of the pipe, it is necessary to limit the width of the lower portion of the trench below an elevation twelve (12) inches above the top of the installed pipe. The trench width shall be a minimum of twelve (12) inches greater than the outside diameter of the barrel of the pipe and a maximum of sixteen (16) inches greater than the outside diameter of the barrel of the pipe. Pipes larger than 24-inch diameter may have greater maximum trench widths upon approval of the Engineer.

1. Trench walls shall be vertical from bottom of trench to twelve (12) inches above the top of pipe. Above that point, trench wall shall be sloped as required to meet safety standards and

all pertinent OSHA Regulations. When Project conditions do not permit safe trench wall slopes, provide sheeting and shoring to protect excavation as specified in this section.

D. UNAUTHORIZED TRENCH WIDTHS: Where, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum specified above, either pipe of adequate design, total concrete pipe encasement, additional granular embedment or arch concrete encasements as required by loading conditions and as determined by the Engineer (at the Contractor's expense) shall be furnished and installed by and at the expense of the Contractor. The determination of necessary pipe, special embedment, or arch concrete encasement shall be based on a pipe strength equal to the minimum three-edge bearing ultimate strength stipulated in the governing pipe specifications for the size and kind of pipe involved with a safety factor of 65. Trench loadings will be based on saturated backfill weighing 120 (one hundred twenty) pounds per cubic foot with suitable allowance for truck or other live loads where required.

1. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

E. Embankment or fill: When pipe is to be installed in embankment or fill, the embankment shall be constructed in accordance with APWA section 2102.6 and shall be built up to a plane at least 18 inches above the top of the pipe prior to the excavation of the sewer trench.

F. MECHANICAL EXCAVATION: The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground; in all such locations, hand excavating tools and methods shall be used.

1. Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the control of the rough trench excavation bottom elevation is accurate and positive at all times, that uniform trench widths and vertical side walls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench and that the trench alignment is such that the pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and side walls of the trench as excavated at all points. Undercutting of the sidewall to obtain such clearance will not be permitted.
2. All mechanical trenching equipment, its operating condition, and the manner of its operations, shall be subject at all times to the approval of the Engineer.

G. BLASTING: The use of explosives is not allowed.

H. BELL HOLES: Excavation for bell holes for the various types of joints to be made, excavation for assembling and bolting mechanical joints or couplings, excavation in trench banks to provide additional working space, and any other excavation outside of rough excavation limits which may be required for pipe jointing operations shall be performed prior to the installation of the specified bedding material below pipe subgrade elevations to prevent contamination of the bedding material.

1. Bell holes for mechanical joint pipe shall provide adequate clearance for the tools and methods used in installing and bolting the joints.
2. Bell holes for boltless gasketed joint pipe shall be excavated to provide at least one-inch clearance between the pipe bell and the bottom of the bell hole.
3. Excavations for the installation of Dresser type couplings on steel pipe shall have a length of twenty-six (26) inches parallel to the center line of the pipe, shall be centered on the middle of the joint, and shall provide a clearance of two (2) feet on the sides of an eighteen (18) inches below the bottom of the pipe.
4. Regardless of the type of joint, all excavations shall be of sufficient size and depth that the joints can be properly made and so that no part of the pipe bell, will be in contact with the trench bottom or pipe bedding thereon.

I. DEWATERING OF TRENCHES: Pipe trenches shall be kept free from water during excavation, fine grading, pipe laying and jointing, and pipe encasement operations in an adequate and acceptable manner. Where the trench bottom is mucky or otherwise unstable because of the presence of ground water, and in all cases where the static ground water elevation is above the bottom of any trench or bell hole excavation, such ground water shall be lowered by means of well point and pumps or by other means acceptable to the Engineer, to the extent necessary to keep the trench free from water and the trench bottom stable at all times when work within the trench is in progress. The disposal of waste water from trench dewatering operations shall be subject to the approval of the Engineer at all times; such waste water shall be conducted to existing drainage ditches, channels, or drains. Surface water shall be diverted to prevent it from entering trenches.

J. CUTTING CONCRETE PAVEMENT AND WALKS: Pipe lines constructed under paved roadways may be constructed by open cut trenching except at specific locations designated on the Plans where they shall be placed by boring, or a combination of boring and jacking. Brick pavement, concrete pavement and all types of concrete base pavement, may be removed or cut only where, in the manner, and to the extent specified herein or authorized by the Engineer. Cuts shall be no larger than necessary to provide adequate working space for proper installation of pipe and pipe line appurtenances. The cutting of pavements along each side of trenches and at structures shall saw cut. The saw cut shall be full depth of the pavement. Concrete pavement and walks shall be placed to existing joints.

1. Concrete pavement, brick and concrete base pavement over trenches excavated for pipe lines shall be removed to a width not less than twelve four (24) inches wider than the width of the trench at the pavement subgrade, which trench width shall not exceed the minimum permissible trench width for the size and type of pipe which is to be installed in the trench by more than twelve (12) inches. The trench width at the trench bottom shall not be greater than at the top and no under-cutting will be permitted. A shoulder not less than twelve (12) inches in width at any point shall be left between the cut edge of the pavement and the top edge of the trench. Pavement cuts shall be made to and between straight lines that, unless otherwise required, shall be parallel to the centerline of the trench.
2. Where the line of trench parallels the length of concrete walks and the trench location is all or partially under the walk, then the entire walk shall be removed and replaced. Crossings not more than eight (8) feet in length shall be accomplished by tunneling where the line of trench crosses concrete walks, curbs or gutters with approval of the engineer. If necessary to remove concrete curbs, gutters or walks, they shall be replaced to and between existing joints.

K. UNPAVED ROAD CROSSINGS: Unpaved roads, driveways or streets may be crossed by trenching unless otherwise noted on the Plans. The Contractor shall install suitable barricades and lights at open trenches and take any precautions necessary to protect the public from damage and as required by the Owner. The Contractor will be financially responsible for any damage or suits arising from said crossings and shall save and hold harmless the Owner and the Engineer from any claims arising from this construction. The surface shall be replaced to permit prompt opening to traffic. The Contractor shall arrange his work to insure that streets, driveways, and roads be closed no longer than necessary for construction operations. Surfacing of unpaved streets, alleys, driveways and other traveled ways shall match existing surface depth and type of surface material.

L. EARTH EXCAVATION BELOW PIPE SUBGRADE: Pipe trenches shall be excavated below pipe subgrade elevations as shown on the Plans to provide for the installation of pipe bedding material as specified hereinafter.

M. PIPE CLEARANCE IN ROCK: Where rock is encountered in excavating and where it is necessary to place pipe in rock excavation, the rock shall be removed to provide a minimum clearance, for the size of the pipe being laid as set forth in the following table:

.....

Size of Pipe	Below Pipe	At Side of Pipe
24" and smaller	6"	4"
24" to 36"	9"	6"
42" and larger	12"	6"

1. The clearance figures given in the above table are minimum clearances from the closest projection of the rock to the outside edge of the pipe, and are not average figures. All material removed from the trench in order to provide the above-specified clearance shall be replaced below and at the sides of the pipe with approved backfill material. All replacement materials specified shall be furnished and installed by and at the expense of the Contractor.

N. TRENCH BOTTOM STABILIZATION: Trench bottoms which become soft, mucky, or otherwise unstable during construction operations shall be stabilized, by and at the expense of the Contractor, with one or more layers of crushed rock or other suitable material, where and as necessary to provide a firm and stable base for granular pipe bedding material. Not more than half-inch depth of mud or muck shall be allowed to remain on the stabilized trench bottom when the granular fill pipe foundation material is installed.

O. ARTIFICIAL FOUNDATIONS IN TRENCHES: Whenever so ordered by the Engineer, the Contractor shall excavate to such depth below grade as the Engineer may direct and the trench bottom shall be brought to grade with such material as the Engineer may order installed. All timber, concrete foundations, wooden inverts, pipes, posts, stringers, and/or saddles, made necessary by quicksand or other treacherous soil, shall be installed as directed by the Engineer. Compensation for extra excavation, timber, concrete, or other foundations, except where provided by Contract unit prices, shall be made in subsidiary to other bid items in the Contract.

3.10 SHEETING AND SHORING

A. TRENCH BRACING AND SHEETING: Except where trench banks are cut on a stable slope to prevent caving or sliding, trenches shall be properly and substantially braced, and sheeted if and where necessary, to prevent caving or sliding and to provide adequate protection to workmen and to the pipe line during and after the construction thereof. Sheeting shall not be pulled until after the initial backfill is complete and then the space left from the sheeting shall be filled immediately and the backfill re-compacted.

1. Fill voids with approved backfill material while shoring and bracing, and as sheeting is removed.
2. Where sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported by stakes driven into the trench bottom on each side of the pipe and with the tops of the stakes supported by cross braces above the top of the pipe or by other means, approved by the Engineer, which will not result in the application of concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe for the purpose of supporting sheeting in the bottom of the trench may be removed after the specified pipe embedment has been completed beyond the point of cross brace removal.
3. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
5. 4.Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, sub-drainage, damp proofing, waterproofing and perimeter installation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring, bracing and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Backfill placed within building areas and in areas to be paved should consist of approved materials, which are free of organic matter and debris. The procedures and recommendations in the Geotechnical Engineering Report and in this specification shall be used. The Geotechnical Engineering Report shall govern if discrepancies exist.

C. Place backfill on subgrades free of mud, frost, snow or ice.

D. Materials within 24 inches of the building floor slab and any granular leveling should be a select, low volume change materiall.

   1. Materials within 8” below the Low Volume Change layer shall be evaluated for moisture content. If the content is inadequate, the 8” layer shall be removed and re-compacted in a maximum of 8” (loose thickness) lifts with adequate moisture conditioning and compaction.

B. Structural fill materials (LVC) should be free of organic matter and be compacted to a minimum of 95 percent of the maximum dry density within 0% and +4% of the optimum moisture content as determined by Standard Proctor ASTM D 698.
   1. Structural Fill should extend a minimum of ten (10) feet outside of the building line to the north, east and south and five (5) feet outside of the building line to the west. The top of slopes should also be a minimum of ten (10) feet outside of the building line.

C. Fill should be placed in no greater than eight (8) inch loose lift thickness (6” compacted thickness) in mass fill areas and as needed to obtain proper compaction in utility trenches and behind walls.

D. The 24” LVC layer beneath the building slab (or 6” LVC layer beneath the 12” aggregate base material in the mechanical room area, see below) can consist of the following:
   1. Low Swell Potential soils (LL,45, PI<25) that are compacted to at least 95 percent of the maximum dry density as determined by ASTM D 698 and a moisture content of 0% to +4% of optimum. The moisture content of the subgrade soils shall be maintained within this range until completion of the building floor slabs and/or placement of the new pavement sections. Rutted subgrade should be repaired prior to placement of base rock to avoid a potential water trap and subsequent subgrade heave.

   2. Within the mechanical room floor slab that houses the boilers, a minimum of 12” of crushed limestone aggregate shall be placed below the building floor slab and leveling course. This 12” layer shall be placed in 6” lifts and compacted to a minimum of 95% of the material’s maximum dry density as determined by ASTM 698.
      a. The 12” aggregate shall be substituted for 18” of the low volume change material (select fill). Therefore, there is an additional 6” of low volume change material below the 12” layer for a total of 18” low volume change materials. This is different from the 24” LVC layer to be constructed in the other areas of the building.
      b. This area consists of the Mechanical Room of the building.

c. The layer shall extend a minimum of 5’ beyond the building footprint.
d. Crushed limestone shall be KDOT AB-3.

3.12 TRENCH BACKFILLING

A. TRENCH BACKFILL: The kinds of backfill materials to be used and the methods of placing and compaction shall conform to the requirements shown on the Plans. Employ placement method that does not disturb or damage foundation perimeter drainage and utilities in trench.

1. After each pipe has been graded, aligned and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to firmly hold and maintain the pipe in proper position and alignment during subsequent pipe jointing, embedment and backfilling operations.
2. Pipe embedment material, in each case, shall be deposited in the trench in such manner that it is scattered along the sides of the pipe and not dropped in compacted masses. In addition, such material shall be deposited, and compacted where required, uniformly and simultaneously on each side of the pipe in order to prevent lateral displacement of the pipe.
3. Drainage maintenance: Backfilling of trenches for pipe installed beneath and/or across roadways, driveways, walks and other traffic ways adjacent to drainage ditches and water courses shall not be done prior to the completion of backfilling to the original ground surface of the trench on the upstream side of such trafficway in order to prevent the impounding of water at any point after the pipe has been laid, and all necessary bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained. Backfilling shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed and the section, grades and contours of such ditches or water courses restored to their original condition, in order that surface drainage will be obstructed no longer than necessary.
4. Protection of trench backfill in drainage courses: Where trenches are constructed in or across roadway ditches or other watercourses, the backfill shall be protected from surface erosion by adequate means.
5. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
6. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
7. Place and compact initial backfill of subbase material, free of particles larger than 2 inches, to a height of 12 inches over the utility pipe or conduit.
8. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
9. Coordinate backfilling with utilities testing.
10. Place and compact final backfill of satisfactory soil material to final subgrade.
11. Install warning tape directly above utilities, 12 inches (min.) - 30 inches (max.) below finished grade.

B. Embankment or fill: When pipe is to be installed in embankment or fill, the embankment shall be constructed in accordance with APWA section 2102.6 and shall be built up to a plane at least 18 inches above the top of the pipe prior to the excavation of the sewer trench.

C. BACKFILL MATERIALS AND PLACEMENT

1. Granular Fill: Granular material for pipe bedding and initial backfill or replacement of rock or unsuitable foundation material removed from trench bottoms shall consist of crushed

limestone or pea gravel and shall be free from clay, and other materials which would cause the materials to crack or cake. When tested with square mesh laboratory sieves, the fill material shall meet the requirements as specified below.

3.

Cleaned & Washed Crushed Limestone with following characteristics:
Retained on 3/4 inch sieve……..…0%
Retained on ½ inch sieve…..……15% to 35%
Retained on 3/8 inch sieve…….40% to 70%
Retained on No. 4 sieve……..90% to 100%
Deleterious Substances, maximum……..5%

a. All granular fill material beneath the pipe shall be compacted no more than necessary, in order to insure a slightly yielding support for the pipe placed thereon. Such material shall be loosely poured or scattered into the trench, to a maximum depth of twelve (12) inches at any point, before spreading or leveling. When deposited in the trench, granular fill material beneath the pipe shall be spread and graded to provide a uniform and continuous support for the installed pipe at all points between bell holes or pipe joints, except that it will be permissible to disturb or otherwise damage the finished subgrade surface by the withdrawal of pipe slings or other lifting tackle.
b. All granular fill material above the bottom of the pipe shall be placed in not to exceed six (6) inch layers and compacted by adequate tamping, vibration, slicing with a shovel, rodding, or by a combination thereof. All backfill compaction equipment, and the results obtained thereby, shall be subject at all times to the approval of the Engineer.

2. Embedment: Embedment shall be as specified in the plans. This material shall be granular, sand or gravel or select backfill as specified in this specification or in the plans.

a. Embedment for pipes with Pipe Stiffness (PS) of 100 or less. This category includes all PVC pipe except schedule 40 and HDPE pipe. Embedment shall consist of specified material to a point 6 inches above the top of pipe. A 6” layer of select backfill shall be used on top of the specified material to a point 12” above the top of the pipe Care shall be taken to insure that embedment material is worked in around the haunches of the pipe. Embedment material shall be compacted as specified for Type A compaction.
b. Embedment for pipes with Pipe Stiffness (PS) over 100. This category includes PVC pipe meeting the requirements of ASTM 2665 (Schedule 40), ductile iron pipe, reinforced concrete pipe and corrugated steel pipe. The Embedment shall consist of specified material to the springline of the pipe. Select backfill shall be used from the springline to 12” above the top of the pipe. Care shall be taken to insure that embedment material is worked in around the haunches of the pipe. Embedment material shall be compacted as specified for Type A compaction.
c. All embedment material shall be placed in not to exceed eight (8) inch layers (loose measurement) and compacted compacted to 95% (ninety percent) maximum density as determined by ASTM Designation D698 by means of suitable equipment or by tamping with mechanical tampers or hand tampers.
d. Granular fill may be substituted for all or part of the embedment.

3. Final Backfill
a. All final backfill under building or paved areas shall be select backfill.
b. The top portion of backfill beneath established sodded areas shall be finished with not less than six (6) inches of topsoil.
c. Backfill trenches to contours and elevations with unfrozen fill materials.
d. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

e. Do not leave more than 50 feet of trench open at end of working day.
f. Place fill material in continuous layers and compact in accordance with COMPACTION SECTION.
g. Protect open trench to prevent danger to the public.

D. UNSUITABLE BACKFILL MATERIAL: No material shall be used for trench backfill which contains rocks or clogs greater than three (3) inches in any dimension, frozen material, debris, junk, or organic material. Such material shall be removed from the backfill and deposited at the direction of the Engineer.

E. DISPOSAL OF EXCESS EXCAVATED MATERIALS: Except as otherwise permitted, all excess excavated materials shall be disposed of away from the work and at a site approved by the Engineer.
1. Broken concrete and other coarse debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be and actually installed in trench backfill, junk and debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site of the work and at a site approved by the Engineer.
2. The disposal of waste and excess excavated materials, including all hauling, handling, and spoil bank leveling and surfacing shall be a subsidiary obligation of the Contractor and the full cost thereof shall be considered as being included in and fully covered by other items in the contract.

F. PROTECTION OF TREES AND SHRUBBERY: No trees shall be removed except where their removal is shown on the Plans or is authorized by the Engineer. Main tree roots shall not be cut except where they fall within the area to be occupied by the pipe. Excavation shall be done by hand where necessary to prevent injury to roots or trees. Trees that are left standing shall be adequately protected from permanent damage by reason of construction operations. Trimming of standing trees where required shall be as directed by the Engineer. All shrubbery outside of the construction limits, which is damaged or removed by the Contractor, shall be replaced under the direction of and to the satisfaction of the Owner, by and at the expense of the Contractor.

G. INTERRUPTION OF TRAFFIC: Interruption to through traffic on streets and roads will be kept to a very minimum and provisions shall be made to permit local traffic to serve residences in the vicinity of the work at all times.

H. REMOVAL AND REINSTALLATION OF ITEMS: Street signs, street stop signs, mail boxes and other existing items noted on the Plans or found within construction limits shall without damage be removed, stored, and reinstalled in a condition comparable to pre-existing condition prior to construction. No separate payment will be made for those items but shall be considered subsidiary to other pay items in the Proposal.

3.13 APPROVAL OF SUBGRADE

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade with a tandem-axle dump truck (with geotechnical engineer present) to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
1. Tandem-axle truck shall be a minimum of 20 tons gross weight.
2. Proof rolling limits to extend a lateral distance of at least 3’ outside of pavement and backs of curbs.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect. In areas where reconstruction or reworking of the subgrade is required due to unstable conditions, unsuitable soils, or as indicated on the drawings, the Contractor shall undercut the area to a stable and firm strata and backfill as directed by the Architect or the Geotechnical Engineer. Backfill shall be accomplished in not more than 6-inch lifts (compacted) with soil meeting the requirements of satisfactory material. All material beneath floor slabs and leveling course, within the top 24 inches of the subgrade must be low volume change material (see Section 3.11 Backfill for additional information). The contractor must meet the following density and moisture requirements:
   1. Satisfactory soils:
      a. Compacted to at least 95% but not more than 100% of standard proctor maximum Density.(ASTM D 698)
      b. Moisture content is 0% to +4% above optimum. (ASTM D 698)
   2. Fill material beneath Low Volume Change Zone (extending at least 10’ horizontally beyond the building footprint and 2' beyond pavement edge or backs of curbs):
      a. Lifts not exceeding 9” in loose lift thickness, compacted to at least 95% of standard proctor maximum density. (ASTM D 698)
      b. Moisture content is 0% to +4% above optimum. (ASTM D 698)
   3. Low Volume Change Zone (PI less than 20, LL less than 45).
      a. Lifts not exceeding 9” in loose thickness compacted to at least 95% of standard proctor maximum density.
      b. Moisture Content: 0% to 4% above optimum. (ASTM D 698)

   4. Paved Areas: Upper 8 inches of exposed subgrade and all additional fill.
      a. 0 to +4% above optimum moisture content (ASTM D-698).

F. Excavation in the building pad area shall allow for the placement of low volume change material. All subgrade materials within 8 inches of the bottom of the low volume change material must be evaluated for moisture content and stability. All soils that do not meet the specified moisture content above shall be re-worked and compacted to 95 percent standard density and moisture contents as identified above.

G. If the soils do not have to be reworked or replaced, the top 8-inches of soil shall be reworked and compacted to 95 percent standard density and at least 0 percent to plus 4 percent of optimum moisture content.

3.13 SOIL FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Prior to placing fill, the existing grade shall be inspected by the geotechnical engineer. All materials within 8 inches of the bottom of the low volume change material must be evaluated for moisture content and stability. If the soils are outside of moisture content range as identified in previous section, the soils shall be reworked and replaced in not to exceed 8-inch lifts between 95 to 100 percent standard density and at moisture content as noted in previous section. If the soils do not have to be reworked or replaced, the top 8-inches of soil shall be reworked and compacted to 95 percent standard density and at moisture content identified in previous section.

D. Place and compact fill material as defined in Section 3.16 “Compaction of Backfills and Fills”.

E. Fill placed within building areas and in areas to be paved should consist of approved materials, which are free of organic matter and debris. The procedures and recommendations in the Geotechnical Engineering Report and in this specification shall be used.

3.14 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to the requirements in the Geotechnical Engineering Report.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

3.15 COMPACTION OF UTILITY TRENCHES

A. Prior to the placement of either structure backfill or trench backfill, a Standard Proctor Curve as determined by AASHTO T 99 (ASTM D 698) shall be obtained for each type of backfill material to be used.

   1. Proctor curves shall be obtained from soil samples selected by a certified testing laboratory from materials excavated by the Contractor.

   2. All costs associated with the selection of soil samples and performing the necessary tests to obtain the Proctor curves shall be paid by the Owner.

   3. Selection of the correct Proctor curve for a particular backfill material shall also be done by the Contractor’s certified testing laboratory.

   4. During backfill operations, soil density tests shall be taken by the Geotechnical Engineer or his representative. When results indicate that compaction does not meet the requirements of these Specifications, the material shall be removed and replaced or re-compacted as necessary to meet the specified requirements at no additional expense to the Owner. Additional tests shall be performed on re-compacted area to insure compliance with the requirements.

B. Compacted backfill material shall be placed in layers and compacted by means of suitable equipment or by tamping with mechanical tampers or hand tampers.

   1. Place and densify embedment material by shovel slicing or vibrating and prepare embedment material so that the pipe will be true to line and grade after installation.

   2. After each pipe has been brought to grade, aligned, and placed in final position, deposit and densify by shovel slicing sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations. Place bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

C. Compacted backfill within two (2) feet of water valve boxes, wyes, and riser pipes shall be hand tamped. Compacted backfill within five (5) feet of sanitary sewer manholes and storm sewer structures shall be hand tamped. Ditch plugs at the pipe outlet and at interval points constructed to the limits specified herein shall be compacted to Type A compaction as specified in this section.

D. All hand placed backfill shall be deposited and spread with hand tools in uniform layers not more than eight (8) inches in thickness on each side of the pipe and for the full width of the trench where above the pipe.

E. TYPE A COMPACTION: Each layer shall be compacted to a density equal to or greater than 95% (ninety-five percent) maximum density. Each successive layer shall contain only the amount of material which will insure proper compaction, but in no case shall any layer be greater than eight (8) inches (loose measurement). The moisture content of the soil to be used for backfill shall be uniform and shall be within plus or minus two percentage points of optimum moisture for the soil.

1. Type A Compaction shall be use under all pavements, sidewalks, curb and gutter, stairs, railings, and structures or buildings or as designated on the plans.

2. The contractor shall certify that 95% (ninety-five percent) compaction has been achieved. Results of tests performed shall be submitted to the Engineer.

3. Testing frequency shall be at each compacted initial and final backfill layer at least one test for each 150 feet or less of trench length, but no fewer than two tests per layer.

   a. Additional testing shall be taken at the recommendation of the engineer or in areas where compaction of trench initial or final backfill is in question.

4. Where applicable, Type A compaction shall begin and end a minimum of 1' behind the back of curb or edge of pavement on street or pavement crossings.

5. The maximum density of the soil shall be determined by ASTM designation: D698. The test to determine the maximum density of the soils (Standard Proctor) shall be performed by an approved testing laboratory without cost to the Owner.

6. Backfill shall be composed of selected excavated material or approved borrow material.

7. Flowable Fill: A controlled low-strength material (flowable fill) may be substituted for Type A compaction. The materials used shall be the following in the approximate quantities per cubic yard:

Cement	100 lbs./Type 1
Water	370 lbs.
Fine Aggregate	3,400 lbs., 100% smaller than half inch; 0 to 10% smaller than No. 200 sieve.

   a. These proportions may be field adjusted to provide a fill that readily flows around the pipe. The fill shall be placed on both sides of the pipe simultaneously so that both sides are kept approximately equal. The pipe shall be secured in place against floatation and movement prior to placement of the fill to secure. The fill shall be placed to the bottom of the pavement to be placed over the trench.

F. TYPE B COMPACTION: Type B Compaction shall be used in all other areas not requiring Type A compaction as stated in this specification or as designated in the plans.

1. Type B Compaction shall be placed in layers and compacted by means of suitable equipment or by tamping with mechanical tampers or hand tampers. Each layer shall be compacted to a density equal to or greater than 90% (ninety percent) maximum density. Each successive

layer shall contain only the amount of material which will insure proper compaction, but in no case shall any layer be greater than eight (8) inches (loose measurement). The moisture content of the soil to be used for backfill shall be uniform and shall be within plus or minus two percentage points of optimum moisture for the soil.

2. The Contractor shall certify that 90% (ninety percent) compaction has been achieved. Results of tests performed shall be submitted to the Engineer.

3. Testing frequency shall be at each compacted initial and final backfill layer at least one test for each 500 feet or less of trench length, but no fewer than one test per layer.

   a. Additional testing shall be taken at the recommendation of the engineer or in areas where compaction of trench initial or final backfill is in question.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place fill and backfill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

a. Materials compacted within the CORPS Critical Zone shall not be compacted by hand tamping or backhoe compaction methods.

B. Compacted fill should consist of inorganic low to moderate plasticity silty clays with liquid limits less than 45 and a plasticity index of less than 20.

C. The upper eight inches (8") below the LVC layer shall be moisture conditioned and compacted prior to LVC layer placement.

D. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

E. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs, steps, and pavements, use the procedures and recommendations in the Geotechnical Engineering Report and as follows:

Subgrade Material	Density Requirements	Moisture Requirements
Satisfactory soils	95 – 100 percent (ASTM D-698)	0 to +4 percent
Subgrade Preparation	95 – 100 percent (ASTM D-698)	0 to +4 percent
Low volume change	95 – 100 percent (ASTM D-698)	0 to +4 percent

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot (3-m) straightedge.

3.18 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing as stated in section 1.5 QUALITY ASSURANCE.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,500 sq. ft. or less of building slab and 5,000 sq. ft. or less of pavement areas, but in no case fewer than three tests.
   2. Trench Backfill:At each compacted initial and final backfill layer at least one test for each 50 linear feet or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Geotechnical Engineer: reshape and re-compact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
   1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 312000

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SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Sections:
1. Division 31 Section "Earth Moving" for excavating, backfilling, site grading, and for site utilities.
2. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
3. Division 33 Section "Subdrainage" for permanent foundation wall, underfloor, and footing drainage.

1.3 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

1.4 SUBMITTALS

A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.

B. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Architect no fewer than two (2) days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Architect's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
2. The geotechnical report is included in the Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Monitor dewatering systems continuously.

E. Promptly repair damages to adjacent facilities caused by dewatering.

F. Protect and maintain temporary erosion and sedimentation controls, which are specified in the project drawings during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 FIELD QUALITY CONTROL

A. Observation Wells: Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

END OF SECTION 312319

SECTION 31 3116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Soil treatment with termiticide.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of termite control product.

1. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For termite control products, from manufacturer.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Final Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Corporation, Agricultural Products; Termidor.
b. Bayer Environmental Science; Premise 75.
c. FMC Corporation, Agricultural Products Group; Dragnet FT.
d. Syngenta; Demon TC.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 3116

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:
1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
2. Division 31 Section "Dewatering" for dewatering system for excavations.

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls, exposed utility conduits, piping, ductbanks and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.
1. The contractor shall coordinate with the individual utility companies for the acceptance of design of support systems for exposed utilities prior to beginning construction.
a. Utility Contacts are as follows:
1) Westar Energy: Wayne Kliewer (785) 575-1693
2) Kansas Gas Services: Dawn Hecker (785) 431-4251
3) AT&T: Keith Gatzemeyer (785) 276-5377
4) City of Topeka Water: Jeff Hunt (785) 368-3842
5) City of Topeka Sewers: Dennis Dunbar (785) 368-4344
6) Fiber Optic – State of Kansas: Rick Willoughby (785) 296-6069
7) Fiber Optic – Centurylink: Kyle Tostenson (318) 417-2768

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements."Qualification Data: For qualified [**land surveyor**] [**and**] [**professional engineer**].

1.5 QUALITY ASSURANCE

A. Pre-installation Conference: The Contractor shall arrange a pre-installation conference with the Architect & Owner prior to beginning construction to review all aspects of the excavation and intended support systems for the excavated sidewalls and suspended utilities due to excavation.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:

a. Geotechnical report.
b. Existing utilities and subsurface conditions.
c. Proposed excavations.
d. Proposed equipment.
e. Monitoring of excavation support and protection system.
f. Working area location and stability.
g. Coordination with waterproofing.
h. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Architect's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is included in the project manual for informational purposes only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
2. The geotechnical report is included in the Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in

elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Shotcrete: Comply with Division 03 Section "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.

F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

H. Tiebacks: Steel bars, ASTM A 722/A 722M.

I. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 96 inches below overlaying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."
3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Geotechnical Engineering Report: "Geotechnical Engineering Report, Proposed Children's Palace Addition", GeoSource Proj. No. D14G1378, November 26, 2014.

C. Kansas Department of Transportation (KDOT) "Standard Specifications for State Road and Bridge Construction", latest edition.

1.2 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Pavement-marking paint.

B. Related Sections include the following:

1. Division 31 Section "Earth Moving" for subbase and base courses.

1.3 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. KDOT: Kansas Department of Transportation.

1.4 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving materials, workmanship, and other applicable requirements in accordance with KDOT "Standard Specifications for State Road and Bridge Construction", latest edition .

1. Standard Specification: Division 1200, Asphalt Materials, of KDOT Standard Specifications.
2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: For each job mix proposed for the Work.

C. Qualification Data: For manufacturer.

D. Material Test Reports: For each paving material.

E. Material Certificates: For each paving material, signed by manufacturers.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

B. Regulatory Requirements: Comply with standards of KDOT for asphalt paving work.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Aggregates for asphaltic concrete shall conform to the requirements specified in KDOT Section 1100, Aggregates, Subsection 1103, Aggregates for Hot Mix Asphalt (HMA).

C. Mineral Filler: Limestone dust, Portland cement, or other inert material complying with AASHTO M 17 (ASTM D 242).

2.2 ASPHALT MATERIALS

A. Asphalt Cement/Binder: AASHTO MP 1-93, PG 64-22 for surface course mix, PG 64-22 for base course mix, unless otherwise specified.

B. Prime Coat: Cutback asphalt type; Comply with KDOT Standard Specification Section 1200, “Asphalt Material”, Subsection 1204, “Cutback Asphalt”.
1. Grades may vary may vary for surface and temperature conditions.

C. Tack Coat: Emulsified asphalt, Comply with KDOT Standard Specification Section 1200, “Asphalt Material”, Subsection 1204, “Emulsified Asphalt”.
1. Grades may vary may vary for surface and temperature conditions.

D. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type II.

1. Color: White for parking stripes. Yellow for Accessible Aisles and no-parking areas.

2.4 MIXES

A. Hot-Mix Asphalt:
1. Surface Course: Class A Commercial Grade SM-12.5A, by KDOT “Standard Specifications for State Road and Bridge Construction”, latest edition., except as amended:
a. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Surface Course: SR-12.5A, by KDOT “Standard Specifications for State Road and Bridge Construction”, latest edition., except as amended:
a. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subgrade using a fully loaded, tandem axle dump truck (minimum gross weight of 20 tons) to locate areas that are unstable or that require further compaction.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Total Pavement thickness shall match existing pavement thickness. Existing pavement thickness to be determined by the Contractor.

2. Place hot-mix asphalt base course in lifts not to exceed 3". Total number of courses as necessary to meet existing total pavement thickness minus 2" (surface course).
3. Place 2" hot-mix asphalt surface course in single lift.
4. Spread mix at minimum temperature of 260 deg F.
5. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
6. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

2. Perform Compaction testing according to KDOT Specifications Section 603 (603.05) or by pre-approved method. At the Engineer's discretion, one test may be taken daily, but no less that 1 test for each pavement thickness called out in the plans.

3. At the Engineer's discretion, one core may be cut and tested daily for conformance with thickness and/or density requirements. Additional tests, at the contractor's expense, may be necessary to determine limits of areas of deficiency. Equipment to cut cores shall be capable of cutting the mixture without shattering the edges or otherwise disturbing the core. The contractor shall, when necessary, furnish and apply cold water ice, or other cooling substance to the surface of the pavement to prevent the samples for shattering or disintegrating.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321216

SECTION 321313 – CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Geotechnical Engineering Report: "Geotechnical Engineering Report, Proposed Kansas Energy and Service Center", GeoSource Proj. No. D14G1399, December 31, 2015.

C. Kansas Department of Transportation (KDOT) "Standard Specifications for State Road and Bridge Construction", latest edition.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Commercial Driveways and roadways.
2. Commercial Curbs and gutters.
3. Commercial Walkways.

B. All concrete pavement, curbs & gutters and sidewalks that are to be constructed within the City right of way shall follow the City of Topeka Standard Technical Specifications for concrete materials and construction requirements.

C. Furnish materials, workmanship, and other requirements in accordance with KDOT standards and specifications except as revised by these plans and specifications.

D. Related Sections include the following:

1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Bonding agent or adhesive.
6. Joint fillers.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
1. Testing Agency shall be provided by the Owner.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

G. Codes and Standards: Comply with local governing regulations if more stringent that requirements herein specified.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
   1. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

   1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

C. Plain Steel Wire: ASTM A 82, as drawn.

D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

E. Tie Bars: ASTM A 615, Grade 40, deformed.

F. Hook Bolts: ASTM A 307, Grade A , internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Cementitious Materials:
   1. Portland Cement: ASTM C 150, Type I/II.

2. Class F Fly Ash: ASTM C618
3. Grade 120 Ground Granulated Bast Furnace Slag: ASTM C989

C. Aggregate: All aggregates shall conform to the requirements of subsection 1102 of the "Standard Specifications for the State Road and Bridge Construction", Kansas Department of Transportation, latest edition, except where otherwise provided by these specifications.

D. Course Aggregate: ASTM C 33, uniformly graded from a single source, as follows:
1. CPA-3, as defined by Subsection 1102 of the "Standard Specifications for State Road and Bridge Construction", Kansas Department of Transportation, 2007 edition.
2. Maximum Aggregate Size: ½ inch nominal.
3. Aggregate for pavement (excluding sidewalks, trails or ramps) shall be entirely granite, quartzite or trap rock easily field identifiable in concrete.
4. Aggregates for sidewalks, trails or ramps shall consist of washed crushed stone having clean, hard, durable, uncoated particles.

E. Fine Aggregate: FA-A, as defined by Subsection 1102 of the "Standard Specifications for the State Road and Bridge Construction", Kansas Department of Transportation, 2007 edition.
1. Do not use fine or coarse aggregates containing substances that cause spalling.
2. Aggregate shall consist of sand having clean, hard, durable, uncoated grains.

F. Water: Potable water meeting ASTM C 94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

2.5 CURING MATERIALS

A. A liquid membrane-forming curing compound shall be used for all applications, unless otherwise specified by the Engineer. The compound shall conform to the requirements for Type 2, white Pigmented Compound as specified in AASHTO M 148 and to the requirements of ASTM C 309.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. All newly placed concrete shall be cured immediately after finishing for a minimum of 7 days unless otherwise specified or approved by the Engineer. Formed surfaces shall be cured if forms are removed prior to 5 days after concrete placement.

2.6 AGGREGATE BASE COURSE

A. Aggregate Base Course shall consist of KDOT AB-3 in accordance with Division 1100, Section 1104 “Aggregates for Aggregate Base Construction” of the KDOT “Standard Specifications for the State Road and Bridge Construction”, latest edition, or approved equal.

B. Aggregate Base shall be constructed in accordance with KDOT Division 300, Section 305 ”Aggregate Base and Aggregate Shoulders” of the KDOT “Standard Specifications for the State Road and Bridge Construction”, latest edition.

C. Aggregate Base thickness to meet the specified minimum thickness indicated on the plans and in the Geotechnical Report.

D. Aggregate Base shall extend 1 foot outside of the back of curb or 1’ outside of the edge of concrete pavement.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751 and AASHTO M 213, non-extruding and resilient filler.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

1. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.
2. Flexural Strength (28 Days): 600 psi.
3. Maximum Water-Cementitious Materials Ratio: 0.44.
4. Slump Range: 1 inch - 3 inches.

D. Cementitious Materials:
1. Pavements (not including sidewalks, trails or ramps): 600 lbs consisting of either of the following:
   a. A minimum of 450 lbs of Type I/II Portland Cement combined with Grade 120 Ground Granulated Blast Furnace Slag at a minimum of 25% of the combined total cementitious weight.
   b. A minimum of 450 lbs of Type I/II Portland Cement combined with Class F Flyash at a maximum of 25% of the combined total cementitious weight.
2. Pavements (sidewalks, trails or ramps): 600 lbs consisting of either of the following:

a. Type I/II Portland Cement (6.4 sacks)

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
1. Air Content: 6.5 percent.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. General: All joints in concrete pavement shall be sealed with hot applied sealant.

C. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at ends of curb returns and changes in curb direction.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Space joints at fifteen (15') feet maximum or as noted on the plan set.

2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

a. Radius: 1/4 inch.

3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

G. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Install reinforcement as per one of the following methods:
1. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
a. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
2. Set welded wire fabric or fabricated bar mats on bar supports as specified in this section or concrete blocks of required height.

I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven

floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Re-float surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 6 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

B. Aggregate Base
   1. Elevation: No Plus Allowed, Minus ½ inch
   2. Thickness: Plus ½ inch, No Minus Allowed

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall coordinate with the Owner's qualified testing and inspection agency for sampling of materials, performance of tests, and submittal of test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:

   1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
   2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
   3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
   5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
   6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
   7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   8. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
   9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
   10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.

C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. 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 as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 – CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Kansas Department of Transportation (KDOT) “Standard Specifications for State Road and Bridge Construction”, latest edition.

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within portland cement concrete pavement.

B. All joints formed by sawing will be sealed with an approved joint sealant compound.

C. Surface joints formed by tooling do not need to be sealed.

D. Furnish materials, workmanship, and other applicable requirements in accordance with KDOT standards and specifications except as revised by these plans and specifications.

E. Related Sections include the following:
1. Division 32 Section "Concrete Paving" for constructing joints in concrete paving.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: Match Architect's samples or as selected by Architect from manufacturer's full range for this characteristic.

C. Joint Filler: For expansion joints, filler shall be non-extruding and resilient filler conforming to AASHTO M 213 and ASTM Designation D1751.

2.2 COLD-APPLIED JOINT SEALANTS

A. Sealing Materials: Cold type joint sealants shall conform to the requirements of ASTM D 1850. Sealant shall consist of a cold applied formulation that is self-priming and compatible with Portland cement concrete. Acetic acid cure sealants are not acceptable.

2.3 SILICONE JOINT SEALANTS

A. Silicone joint sealant shall be self-priming and compatible with portland cement concrete.
1. Silicone joint sealant shall be prequalified prior to use. The joint sealant shall be either Type I (non-self leveling) or Type II (Self leveling). Joint sealants shall be a one-part cold applied silicone formulation that is self priming to and compatible with Portland cement concrete. Acetic acid cure sealants are not acceptable. Type II sealants shall be self leveling within the joint and shall provide a satisfactory surface configuration without tooling. The silicone sealants shall comply with the following applicable test requirements:

PROPERTY		TYPE I	TYPE II
(1)	Skin development time, minutes	120 max.	120 max.
(2)	Cure-through	Pass	Pass
(3)	Extrusion rate, grams/minute	90-250	200-600
(4)	Non-volatile content, %	90 min.	90 min.
(5)	Bond to concrete, @ 0° F, 5 cycles		
	100% (one-hundred percent) extension	pass	pass
(6)	Compression set	pass	pass
(7)	Elongation, %	600 min.	1000 min.

2.4 HOT TYPE JOINT SEALANTS

A. The sealant shall meet all applicable requirements of ASTM 3405. Sealant shall be applied with a pressure applicator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with

joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

F. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 32 9200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Seeding.

B. Related Sections:

1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
3. Division 32 Section “Plants” for exterior planting.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

E. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

G. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

H. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

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

1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass. Include identification of source and name and elephone number of supplier.

C. Qualification Data: For qualified landscape Installer.

D. Product Certificates: For soil amendments and fertilizers from manufacturer.

E. Material Test Reports: For existing native surface topsoil, existing in-place surface soil, and imported or manufactured topsoil.

F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and prairie meadows during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful native turf and prairie meadow establishment.

1. Experience: Three (3) years' experience in native turf and prairie meadow installation in addition to requirements in Division 01 Section "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Spring Planting: May 15th-June 15th.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

A. Initial Turf and Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf/grass stands are established but for not less than the following periods:

1. Seeded Turf: 90 days from date of planting completion.

a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America.

B. Seed Species: State-certified seed of grass species as follows.
1. Seeded Lawn Areas (seed blend)
a. Seeded lawn areas shall consist of a blend of 90% Turf-type Tall Fescue and 10% Kentucky Bluegrass. The blend may consist of any of the varieties in the following Schedule, or approved equal.
b. All Turf-Type Fescues shall have a minimum 70% average endophyte level.
c. Architect to have final approval of all seed blends and mixes.

Name	Min. Pct. Germ.	Min. Pct. Pure Seed	Max. Pct. Weed Seed
Coyote Turf-Type Tall Fescue	85	98.85	0
Falcon II Turf-Type Tall Fescue	85	98.85	0
Jaguar 3 Turf-Type Tall Fescue	85	98.85	0
Rembrandt Turf-Type Tall Fescue	85	98.85	0
Millennium Turf-Type Tall Fescue	85	98.85	0
Midnight Kentucky Bluegrass	85	95	0
Moonlight Kentucky Bluegrass	85	95	0
Fairfax Kentucky Bluegrass	85	95	0

2. Contractor shall furnish certification showing origin of all seed and pure live seed (PLS) purity times percent germination. Each bag of seed shall be tagged and sealed by the seed dealer in accordance

with the State Department of Agriculture or other local certification authority within the state of origin. The label shall indicate analysis of seed and date of analysis, which shall not be more than nine (9) months prior to delivery date. Seed may be premixed by the seed dealer and appropriate data indicated on the bag label for each variety.

2.2 FERTILIZERS

1. Do not fertilize native prairie meadow areas.

2. Turf areas may be fertilized with a controlled release, nitrogen-only fertilizer at a rate of 0.25-0.75 pounds of actual nitrogen per 1,000 square feet. Apply fertilizer in June during active growing period of grass.

2.3 TOPSOIL

A. ASTM D 5268, pH 5.5-7.0, 4 percent organic material minimum, free of stones 1 inch and larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley. 65% of mulch by weight shall be 10 inches or longer. Combine mulch with colloidal tackifier.

2.5 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long. Use on slopes greater than 4:1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Soil clumps or clods shall not be larger than 3 inches (75 mm) in diameter. Remove stones larger than1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Spread planting soil to a minimum depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

D. Limit fine grading to areas to be promptly planted.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

G. Seedbeds should be permitted to settle or should be firmed by rolling before seeding.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate 2 lb/1000 sq. ft. (0.9 kg/92.9 sq. m) for turf areas.

C. Rake seed lightly into top 1/2 inch (12 mm) of soil, roll lightly, and water with fine spray. Wet seeded turf areas thoroughly and keep moist, but not saturated, at all times until grass is up.

D. Protect seeded areas with slopes exceeding 4:1 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 4:1 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

F. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm) and roll surface smooth.

3.6 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 2 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mowing: Mow as needed while grass is establishing in order to control the growth of weeds.

D. Fertilizing: Fertilize at rates and times stated above after grass establishment and when actively growing.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.8 Watering: Install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water meadow with fine spray at a minimum rate of 1/2 inch (13 mm) per week for four weeks after planting unless rainfall precipitation is adequate.

3.9 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 9200

SECTION 32 9300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Shrubs, groundcovers and perennials.
2. Fertilizer and mulch.
3. Soil amendments.
4. Initial maintenance of landscape materials.

B. Related Sections:

1. Division 32 Section "Turf and Grasses" for turf (lawn) planting.

C. Do not make Plant Substitutions without the consent of the Architect.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

E. Finish Grade: Elevation of finished surface of planting soil.

F. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

G. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

H. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

I. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

J. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

K. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

L. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

M. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

N. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including soils.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than fifty (50) plants are required, include a minimum of three (3) photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. Weed Control Barrier: 12 by 12 inches.
2. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.

C. Qualification Data: For qualified landscape Installer.

D. Planting Schedule: Indicating anticipated planting dates for exterior plants.

E. Maintenance Instructions: Provide typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced, full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. 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 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.

E. Plant Material Observation: Architect retains right to observe plant material both at place of growth and at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality.

1. Architect further retains the right for:

a. Observation of shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

b. Observation of plant material after installation for conformance with Construction Documents and Specifications and to reject plants not installed in conformance with Drawings and Specifications.

c. Observation of plant material at end of warranty period.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable. Use all means necessary to protect all materials from deterioration before and during delivery, and while stored on site. Protect the installed work and materials of all other trades.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, and soil amendments with appropriate certificates.

C. Deliver exterior plants freshly dug.

D. Do not prune shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling. Plants with damaged or broken root balls or containers shall be rejected.

E. Handle planting stock by root ball.

F. Deliver plants after preparations for planting have been completed, and install immediately. Contractor shall be responsible to coordinate with Architect when planting preparations are complete. Architect shall be notified 72 hours in advance when trees shall be delivered for final approval of product. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist. All plant material shall be installed within five (5) calendar days of being delivered to Project site. It shall be Contractor's responsibility to coordinate delivery of plant material with all other site construction in order to ensure plant material does not remain unplanted.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

G. Replacements: In the event of damage or rejection, immediately make all repairs and replacements necessary to the approval of the Architect. Owner shall be reimbursed for plant material cost.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify Architect no fewer than two (2) days in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without Architect's written permission.

C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting (Shrubs): February 15-May 31.
2. Fall Planting (Shrubs): September 15-December 15.
3. Spring Planting (Warm Season Grasses): May 15-June 15.

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Planting shall not occur during times of severe drought or when ground is frozen. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. Coordination with Turf Areas (Lawns): Plant shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor’s control.
   a. Warranty period for Shrubs: One year from date of Final Completion.
   b. Remove dead plants immediately. Replace immediately unless required to plant in the succeeding planting season.
   c. Replace plants that are more than 25 percent dead or in an unhealthy condition at the end of the warranty period.
   d. A limit of one replacement of each plant will be required, except for losses or replacements due to failure to comply with requirements.
   e. Warranty lawns through specified lawn maintenance period, and until final acceptance.
   f. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.9 MAINTENANCE SERVICE

A. Shrubs: Maintain until acceptance of Substantial Completion. Maintain by pruning, cultivating, watering, weeding, fertilizing, tightening and repairing stakes and guy supports (if staked), and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings (if wrapped).

1. Maintenance Period: Three (3) months from date of Final Completion.

2. Maintenance Period for Seeded Lawns: Three (3) months from date of Final Completion, or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

3. Maintenance Period for Seeded Areas: Three (3) months from date of Final Completion, or if not considered acceptable at that time, continue maintenance the following spring until acceptable stand of grass is established.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label each shrub variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 EVERGREEN SHRUBS

A. Form and Size: Normal-quality, well-balanced, evergreen shrubs, or type, height, spread, and shape required, complying with ANSI Z60.1.

1. Provide container-grown Evergreen Shrubs

2.3 PERENNIALS

A. Provide healthy, disease-free plants of species and variety shown or listed, complying with ANSI Z60.1.

1. Provide perennial plugs or container-grown perennials.

2.4 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7.0, a minimum of 15 percent organic material content; free of stones 1 inch (25mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.5 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch (13-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

2.6 FERTILIZERS

1. Provide fertilizer only to correct deficiencies as determined by soil test. Do not fertilize native turf areas or areas to be seeded with native grass/wildflower mix.

B. Planting Tablets: Planting areas shall be fertilized with a controlled release formulation of plant fertilizer in a table size no less than 7 grams. Material to be Gro-Power 12-8-8 CRF or equal.

2.7 MULCHES

A. Cypress Mulch:
1. Premium Cypress mulch
2. No recycled content
3. Color: Readily available, natural color.

2.8 WEED-CONTROL BARRIERS

A. Composite Fabric: Dewitt Pro 5 Weed barrier or approved equal. Install weed barrier fabric only in tree planting areas to the outer extents of the tree pit. Do not install barrier fabric in shrub, perennial, grass or wildflower beds.

2.9 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Burlap: Non-synthetic, biodegradable.

C. Mycorrhizal Fungi: Mycorrhizal inoculant containing endomycorrhizal and ectomycorrhizal fungi in a tablet size no less than 7 grams. Material shall be Gro-Life or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. For ALL PLANTING BEDS, mix existing soil with Cotton Burr Compost at the rate of 1/2 cu. Ft. bag for 25 sq. feet and rototill to a depth of 4”. Then place plants and plant.

D. Lay out individual shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

E. Lay out plants at locations directed by Architect. Stake locations of individual shrubs and outline areas for multiple plantings.

F. Apply antidesiccant to shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Wrap shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 4 inches (100 mm.) Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

2. Spread planting soil to a depth required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle to a maximum depth of twelve inches (12”). Excavations with vertical sides are not acceptable. Root ball should protrude 2”-4” above grade. For root balls taller than 12”, further excavate center of planting pit to ensure root ball sits 2”-4” above grade, according to Drawings. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately five times as wide as ball diameter for balled and burlapped stock.
2. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
3. 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.
4. Maintain supervision of excavations during working hours.

5. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

C. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

D. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 SHRUB PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set balled and burlapped stock plumb and in center of planting pit or trench with top of root ball 2"-4" above adjacent finish grades.
1. Use planting soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Set container grown stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
1. Use planting soil for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 SHRUB PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape shrubs according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

C. Do not apply pruning paint to wounds.

3.7 GROUND COVER AND PERENNIAL PLANTING

A. Set out and space ground cover and plants other than trees and shrubs as indicated on Drawings, in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 PLANTING AREA MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm) and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.
1. Premium Cypress Mulch in Planting Areas: Apply 4-inch (100-mm) average thickness of premium cypress mulch over entire surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.9 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, adjusting and repairing tree-stabilization devices (if staked), resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.10 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

3.11 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 32 9300

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Kansas Department of Transportation (KDOT) “Standard Specifications for State Road and Bridge Construction”, latest edition.

C. Geotechnical Engineering Report: “Geotechnical Engineering Report, Proposed Kansas Energy and Service Center”, GeoSource Proj. No. D14G1399, December 31, 2015.

1.2 SUMMARY

A. This Section includes gravity-flow, non-pressure storm drainage outside the building, with the following components:

1. Cleanouts.
2. Precast concrete manholes.
3. Stormwater Inlets

1.3 SUBMITTALS

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

B. Shop Drawings: For manholes and catch basins. Include plans, elevations, sections, details, and manhole frames and covers and catch basin frames and grates.

C. Field quality-control test reports. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PE PIPE AND FITTINGS

A. Corrugated High Density Polyethylene (HDPE) Drainage Pipe and Fittings NPS 10 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated HDPE Pipe and Fittings NPS 12 and Larger: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

C. Corrugated High Density Polyethylene (HDPE) Perforated Drainage Pipe and Fittings (Underdrain), NPS 4: AASHTO M 252, Perforation Class II.
1. Pipe under roadway shall have a minimum pipe stiffness value of 100 psi @ 5% deflection.
2. Perforations located in the outside valleys of the corrugations, circular or slotted and evenly spaced around the circumference and length of the pipe
3. Water inlet area not less than 0.945 in^2/ft.
4. Soiltight Couplings: AASHTO M 252, corrugated matching tube and fittings.

D. Pipe shall have integral wall bell and spigot joint with gaskets conforming to ASTM F477. Natural Rubber gaskets will not be accepted.

2.3 REINFORCED CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall “B” or “C” or the latest revision thereof.
1. The end joints shall be either bell and spigot or tongue and groove. For all pipe both ends of the pipe shall be concentric with the base of the pipe and they shall be smooth, true and free from spalls and other defects and shall be formed in such a manner to insure accuracy and roundness between pipe and manhole. The connectors clamped to pipes and grouted into manhole walls must be used as rigid connections.
a. Gaskets: ASTM C 443, rubber

2.4 ALUMINIZED STEEL (CORRUGATED METAL)

A. Type 2 Corrugated Steel Pipe and fittings: AASHTO M 36. US Standard Gage for corrugated steel pipe shall be in accordance with the Standard Detail Drawings. Joints shall be either Hugger-type or Bell and Spigot.

1. Bell and Spigot Joints. Shall conform to “CONTECH Quick Stab Joint”, or equal 18” through 48” diameter.
2. Hugger-type Joints. Shall conform to “CONTECH HUGGER Band”, or equal for pipes sizes 15” and larger.

2.5 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings: According to the following:
1. The pipe shall be made of PVC plastic having a cell classification of 12454-B or 12454-C as defined in ASTM D 1784.

2. Push-on joints shall conform to ASTM D 3212 and gaskets to ASTM F 477. Solvent cements for joining pipe and socket-type fittings shall conform to ASTM D 2564.
3. PVC Sewer Pipe and Fittings, 4 in. and 6 in: ASTM D 2665 (Schedule 40 wall thickness)
4. PVC Sewer Pipe and Fittings, 8" throuth 15": ASTM D 3034, SDR 35.
5. PVC Sewer Pipe and Fittings, 18" and Larger: ASTM F 679, PS-46.
6. Perforated PVC Sewer Pipe (Underdrain), 4 in.: AASHTO M278
   a. Pipe under roadway shall have a minimum pipe stiffness value of 100 psi at 5% deflection.

2.6 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Available Manufacturers:

   a. Josam Company.
   b. MIFAB Manufacturing Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Wade Div.; Tyler Pipe.
   e. Watts Industries, Inc.
   f. Watts Industries, Inc.; Enpoco, Inc. Div.
   g. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Top-Loading Classification: Medium duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.
1. Available Manufacturers:

   a. Canplas Inc.
   b. IPS Corporation.
   c. NDS Inc.
   d. Plastic Oddities, Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   f. Zurn Light Commercial Specialty Plumbing Products; Zurn Plumbing Products Group.

2.7 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 8-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and of length to provide depth indicated.

5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

    a. Cast-In Resilient Connectors Type cast into manhole wall at the manufacturing facility. The connection is completed by inserting end of pipe through connector. Connector shall be A-Lok or approved equal.
    b. For connection to an existing structure only: Type clamped around end of pipe and grouted into opening in manhole wall. Connector shall be G3 Boot System featuring component packaging as manufactured by A-LOK Products, Inc. or approved equal. Non-shrink grout must be used.

8. Steps: Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.

    a. Cast Iron Steps shall be Vestal Manufacturing No. 918-P, Clay & Bailey No. 2115, Neenah No. R-1981-1 or equal.
    b. Copolymer Polypropylene Plastic Step, PS1-PF or PS2-PF Manufactured by M.A. Ind., Inc. or approved equal.

9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings, 3- to 6-inch total thickness, to match diameter of manhole frame and cover.
11. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

    a. Material: ASTM A 48, Class 35B gray iron, unless otherwise indicated.

2.8 STORMWATER INLETS

A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
2. Top Section: Eccentric-cone type unless flat-slab-top type is indicated.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

B. Frames and Grates: ASTM A 36, Grade 60-40-18, Steel coated with bitumastic Black Solution (Coal Tar based) as manufactured by Koppers or approved equal.

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Include channels and benches in manholes.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to one-half of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 2 percent through manhole (min.) or as indicated on drawings.

b. Benches: Concrete, sloped to drain into channel.

1) Slope: 4 percent.

2. Include channels in storm sewer inlets.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 2 percent through inlet (min.) or as indicated on drawings.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

E. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.10 ENGINEERED PVC SURFACE DRAINAGE PRODUCTS

A. General: PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawings and referenced within these specifications. The cast iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The surface drainage inlets shall be as manufactured by Nyloplast, a division of Advanced Drainage Systems, Inc. or prior approved equal.

B. Materials
1. The drain basins required fir this contract shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The pipe bell spigot shall be joined to the main body of the drain basin. The pipe stock used to manufacture the main body and pipe stubs of the surface drainage inlets shall meet the mechanical property requirements for fabricated

fittings as described by ASTM D3034, Standard for Sewer PVC Pipe and Fittings; ASTM F1336, Standard for PVC Gasketed Sewer Fittings.

2. The grates furnished for all surface drainage inlets shall be ductile iron grates for sizes 8", 10", 12", 15", 18", 24" and 30" (12" and 15" frames are cast iron) shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for drain basins shall be capable of supporting H-25 wheel loading for heavy-duty traffic or H-10 loading for pedestrian traffic. 12" and 15" grates will be hinged to the frame using pins. Metal used in the manufacturing of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron and ASTM A-48-83 class 30B for 12" and 15" cast iron frames. Grates shall be provided painted black.

C. Installation

1. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed limestone or other granular material meeting the requirements of class 1 or 2 material as defined in ASTM D2321. The surface drainage inlets shall be bedded and backfilled uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade so as to maintain a one piece, leak proof structure. No brick, stone or concrete block will be used to set the grte to the final grade height. For H-25 Load rated installations, an 8" to 10" thick concrete ring will be poured under the grate and frame as recommended by details provided by the manufacturer.

2.11 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. End Sections: Unless shown otherwise, provide standard end sections follows:

1. Match connecting pipe material for pipe size indicated.
2. Provide Riprap at each end section in accordance to plans.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving".

1. Backfilling Prior to Approvals: Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this section prior to all required inspections, tests and approvals. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner.

B. General: This section covers excavation, trenching, backfilling and grading incidental to the construction of sewers, pipelines and structures shown on the Drawings and described in these Specifications. Unless specifically shown or designated otherwise, all excavation shall be by open cut. The Contractor shall assume full responsibility for satisfactory performance of the work and for the safety of the work, working personnel and the general public.

1. Excavation: **Reference Section "312000 "Earth Moving", the CORPS Excavation Plan and the Geotechnical Report for excavation within the CORPS Critical zone for the levee.**

a. Structure Excavation: Excavation for structures shall be to lines and grades shown on the Drawings. Extend excavation for formed structures sufficiently to permit construction and inspection of forms, and for installation of drain tile or other below-grade work. The excavation shall be maintained in a condition suitable for placing reinforcing steel and concrete by such dewatering of adjacent and underlying soil as may be required. Dewatering equipment and methods shall be approved by the Engineer. Approved dewatering equipment may be used within the structure provided that any openings in walls or floors shall subsequently be closed watertight, using methods and procedures approved in advance by the Engineer. Excavation shall be shored and braced to protect adjacent structures or installations from damage. Before placing any concrete, excavation shall be inspected and approved by the Engineer.

b. Structure Subgrade: A normal foundation under structures will be undisturbed soil. If over excavation occurs or is required, the subgrade may be brought back to grade using approved material from excavation or borrow sources, uniformly compacted as specified for "Type A" compaction. Unless over-excavation of structure subgrade is authorized by Engineer, the corrective action shall be at Contractor expense. Alternatives to the above corrective method are:

1) Using the bedding material specified in Paragraph h.
2) Increasing the thickness of the concrete base.

c. Trench Excavation: Trench excavation shall be to the lines and grades indicated on the drawings. Banks shall be vertical from bottom of the trench to at least 6 inches above the top of the pipe. Above that point, trench wall may be sloped as required for safety and shall conform to all pertinent OSHA Regulations. Trenches shall be excavated as near as is practical to the widths shown on the applicable Standard Sewer Detail sheet of the Drawings. The bottom of the trench shall be undisturbed soil smoothed to the satisfaction of the Engineer by backhoe bucket or hand shovel, or both, prior to placement of bedding material. Dewatering, when required, shall be subsidiary to other bid items.

d. Rock Excavation: Trench width used in computing rock excavation shall be the width shown on the applicable Standard Sewer Detail sheet of the Drawings. Rock excvation shall include the excavation of all sedimentary, igneous and metamorphic rock which is naturally in place and is firm, rigid and unweathered and all boulders or other detached stone with a volume of 2 cubic yards or more. Rock encountered in two or more ledges with interlying strata of soil, clay, gravel or shale not more than 12 inches in thickness between each ledge will be classified as solid rock from the top of the top ledge to the bottom of the bottom ledge of rock. Rock shall be excavated to a depth of not less than 4 inches below the bottom of structures or of sewer pipe and 12 inches below the bottom of finished subgrade for pavement construction.

e. Sheeting and Bracing: Sheeting and bracing shall be provided in all trenches where required and shall conform to all pertinent OSHA Regulations. Sheeting may be wood or metal. Wherever, because of unstable trench conditions, it is necessary to drive sheeting below the centerline of pipe, it shall be driven to a depth of 2 feet (minimum) below the flowline of the pipe. After the trench has been backfilled up to a level 1 foot above the pipe, sheeting may be removed and the space left because of such removal shall be filled immediately and the backfill re-

compacted. Wood sheeting which has been driven to below the centerline of the pipe shall be left in place below a level of 1 foot above the top of the pipe. Trench boxes or shields may be used instead of sheeting and bracing.

f. Control of Ground Water and Surface Water: Where ground water or surface water is encountered, trenches shall be dewatered as necessary to permit the construction to be carried on in a satisfactory manner. Portions of sewers where all joints have been completed may be used for draining trenches, provided such drainage is free from debris. Drainage may be collected in temporary sumps and then pumped into natural drainage channels as approved by the Engineer. Surface water shall be prevented from entering trenches. Where approved by the Engineer, and approved in writing by the property owner, existing drainage channels may be temporarily diverted. After completion of the construction, the temporary channels and original channels shall be returned to their original condition unless otherwise approved by the property owner. It shall be the contractor's responsibility to obtain the permission of the property owner, in writing, for the temporary channels.

g. Stabilizing Trench Bottoms and Structure Subgrade: Wet or unstable trench bottoms and structure subgrade shall be stabilized by excavating to additional depth as directed by the Engineer and replacing the unsatisfactory soil with crushed limestone with angular shapes for high interlocking capability graded as follows. Field conditions shall be the determining factor for individual or combined use of these materials. The upper 2 inches of any stabilized area shall consist of specification bedding material. In sewer trenches, the minimum depth of bedding material shall be 4 inches under the pipe.

1) 4 inch to 8 inch primary crusher run.
2) 3 inch to 4 inch crusher run.
3) 1 ½ inch poorly graded.
4) ¾ inch poorly graded.
5) Specification bedding material.

h. Bedding Material and Placement: Bedding material shall be placed and compacted as specified for "Type A" compaction. Trenches shall be excavated to a depth not less than 4 inches below the bottom of the pipe and the pipe shall be laid on a bed of crushed limestone having the follow characteristics unless otherwise shown on the plans:

1) Retained on ¾ inch sieve: 0%.
2) Retained on ½ inch sieve: 24% to 35%.
3) Retained on 3/8 inch sieve: 40% to 60%.
4) Retained on No. 4 sieve: 90% to 100%.
5) Deleterious Substances, maximum: 5%.

2. Backfill: **Reference Section "312000 "Earth Moving", the CORPS Excavation Plan and the Geotechnical Report for backfilling within the CORPS Critical zone for the levee.**

a. General: Prior to the placement of either structure backfill or trench backfill, a Standard Proctor Curve as determined by AASHTO T 99 (ASTM D 698) shall be obtained for each type of backfill material to be used. Proctor curves shall be obtained from soil samples selected by a certified testing laboratory from materials excavated by the Contractor. All costs associated with the selection of soil samples and performing the necessary tests to obtain the Proctor curves shall be paid by the Contractor. Selection of the correct Proctor curve for a particular

backfill material shall also be done by the Contractor's certified testing laboratory. During backfill operations, soil density tests shall be taken by the Engineer or his representative. When results indicate that compaction does not meet the requirements of these Specifications, the material shall be removed and replaced or re-compacted as necessary to meet the specified requirements at no additional expense to the Owner. Additional tests shall be performed on re-compacted area to insure compliance with the requirements.

b. Recommendations for Compaction Equipment: Most manufacturers of compaction equipment provide information for the use of their equipment. For compaction of cohesive soils such as clay or clay-silt mixes, the recommended equipment includes rammers which shear and knead the soil and sheepsfoot rollers, either towed or backhoe mounted static types or self-propelled static or vibratory, which shear, blend and bond the soil. These recommendations also indicate that the thickness of the soil layer being compacted should not exceed the capabilities of the compacting force of the equipment being used. Proper thickness allows full and uniform densification of each layer and is directly proportional to the number of passes required to achieve the desired result. Steel wheeled smooth rollers, either static or vibratory or vibratory smooth plates are not normally recommended for use on cohesive soils but are highly recommended for consolidating granular soils. When compacting a mixture of cohesive and granular soils, equipment designed for the predominant soil type should be used.

c. Basis for Acceptance of Compaction: Normally the nuclear densimeter test shall be the basis for acceptance of compacted backfill. However, when backfill materials consist of a mixture of different soil types or contain a substantial amount of rock chips, the nuclear densimeter may give erroneous results. Therefore, the test results may be tempered by the judgement of the Engineer's representative after observing the compaction effort. The decision to accept or reject compacted backfill may be influenced by the thickness of lift, type of compaction equipment, number of passes of compaction equipment, depth of penetration of steel probe into the compacted material or successful proof rolling with a fully loaded tandem axle dump truck.

d. Backfill Around Structures: Backfill around structures with approved material after completion of below grade construction and removal and cleanup of all forms, lumber and trash. Each layer shall be placed and compacted as specified for Type A compaction and shall include emphasis on the area adjacent to the structure walls.

e. Trench Backfill: Backfill trenches only after pipelines, joints, wyes and bedding have been inspected and approved. Backfill with approved material from excavation or supplementary borrow areas, free from rocks or clods larger than 3 inches in any dimension.

    1) Initial Backfill for Pipes with Pipe Stiffness (PS) of 100 or less. This category includes PVC pipe meeting the requirements of ASTM D 3034 SDR 35 and ASTM F 679 PS 46. Initial backfill shall consist of specified bedding material to a point 6 inches above the top of the pipe. Care shall be taken to insure that bedding material is worked in around the haunches of the pipe. Bedding material shall be compacted as specified for Type A compaction.
    2) Initial Backfill for Pipes with Pipe Stiffness (PS) over 100. This category includes PVC pipe meeting the requirements of ASTM D 2665 (Schedule 40), ductile iron pipe, vitrified clay pipe, reinforced concrete pipe and corrugated steel pipe. For pipe up to and including 12 inches in diameter, the initial backfill shall consist of specified bedding material to the top of the pipe. For pipe over 12 inches in diameter, initial backfill shall consist of specified bedding material to the springline of the pipe. Care shall be taken to insure that bedding material is worked in around the haunches of

the pipe. Bedding material shall be compacted as specified for Type A compaction.

3) Backfill from Springline to One Foot Over Top of Pipe: This applies to all types of pipe regardless of where the top of bedding material is located. Selected backfill material shall be placed on both sides of the pipe equally to the full width of the trench in loose layers not to exceed 6 inches thick. Each layer shall be compacted as specified for Type A compaction. Continue to place and compact subsequent layers until the pipe is covered to a depth of at least one foot. All material to this depth shall be compacted as specified for Type A compaction.

4) Backfill for the Remainder of the Trench: After selected backfill and compaction to 1 foot above the top of pipe, the remaining backfill shall be composed of selected excavated materials free from large clods, rocks, frozen materials, debris or junk or of approved supplementary borrow material. Backfill material shall be deposited and compacted as detailed for the required type of compaction.

3. Compaction: **Reference Section "312000 "Earth Moving", the CORPS Excavation Plan and the Geotechnical Report for compaction within the CORPS Critical zone for the levee.**

   a. Type A Compaction: Type A compaction shall be used under all paved areas proposed or future paved areas, except sidewalks and under utility tunnel crossings. Type A compaction shall also be used where sewers intersect stream beds and at other locations designated on the Project Drawings, around structures, and to a level not less than 1 foot above the top of sewer pipes, as specified elsewhere in this section. Backfill shall be composed of selected excavated material or approved supplementary borrow material. Backfill material shall be deposited in loose layers not more than 6 inches thick, and compacted to at least 95 percent of maximum density in accordance with AASHTO T 99 (Standard Proctor).

   b. Type B Compaction: In areas where Type A compaction is not specified, approved backfill material shall be placed in the trench in loose layers not more than 10 inches thick and compacted to a density equal to or greater than that of the material in the adjacent trench wall.

4. Unsuitable Backfill Material: No material shall be used for structure backfill or trench backfill which contains rocks or clods larger than 3 inches in any dimension, frozen material, debris, junk or organic material. Such material shall be removed from the backfill material and disposed of as directed by the Engineer. Removal and disposal of unsuitable material is subsidiary to other bid items.
5. Supplementary Borrow Material: Furnished by Contractor at his expense.
6. Blasting: Prohibited.
7. Clean-Up: Clean-up is considered an integral part of the work. The working area shall be promptly restored to a condition equal to or better than that prevailing before construction. The Engineer may, at his discretion, withhold payment for otherwise completed items of work in areas in which clean-up is not completed, unless the Contractor submits, in writing, acceptable reasons why clean-up is incomplete, and provides an acceptable schedule for completion.

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout

take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

F. Familiarization: Prior to all work of this section, become thoroughly familiar with the site, the site conditions and all portions of the work falling within this section. No extra will be allowed for rock excavation.

G. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, as indicated on the plans.

H. Removal of Water
1. Furnish and operate sufficient pumps and appliances and provide all materials, labor, etc., required to prevent interference with any work by water, ice or snow. Damage of any kind resulting from insufficient pumping facilities or similar lack of proper conduct of the work shall be made good by the Contractor at his own expense.
2. No structure or pipe shall be laid in water and no water shall be allowed to run into or over any concrete work or pipe, or into or through any pipe, unless by special permission in writing.

I. Pipe Handling & Cutting
1. Care shall be used in handling all pipe to prevent damage to pipe ends. Particular care shall be taken not to injure any pipe coatings. No other pipe or material of any kind shall be placed inside of any pipe or fitting, except as specifically indicated.
   a. Damaged pipe or pipe damaged in laying shall be replaced at the expense of the Contractor.
   b. Cutting shall be done in neat and workmanlike manner by a method which will not damage the pipe. All cutting shall be done by means of a mechanical cutter.

J. Provide the necessary mason's lines and supports or laser equipment to insure installation of the pipe to line and grade, as shown on the drawings. Facilities for lowering the pipe into the trench shall be such that neither the pipe nor the trench will be damaged or disturbed.

K. The Engineer may, at his option, inspect all pipe before it is laid and reject any section that is damaged by handling or is found to be defective to a degree which will materially affect the function and service of the pipe.

L. The laying of the pipe in the finished trench shall be started at the lowest point and laid upgrade. When bell and spigot pipe is used, the bell shall be laid upgrade, with the spigots that fit within the bells laid in the direction of flow. If tongue and groove pipe is used, the groove shall be laid upgrade, with the tongue that fits inside the groove laid in the direction of flow. Install gaskets,

seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

M. The pipe shall be firmly and accurately set to the line and grade so that the invert will be smooth and uniform in slope.

N. Granular Bedding: Pipe shall be laid in compacted granular bedding as shown and as indicated in the plans or specified herein.
1. Granular Bedding: Clean, well-graded crushed stone, chat, sand or gravel. Maximum particle size of one inch (1") diameter.
2. Granular bedding shall be placed and compacted simultaneously on each side of pipe using particular care to obtain uniform bedding throughout the length of pipe without causing displacement of or damage to joints.
3. When bell and spigot pipes are used, spaces for the pipe bells shall be dug in the pipe bedding to accommodate the bells. These spaces shall be deep enough to insure that the bells do not bear the load of the pipe; they shall not be excessively wide in relation to longitudinal direction of the trench. When the pipes are laid, the barrel of each section of pipe shall be in contact with the bedding throughout its full length, exclusive of the bell, to support the entire load of the pipe.
4. Pipe shall not be laid on frozen ground under embedment.

O. Pipe which is not true in alignment or which has shown any settlement after laying shall be taken up and re-laid without extra compensation

3.3 PIPE JOINT CONSTRUCTION

A. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, non-pressure drainage piping according to the following:
1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.
2. Join dissimilar pipe materials with non-pressure-type flexible couplings.

C. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Install according to ASTM D 2321.

D. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

2. All joints shall be sealed with an approved plastic compound. In sealing pipe joints with plastic joint compound, trowel grade compound shall be applied to the mating surfaces of both the tongue and groove, or to the entire interior surface of the bell and the upper portion of the spigot. Rope or tape type and trowel grade plastic compound shall be applied in accordance with the manufacturer's recommendations. The joints shall be forced together with excess compound extruding both inside and outside the joint. Excess compound shall be removed from the interior surface where accessible

E. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

F. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

G. Connection to Existing Drainage Structures
1. Where the drawings call for connections to existing or extension of structures, these connections shall be watertight and so made that a smooth uniform flowline will be obtained throughout the drainage system. Method to be approved.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use extra-heavy-duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 24 by 24 by 7-1/2 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1 inch above finished surface elsewhere, unless otherwise indicated.

3.6 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.7 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.8 INLET INSTALLATION

A. Set frames and grates to elevations indicated.

3.9 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping to building's storm building drains specified in Division 15 Section "Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Air Tests: Test storm drainage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

E. Regulatory Requirements: Comply with requirements of applicable codes, regulations and authorities having jurisdiction.

F. Maintenance
1. If at any time before 12 months after the completion and acceptance of the work, there shall be any settlement of trenches requiring repairs to be made in any roadway, parking area or property along the line of the work, or should any defect appear in the work due to neglect, carelessness or improper construction on the part of the Contractor, the Engineer will notify the Contractor to make such repairs and remedy any defects. The Contractor shall, within 5 days after such notice, begin and carry out such repairs at no additional cost to the Owner.

END OF SECTION 334100

SECTION 334600 - SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Perforated-wall pipe and fittings.
2. Drainage panels.
3. Geotextile filter fabrics.

1.3 SUBMITTALS

A. Product Data:
1. Drainage panels, including rated capacities.
2. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL AND UNDER FLOOR PIPES AND FITTINGS

A. Perforated PE Pipe and Fittings:
1. NPS 6 and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
2. Couplings: Manufacturer's standard, band type.

2.2 DRAINAGE PANELS

A. Molded-Sheet Drainage Panels: Prefabricated geocomposite, 36 to 60 inches wide with drainage core faced with geotextile filter fabric.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Mel-Drain; W.R. Meadows, Inc. or comparable product by one of the following:
a. American Wick Drain.
b. W.R. Meadows; Inc.
c. Greenstreak.
d. JDR Enterprises, Inc.
e. Midwest Diversified Technologies Incorporated.
2. Drainage Core: Three-dimensional, nonbiodegradable, molded PP.
a. Minimum Compressive Strength: 18,000 lbf/sq. ft. when tested according to ASTM D 1621.
b. Minimum In-Plane Flow Rate: 7 gpm/ft. of unit width at hydraulic gradient of 1.0 and compressive stress of 25 psig when tested according to ASTM D 4716.
3. Filter Fabric: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
a. Survivability: Class 1.
b. Apparent Opening Size: No. 40 sieve, maximum.
c. Permittivity: 0.5 per second, minimum.

2.3 SOIL MATERIALS

A. Soil materials are specified in Division 31 Section "Earth Moving."

2.4 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.
1. Survivability: AASHTO M 288 Class 2.
2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. Verify that drainage panels installed as part of foundation wall waterproofing is properly positioned to drain into subdrainage system.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 FOUNDATION DRAINAGE INSTALLATION

A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches .

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches .

J. Install drainage panels on foundation walls as follows:
1. Coordinate placement with other drainage materials.
2. Lay perforated drainage pipe at base of footing. Install as indicated in Part 3 "Piping Installation" Article.
3. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.
4. Attach panels to wall beginning at subdrainage pipe. Place and secure molded-sheet drainage panels, with geotextile facing away from wall.

K. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches . Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.4 UMDER FLOOR DRAINAGE INSTALLATION

A. Excavate subgrade fill to allow installation of underfloor drain lines in drainage course.

B. Encase pipe in sock-style geotextile filter fabric. Before installing pipe connect sock sections with adhesive or tape.

C. Install drainage piping as indicated in Part 3. “Piping Installation“, Article for Underfloor subdrainage.

D. Add drainage course to a width of 4 inch on sides of excavation and to the top of pipe to perform tests.

E. After satisfactory testing, cover drainage piping to bottom of floor slab above.

3.5 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
1. Foundation Subdrainage: Install piping level and with a minimum cover of 36 inches unless otherwise indicated.
2. Underfloor Subdrainage: Install piping to slope as indicated, with a minimum 4 inch bottom and side coverage.
3. Lay perforated pipe with perforations down.
4. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install thermoplastic piping according to ASTM D 2321.

3.6 PIPE JOINT CONSTRUCTION

A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with loose banded, coupled, or push-on joints.

B. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.7 CONNECTIONS

A. Comply with requirements for piping specified in Division 33 Section "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect low elevations of subdrainage system to building's solid-wall-piping storm drainage system.

C. Where required, connect low elevations of foundation subdrainage to stormwater sump pumps. Comply with requirements for sump pumps specified in Division 22 Section "Sump Pumps."

3.8 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600

GEOTECHNICAL ENGINEERING REPORT

Proposed Kansas Energy and Service Center
SW 7th Street and SW Van Buren Street
Topeka, Kansas

Project No. D14G1399

December 31, 2014

Prepared for:

Kansas Department of Administration
HTK Architects, PA

Prepared by:

GeoSource
Your Source for Geotechnical and Materials Engineering

JCSBC
2-2-2016
Att.9C.--1062

GeoSource
Your Source for Geotechnical and Materials Engineering

December 31, 2014

Ms. Ramona A. Flower
State of Kansas
Office of Facilities & Procurement Management
800 SW Jackson Street, Suite 600
Topeka, Kansas 66612-1216

Subject: **Geotechnical Engineering Report**
Proposed Kansas Energy and Service Center
SW 7th Street and SW Van Buren Street
Topeka, Kansas
Project No. D14G1399

Dear Ms. Flower:

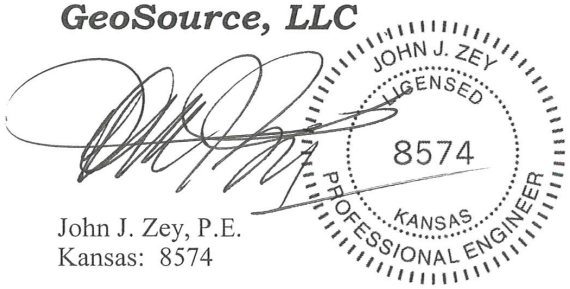
We have completed the subsurface exploration and geotechnical engineering evaluation for the above referenced project. The purpose of the exploration was to obtain information on the subsurface conditions within the building site and, based on this information to provide geotechnical engineering recommendations for design and construction of foundations for the proposed structures.

In summary, the borings encountered existing fill and naturally deposited soils underlain by shale and limestone bedrock that continued to the depths explored. The existing fill was quite variable and contained some rubble. Because of this, we have recommended that the proposed building be supported on drilled pier foundations that extend through the fill to the underlying limestone bedrock.

This report completes our current scope of services for this project. The enclosed report describes our exploration procedures and presents the results of the testing and evaluation along with design and construction recommendations for this project. We appreciate the opportunity to work with you on this project and are prepared to provide the recommended construction services.

Respectfully submitted,

GeoSource, LLC



John J. Zey, P.E.
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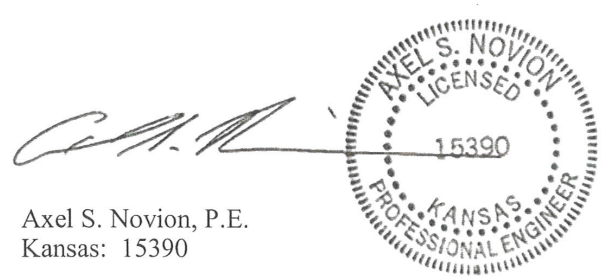

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GEOSOURCE

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GEOTECHNICAL ENGINEERING REPORT
PROPOSED ENERGY AND SERVICE CENTER
SW 7TH STREET AND SW VAN BUREN STREET
TOPEKA, KANSAS

Project No. D14G1399
December 31, 2014

INTRODUCTION

GeoSource has completed the subsurface exploration and geotechnical engineering evaluation of the site for the proposed Kansas Energy and Service Center building, which is located southeast of the intersection of SW 7th Street and SW Van Buren Street in Topeka, Kansas. Our services for this project were provided in general accordance with our November 26, 2014 proposal. The exploration work was authorized on December 4, 2014 with the issuance of Purchase Order No. 17300-0000017324 by the Kansas Department of Administration.

PROJECT DESCRIPTION

We understand that the proposed building will be a two story, steel frame structure, with metal stud infill walls and brick veneer or stone panel exterior facing. The new building will have overall plan dimensions of approximately 120 by 160 feet. Maximum column loads for the new building were estimated by the Structural Engineer to be less than 260 kips. The finished floor elevation of the new building has tentatively been set at elevation 928.76 feet, USGS datum. The floor for the service base on the east side of the building will be stepped to follow the grade of the existing alley. The floor slab elevation at the northeast corner of the building will be at elevation 925.54 feet, the floor slab elevation at the southeast corner will be at 928.76 feet, and the intermediate floor slab elevation will be at 927.04 feet. The bottom of the elevator pit has tentatively been set at elevation 924.76 feet. At this proposed floor elevation up to 6 feet of new fill will be required to establish grades for the proposed building area.

Light duty parking lots are planned for the areas on the north and south sides of the new building. The parking lots will provide space for about 40 automobiles and other light personnel vehicles.

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Drives will connect the parking lots to SW 7th Street and/or to the existing alley. No other specific information was provided regarding the design life of the pavement section.

A new utility tunnel will extend from the proposed Energy and Service Center building to the Kansas Statehouse along SW Van Buren Street. The plan and profile drawing of the tunnel that was provided to GeoSource indicated that the bottom of the tunnel will extend to about elevation 912 ± feet at the proposed building site and will be at about elevation 915 ± feet at the Statehouse parking garage. The tunnel will have a height of about 8 ± feet and will be constructed of reinforced concrete.

The scope of the exploration and engineering evaluation for this study, as well as the conclusions and recommendations in this report, were based on our understanding of the project as described above. If pertinent details of the project have changed or otherwise differ from our descriptions, we must be notified and engaged to review the changes and modify our recommendations, if needed.

DRILLING AND SAMPLING PROCEDURES

The field work for this project was performed between December 17 and 19 of 2014. A total of sixteen exploratory test borings were drilled for this project. Figure 1 in the Appendix shows the approximate locations of the borings with reference to the proposed building lines and other site features. The boring locations were established by GeoSource personnel. Distances from the existing city streets and other reference features to the boring locations were measured using a calibrated wheel. Right angles for locating the borings were estimated. The ground surface elevations shown on the boring logs are approximate and were determined using an engineer's level and rod. The elevations were referenced to the rim of the existing storm water manhole (SWMH), located on the west side of SW Van Buren Street about 165 feet south of SW 7th Street. The elevation of the manhole was given as 924.49 feet, USGS datum, on the site plan that was provided to GeoSource. The locations and elevations of the borings should be considered accurate only to the degree implied by the methods used to make these measurements.

The borings were performed with a truck-mounted, rotary drill rig using 4-inch diameter flight augers to advance the boreholes. Representative samples of the overburden soils and bedrock units were obtained at selected intervals using the Shelby tube and split-barrel sampling procedures as outlined in ASTM Specifications D-1587 and D-1586, respectively. The Shelby tube sampling procedure utilizes a thin-walled, steel tube with a sharp cutting edge that is pushed hydraulically into the bottom of the boring to obtain relatively undisturbed samples of cohesive or moderately cohesive soils. The samples were sealed and returned to our laboratory for further examination, classification and testing.

The split-barrel sampling procedure utilizes a standard 2-inch O.D. split-barrel sampler that is driven into the bottom of the boring with an automatic hammer. The number of blows required to advance the sampler the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Resistance Value (N). These "N" values are indicated on the boring logs at their depth of occurrence and provide an indication of the consistency of clays and the relative hardness of weathered bedrock units. A higher efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the Standard Penetration Resistance Values (N). The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Borings B-2 and B-4 were continued below the point of auger refusal through use of NQ3-diamond bit coring procedures. This diameter core barrel provides a sample having a diameter that is slightly smaller than 2 inches. Descriptions of the rock core are presented on the respective boring logs in addition to recovery and Rock Quality Designation (RQD) for the core recovered. Recovery is defined as the length of core obtained expressed as a percentage of the total length cored. Rock Quality Designation is defined as the total length of core pieces, 4 inches or greater in length, expressed as a percentage of the total length cored. Rock Quality Designation provides an indication of the integrity of the rock mass and relative extent of seams and bedding planes.

Boring logs are included in the Appendix of this report and present such data as soil and bedrock descriptions, consistency and relative hardness evaluations, depths, sampling intervals and observed groundwater conditions. Conditions encountered in each of the borings were monitored and recorded by the drill crew. Field logs were prepared by the drill crew that included visual classification of the materials encountered during drilling, as well as drilling characteristics. Our final boring logs represent the geotechnical engineer's interpretation of the field logs combined with laboratory observation and testing of the samples. Stratification boundaries indicated on the boring logs were based on observations during our field work, an extrapolation of information obtained by examining samples from the borings and comparisons of soils and/or bedrock types with similar engineering characteristics. Locations of these boundaries are approximate, and the transitions between soil and bedrock types may be more gradational in nature rather than clearly defined.

LABORATORY TESTING PROGRAM

The laboratory testing program consisted of performing water content, dry unit weight and unconfined compression tests on representative portions of undisturbed samples obtained with the Shelby tube sampler. A calibrated hand penetrometer was used to determine the approximate unconfined compressive strength of samples that were deformed or otherwise unsuitable for unconfined compression testing. The hand penetrometer has been correlated with unconfined compression tests, and provides a better estimate of the consistency and strength than visual observation alone. Moisture content determinations were also performed on samples obtained using the split-barrel sampler. The results of the laboratory tests are presented on the respective boring logs.

Atterberg Limits tests were conducted on representative samples of the onsite soils. These tests provide information on the plasticity of the soil, which is a basis for soil classification and for estimating the potential of subgrade soils to change volume with variations in moisture content. Results of these tests are also indicated on the respective boring logs.

In addition, unconfined compression tests were performed on selected rock cores to evaluate the compressive strength of the bedrock units encountered in the borings. The results of the unconfined

compression tests are shown on the respective boring logs in the Appendix of this report. The unconfined compressive strengths are in psi (pounds per square inch).

As part of the testing program, the soil samples were classified by a geotechnical engineer using visual and manual procedures outlined in ASTM D-2487 and D-2488. The descriptions of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Estimated group symbols according to the Unified Soil Classification System are shown on the boring logs. A brief description of this classification system is included in the Appendix of this report.

The bedrock units encountered in the borings were described in accordance with the enclosed General Notes for Bedrock on the basis of visual classification of disturbed auger cuttings and drilling characteristics. Core samples may reveal other rock types.

SITE CONDITIONS

The proposed building site is located southeast of the intersection of SW 7th Street and SW Van Buren Street in Topeka, Kansas. The site was bounded on the north by SW 7th Street, on the west by SW Van Buren Street and on the east by an existing alley. At the time the borings were performed, the site was a paved parking lot. Historical photographs indicated that the site was previously occupied by a power plant and several other buildings in the past. The borings encountered undocumented clay fill, most of which contained variable amounts of bricks, cinders, gravel and other miscellaneous construction debris from the former buildings. Auger refusal was encountered on rubble at boring locations B-8 and B-15, suggesting that buried foundations or basement walls and slabs or large concrete or limestone fragments are buried beneath portions of the proposed building site. At Boring B-2, a strong fuel odor was detected in the undocumented fill encountered between depths of about 5 to 10.3 feet.

GeoSource

SUBSURFACE CONDITIONS

The following presents a general summary of the major strata encountered during our subsurface exploration and includes a discussion of the results of field and laboratory tests conducted. Specific subsurface conditions encountered at the boring locations are presented on the individual boring logs in the Appendix of this report. Figure 2 in the Appendix shows a Generalized Subsurface Profile, based on the information obtained from the borings. The stratification lines shown on the boring logs and profile represent the approximate boundaries between soil and bedrock types; in-situ, the transition between materials may be more gradational in nature rather than clearly defined.

All of the borings were drilled in paved areas and encountered about 3 to 5 inches of asphaltic concrete pavement at the surface. Borings B-10 through B-13 were drilled on SW Van Buren Street along the alignment of the proposed utility tunnel and encountered brick pavers below the asphalt pavement.

The pavement section was underlain by undocumented fill that continued to depths of about 5.5 to 14.3 feet below the existing ground surface at the boring locations. The upper 2-½ to 3 feet of the fill was generally comprised of medium stiff to very stiff, light brown lean clay (CL), with a trace of fine sand. Laboratory tests performed on samples of this lean clay fill indicated moisture contents in the range of 13.4 to 25.6 percent, with dry densities of 102 to 115 pcf and unconfined compressive strengths of 1,450 to 5,990 psf. Atterberg Limits performed on this material indicated Liquid Limits in the range of 34 to 39, with Plasticity Indices of 15 to 20.

Beneath the upper fill layer, the borings encountered moderate to high plasticity fill that contained variable amounts of brick, cinders, gravel and other miscellaneous construction debris. No significant amounts of wood, trash or other unsuitable materials were encountered at the boring locations. As previously discussed, fuel contaminated soils were encountered in Boring B-2 below a depth of about 5 feet. In addition, significant amounts of rubble, including large size debris were encountered in Borings B-7, B-8 and B-15. Buried obstructions within the rubble fill were encountered in Borings B-8 and B-15. These obstructions could be buried foundation or large size

fragments of concrete or limestone. Laboratory tests performed on samples of the undocumented fill indicated moisture contents in the range of 11.4 to 55.7 percent, with dry densities of 97 to 106 pcf and unconfined compressive strengths of 1,420 to 5,300 psf. Standard Penetration Tests performed in the existing fill yielded "N" values ranging from 4 to 76 blows for one foot of penetration or less.

The undocumented fill was underlain by naturally deposited clay soils at 9 of the 16 boring locations. The natural clay soils were deposited by glacial ice that covered northeast Kansas in the Pleistocene Period. The glacial soils were visually classified as stiff to very stiff, lean clays (CL) and fat clays (CH). Laboratory tests performed on samples of the natural clay soils indicated moisture contents in the range of 17.1 to 28.0 percent, with dry densities of 102 to 107 pcf and unconfined compressive strengths of 2,050 to 4,440 psf. Soil colors varied from brown to light brown to reddish brown, with light gray and rust mottling. Standard Penetration Tests performed in the natural clay soils yielded "N" values in the range of 7 to 12 blows for one foot of penetration or less.

The undocumented fill and naturally deposited glacial clay soils were underlain by interbedded layers of shale and limestone bedrock that are part of the Topeka Limestone Formation of the Pennsylvanian Age Shawnee Group. The bedrock was encountered in the borings at depths ranging from about 10.3 to 14.3 feet across the proposed building site. The uppermost bedrock unit encountered was the weathered remnants of the Turner Creek Shale Member. The Turner Creek Shale is typically 2 to 5 feet thick and consists of weathered, olive tan to gray brown, clayey to silty shale. The Turner Creek Shale was underlain by the Sheldon Limestone Member. The Sheldon Limestone was described as a buff to light gray, fossiliferous limestone. The thickness of this limestone unit varied from about 1.5 feet to 2.8 feet across the site. The Jones Point Shale Member was encountered below the Sheldon Limestone and this bedrock unit typically consists of gray, silty to clayey shale that was about 1.8 to 2.2 feet thick at the boring locations where it was encountered.

The Jones Point Shale was underlain by the Curzon Limestone, which is the thickest limestone unit of the Topeka Formation. The Curzon Member is typically comprised of two or more beds of medium to thick-bedded, buff to light gray, fossiliferous limestone. The thickness of the Curzon

Limestone ranged from about 5.9 to 6.3 feet at the boring locations where it was encountered. The Curzon Member was underlain by the Iowa Point Shale Member. The Iowa Point Member is typically a hard, gray, clayey to silty shale that locally contains sandstone layers. At the proposed building site, the Iowa Point Shale had a thickness of only about 1 to 2 feet. The Iowa Point Shale was underlain by the Hartford Limestone Member, which is the basal member of the Topeka Limestone Formation. The Hartford Member typically has a total thickness of about 5 to 6 feet and consisted of massive, gray to bluish gray, fossiliferous limestone. Core samples of the bedrock from Borings B-2 and B-4 had recovery rates of 78 to 100 percent, with Rock Quality Designation (RQD) values in the range of 56 to 100 percent, indicating fair to good quality rock. The unconfined strength of the limestone units ranged from about 1,970 to 9,520 psi.

GROUNDWATER OBSERVATIONS

Groundwater observations were made in the boreholes both during and following completion of the drilling operations. Groundwater was encountered in Borings B-1, B-5, B-9 and B-15 at depths ranging from about 0.5 to 12.0 feet below the existing ground surface. At Boring B-15, groundwater was encountered very near the existing ground surface. The other borings remained, dry prior to coring, and no visible groundwater seepage was observed at the time the borings were performed.. The materials encountered in the test borings have relatively low permeabilities and observations over an extended period of time through use of piezometers or cased borings would be required to better define current groundwater conditions.

Coring of the bedrock at boring locations B-2 and B-4 required the introduction of water into the borehole as a drilling fluid to cool the bit and to flush the cuttings from the hole. No noticeable loss of drilling fluid was noted. The water levels indicated on the boring logs where coring procedures were used represent the water level in the borings after removal of casing and drill tools and is generally not an indicated of a true water table.

Groundwater in the underlying bedrock typically flows through joints and fissures in the limestone bedrock units. The shale bedrock units are generally less permeable and do not transmit significant amounts of groundwater seepage.

The composition of the glacial soils is often erratic due to the random nature of its deposition. Glacial deposits frequently contain isolated pockets of water bearing sands and gravel, as well as cobbles and large boulder size materials. Water bearing lenses within natural glacial deposits are generally limited in extent. Excavations encountering such lenses typically experience a sudden influx of groundwater due to the high permeability of the materials within the lens. Foundation and other excavations that encounter trapped water within the glacial soils can normally be dewatered using conventional sump pumps.

Fluctuations of groundwater levels can occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our evaluation, it is our professional opinion that the proposed project site can be developed for the proposed building and utility tunnel using conventional grading and foundation construction techniques. The existing undocumented fill was quite variable across the site and contained significant amounts of rubble and construction debris at some of the boring locations. Because of this, the undocumented fill is not suitable for support of shallow spread footings.

We have recommended that the proposed building be supported on drilled pier foundations that extend through the undocumented fill and naturally deposited glacial clay soils and are founded in the Curzon Limestone Member that underlies the proposed building site. Recommendations for

design and construction of drilled pier foundations are presented in the follow sections of this report.

As an alternative to supporting the proposed building on drilled pier foundations, shallow foundation support bearing on a *Geopier*® reinforced subgrade would appear to be a viable foundation option for this project that may potentially provide an economic benefit to this project. Geopiers are rammed aggregate piers that are installed by a specialty contractor using a proprietary method. Recommendations for design and construction of geopiers is normally provided by Geopier US, the company that developed this method of ground improvement and foundation support.

The major concern, from a geotechnical engineering standpoint, is the presence of undocumented fill and the potential for encountering old foundations, walls and other buried structures, as well as large concentrations of rubble from the former buildings that previously occupied the site. If buried structures and/or large concentration rubble are encountered, they could hamper the installation of the drilled pier foundations and/or the drilling of the boreholes for the Geopiers. Removal and replacement of the existing undocumented fill does not appear to be an economical option for this project. One way to deal with the uncertainty, would be to establish a contingency fund for removal of old buried structures and/or rubble in areas affected by the new construction.

The construction of the proposed utility tunnel between the proposed building and Statehouse Parking Garage should be relatively straight forward. The borings indicated that some rock excavation will likely be required to install the tunnel at the currently proposed bottom elevations. Removal of the rock will likely require the use of pneumatic breakers, rock teeth or some other method of hard rock removal. Groundwater was not encountered in the borings that were drilled along the proposed tunnel alignment. However, it would be prudent to include underdrains below the floor slab of the tunnel and adjacent to the tunnel walls to prevent hydrostatic loading of the walls and seepage into the tunnel, should groundwater levels change in the future.

To reduce the potential for subgrade volume change and floor slab movement, we have recommended that a minimum of 24 inches of select, low volume change material be placed below building floor slabs. Thorough site preparation will be required to correct areas that were disturbed by previous construction activity at the proposed building site. The recommendations given in the following sections of this report describe subgrade preparation for building foundations, floor slabs and pavements, as well as undercutting procedures to remove existing fill, soft soils, expansive clays and other unsuitable materials. Proper fill placement techniques are also discussed and include: recommended types of fill materials, maximum lift thickness, as well as soil moisture content and compaction criteria for structural fill sections.

The recommendations submitted herein are based, in part, upon data obtained from our subsurface exploration. It should be recognized that subsurface conditions may vary between the exploration points and that the nature and extent of any subsurface variations that may exist at the proposed site will not become evident until exposed during construction. If variations appear evident, then the recommendations presented in this report should be reevaluated. In the event that any changes in the nature, design, location or floor slab elevations of the proposed building are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed by the geotechnical engineer and our recommendations modified in writing, if necessary.

SITE PREPARATION

Initial site preparation for the proposed project should commence with the removal of the existing pavement section and the demolition of any existing structures that are located within proposed construction areas. Demolition should include complete removal of all grade supported slabs, pavements, sidewalks and shallow spread footings. All broken concrete, asphalt and other debris from demolition of these structures should be removed from the site. Areas disturbed during demolition of the existing structures should be thoroughly evaluated by the geotechnical engineer prior to placement of structural fill. All disturbed soils should be undercut prior to placement of structural fill.

Relocation of any existing utility lines within the zone of influence of proposed construction areas should also be completed as part of the site preparation. The lines should be relocated to areas outside of the proposed construction. Excavations created during the removal of the existing lines should be cut wide enough to allow for use of heavy construction equipment to recompact the fill. In addition, the base of the excavations should be thoroughly evaluated by a geotechnical engineer or engineering technician prior to placement of fill. All fill should be placed in accordance with the recommendations presented in the Structural Fill section of this report.

Following completion of the demolition work, it is recommended that the exposed grade be scarified to a minimum depth of 8 inches and be moisture conditioned to bring the moisture content of the soils into the range recommended for structural fill. Moisture conditioning is the process of adjusting the moisture content of the scarified materials to a moisture content that is within a range of 0 to 4 percent above the optimum moisture content as determined by the Standard Proctor (ASTM D-698) compaction procedure. Following moisture conditioning, the scarified materials should be recompacted to a minimum of 95 percent of Standard Proctor (ASTM D-698) maximum dry density. Soft or unstable areas that hamper compaction of the subgrade should be undercut and replaced with structural fill.

Following moisture conditioning and prior to placement of any new fill, it is recommended that the exposed grade be proofrolled. Proofrolling of the subgrade provides a more stable base for placement of structural fill and aids in identifying soft or disturbed areas. Unsuitable areas identified by the proofrolling operation should be undercut and replaced with structural fill. Proofrolling can be accomplished through use of a fully-loaded, tandem-axle dump truck or similar equipment providing an equivalent subgrade loading. Suitable structural fill should then be placed to design grades as soon as practical after reworking the subgrade to avoid moisture changes in the underlying soils.

If soft or unstable conditions are encountered during the proofrolling operation, stabilization of the soils may be required. Clean crushed rock having a particle diameter of 3 to 6 inches could be used to stabilize the subgrade prior to placement of structural fill. After initial undercutting, the large rock would be spread over the unstable subgrade and worked into the soft soils by close tracking with a

bulldozer or other suitable construction equipment. Additional rock would be added until the subgrade becomes firm enough to support construction equipment. The use of a geotextile fabric, in conjunction with crushed rock, could also be considered as a means of stabilizing the exposed grade.

CLIMATIC CONDITIONS

Weather conditions will influence the site preparation required. In spring and late fall, following periods of rainfall, the moisture content of the near surface soils may be significantly above the optimum moisture content. Additionally, it is common to encounter wet, unstable soils upon removal of the site pavements or flatwork as a result of moisture becoming trapped beneath relatively impervious concrete or asphalt pavements. These conditions could seriously impede grading by causing an unstable subgrade condition. Typical remedial measures include aerating the wet subgrade, removal of the wet materials and replacing them with dry materials or treating the wet material with fly ash.

If site grading commences during summer months, the moisture contents of the onsite soils may be abnormally low, which can significantly increase the swell potential of the clay soils. Typically, discing and moisture conditioning of the exposed subgrade materials to the moisture content criteria outlined in the Structural Fill section will reduce this swell potential of the dry materials. As an alternative, the dry materials could be undercut and replaced with structural fill.

EXCAVATIONS

Excavations will be required for foundations, underground utilities and a utility tunnel for this project. It is anticipated that the foundation excavations will be in undocumented fill and naturally deposited clay soils above the water table. These materials can generally be excavated with conventional earthmoving equipment such as backhoes and large track hoes. Rubble fill and buried structures within the undocumented fill could hamper excavations in some areas of the site. Utility excavations that extend into the underlying weathered shale bedrock with a Standard Penetration Resistance (N) value of less than 25 blows per foot can generally be excavated with conventional earthmoving

equipment such as backhoes, large track hoes, loaders, etc. The borings indicated that the proposed utility tunnel excavation along SW Van Buren Street will extend into harder, less weathered shale and/or limestone bedrock units. Removal of the hard shale and limestone will be more difficult and will probably require the use of rock teeth, pneumatic breakers, or some other method of hard rock removal to complete the excavation for the utility tunnel.

Temporary construction slopes should be designed in strict compliance with the most recent governing regulations. The naturally deposited clay soils encountered in the borings would generally be classified as Type B soils, under Part 1926 of the OSHA regulations pertaining to open excavations. For these soils, it is recommended that temporary construction slopes be no steeper than 1(H) to 1(V). Construction slopes should be closely observed for signs of mass movement: tension cracks near the crest, bulging at the toe, etc. If potential stability problems are observed, the geotechnical engineer should be immediately contacted. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

STRUCTURAL FILL

All structural fill should consist of approved materials, free of organic matter and debris. Fill placed within 24 inches below the building floor slab and leveling course materials should consist of a lower plasticity cohesive soil having a liquid limit less than 45. Higher plasticity soils could be used as structural fill in the lower portion of deep fill sections in the building area and/or as structural fill in pavement areas where more movement can generally be tolerated. Fill should be placed in lifts having a maximum loose lift thickness of 9 inches. All fill should be compacted to a minimum of 95 percent of the material's maximum dry density as determined by ASTM D-698 (standard Proctor compaction). The moisture content of the fill at time of compaction should be within a range of 0 to 4 percent above optimum moisture content as defined by the standard Proctor compaction procedure. Moisture contents should be maintained within this range until completion of the building floor slab.

Granular materials that do not have a well-defined moisture-density relationship that are placed below foundations and other structures should be compacted to a minimum of 70 percent of the materials

maximum relative density as determined by ASTM Specifications D-4253 and 4254. Granular backfill materials placed next to structures should be compacted to a minimum of 65 percent of the materials maximum relative density. There is no specific moisture content requirement for compaction of sands and sandy soils and the moisture content of these soils should be maintained in a suitable range that facilitates the compaction of the sand.

Based on the proposed floor slab elevations, it appears that it will be necessary to import fill material to the site. It is recommended the low volume change material be imported to complete the required fill sections.

FOUNDATIONS

The borings encountered undocumented fill with variable amounts of rubble and construction debris. The undocumented fill is not considered suitable for support of shallow spread footings. Because of this, we have recommended that the proposed building be supported on drilled pier foundations that extend through the undocumented fill and naturally deposited glacial clay soils and are founded in the Curzon Limestone that underlies the proposed building site. As an alternate to supporting the proposed building on drilled pier foundations, shallow foundation support bearing on a *Geopier*® reinforced subgrade would appear to be a viable foundation option for this project. As previously discussed, Geopiers are rammed aggregate piers that are installed by a specialty contractor using a proprietary method. Recommendations for design and construction of geopiers is normally provided by Geopier US, the company that developed this method of ground improvement and foundation support.

DRILLED PIER FOUNDATIONS

Based on the subsurface conditions encountered at the site, it recommended that the proposed building be supported by a drilled pier and grade beam foundation system. It is recommended that all drilled piers be founded in the Curzon Limestone. Based on the borings, it is anticipated that the bearing elevations of the drilled piers will range from about 908 to 913 feet, across the proposed

building site. Greater penetration into the bedrock may be required at some locations depending on the extent and severity of bedrock weathering. Drilled piers that are founded in suitable limestone may be designed and proportioned using an allowable end bearing pressure of 60,000 psf.

Any uplift loads acting on the foundations can be resisted by the effective dead weight of the piers plus an allowable side friction value of 250 psf for the portion of the shaft in soils and 2,000 psf for the portion of the shaft in weathered shale and/or limestone bedrock.

Properly reinforced drilled piers are also capable of resisting transient lateral loads from wind and/or earthquakes. It has been our experience that drilled piers with a minimum shaft diameter of 30 inches and an embedment length of at least 10 feet are capable of resisting lateral loads of 25 kips or more, with maximum top of pier deflections of ½ inch or less. If desired, GeoSource can perform a more comprehensive lateral load analysis and provide additional recommendations, when final loads become available. All piers subject to lateral loads should be properly reinforced.

All piers should have a minimum shaft diameter of 36-inches in order to accommodate dewatering equipment and/or to permit access for proper hand cleaning and observation of the base. Some groundwater seepage should be anticipated during the installation of drilled piers and use of temporary casing and dewatering techniques may be required. Temporary casing may also be required in areas where significant amounts of debris and/or rubble are present in the undocumented fill. To minimize disturbance to the bearing surfaces caused by ponding of water, it is recommended that concrete be placed the same day that the piers are drilled. It is also recommended that temporary casing be installed when personnel are required to enter a drilled pier excavation to clean or observe the bearing surface.

To minimize disturbance to the bearing surfaces caused by ponding of water, it is recommended that concrete be placed the same day that the drilled shafts are completed. The bottom of the pier excavation should be clean and free of water and loose materials prior to placement of the reinforcing steel and concrete. Concrete placement should be continuous from the bottom to the top elevation of the shaft. For dry excavations, concrete may be placed by the free fall method,

provided that it can be directed down the center of the shaft without hitting the reinforcing steel or sides of the excavation. Wet excavated shafts will require that the concrete either be pumped from the bottom up or placed using a tremie. The tremie pipe should be clean and have a sufficient inside diameter for use with the specific concrete mix, but not less than 10 inches. The discharge end of the tremie should allow free radial flow of the concrete and be immersed at least 5 feet in concrete and maintain a positive pressure differential during placement to prevent water or spoil intrusion.

It is anticipated that the drilled piers can be installed with conventional drilling equipment. It is possible that obstructions, such as rubble fill or old buried foundations, walls and other structures from the former buildings may be encountered during the installation of the drilled piers. Core barrels, rock augers or special construction methods may be required to remove obstructions and/or to remove loose rock and other materials to properly prepare the foundation bearing surface for the drilled piers.

Temporary steel casing and dewatering procedures may be required for proper installation of the drilled piers. If concrete will be placed in conjunction with the use of temporary casing, there must be a sufficient head of concrete inside the casing to prevent soil and water from entering the pier excavation as the temporary casing is pulled. It is recommend that concrete be designed to have a minimum slump in the range of 6 to 8 inches to reduce the potential for arching as the casing is removed.

It is recommended that all drilled pier and/or footing excavations be observed and evaluated by the geotechnical engineer or his representative immediately prior to placement of foundation concrete. Unsuitable areas identified at this time should be corrected. Corrective procedures would be dependent upon conditions encountered and will most probably include deepening of the drilled piers.

Long-term structural settlement of drilled piers designed and constructed as outlined above should be minor; i.e., ½ inch or less.

GEOSOURCE

GEOPIER FOUNDATION SYSTEM

As an alternate to supporting the proposed building on drilled pier foundations, shallow foundation support bearing on a *Geopier*® reinforced subgrade appears to be a viable option for this project and may potentially provide an economic benefit to this project. Based on our experience with the *Geopier* soil reinforcement system, we anticipate that a *Geopier* reinforced subgrade could be designed to increase the net allowable soil bearing pressure at this site while limiting foundation settlement.

The *Geopier* soil reinforcement system has been used for a number of years to support structures as an alternative to deep foundations and/or to the removal and replacement of soft or unsuitable soils. The system allows the use of conventional spread footings and floor slabs cast on-grade, and reliably controls settlement to within design tolerances.

The *Geopier* soil reinforcement system consists of highly densified aggregate piers. The *Geopier* elements are installed by drilling 30-inch diameter holes, and ramming thin lifts of well-graded aggregate within the holes to form very stiff, high-density aggregate piers. The drilled holes for this project should extend through the undocumented fill to the underlying bedrock, a depth of about 13 to 19 feet below the finished floor elevation of the existing building. Following drilling of the geopier hole, well graded aggregate is compacted in 12-inch loose lifts in the drill hole. Ramming takes place with a high-energy beveled tamper that both densifies the aggregate and forces the aggregate laterally into the sidewalls of the hole. This action increases the lateral stress in surrounding soils, thereby further stiffening the reinforced composite soil mass. The result of *Geopier* installation is a significant strengthening and stiffening of subsurface soils that then support floor slabs and high-capacity footings.

Geopier designs are based on a two-layer settlement analysis as described by Lawton et al. (1994) and in the *Geopier* Reference Manual. Settlements within the "upper zone" (zone of soil that is reinforced with *Geopier* elements) are computed using a weighted modulus method that accounts for the stiffness of the *Geopier* elements, the stiffness of the matrix soil, and the area coverage of *Geopier* elements below supported footings. Settlements within the "lower zone" (zone of soils beneath the upper zone

which receives lower intensity footing stresses) are computed using conventional geotechnical settlement methods.

The *Geopier* soil reinforcement system is a design-build system and *Geopier* US should be contacted to provide engineering analyses and project specific design information for this project. Please contact Mr. Aaron J. Gaul, of *Geopier* Foundation Company – Midwest at (816) 531-6026 regarding the final system design, including the allowable foundation bearing pressure, *Geopier* shaft lengths and spacing, anticipated floor slab thickness, and a cost to support the proposed building.

If the *Geopier* system is selected, Quality Assurance testing should be performed during installation, including documentation of the soil conditions encountered, the shaft lengths, amount of aggregate used, verification of the modulus test readings, and tests on the compacted aggregate lifts. GeoSource would be pleased to provide this service.

SEISMIC HAZARDS DETERMINATION

Earthquake hazard evaluation is a complex task. Seismic sources must be identified and characterized, path effects must be evaluated (i.e., selection of appropriate attenuation relationships), and ground motions must be completed. Finally, an analysis of the motion with respect to the proposed construction must be made. In addition to the multi-discipline nature of this process, there is substantial parameter and modeling uncertainty associated with each of the steps. Typically, code based approaches are used for seismic hazard analyses. Our seismic hazard evaluation follows the IBC 2009 procedures.

United States Geological Society (USGS) has developed and mapped maximum earthquake response spectra for two design levels: an earthquake having a 10% probability of exceedance in 50 years and an earthquake having a 2% probability of exceedance in 50 years. The motions developed by USGS represent soft rock conditions, which are assumed to be representative of the

soil/rock that would be encountered below a depth of approximately 100 feet below existing grades at the site.

The USGS "soft rock" peak ground accelerations for the 10%/50 year and 2%/50 year events are 5.10% g and 18.60% g, respectively. Maximum spectral accelerations at the 0.2 second/1.0 second periods for the 10%/50 year and 2%/50 year events are 5.10% g / 2.10% g and 15.40% g / 5.40% g, respectively. Based on the subsurface information, the project site would be characterized as a Site Class C per the 2009 International Building Code (IBC). In addition, there is no significant risk of liquefaction or mass movement of the on-site soils due to a seismic event.

BUILDING FLOOR SLABS

The recommendations outlined in the Site Preparation and Structural Fill sections of this report are intended to produce subgrades that are suitable for support of building floor slabs. These recommendations include capping the building pad with a minimum of 24 inches of select, low volume change material below the floor slab and leveling course. The select fill layer below the floor slabs has been recommended to reduce the potential for subgrade volume change and floor slab movement. The recommended low plasticity structural fill thickness is in addition to any granular section that will be required below the floor slabs. The moisture content of the subgrade soils should be maintained within the recommended range until floor slabs are completed. Depending upon weather conditions, periodic wetting may be required.

Where possible, floor slabs should be designed and constructed as free slabs to allow for some differential movement between the walls, column points and floor slabs. It is recommended that a granular leveling course, having a minimum thickness of 4 inches, be used below normally loaded building floor slabs supported on soil subgrades. The granular section provides a capillary moisture break and acts as a leveling course. Clean crushed limestone gravel, with a nominal size of ½ to ¾ inch, would be recommended for the leveling course. A modulus of subgrade reaction of 100 pci may be used to design floor slabs constructed on an untreated clay subgrade.

In areas where floor loads are greater than 200 psf, it is recommended that a minimum of 12 inches of crushed limestone aggregate be placed below the building floor slab. The crushed rock may be substituted for a portion of 18 inches of select, low volume change fill layer recommended for normally loaded floor slabs. The purpose of the crushed rock is to provide an improved subgrade for the more heavily loaded floor slab areas. In addition, the crushed rock will also provide a good working surface during construction. It is recommended that the crushed rock have a gradation similar to KDOT AB-3. The crushed rock should be placed in 6 inch lifts and compacted to a minimum of 95 percent of the material's maximum dry density as determined by ASTM D 698. A modulus of subgrade reaction of 250 pci may be used to design floor slabs constructed on 12 inches of compacted crushed limestone aggregate.

Subsurface moisture and moisture vapor naturally migrate upward through the soil and, where the soil is covered by a building or pavement, this moisture will collect. To reduce the impact of this subsurface moisture and the potential impact of future induced moisture (such as landscape irrigation or precipitation), the current industry standard is to place a vapor retarder below the compacted crushed limestone layer. This membrane typically consists of visquene or polyvinyl plastic sheeting, having a thickness of at least 10 mils. It should be noted that although vapor barrier systems are currently the industry standard, this system may not be completely effective in preventing floor slab moisture problems. These systems typically will not necessarily assure that floor slab moisture transmission rates will meet floor covering manufacturer standards and that indoor humidity levels be appropriate to inhibit mold growth. The design and construction of such systems are totally dependent on the proposed use and design of the proposed building and all elements of building design and function should be considered in the slab-on-grade floor design. Building design and construction may have a greater role in perceived moisture problems since sealed buildings/rooms or inadequate ventilation may produce excessive moisture in a building and affect indoor air quality.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking or curling of the

slabs. High water-cement ratio and/or improper curing also greatly increase the water vapor permeability of the concrete. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual.

The above procedures should reduce the potential for subgrade moisture variations and consequently reduce floor slab movement and cracking. However, these procedures will not completely eliminate the volume change characteristics of the natural clay soils and, because of the presence of unaltered clay soils that extend to much greater depths, some long-term volume change may occur along with some floor slab movement and cracking. Isolation of floor slabs from walls and columns should be considered to accommodate minor differential movement of floor slabs. If it is desired to further minimize the potential for subgrade volume change, the use of a greater thickness of low volume change material beneath the floor slab should be considered.

LATERAL EARTH PRESSURES

Based on our experience with soils similar to those encountered at the site, it is recommended that the walls of the utility tunnel be designed using an equivalent fluid pressure of 55 pounds per cubic foot. This lateral earth pressure assumes an "at rest" stress distribution condition; i.e., no wall rotation is allowed. The recommended load distribution does not include a factor of safety or take into account the influence of any hydrostatic loading of the walls. Also, the stress distributions do not include the influence of any foundations, pavement or other surcharge loads located in or adjacent to wall backfill.

To prevent hydrostatic loading on the walls and/or seepage into the utility tunnel, it is recommended that perforated drain lines be installed at the base of the walls and also under the bottom floor slab of the tunnel. The drain lines should be sloped to provide positive gravity and should extend to a sump or storm drain where the water is removed. The drain line should be wrapped with filter fabric to prevent intrusion of fines. The drain line should be backfilled with free draining granular material extending vertically above the drain line to within 2 feet of final grade. The remaining portion of the excavation should be backfilled with cohesive soils to minimize the infiltration of surface water. The

granular section behind the wall should have a minimum width of 2 feet and should be encapsulated in the suitable filter fabric to minimize intrusion of fines. The use of a prefabricated drainage blanket on the foundation wall could also be considered to prevent hydrostatic loading. Drainage blankets should be installed in accordance with the manufacturer's recommendations.

PAVEMENTS

Parking and drive area subgrades should be prepared in accordance with the recommendations given in the Site Preparation and Structural Fill sections of this report. The site soils are considered poor subgrade materials for support of pavements. Based on the soil types encountered at this site and previous experience with materials of this type, a design CBR value of 3 is recommended for design of pavement sections. For this design value, a full-depth asphaltic concrete section having a minimum thickness of 6 inches is recommended for automobile parking areas and 7.5 inches is recommended for the access drives. For asphaltic concrete pavements, a minimum surface course thickness of 2 inches is normally recommended.

Service drives used by semi-trailer and other heavy delivery trucks require thicker pavement sections. GeoSource would be pleased to provide specific thickness recommendations for heavy duty pavements, after we receive additional information regarding the type and number of trucks that are projected to use this facility over the design life of the pavement. Portland cement concrete pavements are recommended for approach slabs, dock aprons, truck drives and parking areas, trash dumpster pads and other areas where heavy wheel loads will be concentrated. It is recommended that the concrete pavements in these areas have a minimum thickness of 8 inches. We normally recommend a 4-inch leveling and drainage course of clean, crushed rock be placed below all concrete pavements.

Portland cement concrete pavements are recommended for the trash dumpster pad and other paved areas subjected to concentrated wheel loads and high stresses. The minimum recommended thickness in these areas is 7 inches. Normally, a 4-inch layer of granular fill is placed below concrete pavement sections.

We recommend that the pavement subgrades be evaluated by proofrolling immediately prior to paving. The moisture content and density of the top 8 inches of the subgrade should be checked within two days prior to commencement of actual paving operations. If the material is not in compliance with the required ranges of moisture or density, the subgrade should then be moisture conditioned and recompacted. If any significant event, such as precipitation, occurs after the evaluation, the subgrade should be reviewed by qualified personnel immediately prior to placing the pavement. The subgrade should be in its finished form at the time of the final review.

Proper drainage is a key to the long term performance of any pavement section. It is recommended that all pavements be properly sloped to provide rapid runoff of surface water. Water should not be allowed to pond on or adjacent to pavements, since this could result in saturation of the subgrade and cause premature deterioration of pavements. Pavements in Kansas are normally subjected to 30 or more freeze-thaw cycles in any given year. Because of this, periodic maintenance of all of the pavements is essential to long term performance and should be anticipated. This should include sealing of all cracks and joints and by maintaining proper surface drainage next to paved areas.

PLANS AND SPECIFICATIONS REVIEW

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical engineering recommendations in the design and specifications. In the event that GeoSource is not given the opportunity to perform this recommended review, we will assume no responsibility for misinterpretation of our geotechnical engineering recommendations.

GeoSource

CONSTRUCTION OBSERVATION AND TESTING

To effectively achieve the intent of the geotechnical recommendations presented in this report and to maintain continuity from design through construction, GeoSource should be retained to provide observation and testing services during earthwork and foundation construction phases of the project. This will provide the geotechnical engineer with the opportunity to observe the subsurface conditions encountered during construction, evaluate the applicability of the geotechnical recommendations presented in our report as they relate to the soil and bedrock conditions encountered, and to provide follow up recommendations if conditions differ from those described in our report.

LIMITATIONS

The analysis and recommendations submitted in this report are based in part upon the subsurface information obtained from the exploration points performed at the indicated locations and our present knowledge of the proposed construction as outlined in the Project Description. Subsurface conditions may vary between the exploration points and across the site and our report does not reflect any variations which may occur. The nature and extent of such variations may not become evident until construction. If subsurface conditions are encountered during construction that differ from those described in this report, GeoSource should be notified immediately so that a review may be made and any supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads, floor slab elevations or locations, changes from that described in this report, our recommendations should also be reviewed and the recommendations modified accordingly.

This report has been prepared in accordance with the generally accepted geotechnical engineering practice as it exists in the area at the time of our study. No warranty is expressed or implied. The recommendations provided in this report are based on the assumption that an adequate program of observation and testing will be conducted during the construction phase in order to evaluate

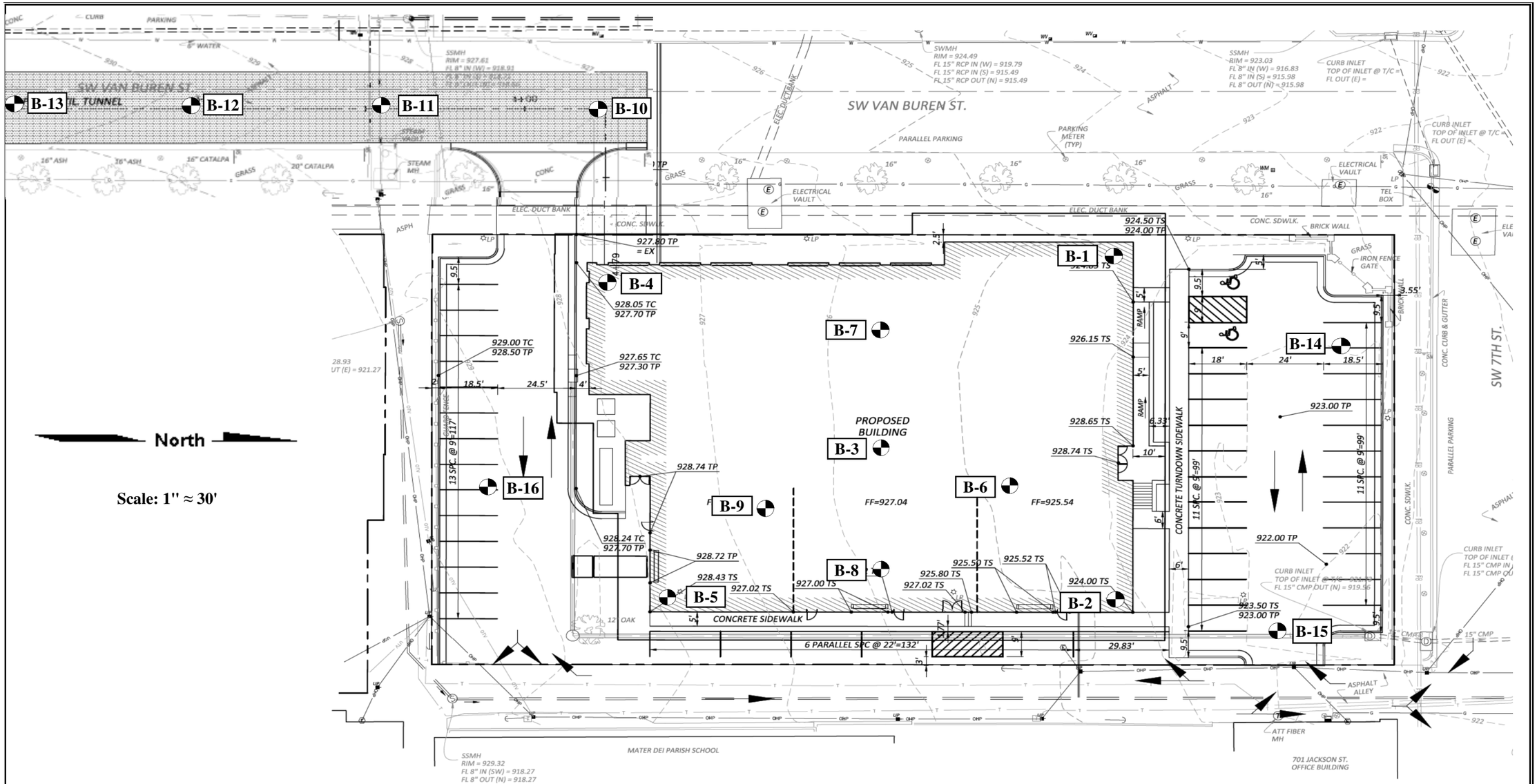
compliance with our recommendations. Our scope of services did not include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, below or around this site.

This report has been prepared for the exclusive use of our client for specific application to the project discussed. Any party other than the client who wishes to use this report shall notify GeoSource in writing of such intended use. Additional work may be required before an updated report can be issued. Non-compliance with any of these requirements will release GeoSource from any liability resulting from the use of this report by any unauthorized party and client agrees to defend, indemnify and hold harmless GeoSource from any claim or liability associated with such unauthorized or non-compliance.

GEOSOURCE

APPENDIX

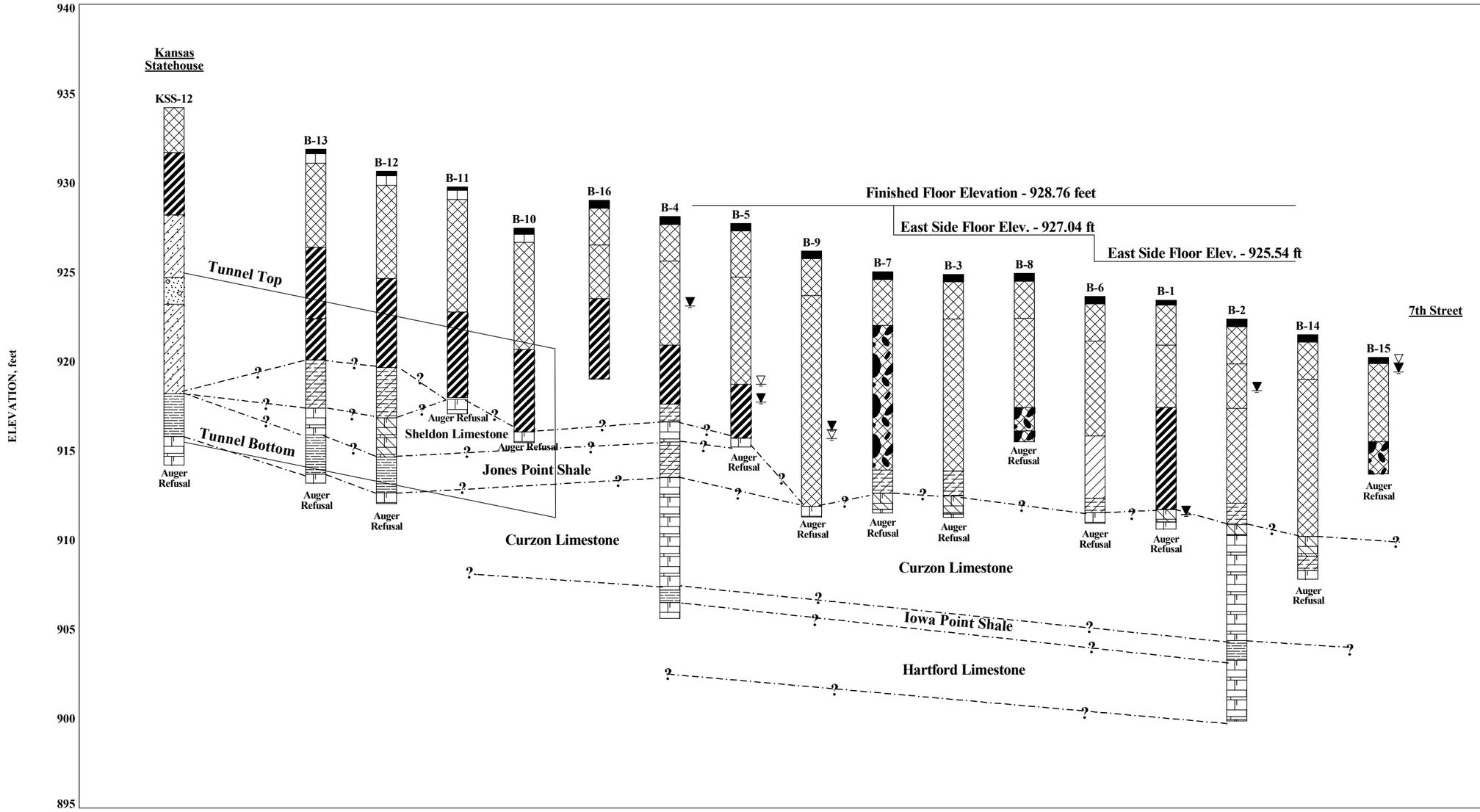
FIGURE 1: BORING LOCATION SKETCH
FIGURE 2: GENERALIZED SUBSURFACE PROFILE
BORING LOGS
GENERAL NOTES AND TERMS
BORING LOG SYMBOLS



Boring Location Sketch **Figure 1**

Proposed Kansas Energy and Service Facility **SW 7th Street and Van Buren Street** **Topeka, Kansas**	GeoSource Your Source for Geotechnical and Materials Engineering
Approved By: JJZ	**Project No. D14G1399**

JCSBC
2-2-2016
Att.9C.--1092



GENERALIZED SUBSURFACE PROFILE

FIGURE 2

Proposed Kansas Energy & Service Center
SW 7th Street and Van Buren Street
Topeka, Kansas

Approved By: JJZ

Project No.: D14G1399

LEGEND

Asphalt	Rubble	Silty Sand	Lean to Fat Clay	Sand (SP)	Fat Clay	Weathered Shale	Shale	Water Levels	
Brick Pavers	Fill	Sandy Silt	Sandy Lean Clay	Sand (SW)	Lean Clay	Weathered Limestone	Limestone	While Drilling	
Baserock	Silt	Clayey Silt	Sandy Clay	Gravel	Fat Clay	Weathered Sandstone	Sandstone	24 hrs. A.B.	

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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-1

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL
	PA						
1	ST	15		*1500	102	25.6	CL
	PA						
2	SS	18	7	*1500		21.6	CL CH
	PA						
3	ST	20		4410	101	28.0	CH
	PA						

* Calibrated Penetrometer ** Rock Strength in psi

DEPTH, Feet.

Offset 4 feet east due to utilities

MATERIAL DESCRIPTION

Approx. Surface Elevation: 923.4

Asphaltic Concrete (3")

FILL, lean clay, medium stiff, light brown, trace fine sand — 2.5 — 920.9

FILL, lean to fat clay, stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris — 6.0 — 917.4

FAT CLAY, stiff, brown mottled light gray and rust — 11.7 — 911.7

****LIMESTONE**, weathered, broken and seamy to very hard, light gray — 12.8 — 910.6

AUGER REFUSAL @ 12.8 FEET

ATTERBERG LIMITS

Sample 1, Depth 1-3 feet

LL	PL	PI
37	18	19

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **12.0 feet W.D.**

▼ **12.0 feet A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-17-14		
BORING COMPLETED	12-17-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

JCSBC
2-2-2016
Att.9C.--1094

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-2

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

Offset 8 feet west due to utilities

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	DEPTH, Feet.	MATERIAL DESCRIPTION	Approx. Surface Elevation: 922.4
	PA								**Asphaltic Concrete (5")**	
1	ST	13		2420	107	22.7	CL		**FILL**, lean clay, stiff, light brown brown, trace fine sand	
								2.5		919.9
	PA								**FILL**, fat clay, stiff, gray brown ▼	
2	SS	18	8	*4000		29.4	CL CH	5.0		917.4
	PA							5	**FILL**, lean to fat clay, soft, dark gray brown and geenish gray mixed, trace gravel (Stong Fuel Odor)	
3	ST	18	9	*1000		55.7	CL CH			
								10		
	PA							10.3		912.1
								11.5	**SHALE, weathered, soft, olive tan	910.9
								12.1	**LIMESTONE, weathered, seamy, gray	910.3
R1	NQ3	100%	RQD= 75%	**4990	138	8.7			**LIMESTONE**, hard, solid, medium to thick-bedded, fossiliferous, buff to light gray	
								15		
R2	NQ3	78%	RQD= 57%	**8040	150	5.4				
								18.0		904.4
								19.1	**SHALE**, mod. hard, very thin bedded, tan	903.3
				**3180	145	6.5		20	**LIMESTONE**, hard, solid, medium bedded, fossiliferous, buff to light gray	

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry Prior to Coring**

▼ **4.0 feet A.C.R.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-17-14		
BORING COMPLETED	12-17-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

JCSBC
2-2-2016
Att.9C.--1095

BOREHOLE INFORMATION **Page 2 of 2**

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-2

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
R3	NQ3	100%	RQD= 100%	**7480	152	3.5			22.5	**LIMESTONE**, hard, solid, thick-bedded, fossiliferous, light gray 899.9
										BOTTOM OF BORING

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry Prior to Coring**

▼ **4.0 feet A.C.R.**

Backfilled @ Completion

GeoSource
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BORING STARTED	**12-17-14**		
BORING COMPLETED	**12-17-14**		
RIG	**CME-55**	DRILLER	**MC**
APPROVED	**JJZ**	JOB #	**D14G1399**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-3

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 924.9
	PA									**Asphaltic Concrete (5")**
1	ST	14		4500	115	15.3	CL			**FILL**, lean clay, very stiff, light brown, trace fine sand
									2.5	922.4
	PA									**FILL**, lean to fat clay, medium stiff to stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris
2	SS	18	20	*1500		19.0	CL CH			
	PA								5	
3	SS	18	9	*3000		31.3	CL CH			
	PA								10	
									11.0	913.9
									12.4	**SHALE, weathered, soft, olive tan 912.5
									13.6	**LIMESTONE, weathered, broken and seamy to very hard, light gray 911.3

AUGER REFUSAL @ 13.6 FEET

ATTERBERG LIMITS
Sample 1, Depth 1-3 feet

LL	PL	PI
39	19	20

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
Your Source for Geotechnical and Materials Engineering

BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

JCSBC
2-2-2016
Att.9C.--1097

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-4

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Approx. Surface Elevation:	**928.1**
	PA									**Asphaltic Concrete (5")**	
1	ST	10		1500	107	19.3	CL			**FILL**, lean clay, medium stiff, light brown, trace fine sand	
									2.5		925.6
	PA									**FILL**, fat clay, stiff, dark gray brown mixed, trace gravel and miscellaneous construction rubble	
2	SS	18	8	*3000		27.0	CH		5	▼	
	PA								7.2		920.9
3	ST	18	10	*4500		17.5	CH			**FAT CLAY**, very stiff, light gray mottled light brown	
	PA								10.5		917.6
									11.5	****SHALE**, weathered, soft, olive tan	916.6
R1	NQ3	94%	RQD= 56%	**7800	153	5.2			12.8	**LIMESTONE**, hard, solid, thin-bedded, fossiliferous, buff	915.3
				**1970	136	15.2			14.6	**SHALE**, weathered, soft, tan to light brown	913.5
R2	NQ3	100%	RQD= 65%	**9520	149	5.6			15	**LIMESTONE**, hard, solid, medium to thick-bedded, fossiliferous, buff to light gray	
				**4410	146	5.7			20		

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry Prior to Coring**

▼ **5.0 feet A.C.R.**

Backfilled @ Completion

GeoSource
Your Source for Geotechnical and Materials Engineering

BORING STARTED	**12-18-14**		
BORING COMPLETED	**12-18-14**		
RIG	**CME-55**	DRILLER	**MC**
APPROVED	**JJZ**	JOB #	**D14G1399**

JCSBC
2-2-2016
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BOREHOLE INFORMATION **Page 2 of 2**

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-4

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
R3	NQ3	25%	RQD= 0%						20.9	**SHALE**, hard, very thin bedded, gray	907.2
									21.6	**LIMESTONE**, hard, light gray	906.5
									22.5		905.6
										BOTTOM OF BORING	

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry Prior to Coring**

▼ **5.0 feet A.C.R.**

Backfilled @ Completion

GeoSource
Your Source for Geotechnical and Materials Engineering

BORING STARTED	**12-18-14**		
BORING COMPLETED	**12-18-14**		
RIG	**CME-55**	DRILLER	**MC**
APPROVED	**JJZ**	JOB #	**D14G1399**

JCSBC
2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-5

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 927.7
	PA									**Asphaltic Concrete (5")**
1	ST	16		2940	109	20.3	CL			**FILL**, lean clay, stiff, light brown, trace fine sand
									3.0	924.7
2	ST	13		5300	106	22.1	CL CH			**FILL**, lean to fat clay, very stiff to medium stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris
	PA								5	
									9.0 ▽	918.7
3	ST	10		2050	106	22.1	CL CH			**FAT CLAY**, stiff, reddish brown ▼
	PA								10	
									12.0	915.7
									12.5	**LIMESTONE**, hard, gray 915.2

AUGER REFUSAL @ 12.5 FEET

ATTERBERG LIMITS
Sample 1, Depth 1-3 feet

LL	PL	PI
36	19	17

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **9.0 feet W.D.**

▼ **10.0 feet A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-17-14		
BORING COMPLETED	12-17-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-6

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Approx. Surface Elevation:	**923.6**
	PA									**Asphaltic Concrete (5")**	
1	ST	14		*2500	104	21.1	CL			**FILL**, lean clay, stiff, light brown, trace fine sand	
									2.5		921.1
	PA									**FILL**, lean to fat clay, medium stiff to stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris	
2	SS	18	16	*2000		22.3	CL CH		5		
	PA								7.8		915.8
3	SS	18	7	*2500		20.1	CL			**LEAN CLAY**, stiff, dark gray brown (Possible Fill)	
	PA								10		
									11.3		912.3
									12.1	**SHALE, weathered, soft, olive tan	911.5
									12.7	**LIMESTONE, hard, gray	910.9
										AUGER REFUSAL @ 12.7 FEET	
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.	

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	**12-19-14**		
BORING COMPLETED	**12-19-14**		
RIG	**CME-55**	DRILLER	**MC**
APPROVED	**JJZ**	JOB #	**D14G1399**

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-7

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 925.0
	PA									**Asphaltic Concrete (5")**
1	ST	20		2950	107	20.0	CL			**FILL**, lean clay, stiff, light brown, trace fine sand
									3.0	922.0
	PA									**RUBBLE FILL**, brick, cinders, limestone and/or concrete rubble in a clay matrix
2	SS	12	76			11.4			5	
	PA									
3	SS	3	50/3"			15.1				
	PA								10	
									11.1	913.9
										SHALE, weathered, soft, grayish tan
									12.4	912.6
									13.5	**LIMESTONE**, weathered, broken and seamy to very hard, light gray 911.5

AUGER REFUSAL @ 13.5 FEET

ATTERBERG LIMITS
Sample 1, Depth 1-3 feet

LL	PL	PI
34	19	15

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-8

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 924.9
	PA									**Asphaltic Concrete (5")**
1	ST	10		3630	110	19.0				**FILL**, lean clay, stiff, light brown, trace fine sand
									2.5	922.4
	PA									**FILL**, lean to fat clay, medium stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris
2	SS	18	5	*2500		23.3			5	
	PA									
									7.5	917.4
3	SS	4	50/4"							**RUBBLE FILL**, brick, cinders, limestone or concrete debris in a clay matrix
	PA								9.4	915.5
										AUGER REFUSAL @ 9.4 FEET
										Driller' Note: Auger refusal on apparent limestone and/or concrete rubble.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

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BORING STARTED	**12-18-14**		
BORING COMPLETED	**12-18-14**		
RIG	**CME-55**	DRILLER	**MC**
APPROVED	**JJZ**	JOB #	**D14G1399**

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-9

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 926.2
	PA									**Asphaltic Concrete (5")**
1	ST	8		2590	109	17.8	CL			**FILL**, lean clay, stiff, light brown, trace fine sand
									2.5	923.7
	PA									**FILL**, lean to fat clay, soft to medium stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris
2	SS	18	4	*1500		25.7	CL CH		5	
	PA									
3	SS	18	10	*2000		30.7	CL CH		10	▼ ▽
	PA									
									14.3	911.9
									14.9	**LIMESTONE, hard, gray 911.3

AUGER REFUSAL @ 14.9 FEET

ATTERBERG LIMITS
Sample 1, Depth 1-3 feet

LL	PL	PI
34	18	16

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **10.5 feet W.D.**

▼ **10.0 feet A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-17-14		
BORING COMPLETED	12-17-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-10

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

Offset 4 feet east due to parked cars

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 927.6
	PA									**Asphaltic Concrete (4")** **Brick Pavers** **FILL**, lean to fat clay, medium stiff, dark gray brown, trace gravel, brick, cinders and miscellaneous construction debris
1	ST	6		*1500	98	26.5	CL CH		5	
	PA								6.8	920.8
										FAT CLAY, very stiff, light grayish tan mottled rust
2	SS	18	10	*4500		17.1	CH		10	
	PA								11.4	916.2
									12.0	**LIMESTONE**, hard, gray 915.6
										AUGER REFUSAL @ 12.0 FEET **Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-11

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

Offset 6 feet east due to parked cars

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Approx. Surface Elevation: 929.8
	PA									**Asphaltic Concrete (4")** **Brick Pavers**
1	ST	10		1420	97	25.8	CL			**FILL**, lean clay, medium stiff, dark gray brown, trace fine sand and gravel
	PA								5	
									7.0	922.8
2	SS	18	10	*5500		24.1	CH			**FAT CLAY**, very stiff, light grayish tan mottled rust
	PA								10	
									11.8	918.0
									12.7	**LIMESTONE**, hard, gray 917.1

AUGER REFUSAL @ 12.7 FEET

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

JCSBC
2-2-2016
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BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-12

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

Offset 6 feet east due to parked cars

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	DEPTH, Feet.	MATERIAL DESCRIPTION	Approx. Surface Elevation: 930.7
	PA								**Asphaltic Concrete (3")** **Brick Pavers**	
1	ST	10		1480	98	25.9	CL CH	5	**FILL**, lean to fat clay, medium stiff, dark gray brown mixed, trace gravel	
	PA							6.0		924.7
3	ST	12		4440	107	20.0	CH		**FAT CLAY**, very stiff, light grayish tan mottled rust	
	PA							10		
4	SS	1	50/1"			6.4		11.0		919.7
	PA								**SHALE, weathered, soft, olive tan to light gray	
								13.8		916.9
								15	**LIMESTONE, weathered, seamy to thin-bedded, buff to light gray	
								16.0		914.7
									**SHALE, hard, gray	
								18.0		912.7
								18.6	**LIMESTONE, hard, gray	912.1
									AUGER REFUSAL @ 18.6 FEET	

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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2-2-2016
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BOREHOLE INFORMATION **Page 2 of 2**

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-12

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	**12-18-14**
BORING COMPLETED	**12-18-14**
RIG **CME-55**	DRILLER **MC**
APPROVED **JJZ**	JOB # **D14G1399**

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-13

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	DEPTH, Feet.	MATERIAL DESCRIPTION	Approx. Surface Elevation: 931.9
	PA								**Asphaltic Concrete (3")** **Brick Pavers**	
1	ST	9		2830	104	28.3	CH		**FILL**, lean to fat clay, stiff, dark gray brown, trace gravel	
								5	5.5	926.4
	PA								**FAT CLAY**, very stiff, gray brown	
3	SS	18	12	*3500		23.6	CH		9.5	922.4
								10	**FAT CLAY**, very stiff, reddish brown	
	PA								11.8	920.1
									**SHALE, weathered, soft, olive tan to gray brown	
4	SS	15	56/9"			20.7			14.5	917.4
								15	**LIMESTONE, weathered, seamy to thin-bedded, light gray	
	PA								16.0	915.9
									**SHALE, hard, gray	
									18.2	913.7
									18.7 **LIMESTONE, hard, gray	913.2
									AUGER REFUSAL @ 18.7 FEET	

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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BOREHOLE INFORMATION **Page 2 of 2**

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-13

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

GeoSource
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BORING STARTED	**12-18-14**
BORING COMPLETED	**12-18-14**
RIG **CME-55**	DRILLER **MC**
APPROVED **JJZ**	JOB # **D14G1399**

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2-2-2016
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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-14

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	Approx. Surface Elevation: 921.5
	PA									**Asphaltic Concrete (5")**	
1	ST	10		1450	109	21.8	CL			**FILL**, lean to fat clay, medium stiff, light brown, trace fine sand	
									2.5		919.0
	PA									**FILL**, fat clay, medium stiff to stiff, reddish brown, dark brown and brown layers, trace gravel	
2	SS	18	5	*2000		18.5	CH		5		
	PA										
3	SS	18	6	*2500		36.5	CH		10		
	PA										
									11.3		910.2
									12.4	**LIMESTONE, weathered, seamy	909.1
									13.2	**SHALE, weathered, soft, tan	908.3
									13.7	**LIMESTONE, hard, gray	907.8
										AUGER REFUSAL @ 13.7 FEET	
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.	

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

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BORING STARTED	12-19-14		
BORING COMPLETED	12-19-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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Att.9C.--1111

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-15

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 920.2
	PA									**Asphaltic Concrete (4")** ▽ ▼
1	SS	18	14	*1000		19.7	CL CH			**FILL**, lean to fat clay, soft, to medium stiff, dark gray brown, tan and brown mixed, with some gravel and miscellaneous construction rubble
	PA									
2	SS	14	55/8"			27.4	CL CH			
									4.7	915.5
	PA								5	**RUBBLE FILL**, brick, cinders, limestone or concrete debris in a clay matrix
									6.5	913.7
										AUGER REFUSAL @ 6.5 FEET

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **0.3 feet W.D.**

▼ **0.8 feet A.B.**

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BORING STARTED	12-18-14		
BORING COMPLETED	12-18-14		
RIG	CME-55	DRILLER	MC
APPROVED	JJZ	JOB #	D14G1399

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BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING EASTING

DRLLING COMPANY **GeoSource, LLC**

METHOD **4-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-16

PROJECT NAME **Proposed Kansas Energy & Service Center**

SITE LOCATION **SW 7th Street and Van Buren Street Topeka, Kansas**

OWNER / ARCHITECT **State of Kansas / HTK Architects**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Approx. Surface Elevation: 929.0
	PA									**Asphaltic Concrete (5")**
1	ST	8		5990	106	13.4	CL			**FILL**, lean clay, very stiff, light brown, trace fine sand
									2.5	926.5
2	ST	13		4570	105	22.9	CL CH			**FILL**, lean to fat clay, very stiff, brown
									5	
									5.5	923.5
	PA									**FAT CLAY**, very stiff, light brown to gray brown mottled rust and light gray
3	SS	18	8	*4500		20.6	CH			
									10	
									10.0	919.0
										BOTTOM OF BORING

* Calibrated Penetrometer ** Rock Strength in psi

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

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BORING STARTED	**12-18-14**		
BORING COMPLETED	**12-18-14**		
RIG	**CME-55**	DRILLER	**MC**
APPROVED	**JJZ**	JOB #	**D14G1399**

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UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

BEDROCK AND OTHER MATERIAL SYMBOLS

- Weathered Shale
- Shale
- Seamy Limestone
- Joint or Void
- Limestone
- Weathered Sandstone
- Sandstone
- Coal
- Topsoil
- Asphaltic Concrete
- Concrete
- Fill
- Rubble or Debris Fill
- Boulders and Cobble
- Granular Baserock
- Lean to Fat Clay

BEDROCK PROPERTIES & DESCRIPTIONS

ROCK QUALITY DESIGNATION

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 -100

BEDDING CHARACTERISTICS

TERM	THICKNESS (inches)
Massive	> 60
Very Thick Bedded	36 - 60
Thick Bedded	12 - 36
Medium Bedded	4 - 12
Thin Bedded	1 - 4
Very Thin Bedded	0.4 - 1
Laminated	< 0.4

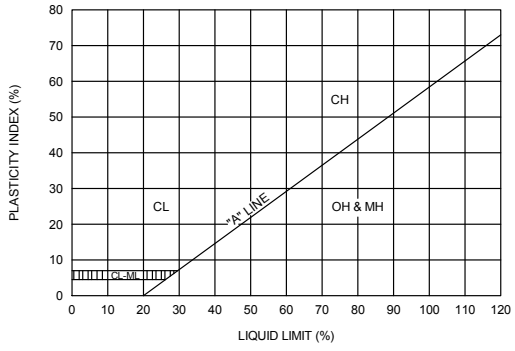
DEGREE OF WEATHERING

Slightly Weathered - Slight decomposition of Parent material in joints and seams.
Weathered - Well-developed and decomposed joints and seams.
Highly Weathered - Rock highly decomposed, may be extreemly broken.

BEDROCK DISCONTINUITIES

Bedding Planes — Planes dividing the individual layers, beds or strata of rocks.
Joints — Fractures in rock, generally more or less vertical to the bedding.
Seams — Applies to bedding planes with an unspecified degree of weathering.

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / 0.5 FT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MEDIUM DENSE	10 - 30	MEDIUM STIFF	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

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General Notes and Terms

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BORING LOG SYMBOLS

SURFACE MATERIALS

TOPSOIL

FILL MATERIAL

ASPHALTIC CONCRETE

CONCRETE

GRANULAR BASE

COHESIVE SOILS

SILT

CLAYEY SILT

LEAN CLAY

LEAN TO FAT CLAY

FAT CLAY

LARGE GRANULAR SOILS

CLAYEY GRAVEL

SILTY GRAVEL

POORLY GRADED GRAVEL

WELL GRADED GRAVEL

COBBLES & BOULDERS

GRANULAR SOILS

SANDY SILT

SILTY SAND

FINE SAND

POORLY GRADED SAND

WELL GRADED SAND

GRAVELLY SAND

BEDROCK UNITS

SHALE

FISSILE SHALE

SANDSTONE

LIMESTONE

COAL

WEATHERED BEDROCK

JOINT OR VOID

WEATHERED SHALE

WEATHERED SANDSTONE

WEATHERED LIMESTONE

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CONTRACT ADDENDUM ONE
April 24, 2015

ISSUED BY:

Horst, Terrill, & Karst Architects, P.A.
900 S. Kansas Ave., Suite 200, Topeka, Kansas 66612
Contact: Dennis Haugh (dah@htkarchitects.net) of
Tel: 785-266-5373
Fax: 785-266-5270

NOTICE TO ALL BIDDERS FOR THE:

State of Kansas Energy and Service Center

221 SW 7th Street, Topeka, Kansas 66612

Project No. A-012651
HTK Project No.: 1410.03

You are instructed to read and note the following described changes, corrections, clarifications, omissions, deletions, additions, approvals and statements pertinent to the Contract Documents. Contract Addendum One is a part of the Contract Bid Documents and Construction Documents and shall govern in the performance of the Work. **(17 pages total)**

ADDENDUM ITEMS TO ADDRESS

BIDDING REQUIREMENTS AND CONTRACT CONDITIONS

Article 1-01: SPECIFICATIONS:

1. Remove the existing specification Table of Contents and insert the new revised Table of Contents attached to this addendum.

Article 1-05: SPECIFICATIONS

1. Section 08113 Aluminum-Framed Entrances and Storefronts shall be revised as follows:
   Part 2. Shall be revised to add the following:
   "2.3a SUN CONTROL DEVICES
   A. Subject to compliance with requirements, provide a comparable product by the following:
   1. Manufacturer: Kawneer.
   2 Series: Versoleil Sunshade Outrigger system
   3. Profile dimension: 30", with Planar Blades.
   4. Sunshade Members: Manufacturer's standard extruded or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   5. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
   6. Perrimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action."

Article 1-09: SPECIFICATIONS

1. Add: Section 083483 Elevator Door Smoke Containment System, attached to this Addendum.

Article 1-04: SPECIFICATIONS

Section 084413 Glazed Aluminum Curtainwalls shall be revised as follows:
1. Part 1.4, C, b. shall be deleted. Blast resistant design is not required.
2. Part 1.6, B, LEED Submittals, shall be deleted.
3. Part 2. Shall be revised to add the following:

"2.3a SUN CONTROL DEVICES

A. Subject to compliance with requirements, provide a comparable product by the following:

1. Manufacturer: Kawneer.
2 Series: Versoleil Single Blade Horizontal Sunshade.
3. Profile dimension: 10".
4. Sunshade Members: Manufacturer's standard extruded or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
5. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
6. Perrimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action."

Article 1-06: SPECIFICATIONS

1. Section 088000 Glazing shall be revised as follows:
   Part 1 - General, 1.5 Performance Requirements, B., 5.: Shall be deleted.

Article 1-03: SPECIFICATIONS

1. Delete: Section 10 2113.13 Metal Toilet Compartments.
2. Retain: Section 102113 Toilet Compartments.

Article 1-02: SPECIFICATIONS

1. Add: Section 10 5300 Pre-Manufactured Aluminum Canopies, attached to this Addendum.

Article 1-07: SPECIFICATIONS

1. Section 122413 Roller Window Shades shall be revised as follows:
   Part 1 General:
   a. 1.2 Summary, 2.: Shall be deleted.
   b. 1.2 Related Sections, B.: Shall be deleted.
   c. 1.5 Quality Assurance, D.: Shall be deleted.

   Part 2 Products:
   a. 2.2 Applications/Scope, B.: Shall be revised to delete Shade Types 1, 2 and 3.
   b. 2.3 Shade Cloths, B.: Shall be deleted.
   c. 2.6 Components, B.: Shall be deleted.
   d. 2.7 Shade Motor Drive System: Shall be deleted.
   e. 2.8 Accessories, A. Fascia: Shall be revised to delete Shade types 1, 2, and 3.
   f. 2.5 Accessories, B.: Shall be deleted.

   Part 3 Execution:
   a. 3.3 Installation, B.: Shall be deleted.

Article 1-08: SPECIFICATIONS

1. Section 142400 Hydraulic Elevators shall be revised as follows:
   Part 1 General:
   a. 1.3 Allowances: Shall be deleted.
   b. 1.4 Coordination, B.: Shall be deleted.

   Part 3 Execution:
   a. 3.2 Installation, A. and B.: Shall be deleted.

END OF CONTRACT ADDENDUM ONE

*****RECEIPT OF THIS ADDENDUM IS TO BE ACKNOWLEDGED ON THE BID FORM*****

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SECTION 08 3483 - ELEVATOR DOOR SMOKE CONTAINMENT SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Smoke detector activated elevator door smoke containment screen and control system designed to provide a tight-fitting, smoke- and draft-control assembly.

B. Products Supplied But Not Installed Under This Section:
1. End-of-line diode (3.9V, 2W). Installed at smoke detector to monitor the circuit.

C. Related Sections:
1. 09 22126–Non-Load Bearing Wall Framing: Metal backing in housing mounting area.
2. 09 9123–Paints: Field painting of specified components.
3. 28 3111– Fire Alarm System: Provision of smoke detectors.
4. 14 2400–Hydraulic Elevators.
5. Division 26 Sections for 120VAC and control circuit power including conduit, boxes, conductors, wiring devices, and emergency power.

1.2 REFERENCES

A. ASTM A240/240M – Standard Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.

B. ICC Evaluation Service ES-AC77 – Acceptance Criteria for Smoke-Containment Systems Used With Fire-Resistive Elevator Hoistway Doors and Frames.

C. ICC Evaluation Service report ESR-1136

D. NFPA Codes and Standards:
1. 70 – National Electrical Code.
2. 105 – Recommended Practice for the Installation of Smoke-Control Door Assemblies.
3. 72-2002 and 2007 – National Fire Alarm Code

E. International Building Code
1. 2012

F. UL Standards:
1. 268 – Smoke Detectors for Fire Protective Signaling Systems.
2. 508 – Industrial Control Equipment.
3. 864 – Control Units for Fire Protective Signaling Systems.
4. 1784 – Air Leakage Tests for Door Assemblies.

1.3 SUBMITTALS

A. Reference Section 01 3300–Submittal Procedures; submit following items:
1. Product Data.
2. Shop Drawings: Include door width and height, jamb width, jamb and head projection, screen width, mounting height, and housing width. Show and identify related work performed under other sections of the specifications.
3. Quality Assurance/Control Submittals:
a. Qualifications:

1) Proof of manufacturer qualifications.
2) Proof of Installer qualifications.

b. Certifications: Copy of specified items.
c. Manufacturer's installation instructions and testing procedures

1.4 CLOSEOUT SUBMITTALS

A. Comply with Section 01 7700–Closeout Submittals; submit following items:
1. Operation and Maintenance [Manual][Video].
2. Manufacturer's Warranties

1.5 QUALITY ASSURANCE

A. Overall Standards:
1. Manufacturer shall maintain a quality control program in accordance with ICC-ES Acceptance Criteria 77.

B. Qualifications:
1. Manufacturer Qualifications: Minimum seven years experience in producing smoke containment systems of the type specified.
2. Installer Qualifications: Factory trained by manufacturer.

C. Certifications:
1. Manufacturer's ICC Evaluation Service report ESR-1136 showing compliance with:
a. ICC-ES AC77
b. UL standard 1784
c. AST, E84
d. NFPA 105
2. IAS (IAS is a trademark of International Accreditation Service) Accredited Testing Laboratory Labels for UL Standard 1784
3. IAS (IAS is a trademark of International Accreditation Service) Accredited Testing Laboratory Labels for UL Standard 864
4. California Department of Forestry and Fire Protection and Office of the State Fire Marshal Listing.
5. OSHPD Anchorage Pre-Approval No. OPA-0318

D. Pre-Installation Meeting:
1. Schedule and convene a pre-installation meeting prior to commencement of field operations with representatives of the following in attendance: Owner, Architect, General Contractor, smoke containment system sub-contractor, painting sub-contractor, and electrical sub-contractor.
2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.
3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6600–Delivery, Storage, and Handling.

B. Comply with manufacturer's instructions.

1.7 WARRANTY

A. Provide manufacturer's standard one year warranty.

B. Maintenance and Testing:
1. Perform minimum semi-annual maintenance and testing on each smoke containment system as required by the manufacturer's warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
2. Provide test documentation.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Smoke Guard (Basis of Design)
2. Door Systems, Inc.

B. Label each smoke containment system with following information:
1. Manufacturer's name.
2. Maximum leakage rating at specified pressure and temperature conditions.
3. Label of quality control agency.

2.2 PRODUCT

A. Elevator Door Smoke Containment System: Smoke Guard Model M200.

2.3 PERFORMANCE

A. Air Leakage: Not to exceed 3 cfm (0.001416 m^3/s) per sf of door opening at 0.1 in (25 Pa) water pressure differential at ambient temperature and 400 degrees F (204 degrees C) tested per IBC 2006, 2009, and 2012.

2.4 COMPONENTS

A. Screen:
1. Film: Minimum 1 mil (0.025 mm) thick transparent polyimide film reinforced with minimum 100 denier Nomex yarn at .25 in (6.35 mm) each way.
2. Magnetic Strips: Flexible multi-pole strips attached to longitudinal edges of film with low modulus silicone adhesive.

B. Housing: 20 gage, powder coated, cold rolled steel container with dust cover and door with concealed hinges and a latch. Housings size to coordinate with elevator opening.

C. Mandatory Auxiliary Rails:
1. Material: 16 gage ASTM A 240/240M, Type 430, ferritic stainless steel.
2. Size: 2 in (51 mm) wide, 1" (25 mm) deep, as shown in Shop Drawings.

D. Rewind Motor: NFPA 70, 90v DC.

E. Release Mechanism: IAS (IAS is a trademark of International Accreditation Service) Accredited Testing Laboratory Labels for UL Standard 864

F. Screen Rewind Switch: Include switch to rewind screen into housing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates upon which work will be installed.
   1. Verify related work performed under other sections is complete and in accordance with Shop Drawings.
   2. Verify wall surfaces and elevator door frames are acceptable for installation of smoke containment system components.

B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.

C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

A. Install smoke containment system components in accordance with manufacturer's installation instructions.

3.3 FIELD QUALITY CONTROL

A. Field Test: Follow manufacturer's cycle test procedures.
   1. Notify Owner's Representative, local Fire Marshal, alarm sub-contractor elevator sub-contractor, and the elevator service company a minimum of one week in advance of scheduled testing.
   2. Complete maintenance service record.

3.4 DEMONSTRATION

A. Demonstrate required testing and maintenance procedures to Owner's Representative.

B. Maintenance and Testing:
   1. Perform minimum semi-annual maintenance and testing on each smoke containment system as required by the manufacturer's warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
   2. Retain permanent record of tests.

C. Future Painting: Paint elevator door frame and/or auxiliary rails in accordance with Operation and Maintenance Manual.

D. Qualified Smoke Guard Inspector assesses units after exposure to a fire event.

END OF SECTION 083483

SECTION 10 5300 – PRE-MANUFACTURED ALUMINUM CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior canopies.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for non-decorative metal fabrications.
2. Division 07 Section "Sheet Metal Flashing and Trim" for items made of formed metal for flashings and trim.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design exterior metal canopies, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Exterior metal canopies, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:

1. Wind Loads on Exterior Items: As indicated on Structural Drawing S100.

C. Seismic Performance: Exterior metal canopies including anchors and connections, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal canopy and sunshade fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include finishing materials.

B. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For exterior metal canopies, show integration of hangers and support locations at building exterior walls, including locations of anchor penetrations, attachments, and necessary clearances.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For qualified Installer and professional engineer.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing formed and extruded metal component canopies similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior metal canopies wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with exterior canopies by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate installation of anchorages for exterior metal canopy items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be secured to metal stud framing. Deliver such items to Project site in time for installation.

B. Coordinate installation of exterior canopies with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Aluminum Sheet: Flat sheet complying with ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H32.

2.2 MISCELLANEOUS MATERIALS

A. Sealants, Exterior: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in decorative formed metal and remain weathertight; and as recommended in writing by exterior canopy and sunshade manufacturer.

B. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834; of type and grade required to seal joints in canopy and sunshade formed and extruded metals; and as recommended in writing by exterior canopy and sunshade manufacturer.

1. Use sealant that has a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.

D. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting canopy metal items and for attaching them to other work unless otherwise indicated.

E. Structural Anchors: For applications indicated to comply with certain design loads, provide anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in cold formed metal framing, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

F. Nonstructural Anchors: For applications not indicated to comply with design loads, provide powder-actuated fasteners, metal anchors of type, size, and material necessary for type of load and installation indicated, as recommended by manufacturer, unless otherwise indicated.

G. Anchor Materials:

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1 (A1)] stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

H. Backing Materials: Provided or recommended by exterior canopy manufacturer.

2.3 EXTERIOR CANOPIES

A. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. Masa Architectural Canopies
2. Mitchell Metals
3. Mapes Industries, Inc.; (Basis of Design)

B. Product: Super Lumideck,

C. Materials

1. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and thickness required by manufacturer to meet applicable loads for sizes indicated on Drawings.
2. Decking shall be 3 inches deep extruded 0.078 inch thick decking.
3. Hanger rods and attachment hardware shall be powder coated to match canopy.
4. Fascia shall be standard 8-inch extruded G style (minimum 0.125 aluminum).
5. Drain scuppers shall be front mounted.

D. Finish: Clear Anodic.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Apply organic and anodic finishes to formed and extruded metals after fabrication unless otherwise indicated.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are

acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place exterior canopies in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install exterior canopies and sunshades.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior canopies weatherproof.

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes of exterior canopies from damage during construction period. Remove temporary protective coverings at time of Final Completion.

END OF SECTION 10 5300

CONTRACT ADDENDUM TWO
May 5, 2015

ISSUED BY:

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NOTICE TO ALL BIDDERS FOR THE:

State of Kansas Energy and Service Center

221 SW 7th Street, Topeka, Kansas 66612

Project No. A-012651
HTK Project No.: 1410.03

You are instructed to read and note the following described changes, corrections, clarifications, omissions, deletions, additions, approvals and statements pertinent to the Contract Documents. Contract Addendum One is a part of the Contract Bid Documents and Construction Documents and shall govern in the performance of the Work. **(14 pages total)**

ADDENDUM ITEMS TO ADDRESS

BIDDING REQUIREMENTS AND CONTRACT CONDITIONS

Article 2-01: SPECIFICATIONS:

1. Division 1: Add Section 12200 - Unit Prices, attached to this Addendum, shall be added to the specifications.

Article 2-02: SPECIFICATIONS

1. Section 095113 Acoustical Panel Ceilings: 2.3, A: Add the following approved manufacturer: Certainteed.
2. Section 089119 Fixed Louvers: 2.3 A, 1.: Add the following approved manufacturer: Industrial Louvers, Inc.
3. Section 083613 Sectional Overhead Door: Overhead door shall be clear anodized aluminum frame with 1/2" inch insulated glazing. Basis of Design is Overhead Door Model 511.

Article 2-03: SPECIFICATIONS

1. Division 10: Add Section 108113 - Deterrent Spikes, attached to this Addendum, shall be added to the specifications.

Article 2-04: SPECIFICATIONS

1. Division 13: Add Section 133600 – Fabricated Paint Booth, attached to this Addendum, shall be added to the specifications.

Article 2-05: DRAWINGS – G201 PARTITION TYPES

1. Partition Type C12a shall be revised to change LWCMU to 10 inches. Partition dimension shall be changed to 11 ¾ inches.

Article 2-06: DRAWINGS – A101 FIRST FLOOR PLAN

1. Room 141 Carpentry Shop: Shall be revised to show the Paint Booth, currently noted with Keynote 133600-1, per the A101 drawing attached to this Addendum.

2. Partition type noted as C12 along grid lines 6 and G shall be revised to read “C12a”.

Article 2-07: DRAWINGS – A201 BUILDING ELEVATIONS

1. West and South building elevations: Shall be revised to clarify stone veneer jointing per A201 drawing attached to this Addendum.

Article 2-08: DRAWINGS - A301 WALL SECTIONS

1. 5A301 Mechanical Pit: Shall be revised to note walls and floors to receive Secondary Containment Coating System.
2. 5A301 Mechanical Pit: Shall be revised to change pipe ladder rung note to read: “Provide M.A. Industries PS2-B-DF black manhole steeps with A-Lok/Flex–Lok step inserts.”

Article 2-09: DRAWINGS - 1A302 WALL SECTION

1. Clarification: Wall section 1A302, at building west elevation curtainwalls, indicates a louver is located within the bottom frame section and refers to detail 15A307. 15A307 is a typical detail for curtainwall framing at west and south building elevations. A mechanical air intake louver is to be mounted between curtainwall frame members at the west curtainwalls in rooms 127 and 128, with an additional exterior ornamental metal stamped grille cover glazed into the curtainwall at the exterior side of the mechanical louver. Ornamental metal stamped grilles are shown and noted on A201 building elevations and A501curtainwall frame elevations. Refer to MEP MH103 for air intake louvers locations.

Article 2-10: DRAWINGS – S101

1. Sheet S101 attached to this Addendum has been revised as follows:
    a. Grid number H.3 has been revised to 1.8.
    b. Revised grade beam depth along Grid A between Grid 18 to 15.
    c. Added footing type 3.0B, 4.0B, and 5.0A to Concrete Footing Schedule.

END OF CONTRACT ADDENDUM TWO

*****RECEIPT OF THIS ADDENDUM IS TO BE ACKNOWLEDGED ON THE BID FORM*****

SECTION 01 2200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Document C – Form of Bid refers to Unit Prices.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. The Owner reserves the right to reject Contractor’s measurement of work-in-place that involves use of established unit prices, and negotiate with the Contractor to establish an agreed upon unit price for materials, equipment of services or a portion of the Work added or deducted from the contract Sum.

E. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Mass Concrete: Price for mass concrete, reinforcing not included, per cubic yard.

B. Unit Price No. 2: Reinforcing Steel: Price for reinforcing steel, per pound, installed.

C. Unit Price No. 3: Common Excavation - Machine: Price for general earth excavation by machine. Based on disposal away from the site, per cubic yard.

D. Unit Price No. 4: Machine Compacted Fill: Price for machine compacted fill below/above depths indicated on drawings, per cubic yard.

E. Unit Price No. 5: Subgrade preparation with imported materials: Cubic yards of compacted in-place fill material to replace material ordered removed by the testing agency, beyond plan dimensions and elevations, including excavation, hauling, off-site wasting of unsuitable material, and furnishing, placing, and compacting of specified fill material.

F. Unit Price No. 6: Trenching: Removal and replacement of unacceptable subgrade material with imported material; Cubic yards of compacted in-place material to replace material ordered removed by Owner's testing agency, beyond plan dimensions and elevations, hauling, off-Site wasting of unsuitable material, and furnishing, placing, and compacting or specified fill material.

G. Unit Price No. 7: Bulk rock excavation and placement of satisfactory materials below Exposed Subgrade. Unit Price for volume of rock excavation below the Exposed Subgrade as directed by the Geotechnical Engineer. This unit price shall include the replacement of an equal volume of satisfactory soil material. Excavation above the Exposed Subgrade as defined below is unclassified and shall be included in the base bid.
   1. Exposed Subgrade: Surface or elevation remaining after completion of excavation to required elevations indicated on Drawings and specified under this Section and as defined below:
      a. Bottom of footings.
      b. Bottom of bedding material in utility trenches and pits.
      c. In pavement areas: bottom of sub-base of the pavement as shown on the drawings.
      d. Under slabs on grades: bottom of 4" drainage course below the slab.
   2. Satisfactory soil materials and placement includes; satisfactory onsite materials and/or borrowed off-site satisfactory soil materials, backfill, fill, placement, grading and compaction as defined in, and required by, Division 31 Section 312000 "Earth Moving".
   3. Rock is defined in Section 312000 "Earth Moving".
   4. Unit of Measurement: Cubic yards of excavated rock as defined in Section 312000 "Earthwork" below the Exposed Subgrade, measured in original position. Unit price shall

include removal, disposal, and replacement with satisfactory material based upon the volume of material removed.

H. Unit Price No. 8: Rock excavation in footings, trenches and pits and placement of satisfactory materials below the Exposed Subgrade. Unit Price for volume of rock excavation in footings, trenches and pits below the Exposed Subgrade as directed by the Geotechnical Engineer. This unit price shall include the replacement of an equal volume of satisfactory soil material. Excavation above the Exposed Subgrade as defined below is unclassified and shall be included in the base bid.

1. Exposed Subgrade: Surface or elevation remaining after completion of excavation to required elevations indicated on Drawings and specified under this Section and as defined below:
   a. Bottom of footings or pier caps.
   b. Bottom of bedding material in utility trenches and pits.
   c. In pavement areas: bottom of sub-base of the pavement as shown on the drawings.
   d. Under slabs on grades: bottom of 4" drainage course below the slab.
2. Satisfactory soil materials and placement includes; satisfactory onsite materials and/or borrowed off-site satisfactory soil materials, backfill, fill, placement, grading and compaction as defined in, and required by, Division 31 Section 312000 "Earth Moving".
3. Rock excavation in trenches, footings and pits is defined in Section 312000 "Earthwork".
4. Excavation below bottom of footings directed by the Geotechnical Engineer shall be replaced with concrete.
5. Unit of Measurement: Cubic yards of excavated rock in trenches, footings and pits as defined in Section 312000 "Earthwork" below the Exposed Subgrade, measured in original position. Unit price shall include removal, disposal, and replacement with satisfactory material based upon the volume of material removed.

I. Unit Price No. 9: Geopier in place aggregate pier elements.

a.	Preparation of plans and specifications and installation of aggregate pier elements	$____ Lump Sum
b.	Additional Installed Piers (w/o remobilization)	$____ Each
c.	Add for Casing Holes	$____ Each
d.	Additional Mobilizations	$____ Each
e.	Additional Modulus or Uplift Load Tests	$____ Each
f.	Removal of Obstructions	$____ /Hour

END OF SECTION 01 2200

SECTION 10 8113 – DETERRENT SPIKES

PART 1 - GENERAL

1.1 - SYSTEM DESCRIPTION:

A. All stainless steel physical surface barriers designed to prevent all types of pest birds and climbing animals from landing, roosting, nesting or climbing on architectural surfaces.

B. Mounting Hardware: Stainless steel mounting clips combined with mechanical fasteners to hold bird spikes to all types of architectural surfaces.

1.2 - QUALITY ASSURANCE

A. Installer to be completely familiar with the proper installation procedures for the Bird Spike and mounting hardware installation.

B. Installer must be completely familiar with the specified mounting hardware and

1.3 – SUBMITTALS

A. Manufacturers literature including planning guide, installation layout drawings and installation instructions for the specified spike model and mounting hardware.

B. Sample of specified bird spike model - not less than 2" (5.1cm) in length.

C. Sample of specified bird spike mounting Hardware.

D. Installation instructions and drawings from manufacturer (if specified).

1.4 - STORAGE & HANDLING

A. Provide storage and/or protection to keep shipping boxes dry, clean and undamaged. Do not stack or place other packaging or objects on the shipping boxes.

B. Keep bird barrier spikes and mounting hardware in original packaging until needed for installation.

PART 2 - PRODUCTS

2.1 - MANUFACTURERS.

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Nixalite of America Inc. (Basis of Design).
   b. Bird-B- Gone, Inc.

2.2 – BIRD BARRIER STRIPS

A. Nixalite Premium Model S Stainless Steel Bird Barrier System:
   1. Spike Wires: Stainless steel, 0.041" (1 mm) diameter, full-hard spring temper.
   2. Base Strip: Stainless steel, 0.25" wide x 0.02" thick (6.3 mm x 0.5 mm), fully annealed.
   3. Spike Strip Lengths: 24" (61.0 cm) and 48" (122.0 cm) strip lengths.
   4. Full row spike, 4" high (10.2 cm), 4" wide (10.2 cm), 120 wire points per foot. Full 180- degree wire coverage.
   5. Finish: Natural stainless steel finish.

2.3 - BIRD SPIKE MOUNTING HARDWARE

A. Stainless steel or non-corrosive materials. Standard mounting hardware supplied with bird barrier spike model in set quantities.

B. Mounting Hardware must allow for bird spike strip installation, removal and reinstallation without damaging the installation surface, the spike strips or the mounting system. Provide

C. Glue clips & adhesive: If surface conditions do not allow for the use of the supplied bird spike mounting hardware, use the glue clip and adhesive installation method. Follow installation instructions available from the manufacturer.

PART 3 - EXECUTION

3.1 - INSPECTION

A. Visually inspect all installation surfaces to insure all surfaces are clean, dry and free from debris or other conditions that could impede the workflow of this section. All surfaces must be sanitized and deodorized before bird spike installation.

B. Notify architect of detrimental conditions. Do not proceed until these conditions are corrected.

3.2 - PREPARATION

A. Field Measurements: Verify the dimensions for each surface specified bird spike installation. Use manufacturers planning guides and shop drawings to verify that sufficient quantities of bird spike strips will be installed on surfaces indicated to receive bird control.

B. Insure all installation surface finishing requirements have been accomplished prior to installing bird spike strips. They are to be the last items installed on each specified surface. Do not apply any surface coating or treatment (paint, sealer, etc.) over bird spike units or

mounting hardware.

3.3 - SURFACE CLEANING

A. All surfaces to be clean, dry and free of obstructions before spikes are installed.

3.4 - INSTALLATION

A. Install bird spike strips in strict accordance with manufacturer's spike strip spacing and installation guidelines.

B. Install bird spike strips so they will protect the entire surface, not just the outside edges. No gaps are allowed in the bird spike strip coverage. Cut the bird spike strips where necessary to fit the surface properly.

C. Wires of bird spike strips must extend over outside edges of each surface by at least 1/4" (0.6cm). The bird spike base strip must extend over the ends of each surface by at least 1/2" (1.2cm).

D. Fasten bird spike strips to the surface with the mounting hardware recommended by the manufacturer. Follow the hardware spacing guidelines and installation procedures supplied by manufacturer.

3.5 - ADJUSTMENTS / CLEANING

A. Remove debris and waste materials from project site. Inspect finished installation. Make any adjustments needed to conform manufacturer’s spacing and installation guidelines.

END OF SECTION 10 2813

SECTION 133600 - FABRICATED PAINT BOOTH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes fabricated steel paint booths.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for paint booths.

B. Shop Drawings: For paint booths. Include plans, elevations, sections, details, accessories, and fastening and anchorage details, including mechanical fasteners.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For paint booth to include in maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair finish or replace paint booth that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Spray Booth shall meet or exceed applicable OSHA and NFPA regulations.

2.2 FABRICATED STEEL PAINT BOOTH

A. General: Fabricate paint booth from an integrated set of mutually dependent components to form a completed assembly, ready for installation on Project site.

1. Manufacturers: Subject to compliance with requirements, provide products by the following

a. Col-Met Engineered Finish Solutions.

B. Booth Model: Model EIB-10-08-05-00 Enclosed Industrial Spray Booth.

C. Structural Framework: Fabricated from 18 Gage galvanized steel panels with bolted connections.

D. Doors:

1. Manufacturer’s standard swinging doors with integral filter units. Equip doors with deadlock and two butt hinges.

a. Deadlock shall be mortised, with lever handle and removable cylinder capable of being master keyed.

E. Wall Panel Assembly: Assembly consisting of exterior face panel fabricated from 18 GA. nominal-thickness, galvanized-steel sheet.

F. No perimeter frame, with surface of supporting concrete base as finished floor.

G. Flat Roof/Ceiling Assembly: Assembly consisting of ceiling panels.

H. Lighting Fixtures: Two manufacturer's standard ceiling-mounted fluorescent lighting fixtures.

I. Accessories: Provide the following:

1. 3 HP open-type exhaust motor with vapor-proof belt housing and factory grease packed bearings.
2. 24 inch dia. tubeaxial exhaust fan. (8,000 CFM).
3. One draft manometer filter gauge control panel.
4. One box 20" x 20" x 2" paint arrestor filter exhaust media.
5. One box 20" x 20" x 1" air intake filter media.

J. Anchorage: Post installed anchors fabricated from non-ferrous or corrosion-resistant materials, with allowable load or strength design greater than or equal to the design load as determined by testing conducted by a qualified testing agency.
1. Materials: Zinc-Coated (Galvanized) Steel: Hot-dip galvanized according to ASTM A 123/A 123M.

2.3 FABRICATION

A. Factory fabricate paint booth components for field assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including concrete bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before paint booth installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install paint booth according to manufacturer's written instructions.

B. Set paint booth plumb and aligned. Level baseplates true to plane with full bearing on concrete floor.

C. Fasten paint booth securely to concrete floor with anchorage per manufacturer's instructions.

D. Connect to electrical power service. .

E. Perform startup checks of units according to manufacturer's written instructions.

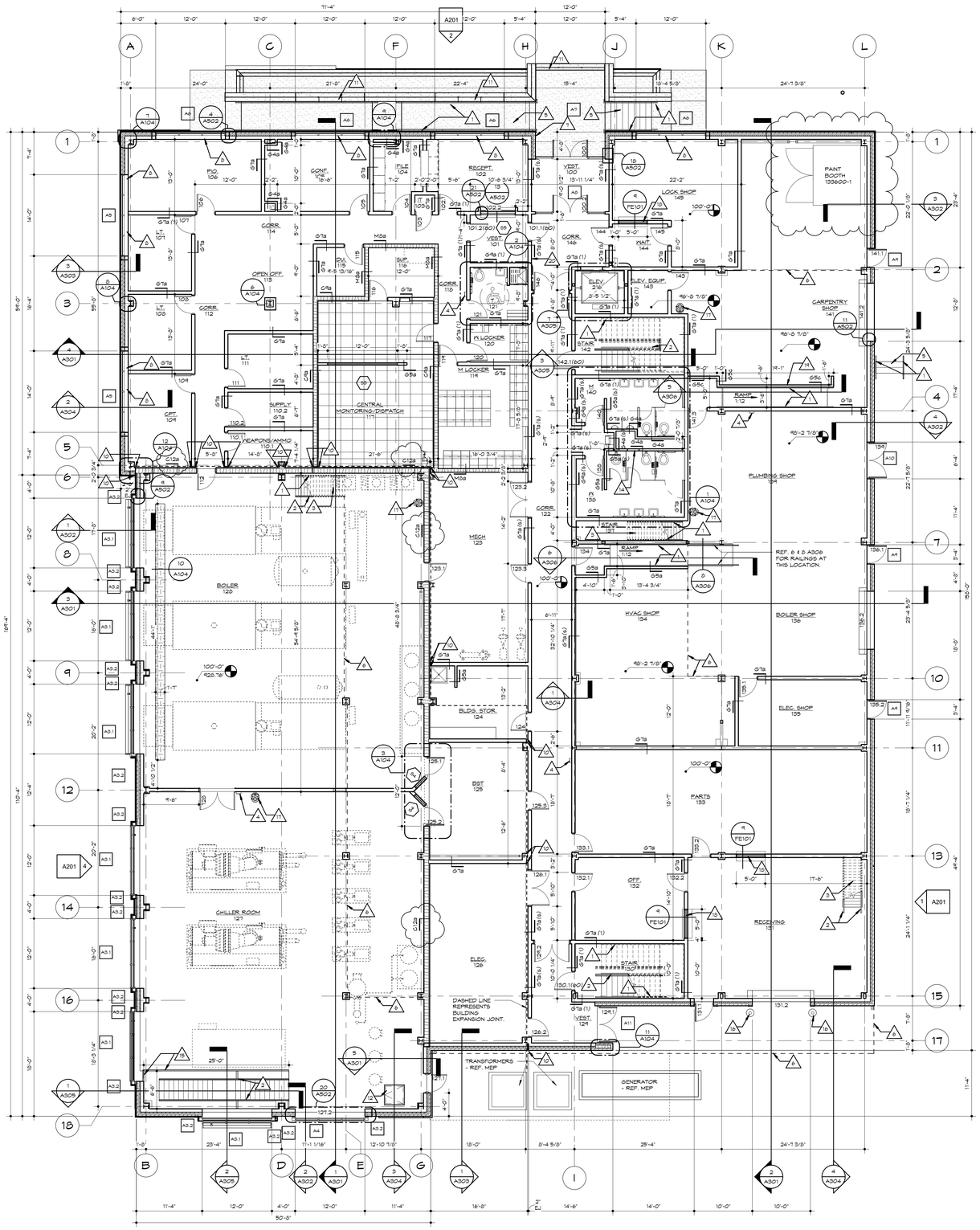
3.3 ADJUSTING

A. Adjust doors, and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

C. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 133600



ROOM FINISH SCHEDULE-FIRST FLOOR

ROOM MARK	ROOM NAME	FLOOR	BASE	WALLS NORTH (or TYP.)	WALLS EAST	WALLS SOUTH	WALLS WEST	CEILING	NO TES
100	VEST.	MOM	RB	LTX	LTX	LTX	LTX	TYPE 1	
101	VEST.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
102	RECEPT.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
103	IT	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
104	FILE	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
105	CONF.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
106	PUD	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
107	LT.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
108	LT.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
109	OPT.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
110.1	KEAPONS/AMMO	SC	RB	LTX	LTX	LTX	LTX	TYPE 1	
110.2	SUPPLY	SC	RB	LTX	LTX	LTX	LTX	TYPE 1	
111	LT.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
112	CORR.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
113	OPEN OFF.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
114	CORR.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
115	DU.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
116	SUP.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
117	CENTRAL MONITORING/DISPATCH	CPT.AC	RB	LTX	LTX	LTX	LTX	STR.	1
118	CORR.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
119	M LOCKER	PT	RB	EPX	EPX	EPX	EPX	TYPE 1	
120	M LOCKER	PT	RB	EPX	EPX	EPX	EPX	TYPE 1	
121	T.	PT	PT	EPX.PWT	EPX.PWT	EPX.PWT	EPX.PWT	TYPE 1/EPX	
122	CORR.	SC	RB	LTX	LTX	LTX	LTX	STR/TYPE 1 /LAX	
123	MECH	SC	RB	LTX	LTX	LTX	LTX	STR	
124	BLDG. STOR.	SC	RB	LTX	LTX	LTX	LTX	STR	
129	BST	SC	RB	LTX	LTX	LTX	LTX	TYPE 1	
128	ELEC.	SC	RB	LTX	LTX	LTX	LTX	STR	
121	CHILLER ROOM	SC	RB	EPX	EPX	EPX	EPX	STR	
120	BOILER	SC	RB	EPX	EPX	EPX	EPX	STR	
124	VEST.	MOM	RB	LTX	LTX	LTX	LTX	TYPE 1	
130	STAIR	VCT, RTR	RB	LTX	LTX	LTX	LTX	TYPE 1	
131	RECEIVING	SC	RB	LTX	LTX	LTX	LTX	STR	
132	OFF.	CPT	RB	LTX	LTX	LTX	LTX	TYPE 1	
133	PARTS	SC	RB	LTX	LTX	LTX	LTX	STR	
134	HVAC SHOP	SC	RB	LTX	LTX	LTX	LTX	STR	
135	ELEC. SHOP	SC	RB	LTX	LTX	LTX	LTX	STR	
136	BOILER SHOP	SC	RB	LTX	LTX	LTX	LTX	STR	
137	STAIR.	VCT, RTR	RB	LTX	LTX	LTX	LTX	STR	
138	PI	PT	PT	EPX	EPX	EPX	EPX	TYPE 1	
134	PLUMBING SHOP	SC	RB	LTX	LTX	LTX	LTX	STR	
140	M	PT	PT	EPX	EPX	EPX	EPX	TYPE 1	
141	CARPENTRY SHOP	SC	RB	LTX	LTX	LTX	LTX	STR.	
142	STAIR	VCT, RTR	RB	LTX	LTX	LTX	LTX	TYPE 1	
143	ELEV. EQUIP.	SC	RB	LTX	LTX	LTX	LTX	STR	
144	KNIT.	VCT	RB	LTX	LTX	LTX	LTX	TYPE 1	
145	LOCK SHOP	VCT	RB	LTX	LTX	LTX	LTX	TYPE 1	
146	CORR.	SC	RB	LTX	LTX	LTX	LTX	STR	

ARCHITECTURAL PLAN NOTES

GENERAL: COORDINATE WITH WORK SHOWN ON STRUCTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS, REF. TE SHEET FOR EQUIP. COORDINATION

1. HANDRAIL; REF. 9A306
2. RAILING; REF. 9A306
3. METAL SHIP LADDER
4. FIRE EXTINGUISHER CABINET; 104413-1
5. REF. CIVIL FOR LANDING, STAIR, & RAMP (N.I.C.)
6. LINE OF SOFFIT, ROOF OVERHANG, OR FLOOR ABOVE.
7. KNOX BOX LOCATION.
8. ROLLER SHADES 123413-1
9. ROOF HATCH-LADDER; REF. 18A309; COORDINATE EXACT LOCATION WITH JOISTS AND MEP EQUIPMENT.
10. 2" BULDING EXPANSION JOINT. PROVIDE WALL, CEILING, AND/OR FLOOR EXPANSION JOINT COVER N.O. PROVIDE THRESHOLD AT DOORS. EXPANSION JOINT REPRESENTED BY DASHED LINE.
11. DECORATIVE RAILING; REF. 4A306.
12. FLOOR ACCESS HATCH. 055113-3
13. WIRE MESH PARTITION BRACE AT STRUCTURE ABOVE. 10'-0" HIGH MIN. INTEGRAL DOOR N.O. PROVIDE 24" X 24" ACCESS PANEL.
14. GATE. REF. 11A306. RAILING IS SIMILAR.
15. BOLLARD REF. 10A5101.
16. EYE WASH STATION. REF. MEP
17. TRANSACTION WINDOW. 3'-6" HIGH. REF. PLAN FOR WIDTH. GLASS TO BE 1/4" TEMPERED.
18. 9'-0" HIGH WALL WITH 092900-12 48" O.C.
19. DIRECTORY

ROOM FINISH SCHEDULE LEGEND

FLOOR
SC SEALED CONCRETE
VCT VINYL COMPOSITION TILE
PT PORCELAIN TILE
CPT CARPET
RTR RUBBER TREADS AND RISERS
MOM MAUK-OFF MAT
AF ACCESS FLOOR

WALL BASE
RB RESILIENT BASE (4" HIGH)
PT PORCELAIN TILE (6" HIGH)

WALLS
LTX PAINT
EPX EPOXY PAINT
PWT PORCELAIN WALL TILE

CEILING
STR/PAINT EXPOSED STRUCTURE
LAX LATEX ENAMEL PAINT ON GYPSUM SOFFITS
TYPE 1 SUSPENDED 2 x 2 ACOUSTIC LAY-IN PANEL

ROOM FINISH SCHEDULE NOTES

1. CARPET TILE SHALL INTEGRATE WITH ACCESS FLOORING.

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DATE:
- 4-15-15

REVISED DATE:
- 12-18-14
- 2-9-15
- 3-10-15

HTK PROJECT NUMBER:
- 1410.03

Department of Administration
Office of Facilities and
Procurement Management
800 SW Jackson, Suite 700
Topeka, Kansas 66612-1216
Phone: 785-296-8899
FAX: 785-296-3456

STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
221 SW 7th Street
BUILDING NUMBER 173000-0038

DATE: 4-15-15 DRAWN BY: CHECKED BY: REV: 1

FIRST FLOOR

A-012651

A101

CONSTRUCTION DOCUMENTS

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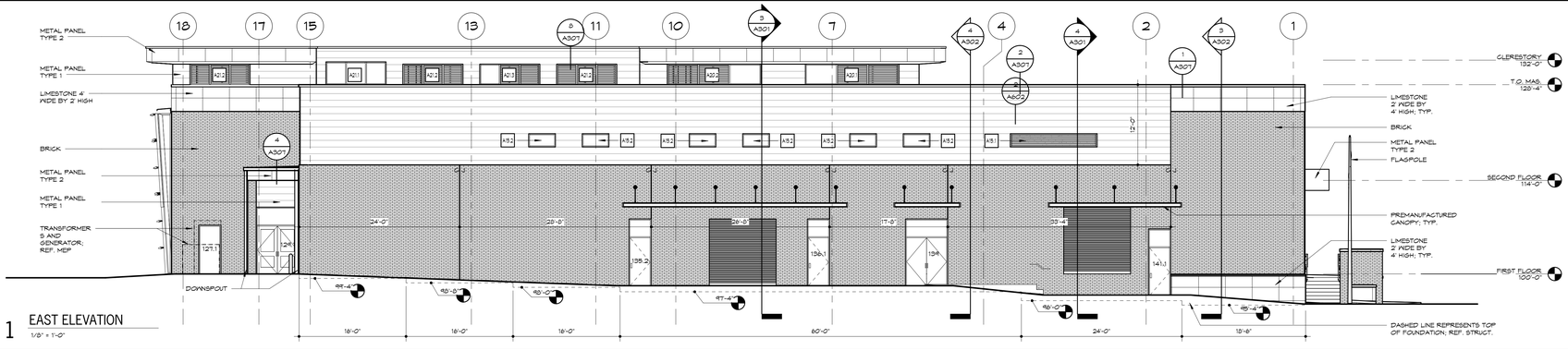
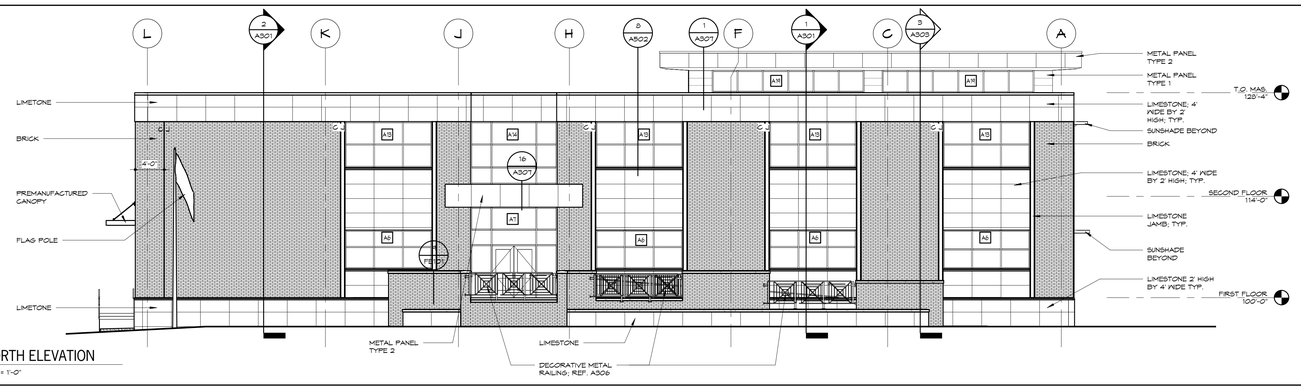
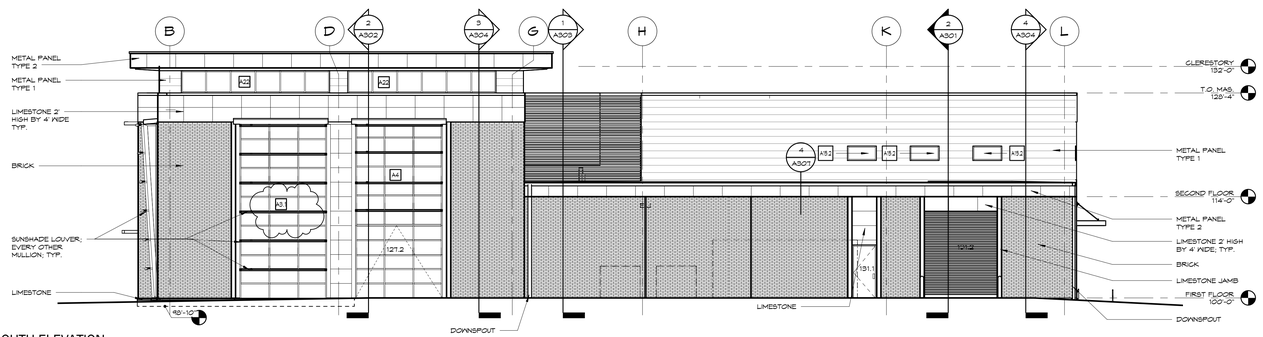


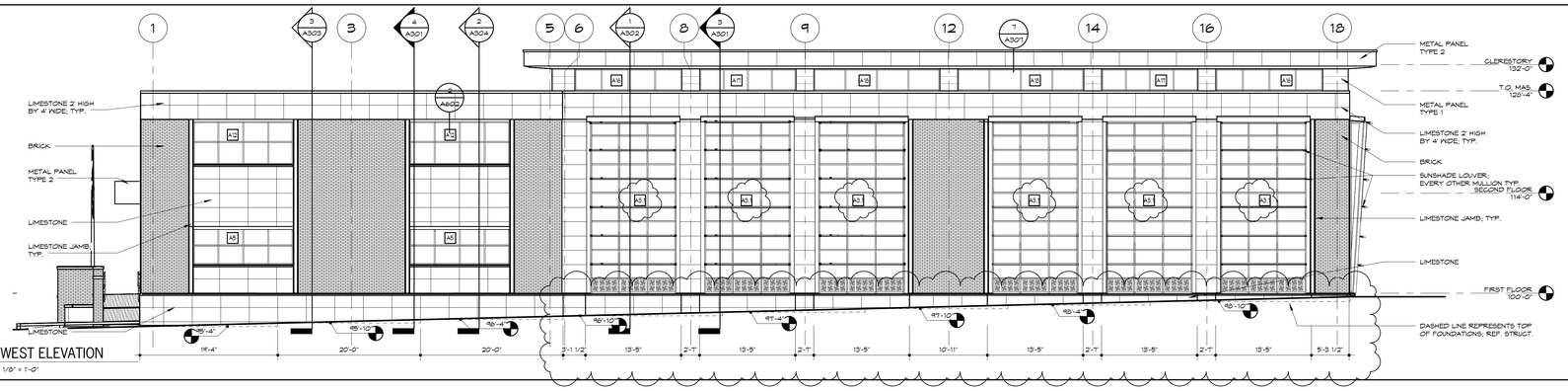
1 EAST ELEVATION
1/8" = 1'-0"



2 NORTH ELEVATION
1/8" = 1'-0"



3 SOUTH ELEVATION
1/8" = 1'-0"



4 WEST ELEVATION
1/8" = 1'-0"

KEYNOTES

Note: Keynotes are drawn from a master list. It may not be sequentially numbered. Sizes (8, 2x4) or other info following keynote on drawings indicates criteria for those materials/locations which may differ from std. material specified.

033000	-1	Concrete Structure	081113	-1 Steel Door
	-2	Concrete Floor Slab		-2 Steel Frame
	-3	Vapor Barrier		-3 Frame Anchor
	-4	Welded Wire Fabric		-4 Louver
	-5	Steel Reinforcing Bar		-5 Plaster Guard
	-6	Rustication Joint		-6 FRP Door
	-7	Waterstop	081416	-1 Flush Wood Door
	-8	Dovetail Anchor	083113	-1 Access Door
	-9	Chamfer		-2 Access Door Frame
	-10	Premolded Joint Filler		-3 Floor Access Door
035000	-1	Concrete Topping	083323	-1 Overhead Coiling Door
042000	-1	Face Brick		-2 Coiling Counter Door
	-2	Concrete Masonry Unit - Normal Weight (")	083613	-1 Sectional Overhead Door
				-2 Sectional Overhead Door Track
	-3	Concrete Masonry Unit - Lightweight (")		-3 Weatherstripping
	-4	Wire Reinforcing	084113	-1 Aluminum Entrance Door
	-5	Metal Tie/Anchor		-2 Aluminum Entrance Frame
	-6	Through Wall Flashing		-3 Sunshade
	-7	Control Joint Strip		-4 Aluminum Bubsill
	-8	Bond Beam (")	084413	-1 Glazed Aluminum Curtain Wall
	-9	Compressible Filler		-2 Trim
	-10	Cavity Drainage Material		-3 Sunshade Louver
	-11	Termination Bar		-4 Aluminum Bubsill
044300	-1	Stone Masonry Anchor	087100	-1 Track Hardware
	-2		088000	-1 Glazing (as scheduled)
	-3	Stone Jamb	088853	-1 Security Glazing (as scheduled)
	-4	Stone Sill		
	-5	Belt Course	089116	-1 Louvers and Vents
047200	-1	Cast Stone	092216	-1 Steel Stud (")
051200	-1	Steel Beams		-2 Steel Stud Runner (")
	-2	Steel Column		-3 Furring Channel (")
	-3	Steel Tube	092400	-1 Portland Cement Plastering
	-4	Steel Channel		-2 Metal Lath
052100	-1	Steel Joist		-3 Casing Bead
	-2	Joist - Extended End	092900	-1 Gypsum Board (")
	-3	Joist - Ceiling Extension		-2 Fire Rated Gypsum Board Assembly
053100	-1	Steel Decking		
	-2	Steel Composite Decking		-3 Cementitious Tile Backer Panel
	-3	Flexible Closure Strips		
054000	-1	Structural Steel Studs		-4 Metal Suspension System
	-2	Structural Steel Joists		-5 Acoustical Sealant
	-3	'Z' Column		-6 Acoustical Insulation (")
055000	-1	Steel Angle		-7 Metal Edge Trim
	-4	Steel Channel		-8 Auxiliary Supports Framing
	-5	Steel Lintel		-9 Metal Control Joint
	-6	Steel Pipe		-10 High Impact Gypsum Board
	-7	Steel Tube		-11 Concrete Interior Finishing Compound
	-8	Steel Plate		
	-9	Steel Ladder		-12 Stiffener
	-10	Steel Bollard	093000	-1 Porcelain Pell Tile
055100	-1	Steel Stairs		(" x ")
	-2	Steel Stair Stringer		-2 Shower Pan
	-3	Steel Base Plate		-3 Shower Pan Flashing
055213	-1	Steel Pipe Handrail		-4 Porcelain Floor Tile (" x ")
	-2	Steel Pipe Railings		
	-3	Steel Handrail Wall Bracket		-5 Tile Base
	-4	Steel Rod		-6 Tile Cap
055500	-1	Steel Grating		-7 Setting Bed
	-2	Steel Frame		-9 Uncoupling water-proof membrane
057300	-1	Decorative Metal Railings		
057500	-1	Ornamental Metal Stamped Grille		-4 Shower Splashguard
				-10 Shower Niche
061093	-1	2x Wood Nailer (")	095113	-1 Acoustical Panel (x) (If = Fire Rated)
	-2	2x Wood Blocking (")		
	-3	1x Wood Continuous ( )		-2 Ceiling Suspension System
	-4	Plywood (")		-3 Edge Mold Trim
	-5	400 Psi		-4 Auxiliary Support Framing
	-6	Furring (")	096813	-1 Resilient Tile Flooring
	-7	Nailing (")		-2 Resilient Wall Base
064116	-1	Interior Architectural Woodwork		-3 Edge Strip
				-4 Tactile Warning Surface
	-2	High Pressure Laminate		-5 Resilient Stair Tread
	-3	Cabinet Liner Laminate		-6 Resilient Stair Riser
	-4	Particle Board		-7 Resilient Stringer Skirt
	-5	Plywood		-8 Resilient Stair Nose
	-6	Stm Edge Molding	096813	-9 Carpet Tile
	-7	Solid Wood Blocking	096900	-1 Access Flooring
	-8	Hardwood	099113	-1 Exterior Painting
	-9	Steel Tube/Leg Frame	099123	-1 Interior Painting
	-10	Door Hinge	099635	-1 Secondary Containment Coating System
	-11	Door/Drawer Pull	101400	-1 Signage
	-12	Magnetic Catch	102113	-1 Toilet Partition
	-13	Drawer		-2 Toilet Accessories
	-14	Shelf Supports	102213	-1 Wire Mesh Partitions
	-15	Countertop	102800	-1 Impact-Resistant Cornerguard
	-16	Solid-Surfacing Material		
071113	-1	Bituminous Dampproofing	102900	-1 Tissue Dispenser
071326	-1	Self-Adhering Sheet Waterproofing		-2 Framed Mirror
				-3 Sanitary Napkin Disposer
072100	-1	Foundation Wall or Under Slab Insulation (R-)		-4 Grab Bar
				-5 Shower Seat
	-2	Cavity Wall Insulation (R-)		-6 Shower Curtain Rod
	-3	Building Insulation - Unfaced (R-)		-7 Coat/Robe Hook
				-8 Shower Curtain
	-4	Building Insulation - Faced (R-)	104413	-1 Fire Extinguisher Cabinet
			104416	-1 Fire Extinguisher
	-5	Sill Sealer	105113	-1 Personnel Locker
	-6	Batt Insulation		-2 Locker
072126	-1	Fluid Applied Membrane Air Barrier		-3 Bench
			105500	-1 Pre- Manufactured Canopies
	-2	Flashing Tape		
074213	-1	Metal Wall Panel (Type 1)	107500	-1 Flagpole
	-2	Trim	108113	-1 Deterrent Spikes
	-3	Z-Furring (")	122413	-1 Roller Window Shades
	-4	Metal Wall Panel (Type 2)	123600	-1 Spray Painting Booth
	-5	Metal Soffit Panel	142400	-1 Hydraulic Elevator
075425	-1	Thermoplastic Polyolefin (TPO) Roofing	311000	-1 Site Clearing
			312000	-1 Earth Moving
	-2	Roof Insulation Flat		-2 Interior Fill
	-3	Roof Insulation Tapered		-3 Exterior Fill
	-4	Roof Expansion Joint		-4 Granular Drainage Course
	-5	Coverboard		-5 Subbase Course
	-6	Walkway Protection Board	321313	-1 Concrete Paving
076200	-1	Sheet Metal Flashing and Counterflashing	334600	-1 Perforated Wall Pipe & Fittings
	-2	Pre-Finished Roof Edge		-2 Geotextile Filter Fabric (Flat/Sock)
	-3	Pre-Finished Coping		
	-4	Sheet Metal Ridge		-3 Drainage Panel
	-5	Sheet Metal Gutter		
	-6	Sheet Metal Downspout		
	-7	Sheet Metal Soldier		
077124	-1	Roof Expansion Joint		
077200	-1	Roof Hatch/Ladder		
078413	-1	Penetration Firestopping		
078440	-1	Joint Firestopping		
079200	-1	Sealant - Make where required		
	-2	Joint Filler		
	-3	Gasket		
	-4	Backer Rod		
079500	-1	Expansion Control		

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DATE:
- 4-15-15

REVISED DATE:
- 12-18-14
- 2-9-15
- 3-10-15
-

HTK PROJECT NUMBER:
- 1410.03

Department of Administration
Office of Facilities and
Procurement Management
800 SW Jackson, Suite 700
Topeka, Kansas 66612-1216
Phone: 785-296-0456
FAX: 785-296-0456

STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
221 SW 7th Street
BUILDING NUMBER 17300-0038

DATE: 4-15-15 DRAWN BY: DWB CHECKED BY: CHK REV: 1

BUILDING ELEVATIONS

A-012651

A201

CONSTRUCTION DOCUMENTS

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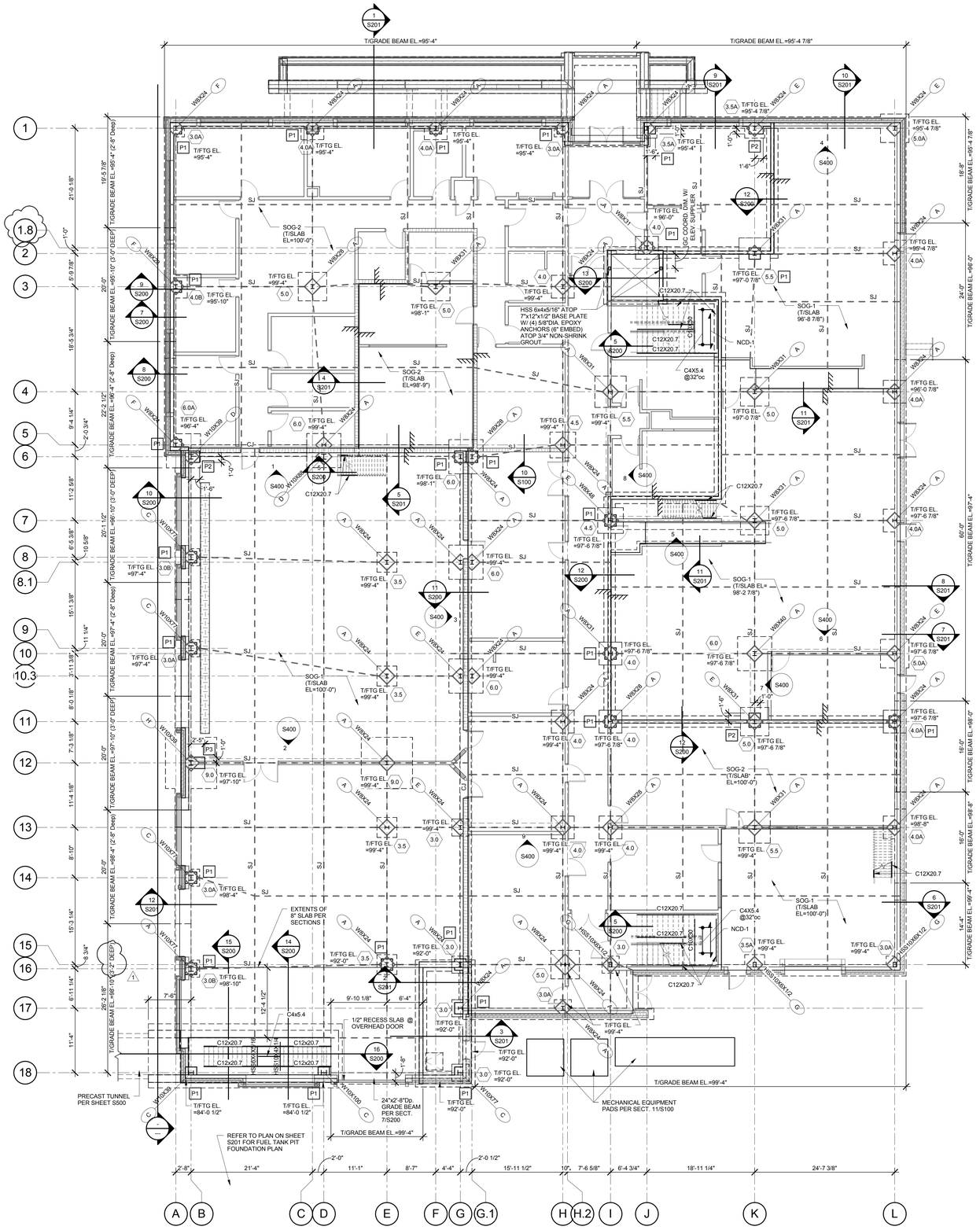

1 FOUNDATION PLAN

1/8" = 1'-0"

NOTES:
1.) REFER TO GENERAL NOTES & LEGEND ON SHEET S100.

NORTH

COLUMN PILASTER SCHEDULE

CONCRETE (PSI): 4000		REBAR (KSI): 60		
TYPE	PILASTER SIZE (DEPTHxWIDTH)	VERTICAL REINFORCING	TIES	SHAPE
P1	24"x24"	(8) #6	(2) #3 @12"oc	
P2	30"x24"	(10) #6	(4) #3 @12"oc	
P3	36"x24"	(12) #6	(5) #3 @12"oc	

1.) ALL PILASTER SHALL HAVE (3) ADDITIONAL SETS OF TIES AT TOP 5".
2.) ALL PILASTERS ARE CENTERED ON STEEL COLUMN UNLESS NOTED OTHERWISE PER PLAN.

COLUMN BASE PLATE SCHEDULE

TYPE	COLUMN	BASE PLATE	BASE PLATE TYPE	ANCHOR BOLTS	GROUT
A	PER PLAN	3/4"x14"x14"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
B	PER PLAN	1"x16"x16"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
C	PER PLAN	3/4"x16"x16"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
D	PER PLAN	3/4"x16"x20"	B	(6) 1" Ø (GRADE 105) x 2' - 0" Lg.	1"
E	PER PLAN	3/4"x16"x20"	C	(6) 1" Ø (GRADE 105) x 2' - 0" Lg.	1"
F	PER PLAN	1"x14"x14"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
G	PER PLAN	3/4"x12"x16"	D	(4) 3/4" Ø x 1' - 6" Lg.	1"
H	PER PLAN	3/4"x19"x24"	E	(6) 1 1/8" Ø (GRADE 105) x 2' - 0" Lg.	
J	PER PLAN	3/4"x16"x20"	F	(6) 1" Ø (GRADE 105) x 2' - 0" Lg.	1"

SHAPE (NOT TO SCALE)

NOTES:
1. COLUMNS SHALL BE CONTINUOUS WITH NO SPLICES UNLESS INDICATED OTHERWISE.
2. SEE PLAN FOR ORIENTATION OF COLUMNS.
3. ANCHOR BOLT LENGTH INCLUDES 4" OF PROJECTION AND 3" HOOK.

CONCRETE FOOTING SCHEDULE

SOIL PRESSURE (PSF): 5000	CONCRETE (PSI): 3500	REBAR (KSI): 60

TYPE	FOOTING SIZE (FT.) THICKNESS (IN.)	BAR SIZE/EA. WAY SPACING (IN.) BOTTOM
3.0	3'-0"x3'-0"x16"Dp	#4 @10"oc
3.0A	3'-0"x3'-0"x32"Dp	#4 @10"oc
3.0B	3'-0"x3'-0"xGR BM DEPTH PER PLAN	#4 @10"oc
3.5	3'-6"x3'-6"x16"Dp	#4 @10"oc
3.5A	3'-6"x3'-6"x32"Dp	#4 @10"oc
4.0	4'-0"x4'-0"x16"Dp	#4 @10"oc
4.0A	4'-0"x4'-0"x32"Dp	#4 @10"oc
4.0B	4'-0"x4'-0"x36"Dp	#4 @10"oc
4.5	4'-6"x4'-6"x18"Dp	#4 @10"oc
5.0	5'-0"x5'-0"x18"Dp	#5 @10"oc
5.0A	5'-0"x5'-0"x32"Dp	#5 @10"oc
5.5	5'-6"x5'-6"x18"Dp	#5 @10"oc
6.0	6'-0"x6'-0"x20"Dp	#5 @10"oc
6.0A	6'-0"x6'-0"x32"Dp	#5 @10"oc
9.0	9'-0"x9'-0"x36"Dp	#5 @10"oc T&B

NOTES:
1. EXTERIOR FOOTINGS OR FOOTING AT GRADE BEAM SHALL MATCH GRADE BEAM DEPTH AND BE PLACED WITH GRADE BEAM.
2. PROVIDE #4 @12"oc EACH WAY IN TOP OF FOOTING AT ALL BRACED BAY COLUMNS.
3. CENTER FOOTINGS ON COLUMNS AND/OR WALL CENTERLINES PER PLAN UNLESS NOTED OTHERWISE.

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JOSHUA ANDREW BAUER NUMBER 23-16211 REGISTERED ARCHITECT

DATE:
- 4-15-15

REVISED DATE:
- 12-18-14
- 2-9-15
- 3-10-15

HTK PROJECT NUMBER:
- 1410.03

Department of Administration
Office of Facilities and
Procurement Management
800 SW Jackson, Suite 700
Topeka, Kansas 66612-1216
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STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
221 SW 7th Street
BUILDING NUMBER 17300-0038

DATE: 4-15-15 DRAWN BY: Author CHECKED BY: Checker REV: 1

FOUNDATION PLAN

A-012651

S101

CONSTRUCTION DOCUMENTS

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JCSBC
2-2-2016
Att 9C--1146

CONTRACT ADDENDUM THREE

May 7, 2015

ISSUED BY:

Horst, Terrill, & Karst Architects, P.A.
900 S. Kansas Ave., Suite 200, Topeka, Kansas 66612

Contact: Dennis Haugh (dah@htkarchitects.net) of

Tel: 785-266-5373

Fax: 785-266-5270

NOTICE TO ALL BIDDERS FOR THE:

State of Kansas Energy and Service Center

221 SW 7th Street, Topeka, Kansas 66612

Project No. A-012651
HTK Project No.: 1410.03

You are instructed to read and note the following described changes, corrections, clarifications, omissions, deletions, additions, approvals and statements pertinent to the Contract Documents. Contract Addendum One is a part of the Contract Bid Documents and Construction Documents and shall govern in the performance of the Work. **(25 pages total)**

ADDENDUM ITEMS TO ADDRESS

BIDDING REQUIREMENTS AND CONTRACT CONDITIONS

Article 3.00: General

1. The rammed aggregate piers system required for this project, as described in the geotechnical report included in the specifications, and referenced on the structural drawings is a proprietary system developed by Geopier. The contractor shall include this system in their scope of work and bid. Contact Aaron Gaul P.E., Ground Improvement Engineering, at 816-421-4334, agaul@groundimprovementeng.com.
2. The cost for temporary and permanent utilities for the project shall be the contractor's responsibility until final acceptance of the project by the owner.

Article 3-01: SPECIFICATIONS:

1. Division 1: Section15000 – Temporary Facilities and Controls: Site fencing and gates are required for this project as described in this Section. If staging of storage areas beyond the site property line is required, the contractor shall contact the City of Topeka for required approval, permits and regulations to be followed.

Article 3-02: SPECIFICATIONS

1. Section 074213 Metal Wall and Soffit Panels: 3.4, E. 7.Shall be revised to read: "Provide wall panels with staggered, swedged (factory crimped) end laps."
2. Section 105300 Pre-Manufactured Aluminum Canopies: 2.3A: Perfection Architectural Systems shall be added as an approved manufacturer.

Article 3-02a: SPECIFICATIONS

1. Section 21 0500 Sprinkler System
   a. In 1.1.A omit "and one dry pipe sprinkler system". There is no dry pipe sprinkler system on this project.

Article 3-03: SPECIFICATIONS

1. Section 22 3150 Fuel Oil Transfer Pumps
   a. 2.1.M omit reference to “day tanks”. There are no day tanks on this project.

Article 3-04: SPECIFICATIONS

1. Section 22 6100.2.5, Domestic Hot Water Recirculating Pumps
   a. The domestic hot water recirculating pump shall be Bell and Gossett PL-30 all bronze construction capable of 10 GPM at 18 Ft. TDH with 1/12 HP 120 VAC motor.

Article 3-05: SPECIFICATIONS

1. Section 23 1100 Chilled Water, Steam an Steam Condensate Piping and Steam/Piping Specialties
   a. This section shall also apply to HVAC hot water piping
   b. Pump flexible connectors shall be Teflon bellows type similar to Resistoflex R6904 or equal.
   c. A grooved piping solution either manufactured by Victaulic or Anvil will be allowed on chilled water and hot water piping systems located within the energy center.

Article 3-06: SPECIFICATIONS

1. Section 23 3100 Pumps
   a. Vertical Turbine Pumps
      i. In addition to the specification, each pump shall be provided with the following:
         Vertical Solid Shaft (VSS) motor
         Mechanical seal with drop-out spacer coupling
         1.1875” pump shaft
         5 foot bearing spacing
         Threaded column

Article 3-07: SPECIFICATIONS

1. Section 23 5100 Meters and Gauges for HVAC
   a. 2.5 Flow Meters
      i. Add the following:
         Provide a flow element of the averaging pitot type, (VERABAR®), as manufactured by Veris, Inc. The sensing element shall be made from 316SS and be of a solid one-piece construction with dual chambers. The element shall be bullet shaped and be self-averaging with multiple sensing ports on both high and low chambers. The low-pressure sensing ports shall be located on both sides of the element forward of the fluid separation point (to eliminate low-pressure plugging). The leading edge of the sensor shall be roughened to allow accurate measurement at low velocity flows. The flow element shall consist of a solid one-piece welded design. The element shall have an array of sensing ports whose quantity and location are a function of line size and in accordance with the Centroid of equal area calculus.

         This applies to:
         Each Chiller Evaporator Entering Piping
         Each Chiller Condenser Entering Piping
         Each Heat Recovery Chiller Heat Recovery Condenser Entering Piping

   b. 2.6 Installation schedule
      ii. Add gas flow meters in gas feeding each boiler

Article 3-08: SPECIFICATIONS

1. Section 23 8100 Scotch Marine Packaged Boilers

   a. 2.3.A Replace “working pressure” with “design pressure”.
   b. 2.3.C Add “provide a manual damper in the flue exhaust vent connection.

c. 2.4.C.7 Add “burner shall have a turndown of 4 to 1 when operating on fuel oil”.
d. 2.8.3 Replace “control and switchgear” with “control circuit transformers and motor starters”
e. 2.8.7.C omit “exhaust gas temperature, ambient temperature and differential temperature”
f. 2.9 add “Boiler manufacture to provide O2 Probe, temperature transmitter, steam flow meter, and gas flow meter for each boiler. The following information shall be displayed on the DTI and make available to the BMS:
   i. Exhaust O2 level
   ii. Steam Flow
   iii. Gas Flow
   iv. Stack exhaust temperature.
g. 3.2.D omit “boiler piping and instrument diagram”
h. 3.3.B omit this excerpt

Article 3-09: SPECIFICATIONS

1. Section 23 8200 Condensate Surge Unit
   a. 2.2.D There are (2) transfer pumps in lieu of (3) as indicated

Article 3-10: SPECIFICATIONS

1. Section 23 8300 Deaerator Boiler Feedwater Unit
   a. 2.2.D There are (2) feedwater pumps in lieu of (4) as indicated

Article 3-11: SPECIFICATIONS

1. Section 23 9100 HVAC Instrumentation Controls
   a. 1.3.A the automatic temperature control bid shall be incorporated into the bidders bid submission. This is in lieu of “Johnson Controls will contract directly with the Capitol Complex…”

Article 3-12: SPECIFICATIONS

1. Section 26 0600, EXISTING EQUIPMENT TO BE RELOCATED
   a. page 2, omit line item “Variable Speed Motor Controller for Primary Pump…”
   b. The matrix indicates existing electrical equipment in the Docking State Office Building (DSOB) that is available to the Contractor for reuse in the Energy and Service Center. All equipment indicated on the drawings shall be provided by the Contractor. If specific equipment is available as indicated in the schedule, the contractor shall remove it from the DSOB and reinstall it in the Energy and Service Building. For example, a variable speed motor controller is indicated on the drawings for a condenser water pump. This pump has a 30 HP 460 volt motor. In the DSOB there is a variable speed motor controller that currently serves a pump that has a 40 HP 460 volt motor. This existing variable speed motor controller can be used for the condenser water pump.

Article 3-13: SPECIFICATIONS

1. Section 26 1100, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
   a. 2.3.D, minimum conduit size shall be 3/4”.

Article 3-14: SPECIFICATIONS

1. Section 228 3111 FIRE ALARAM SYSTEM
   a. The fire alarm system shall be an extension of the State of Kansas life safety fire alarm network, and shall be provided under procurement contract number 13010066. Contact Cliff Price with SimplexGrinnell at 785 249-3837, or clprice@simplexgrinnell.com.” All costs associated with the fire alarm system shall be included in the contractor’s base bid.

Article 3-15: DRAWINGS – CIVIL

1. Sheet C050: Revised to show 7th Street demolition limits to match revised 7th St. access.
2. Sheet C100: Revised 7th Street access.

3. Sheet C101: Revise to add the following general note:

"The contractor shall provide filter fabric covering the outside of the vertical drain panels along each side of the utility tunnel. The filter fabric shall be extended such that there is a minimum of 6" lapping over the top and behind the drain panels (between the tunnel wall and the drain panel). It shall also be extended around and under the foundation drain pipe and extended behind the drain panels a minimum of 6" lap (between the tunnel wall and drain panel).
The foundation drain pipe shall be placed at the bottom of the tunnel sides snug with the bottom (horizontally) of the drain panels (filter fabric placed to assist with holding the pipe against the drainage panels) along both sides of the utility tunnel. The pipe shall be 4" diameter perforated PVC (Schedule 40).
The contractor shall install sewer cleanouts extending vertically upwards to the surface such that the cast top is flush with the pavement. The sewer cleanouts shall be 4" solid walled Schedule 40 PVC. In accordance with the sewer cleanout details. The sewer cleanouts shall be spaced at no more than 100' increments along each side of the tunnels and with the first one placed at the uppermost end of the tunnels. The sewer cleanouts shall project through the filter fabric and the contractor shall secure the filter fabric around the sewer cleanout to prevent dirt from entering the drainage panels or perforated foundation drain lines.
The foundation drain lines shall be connected to the sump pit at the north end of the tunnel, adjacent to the Energy Center building. See Sh. PH101 for sump details."

4. Sheet C200: Revised 7th Street Access and adjacent grading.
5. Sheet C300: Added storm sewer to the 7th St. access location. Two area inlets and associated storm sewer pipe.
6. Sheet C400: Added sidewalk closure signage.
7. Sheet C500: Revised sheet number and title from C100-Site Plan to C500-Erosion Control Plan and added inlet protection at revised 7th St. access.
8. Refer to Sheets C050, C100, C200, C300, C400, and C500 attached to this Addendum.

Article 3-16: DRAWINGS – AS101 ARCHITECTURAL SITE PLAN

1. Site plan: Has been revised to show:
    a. Revised 7th Street access.
    b. Location of existing trees to remain and protected during construction per note No. 5.
    c. Refer to Sheet AS101 attached to this Addendum.

Article 3-17: DRAWINGS – AS102 LANDSCAPE PLAN

1. 6AS102 Landscape Plan has been revised to show:
    a. Revised 7th Street access and landscaping.
    b. Location of existing trees to remain and protected during construction.
    c. Refer to Sheet AS102 attached to this Addendum.

Article 3-18: DRAWINGS – A105 STATEHOUSE FLOOR PLANS

1. 8a105, 9a105, and 13A105: Shall be revised to add the following note: "At large openings cut through existing floor/ceilings or foundation walls for new tunnel entrances for mechanical piping, electrical conduit, provide 2 hour rated, (UL Des U419). Barrier construction shall consist of 3 1/2" metal stud framing, 24 o.c. maximum and as required to allow penetration of mechanical piping, with two layers of 5/8" fire rated gypsum board each side, fire taped. Provide penetration fire stopping between drywall edges and adjacent walls, piping, or conduits each side of barrier."

Article 3-19: DRAWINGS - SHEET S101

1. Plan note to indicate utility tunnel is to be "cast-in-place" per sheet S500. Refer to Sheet S101 attached to this Addendum.
2. Add plan note on foundation plan: " Provide mechanical pad per section 11/S100 at boilers and chillers."

Article 3-20 DRAWINGS - SHEET S200

3. Notes in Section 16/S200 shall be revised to indicate utility tunnel is to be "cast-in-place" per sheet S500. Refer to Sheet S200 attached to this Addendum.

Article 3-21: DRAWINGS - SHEET S500

1. Notes in Section 1/S500 shall be revised to indicate utility tunnel is to be "cast-in-place" concrete.
2. Notes in Section 2/S500 shall be revised to indicate utility tunnel is to be "cast-in-place" concrete.
3. Notes in Section 3/S500 shall be revised to indicate utility tunnel is to be "cast-in-place" concrete.
4. Notes in Section 6/S500 shall be revised to indicate utility tunnel is to be "cast-in-place" concrete.
5. Notes in Section in Plan 9/S500 shall be revised to indicate utility tunnel is to be "cast-in-place" concrete.
6. Add the following note to Section 1/S500:

   "The contractor shall provide filter fabric covering the outside of the vertical drain panels along each side of the utility tunnel. The filter fabric shall be extended such that there is a minimum of 6" lapping over the top and behind the drain panels (between the tunnel wall and the drain panel). It shall also be extended around and under the foundation drain pipe and extended behind the drain panels a minimum of 6" lap (between the tunnel wall and drain panel). The foundation drain pipe shall be placed at the bottom of the tunnel sides snug with the bottom (horizontally) of the drain panels (filter fabric placed to assist with holding the pipe against the drainage panels) along both sides of the utility tunnel. The pipe shall be 4" diameter perforated PVC (Schedule 40). The contractor shall install sewer cleanouts extending vertically upwards to the surface such that the cast top is flush with the pavement. The sewer cleanouts shall be 4" solid walled Schedule 40 PVC. In accordance with the sewer cleanout details. The sewer cleanouts shall be spaced at no more than 100' increments along each side of the tunnels and with the first one placed at the uppermost end of the tunnels. The sewer cleanouts shall project through the filter fabric and the contractor shall secure the filter fabric around the sewer cleanout to prevent dirt from entering the drainage panels or perforated foundation drain lines. The foundation drain lines shall be connected to the sump pit at the north end of the tunnel, adjacent to the Energy Center building. See Sh. PH101 for sump details."

7. Refer to Sheet S500 attached to this Addendum.

Article 3-22: DRAWINGS – ME101

1. The luminaires located just north of the building, to the east of the north entry stair shall be type "SL-6".
2. A concrete foundation shall be provided for the engine driven generator. This concrete foundation shall be 12" longer and 12" wider than the engine driven generator. A full perimeter concrete foundation shall be provided. This foundation shall be a minimum of 24" thick. The foundation shall be reinforced with #4 bars at 12" centers each way at each face with 3" concrete cover provided. The concrete slab shall be a minimum of 8" thick, shall be installed on a minimum of 8" of compacted granular fill and reinforced with #6 bars at 8" centers.
3. Refer to the attached drawings ME3-1 and ME3-2 for work associated with the new stair that exits the ground floor of the Kansas Statehouse.

Article 3-23: DRAWINGS – ME201 SCHEDULES

1. Existing Equipment Schedule

   a. The Chiller 3 is located in the Eisenhower Building and is not a heat recovery chiller.

Article 3-24: DRAWINGS – ME202 SCHEDULE

1. Piping Material Schedule

   a. Drain Waste and Vent Piping
      Below grade piping in the boiler and chiller room shall be service weight cast iron with bell and spigot joints and fittings

      Below grade piping in the remainder of the building shall be schedule 40 PVC with solvent weld joints and fittings.

      All above grade piping shall be service weight cast iron with heavy duty no hub bands with stainless steel straps.

Article 3-25: DRAWINGS – ME203 SCHEDULES

1. High Pressure Steam Boiler Schedule

    a. The boiler manufacturer shall provide steam and gas flow meters, temp transmitters and O2 transmitters

2. Water Softener

    a. The water softener shall be duplex with automatic controls to assure only one of the softeners is off line for regeneration at any given time. Controls shall be programmed to regenerate a softener between the hours of 12:00 midnight and 5:00 AM.

Article 3-26: DRAWINGS – ME204 SCHEDULES

1. Welding and Paint Spray Booth Exhaust Schedule

    a. The paint spray booth exhaust fan shall be provided by the paint spray booth manufacturer. The motor shall be 3 HP in lieu of 2 HP and the fan shall exhaust 8,000 CFM.

Article 3-27: DRAWINGS – ME301 AUTOMATIC SYSTEM CONTROL DIAGRAM

1. Refer to the attached revised sheet ME301 for revision in the piping connections at the Kansas Statehouse.

Article 3-28: DRAWINGS – ME303 AUTOMATIC TEMPERATURE CONTROLS

1. Add the following Sequences of Operation

    a. HOT WATER HEATING SYSTEM

    The hot water pump shall run continuously. The operation of each pump shall be equalized based on an adjustable time of operation schedule. Should the enable pump fail to start, the stand by pump shall be energized automatically and an alarm shall be sounded at the central control computer. A differential pressure sensor, located across a coil in a location as determined collectively by the Engineer and Automatic Temperature Control Contractor in conjunction with a variable speed motor controller shall very the speed of the pump motor as required to maintain the differential pressure at the sensor. Steam will be delivered to operate the “steam-to-water” heat exchanger. The steam control valves sized for 1/3 and 2/3 of the total steam load respectively shall be sequenced as required to maintain the desired hot water supply temperature. Pump status will be verified prior to operation of the control valves.

    A sensor sensing hot water supply temperature and a sensor sensing the outdoor air temperature will act through the DDC controller so as to control the heat exchanger as required to produce the desired hot water supply temperature schedule. The water temperature will increase as the outdoor air temperature decreases. The schedule shall linear and shall provide 180 degree supply water temperature at 0 degree ambient air temperature and 120 degree supply water at 60 degree ambient air temperature. Identified alarms shall register at the central control computer if the value of any control parameter is outside of its setpoint by a predetermined amount or if a pump fails to start.

b. VARIABLE AIR VOLUME AIR HANDLING UNIT

    The occupied / unoccupied mode shall be determined by a time-of-day schedule at the central computer.

    In the occupied mode of operation, the unit fan shall run continuously. In the unoccupied mode of operation the fan shall be cycled as required to maintain the set back temperature (adjustable). A differential pressure transmitter, located 2/3 the distance of the longest supply duct shall, through the DDC controller and variable frequency drive, vary the fan speed as required to maintain the static pressure setpoint. The setpoint shall be determined by the testing and balancing contractor. A

manual reset duct high pressure limit shall shut the fan down if pressure rises above its setting.

In the occupied mode, the hot water valve, chilled water valve and mixing dampers shall be modulated in sequence as required to maintain a discharge air temperature of 55 degrees F. (adjustable). At ambient temperatures above 60 degrees F. (adjustable) the outside air dampers shall be at an adjustable minimum position.

An automatic reset low limit temperature sensor shall close the outside air damper, open the return air damper to the full open position, modulate the hot water control valve to the full open position and start the fan, if the unit is operating in the set back mode, if the mixed air temperature drops below 42 degrees F. (adjustable).

A serpentine manual reset low limit temperature sensor shall shut the unit fan off, adjust the outside air damper to the closed position, return damper to the full open position and adjust the hot water control valve to the full open position if the temperature, sensed along any 12" of the element, drops below 38 degrees F. (adjustable).

Identified alarms shall register at the central control computer if the value of any control parameter is outside of its setpoint by a predetermined amount, if the low limit control is activated, or if the unit is shut down by high duct static pressure or low temperature limit.

c. VARIABLE VOLUME TERMINAL UNITS

The DDC controller shall position, in sequence, the damper actuator and hot water control valve as required to maintain room temperature (adjustable). Room temperature sensors shall be provided which allow a predetermined set point adjustment above and below a predetermined value. A button shall be provided to bring the air handling unit out of the set back mode of operation for a predetermined period of time. Each variable air volume terminal unit shall be provided with an air flow sensing device, a control transformer, DDC controller, pressure transducer and damper actuator. The automatic temperature control contractor shall furnish damper actuator DDC controller and pressure transducer to the terminal unit manufacturer for factory installation. The completed assembly shall be factory wired and tested by the terminal unit manufacturer prior to shipping.

d. VENTILATION CONTROL

Each variable air volume terminal shall be set to maintain a minimum air flow. If the temperature at the space temperature sensor drops below a predetermined value below set point, the damper in the variable air volume terminal shall be closed.

A space CO2 sensor shall be provided in a locations as determined by the engineer and temperature control contractor in each the open office on the first floor in open office room 113 and in conference room 106 and on the second floor in room 211 and conference room 210. A CO2 sensor shall be provided in the common return air duct. If space CO2 levels in any of these locations rise above a predetermined minimum, the damper in the variable air volume terminal shall be modulated open to the predetermined minimum, if it is closed. The air handling unit outside air shall be modulated open as required to lower the CO2 levels in the return air.

e. PRESSURE CONTROL

A space static pressure sensor shall be provided to monitor space static pressure in the space. A relief damper and actuator shall be provided in each the first and the second floor to relieve excess air into the boiler room.

Dampers with actuators shall be provided behind the louvers in each the main boiler room and the main chiller room. A space static pressure sensor shall be provided in each the main boiler room and the main chiller room. The dampers in each respective space shall modulate as required to maintain static pressure in the respective space.

f. SINGLE ZONE AIR HANDLING UNIT CONTROL

The occupied / unoccupied mode shall be determined by a time-of-day schedule at the central computer.

In the occupied mode of operation, the unit fan shall run continuously. In the unoccupied mode of operation the fan shall be cycled as required to maintain the set back temperature (adjustable).

In the occupied, the outside air and return air dampers shall be set to supply a predetermined minimum amount of ventilation air. In the unoccupied mode, the outside air damper shall be closed and the return damper modulated to the full open position.

The hot water coil, air cooled condensing unit and mixing dampers shall be modulated as required to maintain space temperature. At ambient temperatures above 60 degrees (adjustable) the outside air damper shall be set to minimum position. During a call for cooling at ambient temperatures below 60 degrees the mixing dampers shall modulate to provide a mixed air temperature of 55 degrees F. (adjustable).

An automatic reset low limit temperature sensor shall close the outside air damper, open the return air damper to the full open position, modulate the hot water control valve to the full open position and start the fan, if the unit is operating in the set back mode, if the mixed air temperature drops below 42 degrees F. (adjustable).

A serpentine manual reset low limit temperature sensor shall shut the unit fan off, adjust the outside air damper to the closed position, return damper to the full open position and adjust the hot water control valve to the full open position if the temperature, sensed along any 12” of the element, drops below 38 degrees F. (adjustable).

Identified alarms shall register at the central control computer if the value of any control parameter is outside of its setpoint by a predetermined amount, if the low limit control is activated, or if the unit is shut down by low temperature limit.

g. FAN COIL UNIT CONTROL

The room thermostat shall modulate the chilled water and hot water coils as required to maintain set room temperature.

The fan shall run continuously in the occupied mode of operation and shall cycle as required to maintain a setback temperature in the unoccupied mode of operation.

h. BOILER ROOM VENTILATION CONTROL

Three steam make up air handling units shall be provided. Each shall be interlocked to operate when the burner on the boiler, to which it is interlocked, is firing. A discharge temperature sensor and space temperature sensor shall be provided and the steam control valve shall be modulated as required to maintain a predetermined discharge air temperature and a minimum space temperature.

i. CHILLER ROOM VENTIALTION CONTROL

One steam make up air handling unit shall be provided. The unit shall be provided with a discharge temperature sensor and space temperature sensor. The steam control valve shall be modulated as required to maintain a predetermined discharge air temperature and a minimum space temperature.

j. PAINT SPRAY BOOTH AND WELDING EXHAUST MAKE UP AIR UNIT CONTROL

One steam make up air handling unit shall be provided. The unit shall be interlocked with each the paint spray booth and the welding exhaust fan. The unit shall be provided with a discharge temperature sensor. The steam control valve shall be modulated as required to maintain a predetermined discharge air temperature when the unit is operating.

Return air and outside air dampers shall be provided. These dampers shall be modulated to provide the required make up air supply dependent on which unit is operating. When the total outside air

supply is lower than the total unit supply, the difference shall be returned to the unit via the return duct.

Article 3-29: DRAWINGS – ME302 SEQUENCE OF OPERATION

1. In 1.B.I.6 omit "and the isolation valve for the selected tower shall be opened". There are no automatic isolation valves for each of the tower cells.

Article 3-30: DRAWINGS – PH102 FIRST FLOOR PLAN, PLUMBING

1. Domestic water service shall be 3"
2. Domestic water above room 125 shall be 1-1/4" DHW, 2" DCW.
3. Domestic water above corridor 122 east of room 124 shall be 1-1/4" DHW, ¾" DHWR.,2" DCW.
4. Domestic hot and cold water to the domestic water heater shall each be 1-1/2". DHWR shall be 1-1/4"
5. Domestic water above corridor 122 east of room 120 shall be ¾" DHW, ¾" DHWR and 1-1/4" DCW.
6. Domestic cold water feeding into rooms 140 and 138 shall be 2"
7. Domestic Cold water feeding up to the second floor shall be 2"
8. Domestic hot water return line in room 139 shall be 1" in lieu of ¾".
9. The south 2" waste up to FD above room 117 actually feeds up to fixture type "P-6" which is a (2) compartment sink.

Article 3-31: DRAWINGS – PH103 SECOND FLOOR PLAN, PLUMBING

1. Domestic hot and cold water and domestic hot water return above corridor 205 east of room 219 shall be ¾".
2. Domestic hot and cold water and domestic hot water return above corridor 205 east of room 215 shall be ¾".
3. Domestic hot and cold water and domestic hot water return above room 218 feeding the lavatories shall be 1".
4. Domestic cold water feeding to the main above corridor 205 and domestic cold water piping above room 205 from south side of take off to lavatories in room 218 and to the north side of the take off to lavatories in room 217 shall be 2".
5. Domestic hot and cold water and domestic hot water return feeding lavatories in room 218 shall be 1".
6. Domestic hot and cold water and domestic hot water return feeding lavatories in room 217 shall be 1".
7. The 2 compartment sink in room 211 is fixture type "P-6"
7. The ice maker indicated in 211 will be furnished by the Owner, installed by the contractor. Provide a RPZ type back flow preventer in the supply piping.

Article 3-32: DRAWINGS – MH101 FIRST FLOOR PLAN, HVAC

1. In room 145 provide a thermostat for control of V16. Locate the thermostat in the southeast corner of the room.

Article 3-33: DRAWINGS – MH102 SECOND FLOOR PLAN, HVAC

1. In room 213 provide a thermostat for control of V7. Locate the thermostat on the south wall of the room below generally below the return grille.

Article 3-34: DRAWINGS – MH103 PARTIAL FIRST FLOOR PLAN, CHILLER ROOM AND BOILER ROOM

1. Provide automatic control dampers behind each of the louvers that are indicated on the west wall of each the chiller room and the boiler room.
2. The grilles identified as type "A" in the chiller room shall be type "J".
3. Provide an automatic damper in the outside air intake ductwork for each of (3) MUA units in the boiler room.

Article 3-35: DRAWINGS – MP201 PARTIAL FIRST FLOOR PLAN, CHILLER ROOM AND BOILER ROOM

1. Provide independent 5" type ACR copper discharge piping for the rupture discs on each chiller. Termination shall be above roof. Provide pipe penetration curb and turn the pipe 90 degrees to result in a horizontal discharge and to protect the pipe from water infiltration. Provide bird screen at the terminus of the respective pipe. Support the piping system independent of the rupture disc and provide a stainless steel flexible connection at the final connection to the rupture disc. Provide a minimum 3'-0"

drip leg with ¼" drain line from the base of the trip leg to terminate over a floor drain.
2. The chilled water by-pass required to maintain minimum chiller flow shall be 5".

Article 3-36: DRAWINGS – MP202 PARTIAL SECOND FLOOR PLAN

1. The Cooling Tower, Cell 3 shall be provided as a part of the base bid. Omit the "future" notation.

Article 3-37: DRAWINGS – MP403 MECHANICAL PIPING DETAILS

1. In detail C1, relocate the 3 way by pass originally indicated on the condenser water inlet piping to the heat recovery condenser .

Article 3-38: DRAWINGS – FH101 FIRE PROTECTION SPRINKLER, FIRST FLOOR

1. Provide a sprinkler in the exhaust ductwork for the paint spray booth.

Article 3-39: DRAWINGS – EP101 FIRST FLOOR PLAN, POWER

1. In room 135 there are (3) disconnect switches that are provided for testing. One is 250 volt 30 amp 3 pole, one is 250 volt 30 amp 2 pole and one is 600 volt 30 amp 3 pole.
2. Refer to sheet EY101 for locations of access control doors that require 120 VAC electrical circuit. Provide the required 120 VAC electrical circuit from panel ELP-1. Provide a 20 amp circuit with 20 amp 1 pole circuit breaker and (3)#12 in ¾" conduit.

Article 3-40: DRAWINGS – EP102 FIRST FLOOR PLAN, HVAC POWER

1. Add an overhead door operator for the overhead door in the south wall of room 127. Provide a push button control switch adjacent to the door. Circuit to a 20 amp 1 pole circuit breaker in pole position 37 in panel LP-1 using (3) #12 in ¾" conduit. Provide all connections required for a complete and fully operationally door operator.
2. The starters required for all overhead door operators shall be provided with the unit manufacturer.
3. In room 129, the disconnect switch provided for the cab power shall be a 30 amp 2 pole heavy duty disconnect switch.
4. The paint spray booth exhaust fan shall be 3 HP in lieu of 2 HP. Omit the variable speed drive indicated to control the paint spray booth exhaust fan. The paint spray booth manufacturer shall provide a control panel. The motor control for the paint spray booth exhaust fan shall be incorporated into the panel. The Contractor shall connect power to the control panel in lieu of to the variable speed motor controller. Provide all connections, miscellaneous equipment and material to result in a complete and fully operational system.
4. Provide power for the smoke barrier curtain at the elevator door in room 146. Provide (3) #12 in ¾ " conduit to a 20 amp 1 pole circuit breaker in panel ELP-1.

Article 3-41: DRAWINGS – EP103 SECOND FLOOR PLAN, POWER

1. In room 211, the disconnect switch for the ice machine shall be 30 amp 2 pole. The circuit feeding the ice machine shall be (3) #10 in ¾" conduit in lieu of (3) #12 and the circuit breaker protecting this circuit shall be 30 amp in lieu of 20 amp. Verify the electrical connection requirements with the engineer prior to installation of the circuit. If it differs from that indicated, so inform the Engineer.

Article 3-42: DRAWINGS – EP104 SECOND FLOOR PLAN, HVAC POWER

1. The CMS serving MUA-S1, 5 HP 460 VAC 3 Phase, shall be size 1/0.
2. The circuit feeding the welding exhaust fan shall be (4) #12 in ¾" conduit from a 20 amp 3 pole circuit breaker installed in panel HP-3A.
3. Provide power for the smoke barrier curtain at the elevator door in room 205. Provide (3) #12 in ¾ " conduit to a 20 amp 1 pole circuit breaker in panel ELP-1

Article 3-43: DRAWINGS – EP105 ROOF PLAN, POWER

1. Disconnect switch for EEAC-1 shall be 30 amp 2 pole heavy duty rain tight fused at 15 amps RK-5.

Article 3-44: DRAWINGS – EP201 PARTIAL FIRST FLOOR PLAN, BOILER ROOM AND CHILLER ROOM POWER

1. The CMS serving AHU-2, 1/2 HP 120 VAC 1 phase, shall be size 1/0.
2. The CMS serving MUA-C1, 3 HP 460 VAC 3 phase, shall be size 1/0.
3. The existing CMS that serves the existing RRVF-1 which is scheduled to be relocated from the DSOB can be relocated and reused for this fan in the new Energy and Service Building. This fan has a 1 HP 460 VAC 3 phase motor 2ith 2 windings. If a new starter is provided, the fan only requires operation at the high speed. The motor starter shall be size 1/0.
4. The adaptive control for chiller #3 is actually unit mounted and not remote floor mounted as indicated on the original plans.

Article 3-45: DRAWINGS – EL102 SECOND FLOOR PLAN, LIGHTING

1. Room 211, lighting luminaires indicated above the counter top, in lieu of the two luminaires indicated, provide (1) nominal 24" long lighting luminaire, Kenall AUCLED I MW 16L35K 24" 277 VAC. This luminaire shall be mounted on the bottom side of the cabinet that is directly above the sink.
2. In rooms 211, 212, 213 and 214 the originally indicated type "A1" luminaires shall be relabeled as type "A2".

Article 3-46: DRAWINGS – EY101 FIRST FLOOR PLAN, FIRE ALARM

1. Provide fire alarm system connection for the smoke barrier curtain at the elevator door in room 146. Provide cable, connections programming and any miscellaneous material and equipment to result in a fully functional system.

Article 3-47: DRAWINGS – EY102 SECOND FLOOR PLAN, FIRE ALARM

1. Provide fire alarm system connection for the smoke barrier curtain at the elevator door in room 205. Provide cable, connections programming and any miscellaneous material and equipment to result in a fully functional system.

Article 3-48: DRAWINGS – MT303, PARTIAL NW MECHANICAL VAULT IN KSH

1. Refer to the attached revised sheet MT303 for chilled water piping revision.

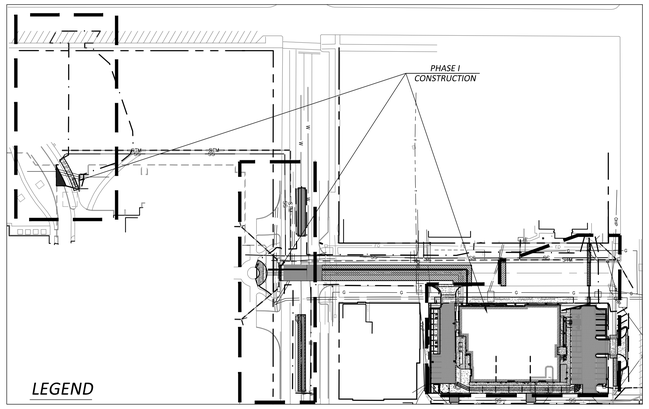
Article 3-49: EQUIVALENT MANUFACTURERS

1. The following list of manufacturers will be acceptable for bidding. Note that listing as an approved equivalent does not relieve the manufacturer of any requirement to adhere to the original specification.

Section	Description	Manufacturer
23 2100	Heat Exchanger	Patterson
23 2200	Condensate Pumps	BFS
23 3100	Pumps	Patterson Hydro Flo
Plan ME 201	Steam Pressure Reducing Station	Armstrong Hoffman Spence
Plan ME202	Cooling Tower	EVAPCO
Plan ME203	Exhaust Silencer	Armstrong Stoddard

END OF CONTRACT ADDENDUM THREE

*****RECEIPT OF THIS ADDENDUM IS TO BE ACKNOWLEDGED ON THE BID FORM*****



PHASING NOTES:

PHASE IA: *PHASE IA - CLOSE THE MIDDLE LANES OF SW 8TH AVE. DEMOLISH THE EXISTING MEDIAN ISLANDS AND CONSTRUCT TEMPORARY 6" ASPHALTIC CONCRETE PAVEMENT FLUSH WITH THE EXISTING PAVEMENT. CROWN IN MIDDLE TO DRAIN TO NORTH AND SOUTH.*

PHASE IB: *CLOSE THE NORTH INTERNAL ACCESS ROAD TO TRAFFIC AT THE EAST AND WEST ENTRANCES. COMPLETE DEMOLITION AS NOTED AND/OR AS NECESSARY AND CONSTRUCT 7'XS' CONCRETE TUNNEL FROM STA. 19+99.00 TO STA. 20+37.84 BETWEEN THE EXISTING PARKING GARAGE AND NORTHWEST VAULT OF CAPITOL BUILDING.*

CLOSE SOUTH THREE LANE WIDTHS OF SW 8TH AVE. TO THROUGH TRAFFIC. MAINTAIN ONE LANE OF TRAFFIC IN EACH DIRECTION ON SW 8TH AVE. ALONG NORTH SIDE. CLOSE CUT-BACK PARKING STALLS ALONG NORTH SIDE OF SW 8TH AVE. BETWEEN SW JACKSON ST. AND SW HARRISON ST. COMPLETE DEMOLITION AS NOTED AND/OR AS NECESSARY AND CONSTRUCT 7'X7' CONCRETE TUNNEL FROM STATION 1+00.00 TO STA. 1+65.00.

COMPLETE DEMOLITION AS NOTED AND/OR AS NECESSARY OF EXISTING RAISED MEDIAN ISLANDS WITHIN SW 8TH AVE. TO EAST AND WEST OF TUNNEL (APPROX. STA. 1+55.34, LT AND RT) AND CONSTRUCT 10" ASPHALTIC CONCRETE PAVEMENT. MATCH CROSS SLOPE OF EXISTING PAVEMENT TO EAST AND WEST OF THE ISLANDS.

COMPLETE DEMOLITION AS NOTED AND/OR AS NECESSARY OF PROPOSED BUILDING SITE AND CONSTRUCT PROPOSED BUILDING AND SITE IMPROVEMENTS.

CLOSE SW VAN BUREN ST. TO THE NORTH OF THE COMMERCIAL ENTRANCE TO THE SOUTH OF THE EISENHOWER BUILDING AT 7TH & VAN BUREN FOR WATER AND FIBER OPTIC UTILITY INSTALLATIONS. COMPLETE DEMOLITION AND CONSTRUCT WATER FIRE LINE, DOMESTIC WATER SERVICE LINE AND FIBER OPTIC CONDUITS UNDER SW VAN BUREN AVE. FROM WEST TO EAST. BACKFILL TRENCH AND PROVIDE TEMPORARY CRUSHED ROCK SURFACING TO MATCH EXISTING GRADE.

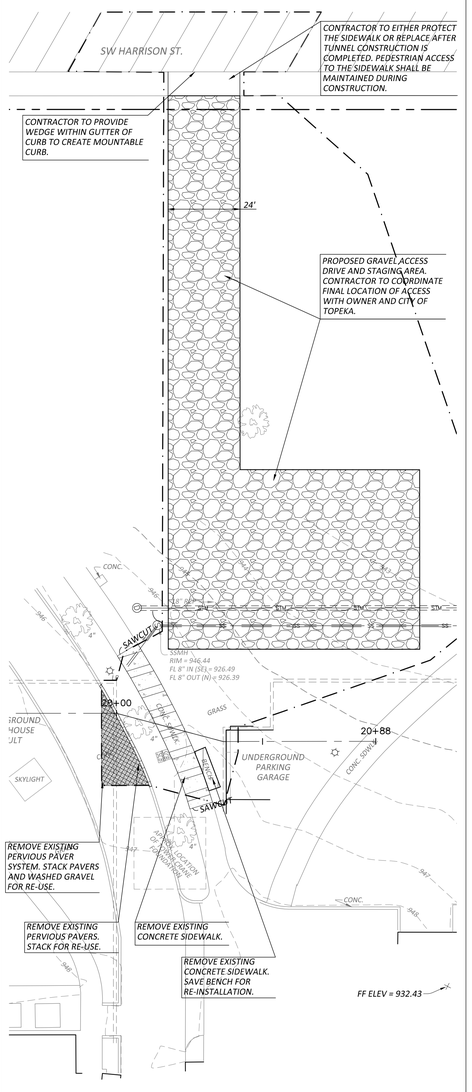
MAINTAIN ACCESS TO EXISTING BUSINESS ON WEST SIDE OF VAN BUREN FROM 8TH AVE. CLOSURE OF VAN BUREN FROM NORTH SHALL BE FOR NO MORE THAN 1 WEEK AND SHALL NOT COINCIDE WITH PHASE II CONSTRUCTION.

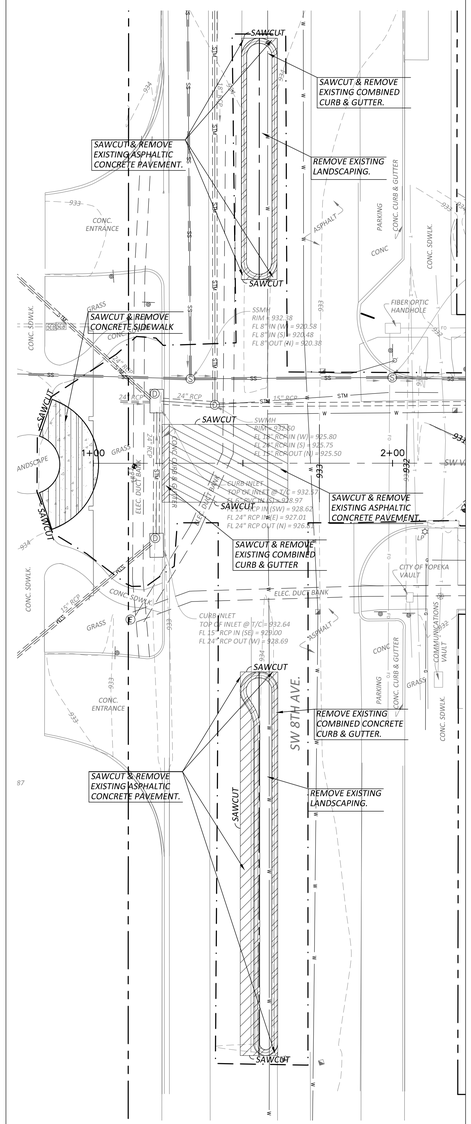
GENERAL NOTES:

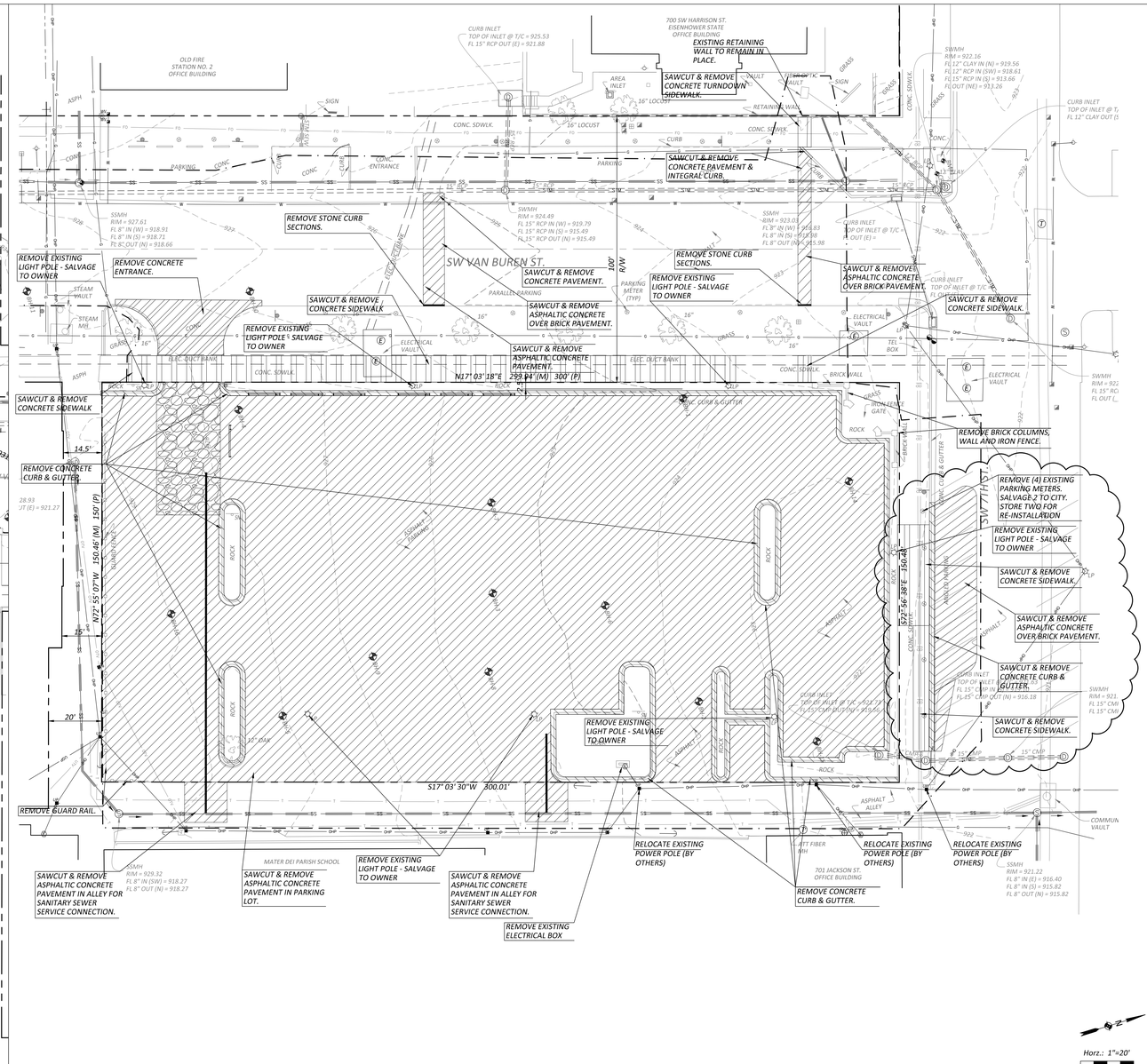
1. *ALL CONSTRUCTION METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS COVERED BY THESE PLANS SHALL BE IN ACCORDANCE WITH THE KANSAS DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR STATE ROAD & BRIDGE CONSTRUCTION", LATEST EDITION AND SPECIAL PROVISIONS, SUPPLEMENTED WITH THE SPECIFICATIONS NOTED ON THIS SHEET AND ALL APPLICABLE CITY CODES, ORDINANCES AND STANDARD TECHNICAL DESIGN AND DRAWING DETAILS ON FILE AT THE CITY OF TOPEKA, KANSAS.*
2. *THE LOCATION OF ALL OVERHEAD AND UNDERGROUND UTILITIES MAY VARY FROM WHAT IS INDICATED IN THESE PLANS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE UTILITY OWNER TO LOCATE AND FLAG ALL UNDERGROUND UTILITIES WHETHER INDICATED OR NOT. NO EXCAVATION WILL BE PERMITTED IN THE AREA OF UNDERGROUND UTILITIES UNTIL ALL SUCH UTILITIES HAVE BEEN LOCATED AND IDENTIFIED TO THE SATISFACTION OF ALL PARTIES AND THEN ONLY WITH EXTREME CARE TO AVOID ANY POSSIBILITY OF DAMAGE TO THE UTILITY.*
3. *THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL PERMITTING AND FEES THROUGH THE CITY OF TOPEKA DEVELOPMENT SERVICES DEPARTMENT.*
4. *REMOVAL LIMITS FOR CONCRETE CURB & GUTTER, STONE CURB AND SIDEWALK ARE APPROXIMATE. THE CONTRACTOR SHALL REMOVE THESE ITEMS TO THE NEAREST JOINT AND TO THE MINIMAL EXTENTS NECESSARY FOR SAFE AND SATISFACTORY CONSTRUCTION OF THE CONCRETE TUNNEL.*
5. *THE STONE CURB SHALL BE SALVAGED AND STORED FOR RE-INSTALLATION. ANY STONE CURB THAT IS DAMAGED DURING REMOVAL SHALL BE REPLACED WITH LIKE MATERIALS AND DIMENSIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO EVALUATE CONDITION OF EXISTING CURB PRIOR TO THE BID AND INCLUDE ALL COSTS ASSOCIATED WITH THE REMOVAL, STORAGE, REPLACEMENT AND RE-INSTALLATION OF THE CURB IN THE BID.*
6. *ALL BRICKS REMOVED FROM SW VAN BUREN ST. SHALL BE SALVAGE TO THE CITY OF TOPEKA STREET MAINTENANCE DIVISION. THE CONTRACTOR SHALL COORDINATE WITH THE STREET MAINTENANCE DIVISION FOR REMOVAL FROM THE SITE.*
7. *THE CONTRACTOR SHALL PROTECT THE EXISTING UTILITY DUCTBANKS, CONDUITS AND PIPES FROM BEING DAMAGED DURING CONSTRUCTION. ANY DIRECT AND/OR INCIDENTAL DAMAGES CAUSED BY CONSTRUCTION ACTIVITIES SHALL BE PAID FOR BY THE CONTRACTOR.*
8. *THE CONTRACTOR SHALL ADEQUATELY AND FULLY SUPPORT ALL EXISTING UTILITIES CROSSING THE CONSTRUCTION AREA. THE CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OF THE UTILITY OWNERS AND SHALL GAIN APPROVAL OF PROPOSED SUPPORT SYSTEM PRIOR TO BEGINNING CONSTRUCTION.*
9. *THE PROPOSED LOCATION OF ACCESS OFF OF SW HARRISON ST. FOR CONSTRUCTION OF THE TUNNEL SECTION BETWEEN THE NW VAULT AND PARKING GARAGE IS APPROXIMATE. THE CONTRACTOR SHALL ADJUST TO MISS TREES AND SPRINKLER HEADS WITHIN THE GRASSED AREA. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER FOR SPRINKLER HEAD LOCATIONS AND OTHER ITEMS TO BE PROTECTED WITHIN THIS AREA.*

GENERAL NOTES:

10. *THE CONTRACTOR SHALL COORDINATE THE TEMPORARY CLOSURE OF EXISTING PARKING METERS ALONG SW HARRISON FOR THE CONSTRUCTION ENTRANCE.*
11. *THE CONTRACTOR SHALL REMOVE THE GRAVEL FROM THE STATEHOUSE LAWN IMMEDIATELY UPON COMPLETION OF THE 7'XS' TUNNEL SECTION. THE DISTURBED AREA SHALL BE RE-GRADED, A MINIMUM OF 6" OF TOPSOIL SHALL BE PLACED AND NEW SOD INSTALLED.*
12. *ANY SIDEWALK, CURB, GUTTER, LANDSCAPING, TREES, SPRINKLER HEADS OR PAVEMENT THAT IS DAMAGED DUE TO CONSTRUCTION ACTIVITIES SHALL BE REMOVED AND REPLACED AT THE CONTRACTOR'S EXPENSE.*
13. *THE CONTRACTOR SHALL PROVIDE ADEQUATE CONSTRUCTION FENCING AND PROTECTION OF THE PROJECT SITE TO PROMOTE THE SAFETY AND SECURITY OF THE CONSTRUCTION FORCES AS WELL AS THE PUBLIC. THIS INCLUDES PROTECTION FOR VEHICULAR, PEDESTRIAN AND OTHER MODES OF TRANSIT.*







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SBB Schmidt, Beck & Boyd Engineering / Surveying
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DATE:
- 4-15-15

REVISED DATE:
- 5-07-15

HTK PROJECT NUMBER:
- 1410.03

Department of Administration
Office of Facilities and
Procurement Management
800 SW Jackson, Suite 700
Topeka, Kansas 66612-1216
Phone 785-296-8899
FAX 785-296-3456

STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
Seventh & Van Buren Street, Topeka, Kansas
BUILDING NUMBER
173000038
DRAWN BY: Author CHECKED BY: Checker REV:
DATE: 4-15-15

DEMOLITION & CONSTRUCTION PHASING PLAN - PHASE IA & IB

A-012651

C050

CONSTRUCTION DOCUMENTS

JCSBC
2-2-2016
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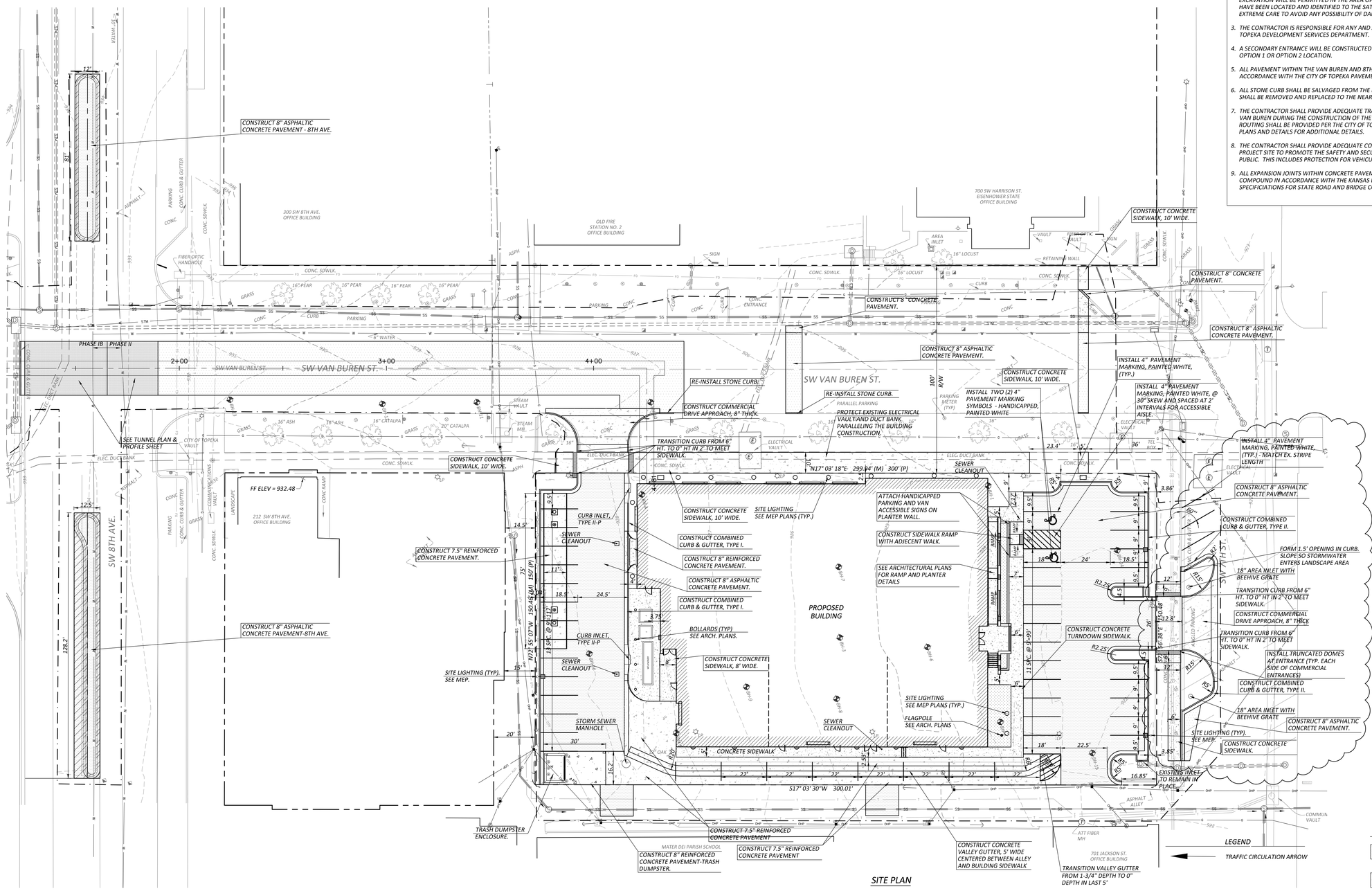

SITE PLAN

GENERAL NOTES:

1. *ALL CONSTRUCTION METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS COVERED BY THESE PLANS SHALL BE IN ACCORDANCE WITH THE KANSAS DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR STATE ROAD & BRIDGE CONSTRUCTION", LATEST EDITION AND SPECIAL PROVISIONS, SUPPLEMENTED WITH THE SPECIFICATIONS NOTED ON THIS SHEET AND ALL APPLICABLE CITY CODES, ORDINANCES AND STANDARD TECHNICAL DESIGN AND DRAWING DETAILS ON FILE AT THE CITY OF TOPEKA, KANSAS.*
2. *THE LOCATION OF ALL OVERHEAD AND UNDERGROUND UTILITIES MAY VARY FROM WHAT IS INDICATED IN THESE PLANS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE UTILITY OWNER TO LOCATE AND FLAG ALL UNDERGROUND UTILITIES WHETHER INDICATED OR NOT. NO EXCAVATION WILL BE PERMITTED IN THE AREA OF UNDERGROUND UTILITIES UNTIL ALL SUCH UTILITIES HAVE BEEN LOCATED AND IDENTIFIED TO THE SATISFACTION OF ALL PARTIES AND THEN ONLY WITH EXTREME CARE TO AVOID ANY POSSIBILITY OF DAMAGE TO THE UTILITY.*
3. *THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL PERMITTING AND FEES THROUGH THE CITY OF TOPEKA DEVELOPMENT SERVICES DEPARTMENT.*
4. *A SECONDARY ENTRANCE WILL BE CONSTRUCTED WITH 8" CONCRETE ENTRANCE PAVEMENT IN EITHER OPTION 1 OR OPTION 2 LOCATION.*
5. *ALL PAVEMENT WITHIN THE VAN BUREN AND 8TH AVE. RIGHT OF WAY SHALL BE REPLACED IN ACCORDANCE WITH THE CITY OF TOPEKA PAVEMENT REPAIR DETAILS.*
6. *ALL STONE CURB SHALL BE SALVAGED FROM THE DEMOLITION PROCESS AND RE-INSTALLED. STONE CURB SHALL BE REMOVED AND REPLACED TO THE NEAREST JOINT.*
7. *THE CONTRACTOR SHALL PROVIDE ADEQUATE TRAFFIC CONTROL FOR THE CLOSURE OF 8TH AVENUE AND VAN BUREN DURING THE CONSTRUCTION OF THE UTILITY TUNNEL PORTION OF THE PROJECT. DETOUR ROUTING SHALL BE PROVIDED PER THE CITY OF TOPEKA STANDARD DRAWINGS. SEE TRAFFIC CONTROL PLANS AND DETAILS FOR ADDITIONAL DETAILS.*
8. *THE CONTRACTOR SHALL PROVIDE ADEQUATE CONSTRUCTION FENCING AND PROTECTION OF THE PROJECT SITE TO PROMOTE THE SAFETY AND SECURITY OF THE CONSTRUCTION FORCES AS WELL AS THE PUBLIC. THIS INCLUDES PROTECTION FOR VEHICULAR, PEDESTRIAN AND OTHER MODES OF TRANSIT.*
9. *ALL EXPANSION JOINTS WITHIN CONCRETE PAVEMENT SHALL BE SEALED WITH COLD TYPE JOINT SEALING COMPOUND IN ACCORDANCE WITH THE KANSAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICIATIONS FOR STATE ROAD AND BRIDGE CONSTRUCTION, SUBSECTION 1502.*

PROJECT CONTROL:
HORIZONTAL CONTROL:

CP #1: ½" REBAR W/SBB ENG CAP
N 269273.86, E 1971866.56

CP #2: ½" REBAR W/SBB ENG CAP
N 269829.48, E 1972006.45

VERTICAL CONTROL:

BM #1: "□" CUT IN NE CORNER OF ABANDONED CONCRETE PAD, SW QUAD. OF 7TH & VAN BUREN ELEV.=922.42
N 269833.15, E 1972002.50

C.T.B.M. #253.1 ON TRAFFIC SIGNAL BASE IN SW CORNER OF SW KANSAS AVE. AND SW 9TH ST. ELEV.=947.38

LEGEND

- 8" ASPHALTIC CONCRETE PAVEMENT - SITE (SEE SH. C103 FOR TYPICAL SECTION)
- 8" ASPHALTIC CONCRETE PAVEMENT - VAN BUREN (SEE SH. C103 FOR TYPICAL SECTION)
- 8" ASPHALTIC CONCRETE PAVEMENT - 8TH AVE. (SEE SH. C103 FOR TYPICAL SECTION)
- 7.5" REINFORCED CONCRETE PAVEMENT (SEE SH. C103 FOR TYPICAL SECTION)
- 8" REINFORCED CONCRETE PAVEMENT - DUMPSTER PAD (SEE SH. C103 FOR TYPICAL SECTION)
- 4" CONCRETE SIDEWALK OR TURNDOWN SIDEWALK (SEE PLAN)

LEGEND

- SECTION CORNER
- FOUND CORNER AS NOTED
- SET 1/2"x24" REBAR W/ LS 919 CAP
- BENCH MARK
- U/E UTILITY EASEMENT
- D/E DRAINAGE EASEMENT
- D&U/E DRAINAGE & UTILITY EASEMENT
- (M) MEASURED
- (P) PLATTED
- WATER METER
- WATER VALVE
- SPRINKLER VALVE
- FIRE HYDRANT
- GAS METER
- GAS VALVE
- TELEPHONE PEDESTAL
- TELEPHONE MANHOLE
- TRANSFORMER/JUNCTION CABINET
- TV PEDESTAL
- POWER POLE
- GUY WIRE
- LIGHT POLE
- ELECTRIC MANHOLE
- ELECTRIC METER
- TRAFFIC SIGNAL LIGHT
- TRAFFIC SIGNAL BOX
- TRAFFIC SIGNAL MANHOLE
- CLEAN OUT
- STEEL PIPE BOLLARD
- SIGN
- TREE (DECIDUOUS)
- STUMP
- BUSH OR SHRUB
- ROOF DRAIN
- WATER LINE
- UGP UNDERGROUND POWER LINE
- OHP OVERHEAD POWER LINE
- GAS LINE
- TELEPHONE CABLE
- FIBER OPTIC LINE
- CATV CABLE TELEVISION LINE
- TS TRAFFIC SIGNAL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- AREA INLET
- EXISTING FENCE
- DENOTES NUMBER OF PARKING STALLS
- EXISTING GROUND ELEVATION

Horz.: 1"=20'
0 20'

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Department of Administration
Office of Facilities and
Procurement Management
800 SW Jackson, Suite 700
Topeka, Kansas 66612-1216
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STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
Seventh & Van Buren Street, Topeka, Kansas
BUILDING NUMBER 173000038
4-15-15 DRAWN BY: Author CHECKED BY: Checker REV:

SITE PLAN

A-012651

C100

CONSTRUCTION DOCUMENTS

JCSBC
2-2-2016
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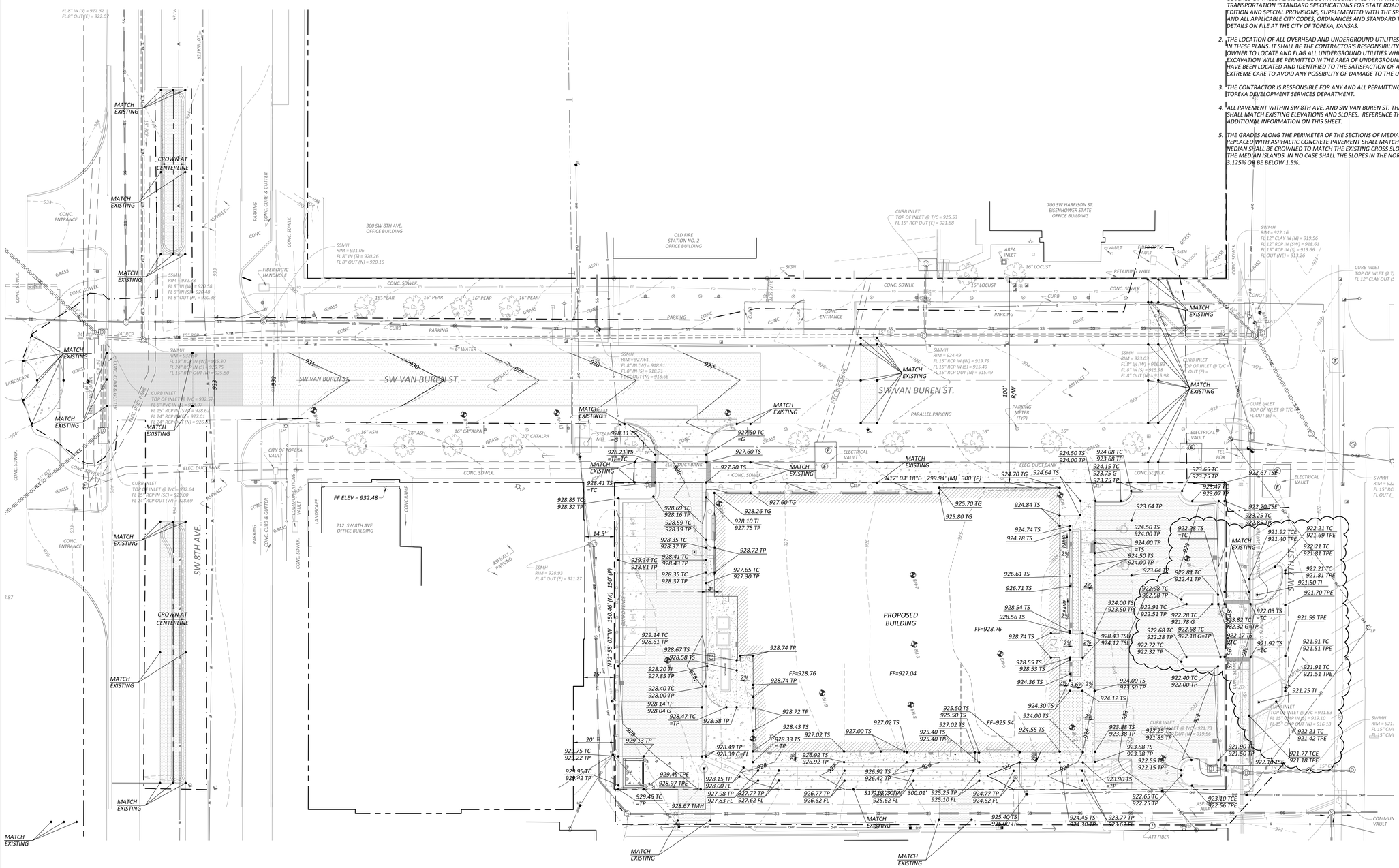

GENERAL NOTES:

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3. *THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL PERMITTING AND FEES THROUGH THE CITY OF TOPEKA DEVELOPMENT SERVICES DEPARTMENT.*
4. *ALL PAVEMENT WITHIN SW 8TH AVE. AND SW VAN BUREN ST. THAT IS TO BE REMOVED AND REPLACED SHALL MATCH EXISTING ELEVATIONS AND SLOPES. REFERENCE THE PLAN AND PROFILE SHEET AND ADDITIONAL INFORMATION ON THIS SHEET.*
5. *THE GRADES ALONG THE PERIMETER OF THE SECTIONS OF MEDIAN ISLAND BEING REMOVED AND REPLACED WITH ASPHALTIC CONCRETE PAVEMENT SHALL MATCH EXISTING. THE CENTERLINE OF THE NEDIAN SHALL BE CROWNED TO MATCH THE EXISTING CROSS SLOPES AT THE EAST AND WEST ENDS OF THE MEDIAN ISLANDS. IN NO CASE SHALL THE SLOPES IN THE NORTH OR SOUTH DIRECTION EXCEED 3.125% OR BE BELOW 1.5%.*

ABBREVIATIONS

FF	-	*FINISHED FLOOR*
TC	-	*TOP OF CURB*
TCE	-	*TOP OF EXISTING CURB*
G	-	*GUTTER*
TI	-	*TOP OF INLET*
TMH	-	*TOP OF MANHOLE*
TP	-	*TOP OF PAVEMENT*
TPE	-	*TOP OF EXISTING PAVEMENT*
TS	-	*TOP OF SIDEWALK*
TSE	-	*TOP OF EXISTING SIDEWALK*
TSL	-	*TOP OF UPPER SIDEWALK*
TSU	-	*TOP OF LOWER SIDEWALK*

Horz.: 1"=20'
0 20'

HTK ARCHITECTS PA
3100 W 110TH ST, STE. 150
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3905 KANSAS AVE
TOPEKA KANSAS 66612
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KEVIN W. BECK LICENSED 16259 4-15-15 KANSAS PROFESSIONAL ENGINEER

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1415 SW Topeka Blvd.
Topeka, KS 66612
Ph: (785) 215-8630

DATE:
- 4-15-15

REVISED DATE:
- 5-07-15

HTK PROJECT NUMBER:
- 1410.03

Department of Administration
Office of Facilities and
Procurement Management
800 SW Jackson, Suite 700
Topeka, Kansas 66612-1216
Phone 785-296-8899
FAX 785-296-3456

STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
Seventh & Van Buren Street, Topeka, Kansas
BUILDING NUMBER
17300.00038

4-15-15 DRAWN BY: Author CHECKED BY: Checker REV:

GRADING PLAN

A-012651

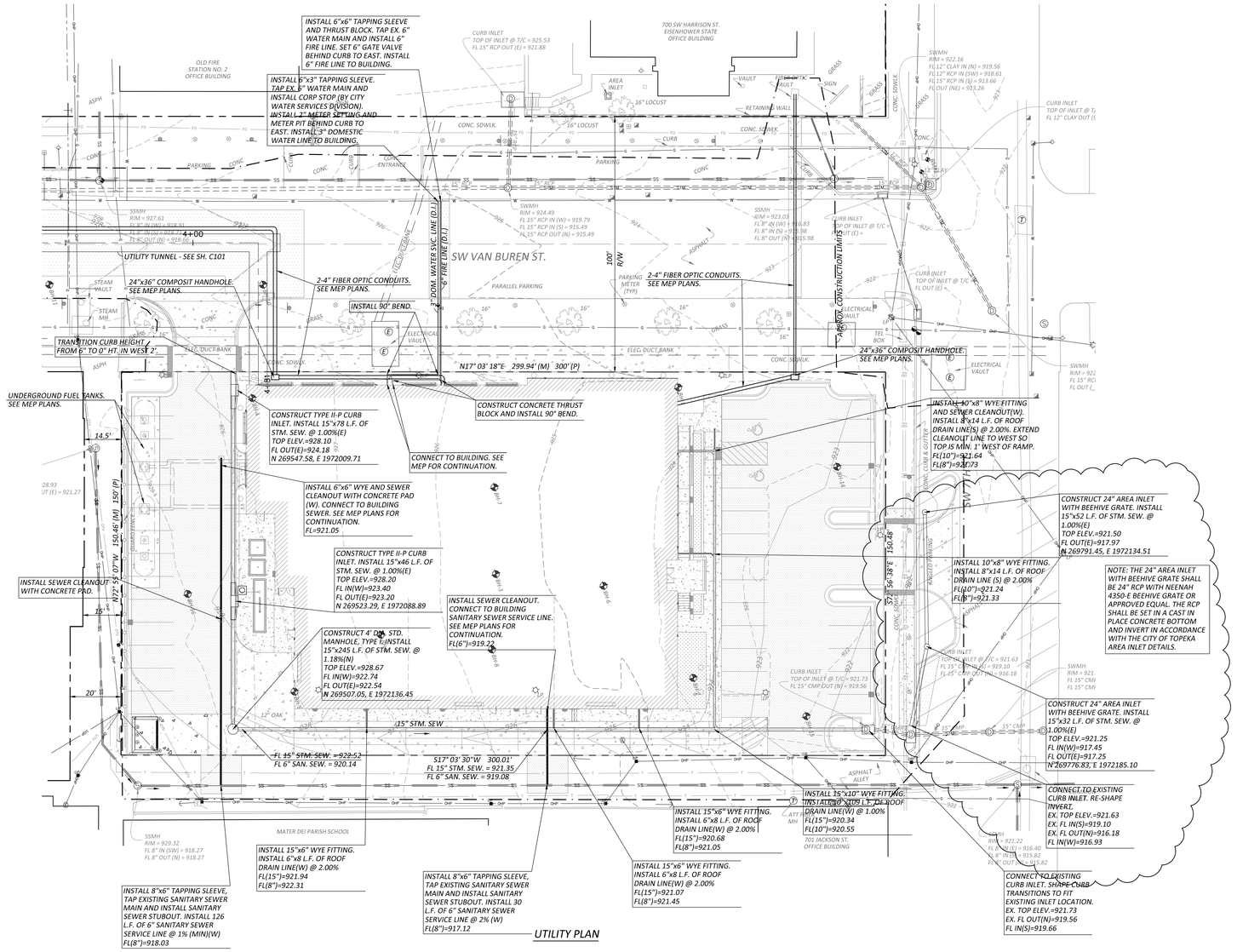
C200

CONSTRUCTION DOCUMENTS

JCSBC
2-2-2016
Att.9C---1160

GENERAL NOTES:

1. *ALL CONSTRUCTION METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS COVERED BY THESE PLANS SHALL BE IN ACCORDANCE WITH THE KANSAS DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR STATE ROAD & BRIDGE CONSTRUCTION", LATEST EDITION AND SPECIAL PROVISIONS, SUPPLEMENTED WITH THE SPECIFICATIONS NOTED ON THIS SHEET AND ALL APPLICABLE CITY CODES, ORDINANCES AND STANDARD TECHNICAL DESIGN AND DRAWING DETAILS ON FILE AT THE CITY OF TOPEKA, KANSAS.*
2. *THE LOCATION OF ALL OVERHEAD AND UNDERGROUND UTILITIES MAY VARY FROM WHAT IS INDICATED IN THESE PLANS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE UTILITY OWNER TO LOCATE AND FLAG ALL UNDERGROUND UTILITIES WHETHER INDICATED OR NOT. NO EXCAVATION WILL BE PERMITTED IN THE AREA OF UNDERGROUND UTILITIES UNTIL ALL SUCH UTILITIES HAVE BEEN LOCATED AND IDENTIFIED TO THE SATISFACTION OF ALL PARTIES AND THEN ONLY WITH EXTREME CARE TO AVOID ANY POSSIBILITY OF DAMAGE TO THE UTILITY.*
3. *THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL PERMITTING AND FEES THROUGH THE CITY OF TOPEKA DEVELOPMENT SERVICES DEPARTMENT.*
4. *THE CONTRACTOR SHALL COORDINATE ALL WATER SERVICE AND FIRE SERVICE*



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Seventh & Van Buren Street, Topeka, Kansas
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DRAWN BY: Author CHECKED BY: Checker REV:
4-15-15

UTILITY PLAN

A-012651

C300

CONSTRUCTION DOCUMENTS

Horz.: 1"=20'
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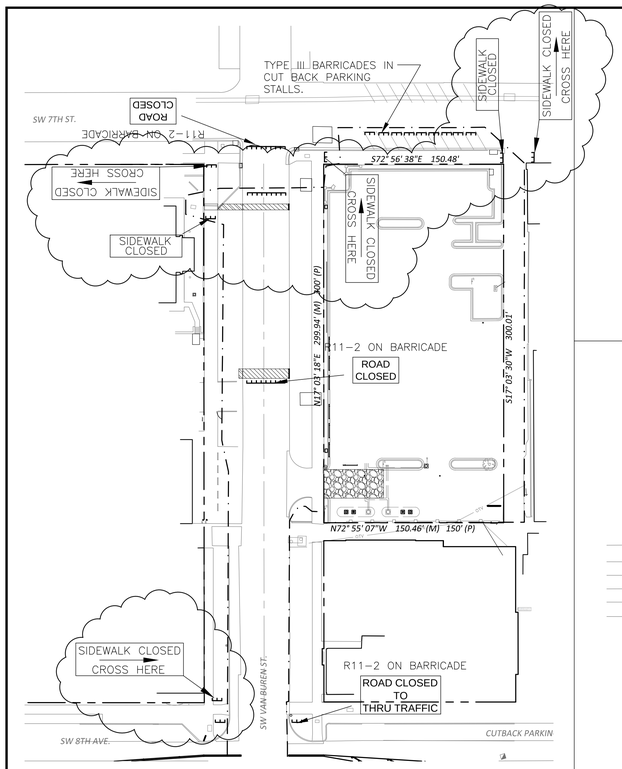
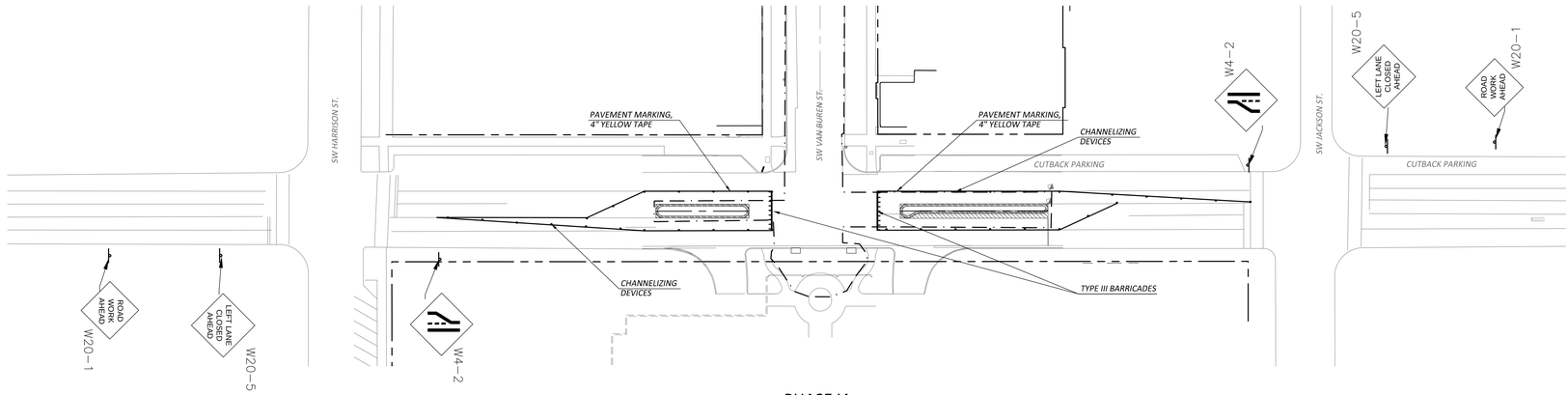
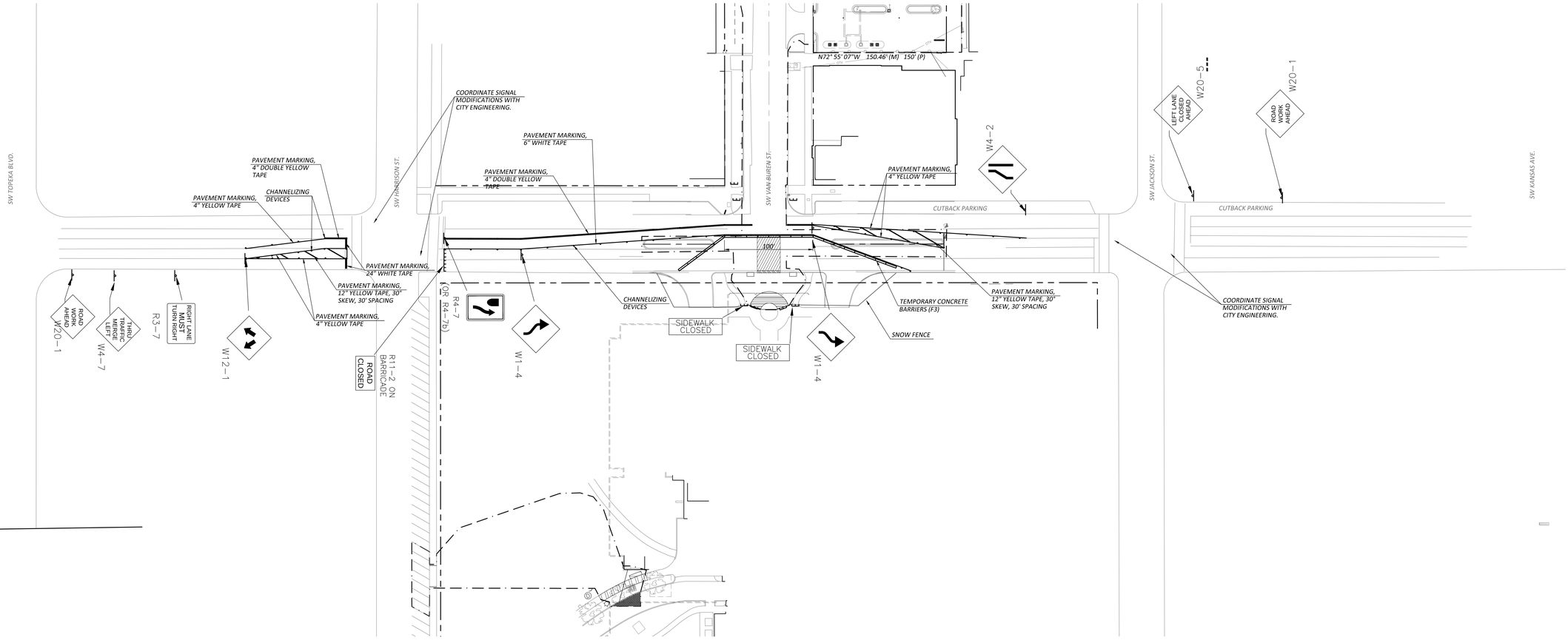


PHASE IB - SW VAN BUREN ST.



PHASE IA



PHASE IB - SW 8TH AVE.

PHASING NOTES:

PHASE I: *SEE SHEET C050 FOR PHASE IA & PHASE IB CONSTRUCTION ACTIVITIES.*

THIS TRAFFIC CONTROL PLAN IS PROVIDED FOR GUIDANCE. THE CONTRACTOR SHALL PROVIDE ALL TRAFFIC CONTROL FOR STREETS AND SIDEWALKS IN ACCORDANCE WITH THE CITY OF TOPEKA STANDARD DETAILS AND LATEST EDITION OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. SEE THE STANDARD DRAWINGS FOR SPACING AND ADDITIONAL SIGNAGE.

THE CONTRACTOR SHALL PROVIDE THE CITY OF TOPEKA ENGINEERING DIVISION WITH THE FINAL TRAFFIC CONTROL PLAN BASED ON FINAL PHASING OF CONSTRUCTION. THE PLAN SHALL BE APPROVED BY THE CITY ENGINEERING DEPARTMENT PRIOR TO BEGINNING CONSTRUCTION.

THE CONTRACTOR SHALL INCLUDE ALL NECESSARY SIDEWALK CLOSURE TRAFFIC CONTROL DEVICES PER CITY STANDARDS.

THE CONTRACTOR SHALL COORDINATE TEMPORARY SIGNAL MODIFICATIONS AT SW 8TH & SW HARRISON INTERSECTION AND SW 8TH & SW JACKSON INTERSECTION AS NECESSARY.

THE CONTRACTOR SHALL PROVIDE ADEQUATE CONSTRUCTION FENCING AND PROTECTION OF THE PROJECT SITE TO PROMOTE THE SAFETY AND SECURITY OF THE CONSTRUCTION FORCES AS WELL AS THE PUBLIC. THIS INCLUDES PROTECTION FOR VEHICULAR, PEDESTRIAN AND OTHER MODES OF TRANSIT.

Horz.: 1"=50'
0 50'

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1730000038
4-15-15 DRAWN BY: Author CHECKED BY: Checker REV:

TRAFFIC CONTROL PLAN
PHASE IA & IB

A-012651

C400

CONSTRUCTION DOCUMENTS

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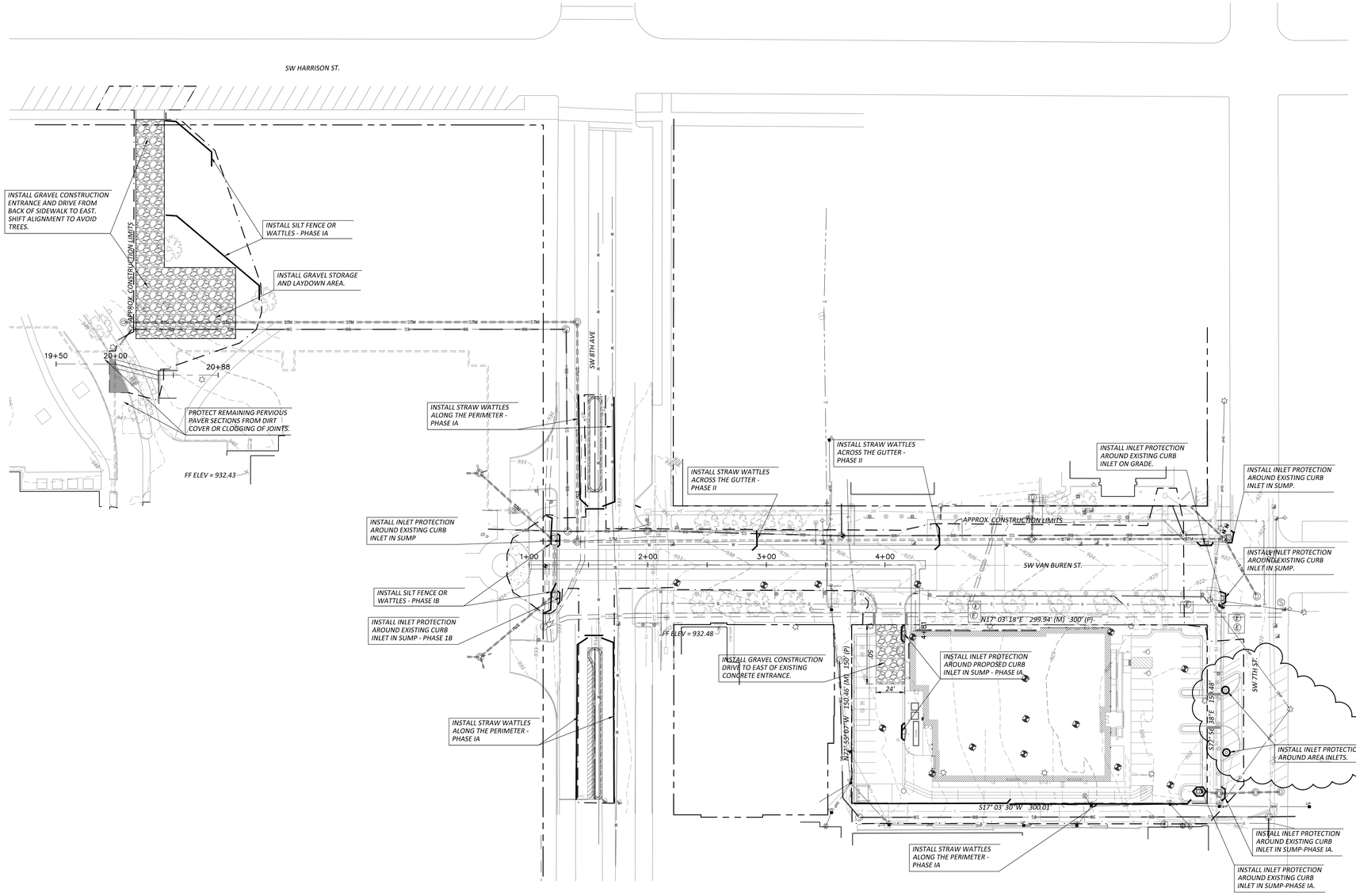

GENERAL NOTES:

1. THE LOCATION OF ALL OVERHEAD AND UNDERGROUND UTILITIES MAY VARY FROM WHAT IS INDICATED IN THESE PLANS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE UTILITY OWNER TO LOCATE AND FLAG ALL UNDERGROUND UTILITIES WHETHER INDICATED OR NOT. NO EXCAVATION WILL BE PERMITTED IN THE AREA OF UNDERGROUND UTILITIES UNTIL ALL SUCH UTILITIES HAVE BEEN LOCATED AND IDENTIFIED TO THE SATISFACTION OF ALL PARTIES AND THEN ONLY WITH EXTREME CARE TO AVOID ANY POSSIBILITY OF DAMAGE TO THE UTILITY.

2. ALL DISTURBED AREAS THAT ARE NOT PAVED OR LANDSCAPED SHALL BE SEEDED, FERTILIZED AND MULCHED IN ACCORDANCE WITH THE SPECIFICATIONS.

EROSION CONTROL GENERAL NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING, MONITORING AND MAINTAINING BEST MANAGEMENT PRACTICES (BMP'S) AT ALL TIMES DURING THE CONSTRUCTION ON THIS PROPERTY.

2. PRIOR TO COMMENCEMENT OF EARTHWORK OPERATIONS, CONTRACTOR SHALL INSTALL PERIMETER WATTLES AND CONSTRUCTION ENTRANCE AS SHOWN ON THE PLAN. THE INLET PROTECTION AND ADDITIONAL WATTLES WITHIN WORK AREA SHALL BE INSTALLED IMMEDIATELY AFTER INSTALLATION OF THE INLETS AND COMPLETION OF ROUGH GRADING.

3. EROSION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED BY THE CONTRACTOR NOT LESS THAN WEEKLY OR WITHIN 24 HOURS AFTER A RAINFALL EVENT OF 0.5 INCHES OR MORE. MAINTENANCE SHALL INCLUDE BUT NOT BE LIMITED TO SEDIMENT REMOVAL AND SILT FENCE REPAIR AND/OR REPLACEMENT.

4. CONTRACTOR SHALL CLEAR ALL SURROUNDING PARKING LOTS AND STREETS OF ANY TRACKED DEBRIS BY SWEEPING OR SCRAPING THE EXISTING PAVEMENT BY THE END OF EACH WORKDAY AND THE CONTRACTOR SHALL CLEAN UP SOIL WASHED OFF THE CONSTRUCTION SITE AFTER A STORM BY THE END OF THE NEXT WORKDAY.

5. DURING ALL SOIL DISTURBING ACTIVITIES, THE CONTRACTOR WILL TAKE APPROPRIATE STEPS USING ACCEPTED CONSTRUCTION METHODS TO MINIMIZE THE TIME OF EXPOSURE OF UNPROTECTED SOIL AND OTHER CONSTRUCTION MATERIALS TO RAINFALL.

6. CONTRACTOR SHALL KEEP A WRITTEN LOG OF WHEN CONSTRUCTION ACTIVITIES BEGIN, EROSION AND SEDIMENT CONTROLS ARE INSTALLED, INSPECTED AND REPAIRED.

7. EROSION AND SEDIMENT CONTROL MEASURES SHALL NOT BE REMOVED UNTIL GRASS COVER HAS BEEN ESTABLISHED OR AS DIRECTED BY ENGINEER.

8. ALL AREAS SHALL BE GRADED TO FINISHED GRADE PRIOR TO SEEDING AND MULCHING. ALL AREAS NOT PART OF THE HARDSCAPE OR OTHER NOTED LANDSCAPING SHALL BE PERMANENTLY SEEDED, FERTILIZED AND MULCHED.

9. ALL WATTLES SHALL BE STRAW WATTLE WS-12 AS MANUFACTURED BY NORTH AMERICAN GREEN, OR APPROVED EQUAL. THE WATTLES SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. THE CONTRACTOR MAY USE WATTLES AND SILT FENCE INTERCHANGEABLY IN AREAS IDENTIFIED ON THE DRAWINGS.

10. THE CONTRACTOR HAS THE OPTION TO MODIFY THE LOCATION OF THE CONSTRUCTION ENTRANCE TO FIT THE PREFERRED WORK PATTERN.

WASTE DISPOSAL:

1. WASTE MATERIALS: ANY WASTE AND OTHER UNUSABLE MATERIALS WILL BE REMOVED FROM THE SITE ON A REGULAR BASIS AND PROPERLY DISPOSED OF IN AN APPROVED SITE.

2. CHEMICAL WASTE: ALL CHEMICAL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A TIGHTLY SEALED METAL OR OTHER CHEMICAL RESISTANT CONTAINER. THE CONTAINER WILL MEET ALL LOCAL AND ANY STATE SOLID WASTE MANAGEMENT REGULATIONS. THE WASTE MATERIALS AND ALL DISPOSABLE MATERIALS WILL BE TRANSPORTED TO A COMMERCIAL CHEMICAL DISPOSAL FACILITY CAPABLE OF EITHER RECYCLING OR PROPERLY DISPOSING OF THE POLLUTANTS IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS. THE STATE WASTE MANAGEMENT SECTION CONTACT NUMBER IS (785) 296-1600.

3. HAZARDOUS WASTE: ALL HAZARDOUS WASTE MATERIALS, SUCH AS OIL FILTERS, PETROLEUM PRODUCTS, EQUIPMENT MAINTENANCE FLUIDS AND PAINTS, SHALL NOT BE STORED ON SITE AND WILL BE DISPOSED OF IN THE MANNER SPECIFIED BY LOCAL, STATE AND/OR FEDERAL REGULATIONS. IF THERE ARE QUESTIONS REGARDING THE PROPER HANDLING OF HAZARDOUS WASTES THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT HAZARDOUS WASTE SECTION AT (785) 296-1600.

4. SANITARY WASTE: PORTABLE TOILET FACILITIES WILL BE PROVIDED ON THE PROJECT SITE AND SERVICED BY THE PROVIDER ON A REGULAR BASIS.

MATERIAL MANAGEMENT PRACTICES:

GOOD HOUSEKEEPING: THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ON-SITE DURING CONSTRUCTION.

1. ALL MATERIALS STORED ON-SITE WILL BE STORED IN A NEAT, ORDERLY MANNER IN ORIGINAL CONTAINERS IF APPROPRIATE.

2. PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH THE ORIGINAL MANUFACTURER'S LABELS.

3. MANUFACTURERS' RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.

SPILL PREVENTION:

1. PETROLEUM PRODUCTS: ALL ON-SITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED.

2. FERTILIZERS: FERTILIZERS USED WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORM WATER. FERTILIZER SHALL NOT BE STORED ON-SITE.

3. CONCRETE TRUCKS: CONCRETE TRUCKS ARE LIMITED TO A DESIGNATED AREA TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER ON THE SITE. PROPER SIGNAGE SHALL BE INSTALLED AND MAINTAINED ON SITE DEFINING DIRECTIONS TO AND LOCATIONS OF THE SPECIFIED WASH OUT AREA. IF A WASH OUT AREA CANNOT BE DESIGNATED OR MAINTAINED ON SITE, CONCRETE WASH OUT AND DISPOSAL MAY BE PROHIBITED AT THE OWNERS DISCRETION.

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BUILDING NUMBER
17300/00038

4-15-15 DRAWN BY: Author CHECKED BY: Checker REV:

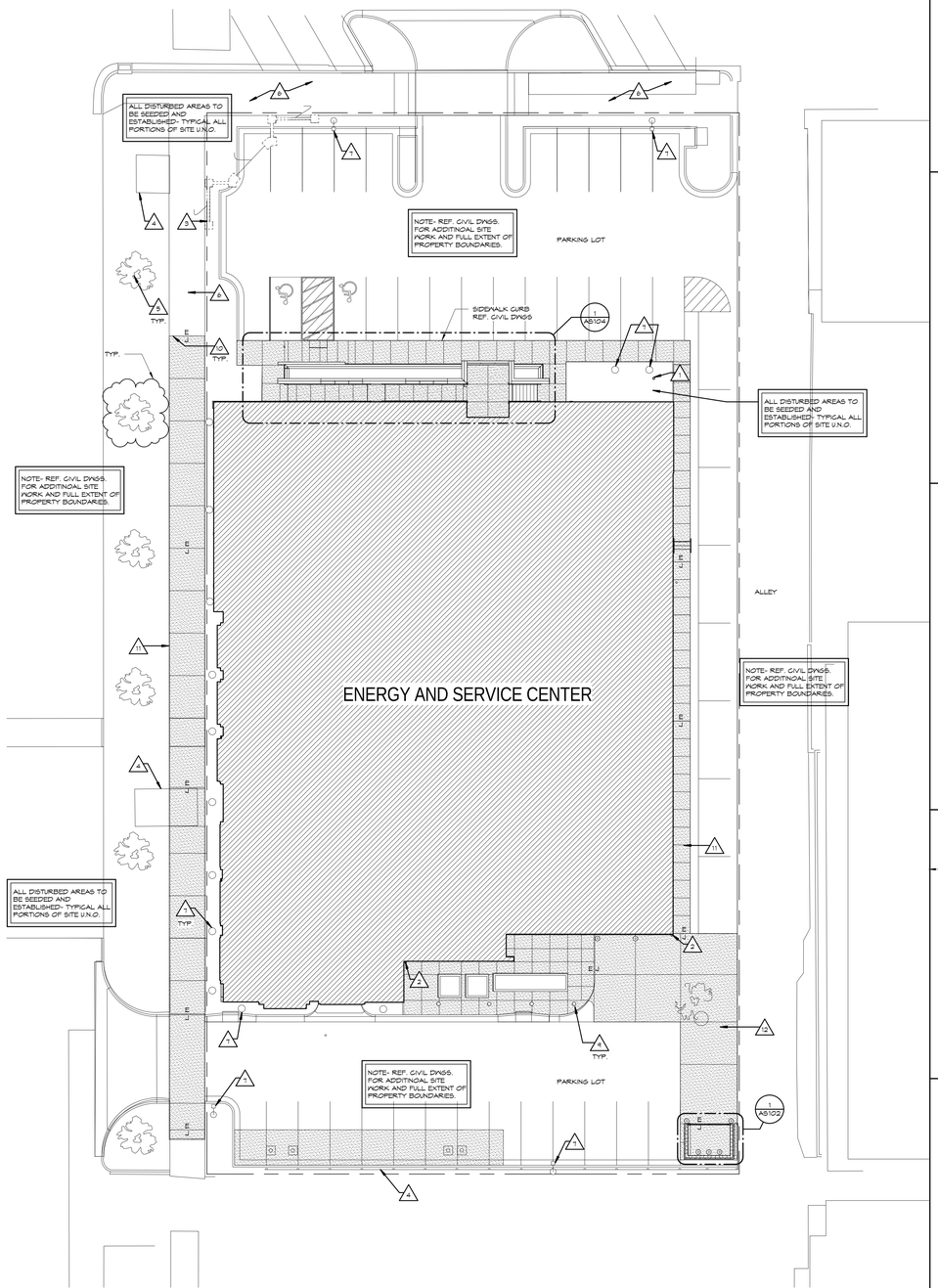
EROSION CONTROL PLAN

A-012651

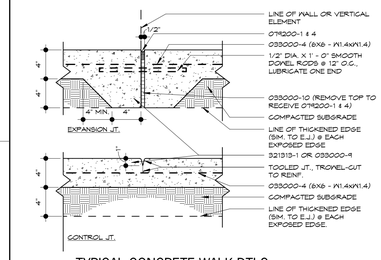
C500

CONSTRUCTION DOCUMENTS

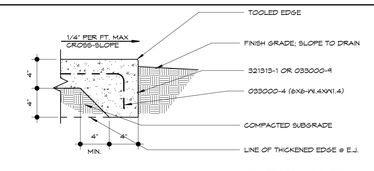
JCSBC
2-2-2016
Att.9C--1163



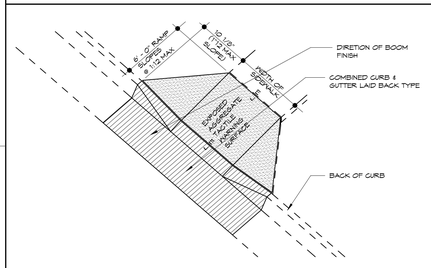
1 SITE PLAN
1/16" = 1'-0"



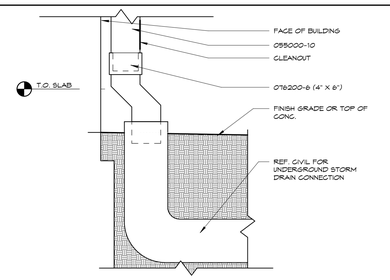
3 TYPICAL CONCRETE WALK DTLS.
1 1/2" = 1'-0"



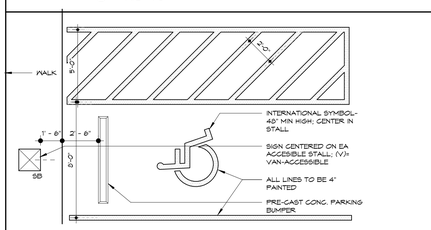
4 TYPICAL THICKENED EDGE
1 1/2" = 1'-0"



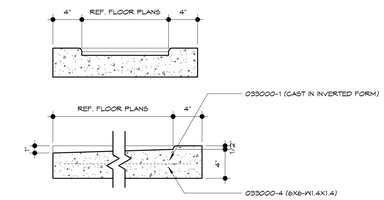
5 SIDEWALK HANDICAP RAMP
1 1/2" = 1'-0"



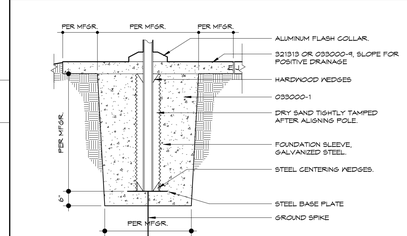
6 DOWNSPOUT BOOT
1 1/2" = 1'-0"



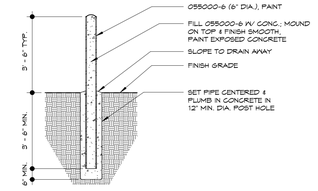
7 H.C. GRAPHICS / ACCESSIBLE PARKING
1/4" = 1'-0"



8 CONCRETE SPLASHBLOCK
1 1/2" = 1'-0"



9 FLAGPOLE BASE
1/2" = 1'-0"



10 STEEL BOLLARD
1 1/2" = 1'-0"

SITE PLAN NOTES

GENERAL: COORDINATE WITH WORK SHOWN ON STRUCTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS, REF. TE SHEET FOR EQUIP. COORDINATION

1. LOCATION OF FLAGPOLE. 107500-1.
2. LOCATION OF DOWNSPOUT BOOT. REF. 6/AS101.
3. REMOVE EXISTING BRICK & WROUGHT IRON FENCE COMPLETELY, INCLUDING ELECTRICAL & FOOTINGS.
4. EXISTING GUARDRAIL TO REMAIN.
5. EXISTING TREE TO REMAIN. PROTECT DURING CONSTRUCTION.
6. EXISTING CONCRETE SIDEWALK TO REMAIN.
7. BUILDING LIGHTING REF. ELECT.
8. PROPERTY LINE REF. CIVIL DWGS.
9. BOLLARD REF. 10/AS101
10. EXPANSION JOINT REF. 3/AS101
11. CONCRETE SIDEWALK REF. 3/AS101
12. CONCRETE PAVEMENT REF. CIVIL DWGS.

GENERAL SITE NOTES

1) ALL UTILITY INFORMATION SHOWN HEREIN IS BASED ON THE INFORMATION AVAILABLE. THE CONTRACTOR SHALL VERIFY ALL UTILITY DEPTHS & LOCATIONS PRIOR TO CONSTRUCTION. ANY DAMAGE CAUSED BY THE CONTRACTOR'S CONSTRUCTION OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.

2) ALL GROUND SURFACES SHALL VARY UNIFORMLY BETWEEN INDICATED ELEVATIONS. GRADING PLAN REFLECTS TOP OF TURF OR PAVEMENT ELEVATIONS U.N.O.

3) AFTER CONSTRUCTION COMPLETION, STAGING, PARKING, AND STORAGE AREA SHALL BE RESTORED TO THE PRE-CONSTRUCTION CONDITIONS. ANY DAMAGE TO OR REMOVAL OF EXISTING CONDITIONS OCCURRING ON-SITE DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER.

4) CARE SHALL BE EXERCISED TO PRESERVE AND/OR PROTECT EXISTING TREES AND VEGETATION OUTSIDE OF AREAS TO BE GRADED. ANY NECESSARY REPAIR OF THESE AREAS DAMAGED BY THE GENERAL CONTRACTOR AND/OR HIS ASSIGNEES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE PERFORMED TO THE SATISFACTION OF THE OWNER.

5) CONTRACTOR SHALL PROVIDE AND MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION.

6) THE CONTRACTOR IS RESPONSIBLE FOR THE PROVISION OF ALL MATERIALS, TOOLS, EQUIPMENT AND LABOR NECESSARY TO CONTROL EROSION, SILTATION AND DISCHARGES OF FILL MATERIAL (SEDIMENT) INTO DOWNSTREAM SYSTEMS OR RECEIVING CHANNELS. THIS SHALL BE REQUIRED DURING ALL PHASES OF CONSTRUCTION AND UNTIL SUITABLE GROUND COVER IS ESTABLISHED FOR ALL DISTURBED AREAS. IF ANY METHOD OF CONTROL FAILS, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT IMMEDIATELY.

7) ALL METHODS AND MEANS OF CONSTRUCTION PERFORMED ON THIS PROJECT SHALL CONFORM TO THE DESIGN CRITERIA AND STANDARD TECHNICAL SPECIFICATIONS FOR THE CITY OF TOPEKA AND SHAWNEE COUNTY, KANSAS, CURRENT EDITION. THE MORE STRINGENT REQUIREMENT SHALL APPLY FOR DISCREPANCIES BETWEEN THE CONTRACT DOCUMENTS AND THE SAID SPECIFICATIONS.

8) ALL DISTURBED AREAS SHALL BE SEEDED, FERTILIZED AND MULCHED WITHIN 14 DAYS OF THE COMPLETION OF WORK IN EACH AREA IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.

9) CONTRACTOR SHALL LIMIT SITE DISTURBANCE TO ALL PRACTICAL EXTENTS, TO THOSE AREAS SHOWN FOR CONSTRUCTION OPERATIONS.

10) OWNER SHALL PROVIDE REQUIRED GEOTECHNICAL MATERIALS AND CONSTRUCTION TESTING. CONTRACTOR SHALL COORDINATE WITH AND NOTIFY GEOTECHNICAL ENGINEER OF REQUIRED TESTING SCHEDULE.

11) SIX (6) FOOT CHAIN LINK PERIMETER FENCING AND ROCK SURFACING IS REQUIRED FOR ANY STORAGE, STAGING OR PARKING.

12) ALL DRIVE LANES ON THE SCHOOL CAMPUS, OUTSIDE OF THE AREA OF THE CONSTRUCTION FENCING SHALL BE KEPT CLEAR FOR SCHOOL TRAFFIC. THE SCHEDULE OF CONSTRUCTION DELIVERIES SHALL BE COORDINATED WITH THE OWNER IN ORDER TO AVOID BEFORE AND AFTER SCHOOL TRAFFIC.

13) ALL CONCRETE SIDEWALKS SHALL HAVE A SLOPE NO GREATER THAN 1:12.

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DENNIS A. HAIGH — LICENSED ARCHITECT — 4-15-15 — 2561 — KANSAS — PROFESSIONAL ARCHITECT

DATE:
- 4-15-15

REVISED DATE:
- 12-18-14
- 2-9-15
- 3-10-15

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STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
221 SW 7th Street
BUILDING NUMBER 173000038

DATE: 4-15-15 DRAWN BY: Author CHECKED BY: Checker REV: 1

ARCHITECTURAL SITE PLAN

A-012651

AS101

CONSTRUCTION DOCUMENTS

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JCSBC
2-2-2016
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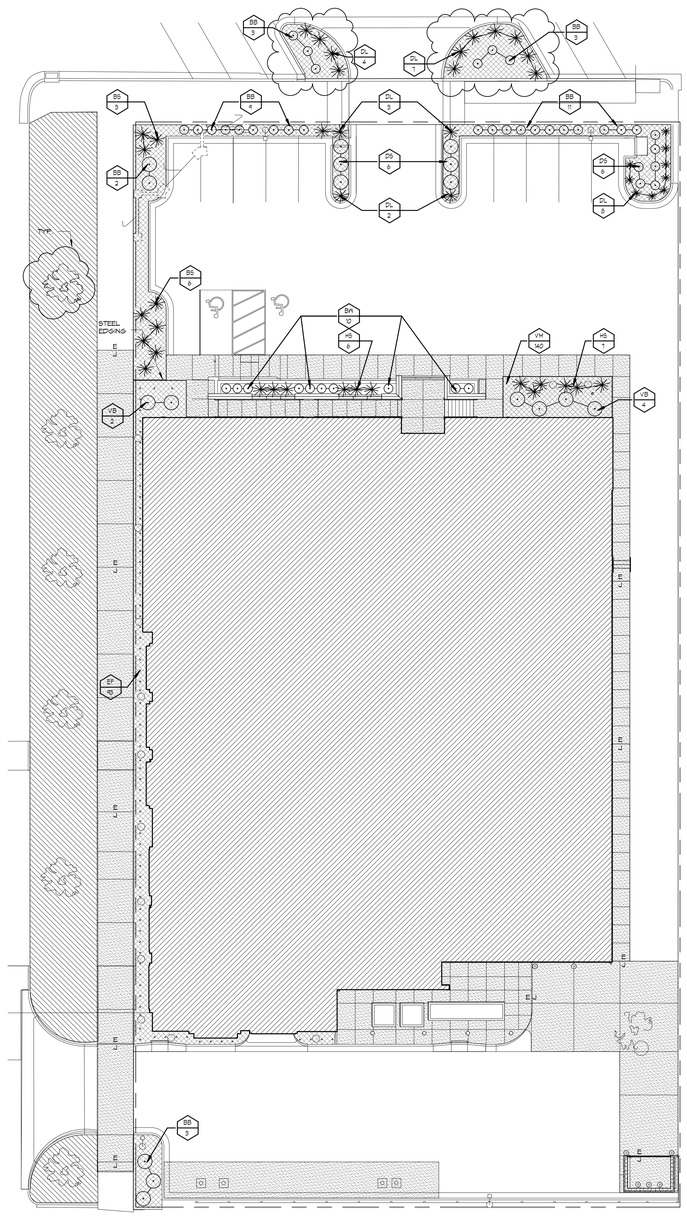


6 LANDSCAPING PLAN
1/16" = 1'-0"

NORTH

LANDSCAPE LEGEND

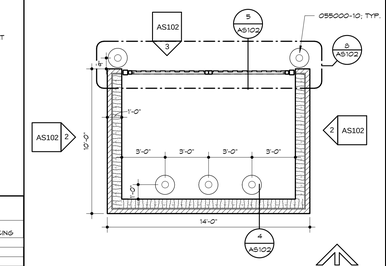
EXISTING TREE TO REMAIN
SHRUB TYPE 1
SHRUB TYPE 2
STEEL EDGING
MULCH AND WEED MAT
SEEDED GRASS
GROUNDCOVER

PLANTING SCHEDULE

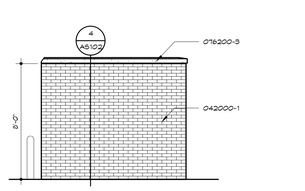
PLANT ABBREVIATION	QUANTITY	COMMON NAME	SIZE	SPACING
BB	31	Burning Bush "Dwarf Winged"	5 Gal.	4 Ft.
DS	12	Dwarf Spirea "Goldene Flame"	1 Gal.	3 Ft.
NB	6	Viburnum "Ann Russel"	5 Gal.	6 Ft.
SH	10	Stonecrop "Garden of Velvet"	2 Gal.	3 Ft.
DL	24	Daylily "Stella D Oro"	1 Gal.	3 Ft.
BS	9	Lord Snowdon "Big Blue Stem"	1 Gal.	3 Ft.
HS	13	Hosta "Sirko Craig"	1 Gal.	3 Ft.
EF	93	Euonymus Fortuni "Colorados"	1 Gal.	3 Ft.
VM	140	Vinca Minor	4"	1 per 2 S.F.

LANDSCAPING NOTES

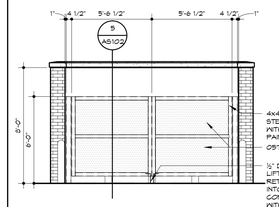
1) CONTRACTOR SHALL STAKE ALL PLANTING AREAS IN THE FIELD PRIOR TO PLANTING FOR APPROVAL OF ARCHITECT.
2) CONTRACTOR SHALL VERIFY ALL PLANT QUANTITIES PRIOR TO PLANTING. NOTIFY THE ARCHITECT OF ANY DISCREPANCIES WITH THE PLAN. PLAN QUANTITIES SHALL SUPERCEDED SHEDULED QUANTITIES.
3) ALL PLANT MATERIAL SHALL BE SPECIMEN QUALITY AND SHALL COMPLY WITH THE RECOMMENDATIONS AND REQUIREMENTS OF ANSI A60.1 THE AMERICAN STANDARD FOR NURSERY STOCK.
4) ALL PLANTING BEDS SHALL BE EDGED WITH GREEN STEEL EDGING WHERE SHOWN.
5) PREPARE PLANTING BEDS AND INCORPORATE AMENDMENTS ACCORDING TO SPECIFICATIONS.
6) CYPRUS MULCH, PER SPECIFICATIONS, SHALL BE USED AS A THREE INCH (3") TOP DRESSING WITH COMMERCIAL GRADE WEED BARRIER UNDER; IN ALL PLANTING BEDS AND AROUND ALL TREES.
7) THE LANDSCAPE CONTRACTOR SHALL NOT COMMENCE WORK UNTIL THE SITE IS FREE OF DEBRIS CAUSED BY ON-GOING CONSTRUCTION OPERATIONS. REMOVAL OF DEBRIS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. LANDSCAPE WORK SHALL NOT BEGIN UNTIL THE ARCHITECT HAS GIVEN WRITTEN APPROVAL FOR SUCH. THERE SHALL BE NO DELAYS DUE TO LACK OF COORDINATION FOR THIS ACTIVITY.
8) THE ARCHITECT SHALL APPROVE GRADES AND CONDITION OF SITE PRIOR TO SEEDING OPERATIONS.



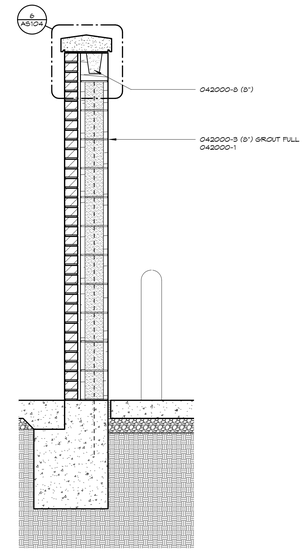
1 TRASH ENCLOSURE
1/4" = 1'-0"



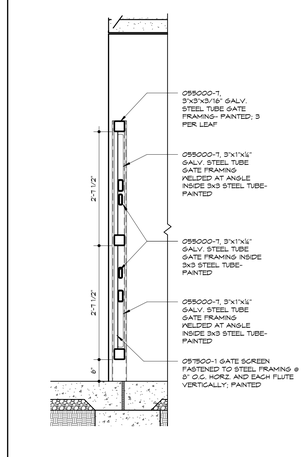
2 TRASH ENCLOSURE EAST/WEST ELEVATION
1/4" = 1'-0"



3 ENLARGED GATE ELEVATION
1/4" = 1'-0"

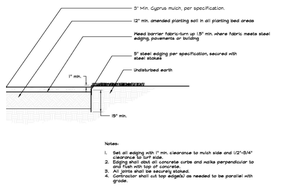


4 TRASH ENCLOSURE WALL SECTION
3/4" = 1'-0"

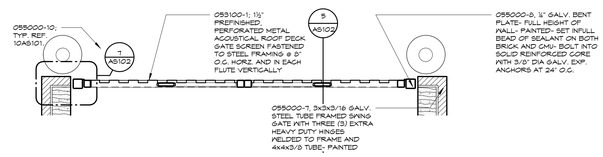


5 GATE SECTION
3/4" = 1'-0"

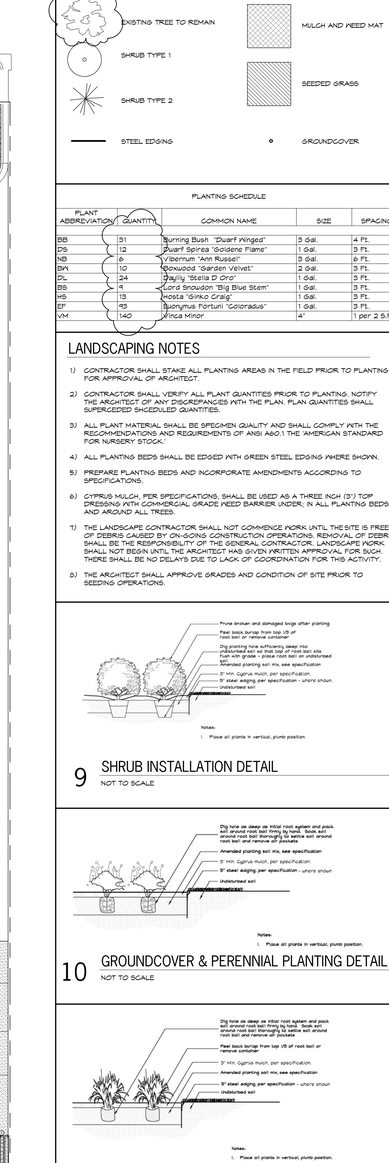
13 PLANT SPACING DIAGRAM
NOT TO SCALE



12 STEEL EDGING DETAIL
NOT TO SCALE



8 ENLARGED GATE PLAN
1/2" = 1'-0"



9 SHRUB INSTALLATION DETAIL
NOT TO SCALE

10 GROUNDCOVER & PERENNIAL PLANTING DETAIL
NOT TO SCALE

11 ORNAMENTAL GRASS PLANTING DETAIL
NOT TO SCALE

KEYNOTES

Note: Keynotes are drawn from a master list. It may not be sequentially numbered. Sizes (ex. 2x4) or other info. following keynote on drawings indicates criteria for those materials/locations which may differ from std. material specified.

033000	-1	Concrete Structure	081113	-1	Steel Door
	-2	Concrete Floor Slab		-2	Steel Frame
	-3	Vapor Barrier		-3	Frame Anchor
	-4	Welded Wire Fabric		-4	Louver
	-5	Steel Reinforcing Bar		-5	Plaster Guard
	-6	Rustication Joint		-6	FRK Door
	-7	Waterstop	081416	-1	Flush Wood Door
	-8	Dovetail Anchor	083113	-1	Access Door
	-9	Sidewalk		-2	Access Door Frame
	-10	Premolded Joint Filler		-3	Floor Access Door
033500	-1	Concrete Topping	083323	-1	Overhead Coiling Door
042000	-1	Face Brick		-2	Coiling Counter Door
	-2	Concrete Masonry Unit - Normal Weight (")	083613	-1	Sectional Overhead Door
	-3	Concrete Masonry Unit - Lightweight (")		-2	Sectional Overhead Door Track
	-4	Wire Reinforcing	084113	-1	Weatherstripping
	-5	Metal Tie/Anchor		-2	Aluminum Entrance Door
	-6	Through Pan Flashing		-3	Aluminum Entrance Frame
	-7	Control Joint Strip		-4	Sunshade
	-8	Bond Beam (")	084413	-1	Aluminum Subsill
	-9	Compressible Filler		-2	Glazed Aluminum Curtain Wall
	-10	Cavity Drainage Material		-3	Thru-Wall Flashing
	-11	Cavity Drainage Material		-4	Sunshade Louver
	-12	Termination Bar		-5	Aluminum Subsill
044300	-1	Stone Masonry	087100	-1	Track Hardware
	-2	Anchor	088000	-1	Glazing (as scheduled)
	-3	Stone Jamb	088353	-1	Security Glazing (as scheduled)
	-4	Stone Sill			
	-5	Belt Course	089116	-1	Louvers and Vents
047200	-1	Cast Stone	092216	-1	Steel Stud (")
051200	-1	Steel Beams		-2	Steel Stud Runner (")
	-2	Steel Column		-3	Furring Channel (")
	-3	Steel Tube	092400	-1	Portland Cement Plastering
	-4	Steel Channel		-2	Metal Lath
052100	-1	Steel Joist		-3	Casing Bead
	-2	Joist - Extended End	092900	-1	Gypsum Board (")
	-3	Joist - Ceiling Extension		-2	Fire Rated Gypsum Board Partition
053100	-1	Steel Decking		-3	Cementitious Tile Backer Panel
	-2	Flexible Closure Strips		-4	Metal Suspension System
054000	-1	Structural Steel Studs		-5	Acoustical Sealant
	-2	Structural Steel Joists		-6	Acoustical Insulation (")
	-3	'Z' Girbuns		-7	Metal Edge Trim
055000	-1	Steel Angle		-8	Auxiliary Supports Framing
	-2	Steel Channel		-9	Metal Control Joint
	-3	Steel Lintel		-10	High Impact Gypsum Board
	-4	Steel Pipe		-11	Concrete Interior Finishing Compound
	-5	Steel Tube		-12	Stiffener
	-6	Steel Plate	093000	-1	Porcelain Pell Tile
	-7	Steel Ladder		-2	Tile (" x ")
	-8	Steel Bollard		-3	Shower Pan
055100	-1	Steel Stairs		-4	Shower Pan Flashing
	-2	Steel Pan Stringer		-5	Porcelain Floor Tile (" x ")
	-3	Steel Bollard Plate		-6	Tile Base
055213	-1	Steel Pipe Handrail		-7	Tile Cap
	-2	Steel Pipe Railings		-8	Tile Cap
	-3	Steel Handrail Wall Bracket		-9	Setting Bed
	-4	Steel Rod		-10	Uncoupling water-proof membrane
055300	-1	Steel Grating	094113	-1	Ornamental Metal Stamped Grille
	-2	Steel Frame		-2	Ceiling Suspension System
057300	-1	Decorative Metal Railings		-3	Edge Mold Trim
057500	-1	Ornamental Metal Stamped Grille		-4	Auxiliary Support Framing
061053	-1	2x Wood Nailer (")	095113	-1	Acoustical Panel ('x ') (If = Fire Rated)
	-2	2x Wood Blocking (")		-2	Ceiling Suspension System
	-3	1x Wood Continuous (")		-3	Edge Mold Trim
	-4	Plywood (")		-4	Auxiliary Support Framing
	-5	OSB Pad		-5	Resilient Tile Flooring
	-6	Sheathing (")	096513	-2	Resilient Pell Base
	-7	Sheathing (")		-3	Edge Strip
064116	-1	Interior Architectural Woodwork		-4	Tactile Warning Surface
	-2	High Pressured Laminate		-5	Resilient Stair Tread
	-3	Cabinet Liner Laminate		-6	Resilient Stair Riser
	-4	Particle Board		-7	Resilient Stringer Skirt
	-5	Plywood		-8	Resilient Stair Nose
	-6	Trim Edge Molding	096813	-1	Carpet Tile
	-7	Solid Wood Blocking	096900	-1	Access Flooring
	-8	Hardwood	099113	-1	Exterior Painting
	-9	Steel Tube/Leg Frame	099123	-1	Interior Painting
	-10	Door Hinge	099635	-1	Secondary Containment Coating System
	-11	Door/Drawer Pull	101400	-1	Signage
	-12	Magnetic Catch	102113	-1	Toilet Partition
	-13	Drawer		-2	Urinal Screen
	-14	Shelf Supports	102213	-1	Wire Mesh Partitions
	-15	Countertop	102800	-1	Impact-Resistant Cornerguard
	-16	Solid-Surfacing Material		-2	Tissue Dispenser
071113	-1	Bituminous Dampproofing	102800	-1	Framed Mirror
071326	-1	Self-Adhering Sheet Waterproofing		-2	Sanitary Napkin Disposer
072100	-1	Foundation Pell or under Slab Insulation (R-)		-3	Grab Bar
	-2	Cavity Pell Insulation (R-)		-4	Shower Seat
	-3	Building Insulation - Unfaced (R-)		-5	Shower Curtain Rod
	-4	Building Insulation - Faced (R-)	104413	-6	Coat/Robe Hook
	-5	Sill Sealer	104416	-7	Shower Curtain
	-6	Batt Insulation	105113	-8	Fire Extinguisher Cabinet
072126	-1	Fluid Applied Membrane Air Barrier	105500	-1	Fire Extinguisher
	-2	Flashing Tape		-2	Personnel Locker
074213	-1	Metal Pell Panel (Type 1)		-3	Bench
	-2	Trim	107500	-1	Flagpole
	-3	Z-Furring (")	122113	-1	Deterrent Spikes
	-4	Metal Pell Panel (Type 2)	122413	-1	Roller Window Shades
	-5	Metal Soffit Panel	133400	-1	Spray Painting Booth
075425	-1	Thermoplastic Polyolefin (TPO) Roofing	142400	-1	Hydraulic Elevator
	-2	Roof Insulation Flat	311000	-1	Site Clearing
	-3	Roof Insulation Tapered	312000	-1	Earth Moving
	-4	Roof Expansion Joint		-2	Interior Fill
	-5	Coverboard		-3	Exterior Fill
	-6	Walkway Protection Board	321313	-1	Granular Drainage Course
076200	-1	Sheet Metal Flashing and Counterflashing	334600	-1	Subbase Course
	-2	Pre-Finished Roof Edge		-2	Concrete Paving
	-3	Pre-Finished Coping		-3	Perforated Wall Pipe & Fittings
	-4	Sheet Metal Reglet		-4	Geotextile Filter Fabric (Fab/Sock)
	-5	Sheet Metal Gutter		-5	Drainage Panel
	-6	Sheet Metal Downspout			
	-7	Sheet Metal Counterflashing			
077124	-1	Roof Expansion Joint			
077200	-1	Roof Hatch/Ladder			
079413	-1	Penetration Firestopping			
079449	-1	Joint Firestopping			
079200	-1	Sealant - Make where required			
	-2	Joint Filler			
	-3	Gasket			
	-4	Backer Rod			
079500	-1	Expansion Control			

NOTE: REFER TO STRUCTURAL DRAWINGS FOR REINFORCING STEEL IN EXTERIOR WALLS AND CONCRETE NOT SHOWN

NOTE: REFER TO ALL DETAILS (DETAILS LOCATED ON THIS SHEET, PRECEEDING SHEETS AND FOLLOWING SHEETS) FOR APPLICABLE NOTES NOT SHOWN

NOTE: REFER TO ALL SECTIONS (SECTIONS LOCATED ON THIS SHEET, PRECEEDING SHEETS AND FOLLOWING SHEETS) FOR APPLICABLE NOTES NOT SHOWN

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- 4-15-15

REVISED DATE:
- 12-18-14
- 2-9-15
- 3-10-15

HTK PROJECT NUMBER:
- 1410.03

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STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
221 SW 7th Street
BUILDING NUMBER 17300-0038
DATE: 4-15-15 DRAWN BY: Author CHECKED BY: Checker REV: 1

LANDSCAPE PLAN AND SITE DETAILS

A-012651

AS102

CONSTRUCTION DOCUMENTS

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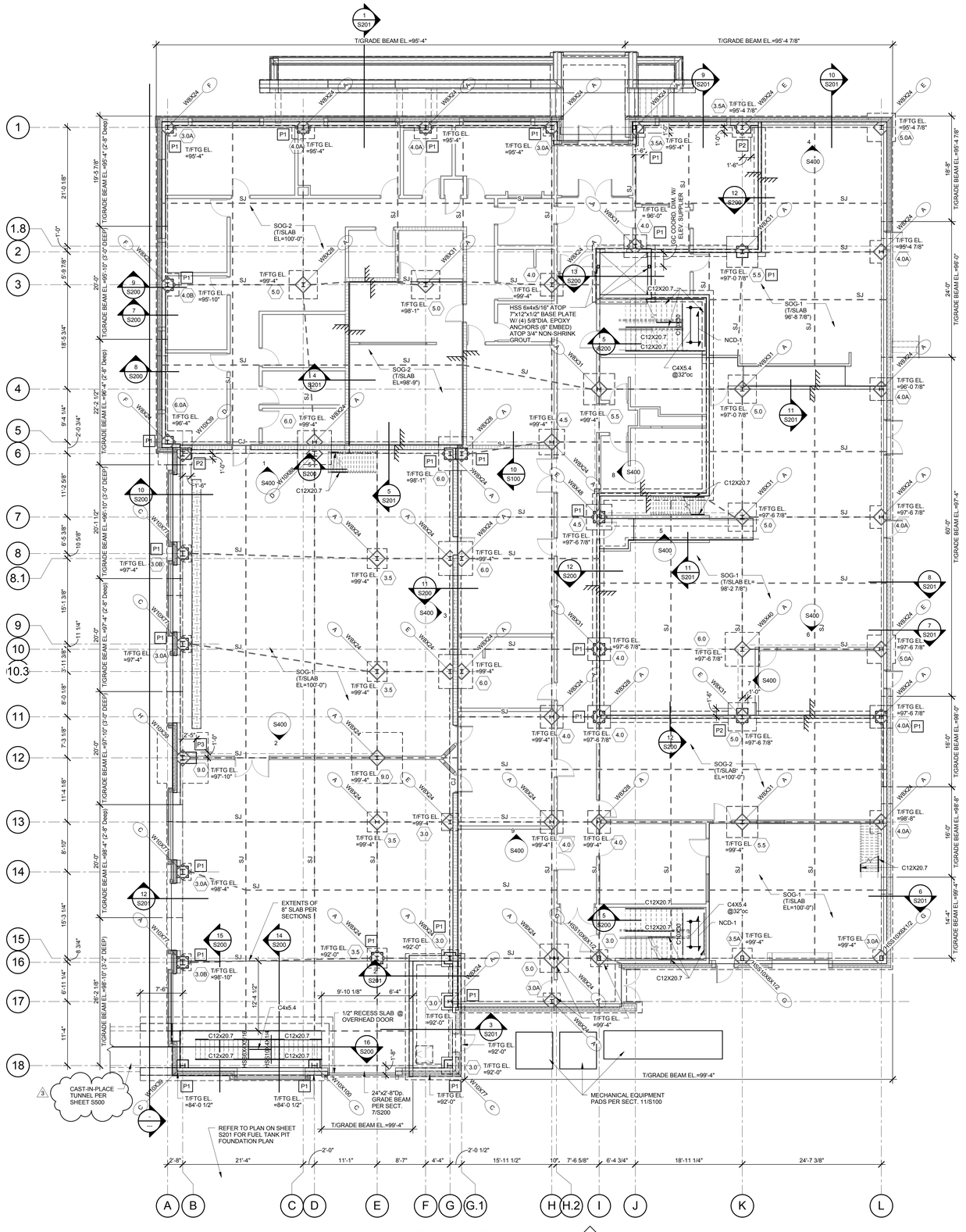


1 FOUNDATION PLAN

1/8" = 1'-0"

NOTES:
1.) REFER TO GENERAL NOTES & LEGEND ON SHEET S100.

NORTH

COLUMN PILASTER SCHEDULE

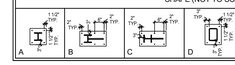
CONCRETE (PSI): 4000		REBAR (KSI): 60		
TYPE	PILASTER SIZE (DEPTHxWIDTH)	VERTICAL REINFORCING	TIES	SHAPE
P1	24"x24"	(8) #6	(2) #3 @12"oc	
P2	30"x24"	(10) #6	(4) #3 @12"oc	
P3	36"x24"	(12) #6	(5) #3 @12"oc	

1.) ALL PILASTER SHALL HAVE (3) ADDITIONAL SETS OF TIES AT TOP 5".
2.) ALL PILASTERS ARE CENTERED ON STEEL COLUMN UNLESS NOTED OTHERWISE PER PLAN.

COLUMN BASE PLATE SCHEDULE

TYPE	COLUMN	BASE PLATE	BASE PLATE TYPE	ANCHOR BOLTS	GROUT
A	PER PLAN	3/4"x14"x14"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
B	PER PLAN	1"x16"x16"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
C	PER PLAN	3/4"x16"x16"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
D	PER PLAN	3/4"x16"x20"	B	(6) 1" Ø (GRADE 105) x 2' - 0" Lg.	1"
E	PER PLAN	3/4"x16"x20"	C	(6) 1" Ø (GRADE 105) x 2' - 0" Lg.	1"
F	PER PLAN	1"x14"x14"	A	(4) 3/4" Ø x 1' - 6" Lg.	1"
G	PER PLAN	3/4"x12"x16"	D	(4) 3/4" Ø x 1' - 6" Lg.	1"
H	PER PLAN	3/4"x19"x24"	E	(6) 1 1/8" Ø (GRADE 105) x 2' - 0" Lg.	
J	PER PLAN	3/4"x16"x20"	F	(6) 1" Ø (GRADE 105) x 2' - 0" Lg.	1"

SHAPE (NOT TO SCALE)



NOTES:
1. COLUMNS SHALL BE CONTINUOUS WITH NO SPLICES UNLESS INDICATED OTHERWISE.
2. SEE PLAN FOR ORIENTATION OF COLUMNS.
3. ANCHOR BOLT LENGTH INCLUDES 4" OF PROJECTION AND 3" HOOK.

CONCRETE FOOTING SCHEDULE

SOIL PRESSURE (PSF): 5000	CONCRETE (PSI): 3500	REBAR (KSI): 60
TYPE	FOOTING SIZE (FT.) THICKNESS (IN.)	BAR SIZE/EA. WAY SPACING (IN.) BOTTOM
3.0	3'-0"x3'-0"x16"Dp	#4 @10"oc
3.0A	3'-0"x3'-0"x32"Dp	#4 @10"oc
3.0B	3'-0"x3'-0"xGR BM DEPTH PER PLAN	#4 @10"oc
3.5	3'-6"x3'-6"x16"Dp	#4 @10"oc
3.5A	3'-6"x3'-6"x32"Dp	#4 @10"oc
4.0	4'-0"x4'-0"x16"Dp	#4 @10"oc
4.0A	4'-0"x4'-0"x32"Dp	#4 @10"oc
4.0B	4'-0"x4'-0"x36"Dp	#4 @10"oc
4.5	4'-6"x4'-6"x18"Dp	#4 @10"oc
5.0	5'-0"x5'-0"x18"Dp	#5 @10"oc
5.0A	5'-0"x5'-0"x32"Dp	#5 @10"oc
5.5	5'-6"x5'-6"x18"Dp	#5 @10"oc
6.0	6'-0"x6'-0"x20"Dp	#5 @10"oc
6.0A	6'-0"x6'-0"x32"Dp	#5 @10"oc
9.0	9'-0"x9'-0"x36"Dp	#5 @10"oc T&B

NOTES:
1. EXTERIOR FOOTINGS OR FOOTING AT GRADE BEAM SHALL MATCH GRADE BEAM DEPTH AND BE PLACED WITH GRADE BEAM.
2. PROVIDE #4 @12"oc EACH WAY IN TOP OF FOOTING AT ALL BRACED BAY COLUMNS.
3. CENTER FOOTINGS ON COLUMNS AND/OR WALL CENTERLINES PER PLAN UNLESS NOTED OTHERWISE.

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FOUNDATION PLAN

A-012651

S101

CONSTRUCTION DOCUMENTS

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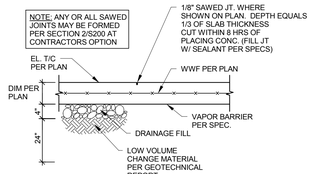
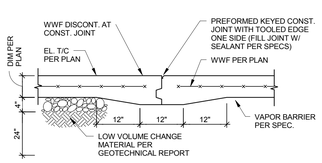


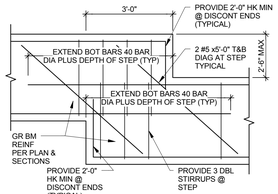
TYPICAL SAW JOINT
NOTED "SJ" ON PLAN

1 SECTION
3/4" = 1'-0"

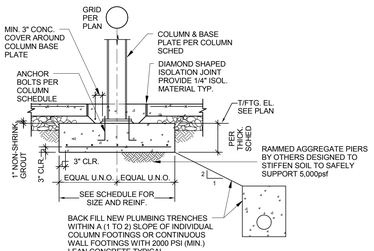


TYP. CONST JT (CJ)

2 SECTION
3/4" = 1'-0"



3 SECTION
1/2" = 1'-0"



4 SECTION
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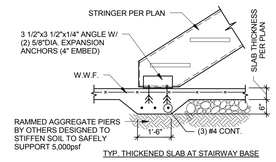
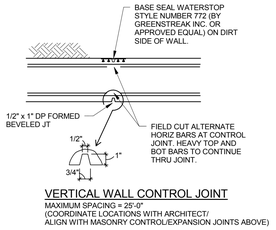


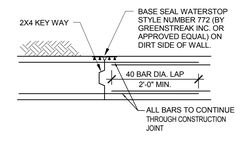
TYP. THICKENED SLAB AT STAIRWAY BASE

5 SECTION
3/4" = 1'-0"

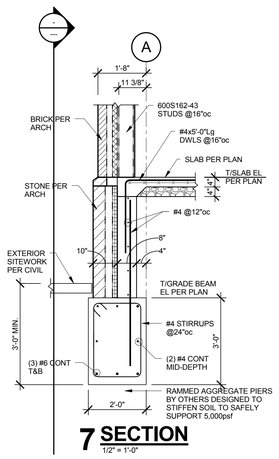


VERTICAL WALL CONTROL JOINT
MAXIMUM SPACING = 25'-0"
(COORDINATE LOCATIONS WITH ARCHITECT/ ALIGN WITH MASONRY CONTROL/EXPANSION JOINTS ABOVE)

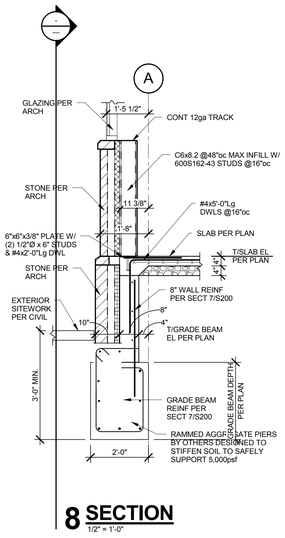
6 VERTICAL WALL CONTROL JOINT
3/4" = 1'-0"



VERTICAL WALL CONSTRUCTION JOINT
MAXIMUM SPACING = 100'-0"



7 SECTION
1/2" = 1'-0"



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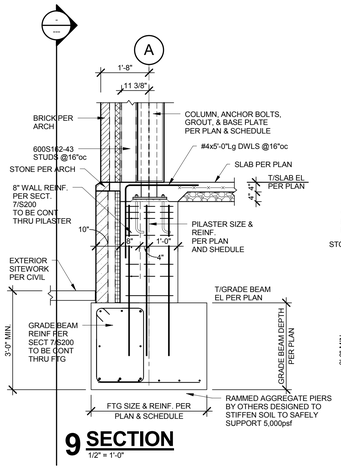
1/2" = 1'-0"



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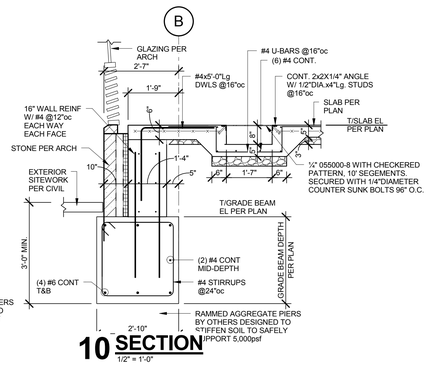
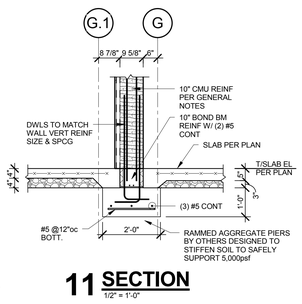
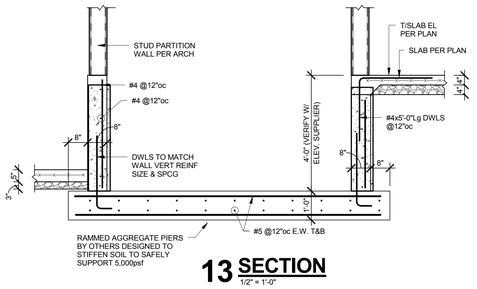
1/2" = 1'-0"



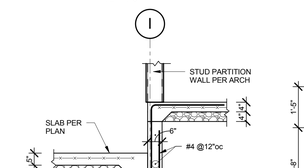
10 SECTION
1/2" = 1'-0"



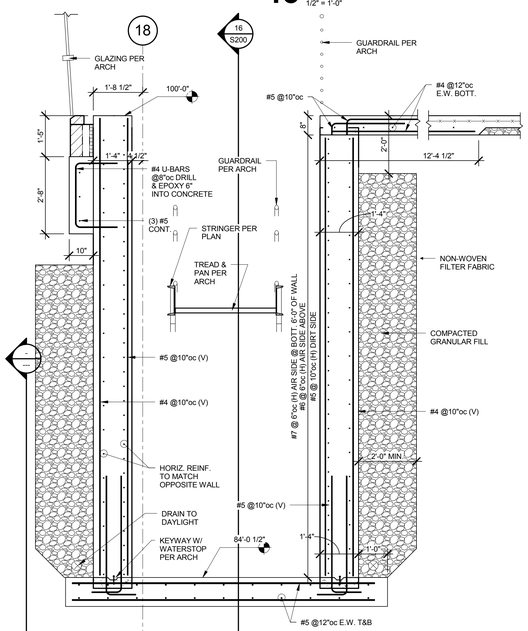
11 SECTION
1/2" = 1'-0"



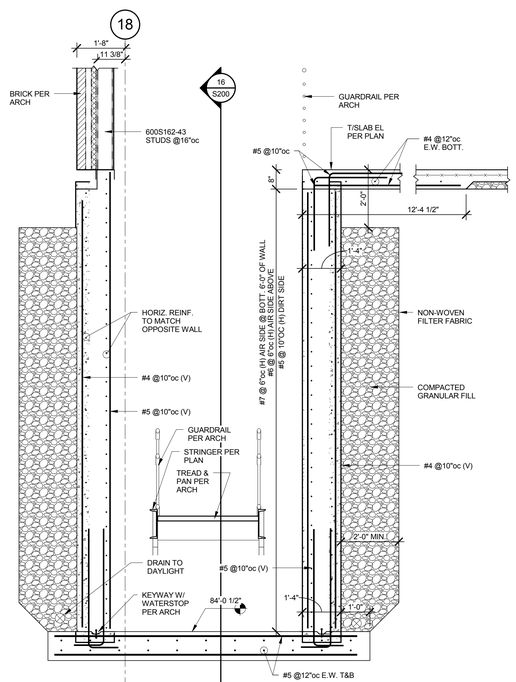
13 SECTION
1/2" = 1'-0"



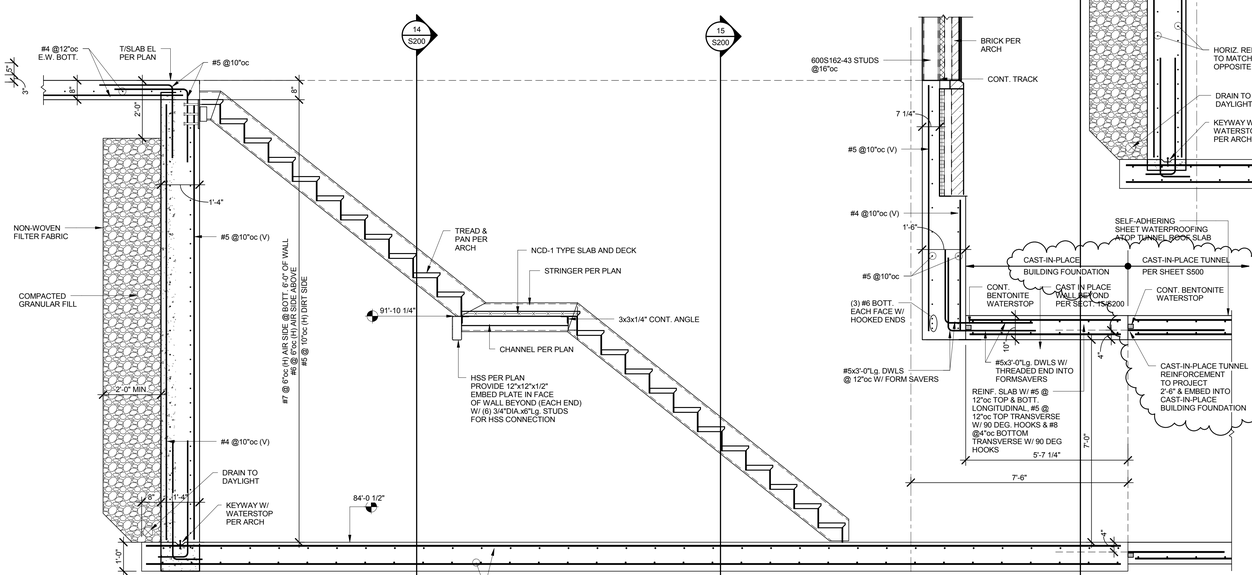
12 SECTION
1/2" = 1'-0"



14 SECTION
1/2" = 1'-0"



15 SECTION
1/2" = 1'-0"



16 SECTION
1/2" = 1'-0"

HTK ARCHITECTS PA
900 S. KANSAS AVE., SUITE 200 TOPEKA, KANSAS 66612
P 785-232-8844 F 785-232-8277
9300 W 110TH ST. STE. 150 OVERLAND PARK, KANSAS 66210
P 913-663-3223
www.htkarchitects.com

DATE:
- 4-15-15

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- 12-18-14
- 2-9-15
- 3-10-15

HTK PROJECT NUMBER:
- 1410.03

Department of Administration
Office of Facilities and Procurement Management
800 SW Jackson Suite 1200
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FAX 785-296-3456

STATE OF KANSAS
STATE OF KANSAS ENERGY & SERVICE CENTER
221 SW 7th Street
BUILDING NUMBER 17300-0038

DATE: 4-15-15 DRAWN BY: Author CHECKED BY: Checker REV: 3

FOUNDATION SECTIONS

A-012651

S200

CONSTRUCTION DOCUMENTS

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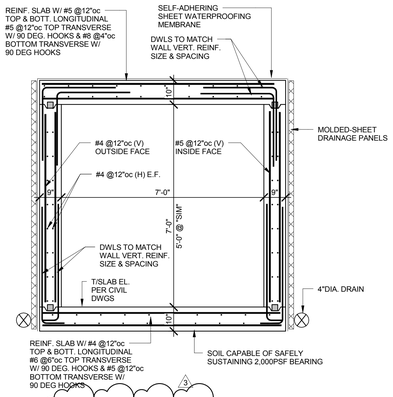
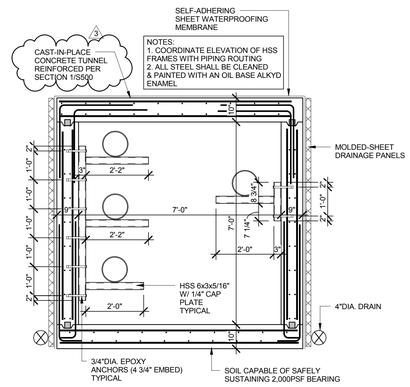
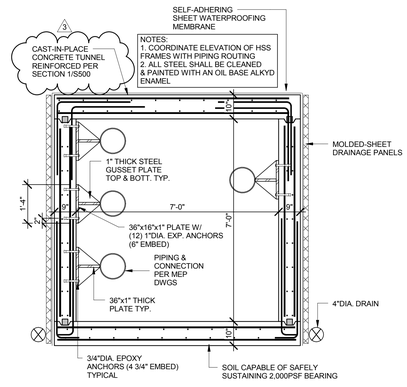


1 TYPICAL CAST-IN-PLACE TUNNEL SECTION
1/2" = 1'-0"



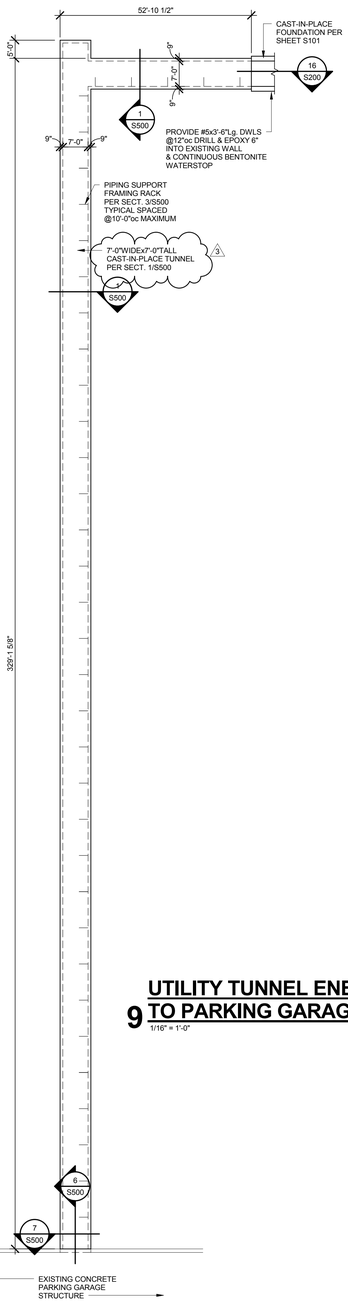
REFER TO CIVIL AND MEP DRAWINGS FOR SUPPORT LOCATIONS AND QUANTITY

2 TYPICAL PIPING SUPPORT FRAMING @ TUNNEL
1/2" = 1'-0"

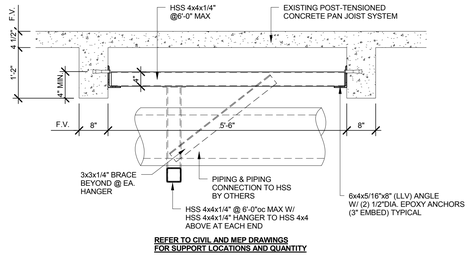


REFER TO CIVIL AND MEP DRAWINGS FOR SUPPORT LOCATIONS AND QUANTITY

3 TYPICAL PIPING EXPANSION COMPENSATING SUPPORT FRAMING
1/2" = 1'-0"

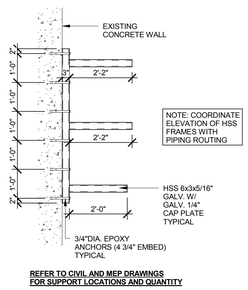


NOTE: CONTRACTOR SHALL SCAN EXISTING CONCRETE BEAMS AND LOCATE REINFORCEMENT. LOCATE PIPING SUPPORT ANGLES TO AVOID DRILLING REINFORCEMENT



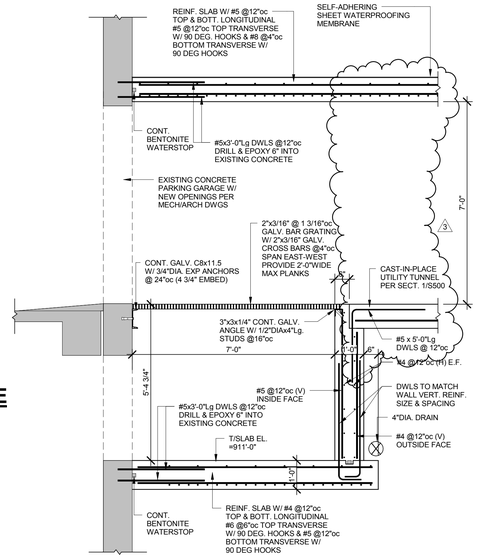
REFER TO CIVIL AND MEP DRAWINGS FOR SUPPORT LOCATIONS AND QUANTITY

TYPICAL PIPING SUPPORT FRAMING 4 HUNG FROM EXISTING GARAGE STRUCTURE ABOVE
3/4" = 1'-0"

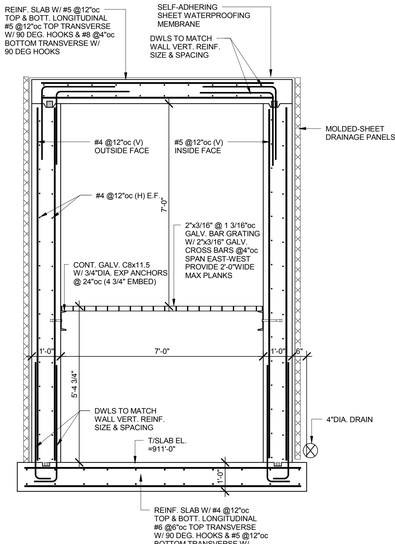


REFER TO CIVIL AND MEP DRAWINGS FOR SUPPORT LOCATIONS AND QUANTITY

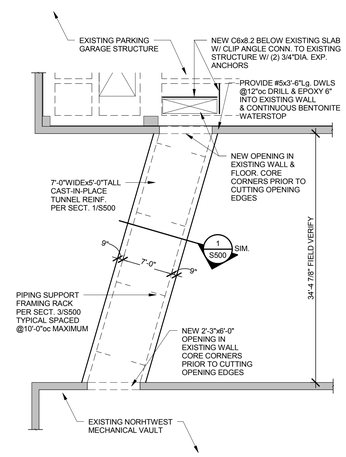
TYPICAL PIPING SUPPORT FRAMING 5 @ EXISTING CONCRETE WALL
1/2" = 1'-0"



6 UTILITY TUNNEL SECTION
1/2" = 1'-0"



7 UTILITY TUNNEL SECTION
1/2" = 1'-0"



UTILITY TUNNEL PARAKING GARAGE 8 TO STATEHOUSE FRAMING PLAN
1/8" = 1'-0"

UTILITY TUNNEL ENERGY BUILDING 9 TO PARKING GARAGE FRAMING PLAN
1/16" = 1'-0"

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www.htkarchitects.com

DAVID ANDREW BANNISTER — 2015 — REGISTERED PROFESSIONAL ENGINEER

DATE:
- 4-15-15

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- 12-18-14
- 2-9-15
- 3-10-15

HTK PROJECT NUMBER:
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TUNNEL AND PIPING SUPPORT PLAN

A-012651

S500

CONSTRUCTION DOCUMENTS

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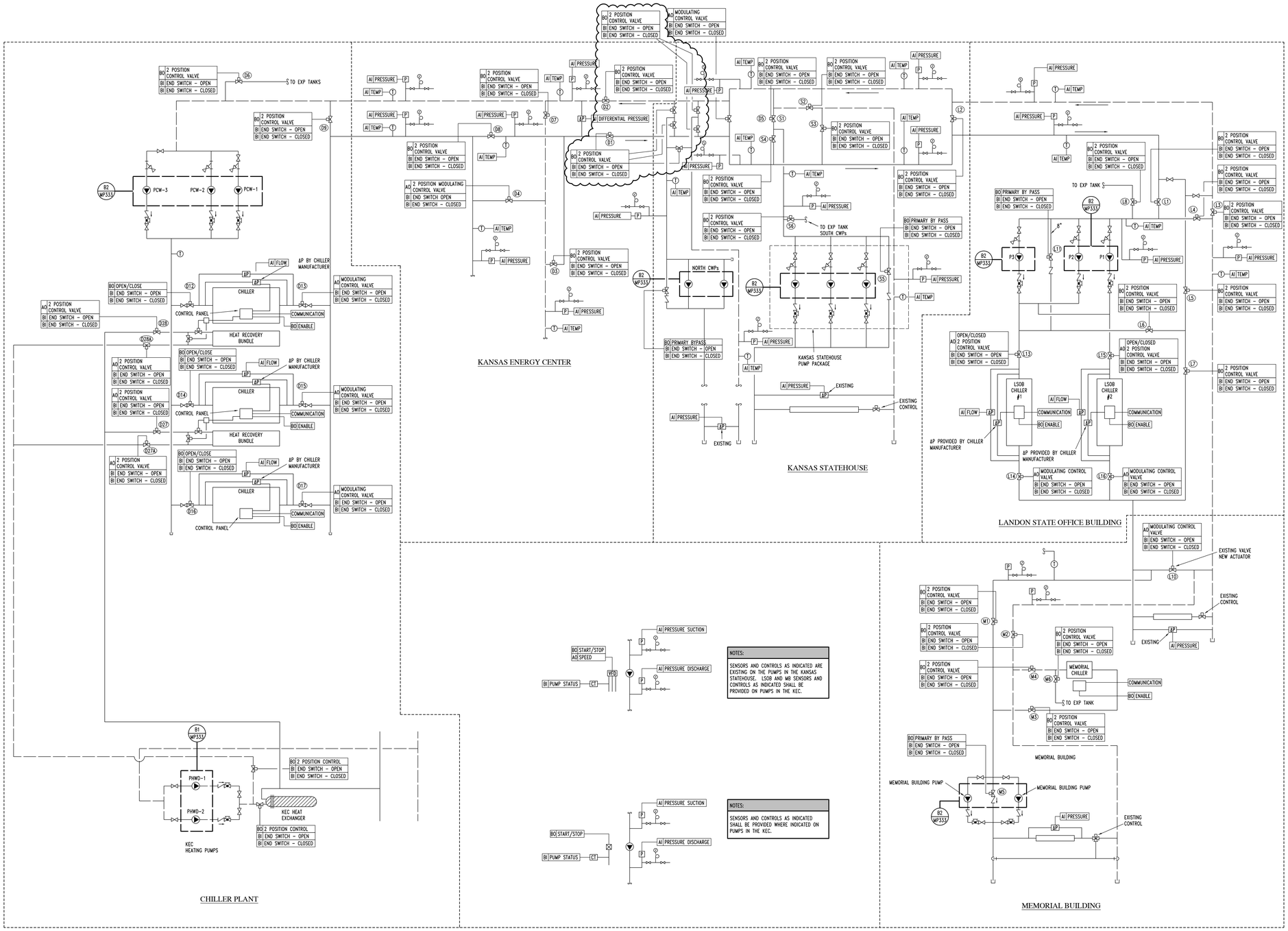

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LSA PROJECT NO. 1400032

WILLIAM R. BASSETT LICENSED 10530 ENGINEER 4-15-15

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AUTOMATIC SYSTEM CONTROL DIAGRAM

A-012651

ME301

CONSTRUCTION DOCUMENTS

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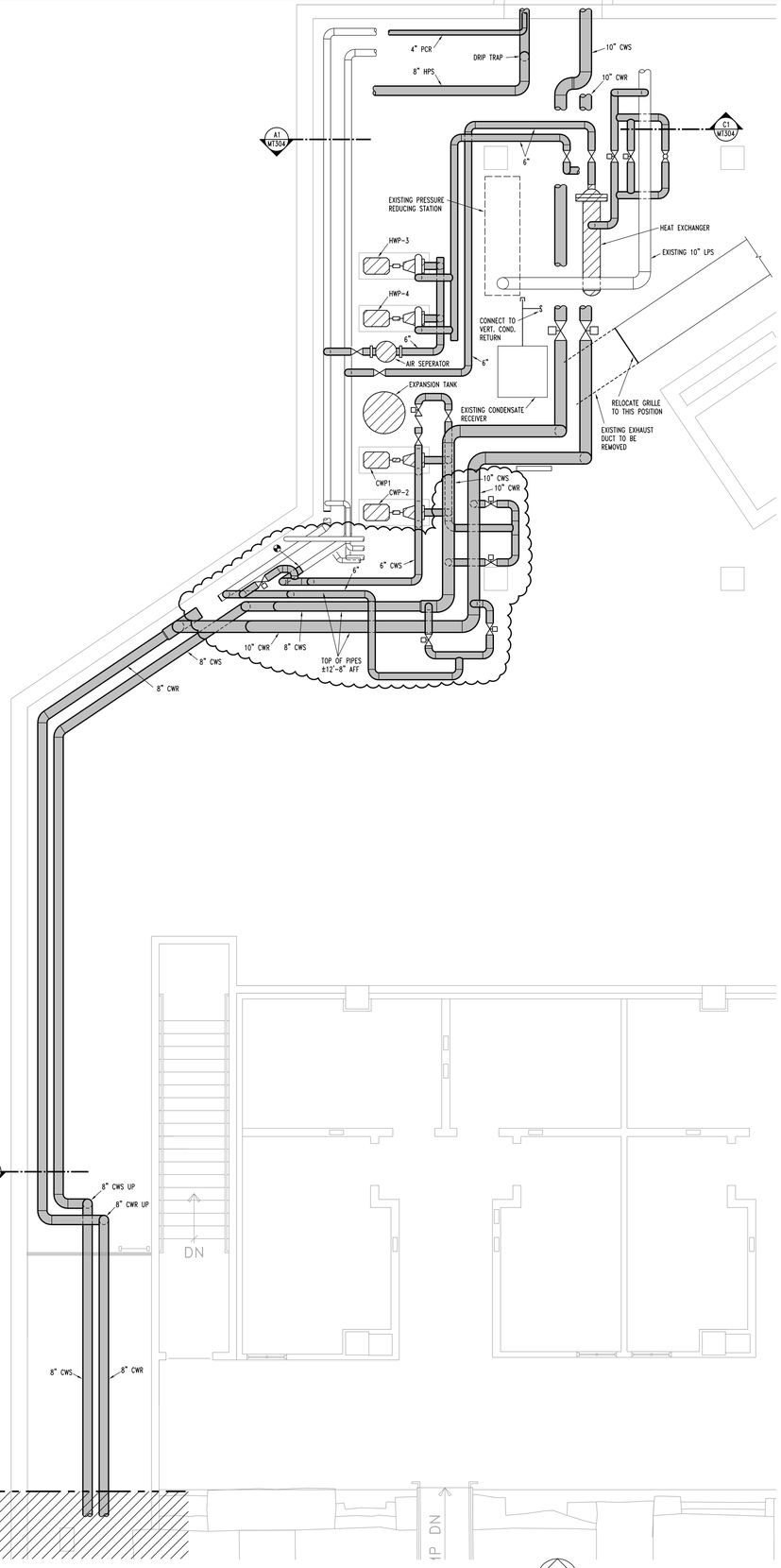
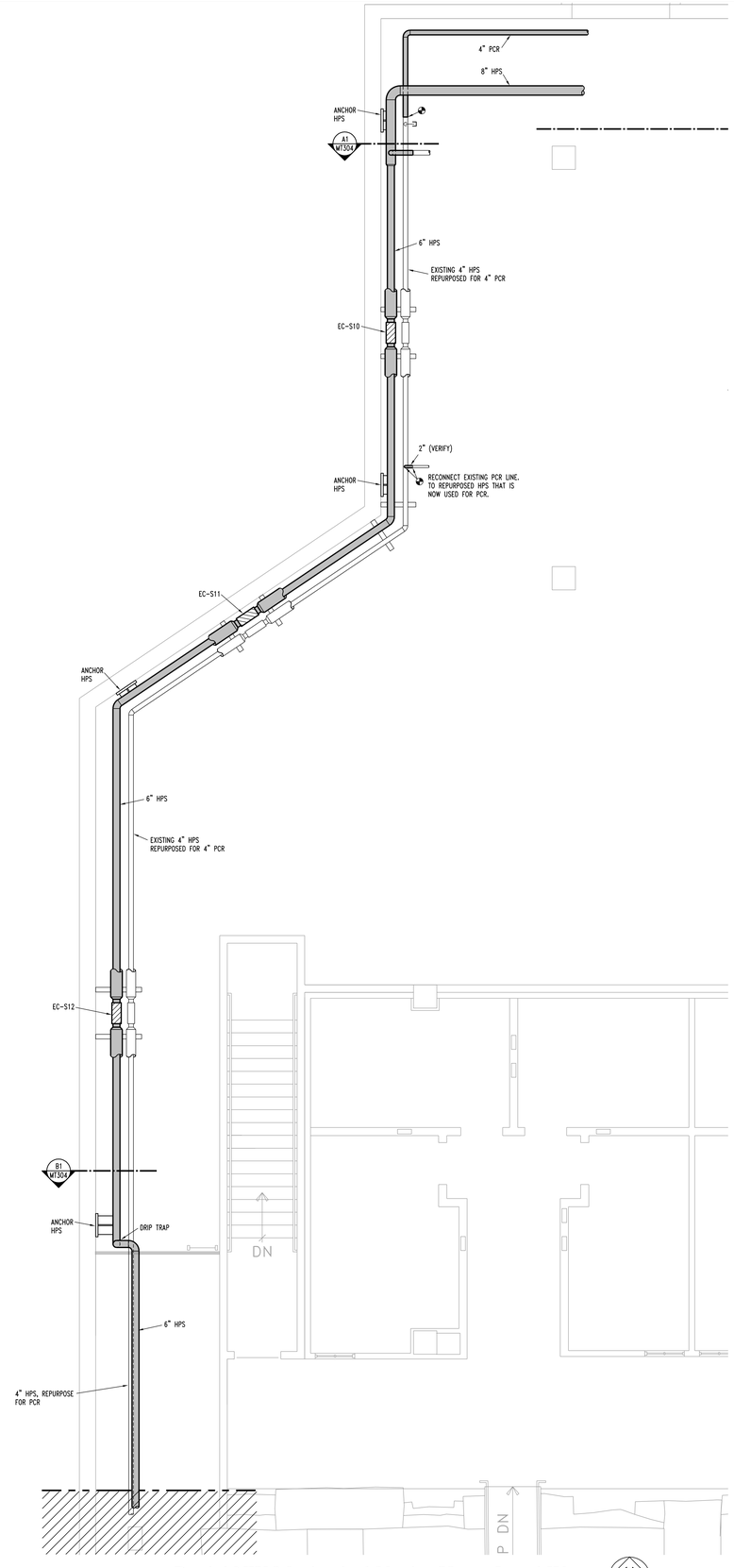
2-2-2016
Att.9C--1169

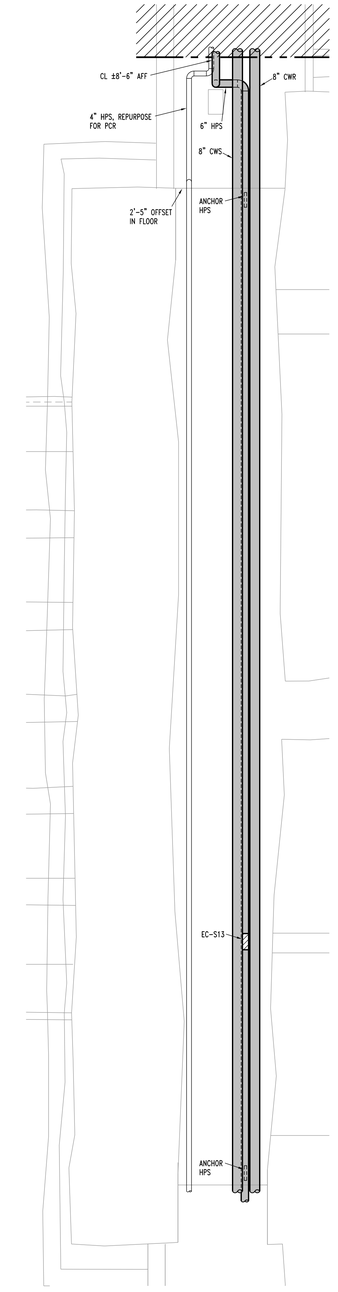
... ME301_Automatic System Control Diagram.dwg 98 05/07/15 GTC 98 05/07/15 GTC 98 04/14/15 GTC 98 04/14/15 GTC 98 04/13/15 GTC 98 04/12/15 GTC 98 04/12/15 GTC 98 04/12/15 GTC 98 04/12/15 GTC ListArea 98 02/24/15 GTC ListArea 98 02/24/15 GTC ListArea 98 02/24/15 GTC



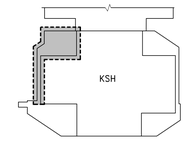
C1 Partial NW Mechanical Vault - Lower Level West
HVAC Piping
1/4"=1'-0"
N.



B1 Partial NW Mechanical Vault - Upper Level West
HVAC Piping
1/4"=1'-0"
N.



A1 Connecting Tunnel Between NW and SW Mech. Vault
HVAC Piping
1/4"=1'-0"
N.



KEY PLAN
NO SCALE
N.

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LSA PROJECT NO. 1402032

WILLIAM R. BARNETT
LICENSED
10530
PROFESSIONAL ENGINEER
4-15-15

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KSH MECHANICAL VAULT - HVAC PIPING

A-012651

MT303

CONSTRUCTION DOCUMENTS

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2-2-2016
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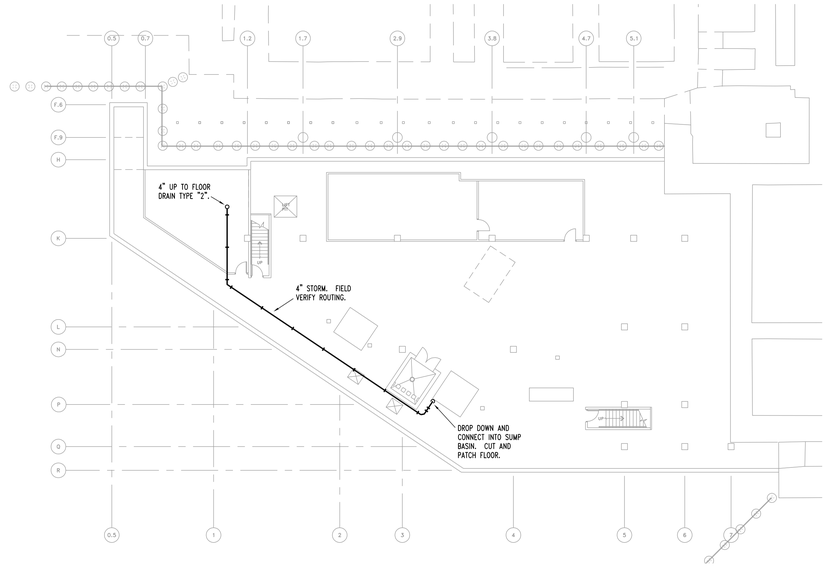
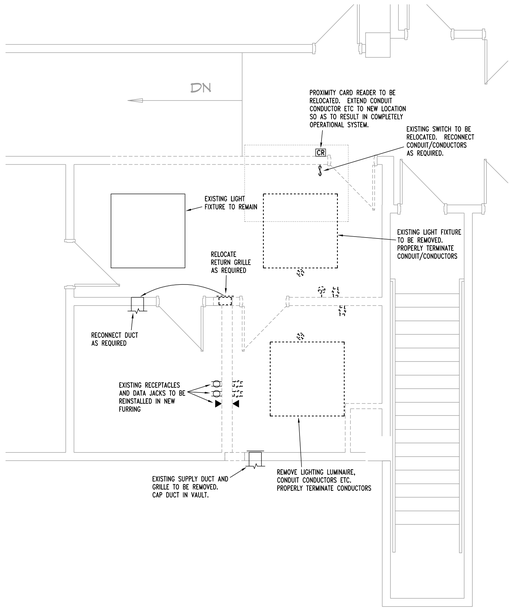


B4 SW Vault Floor Plan
1/16"=1'-0" Mechanical
N.



B2 Demolition Floor Plan - Capitol Stair
1/4"=1'-0" Mech/Elec Demolition
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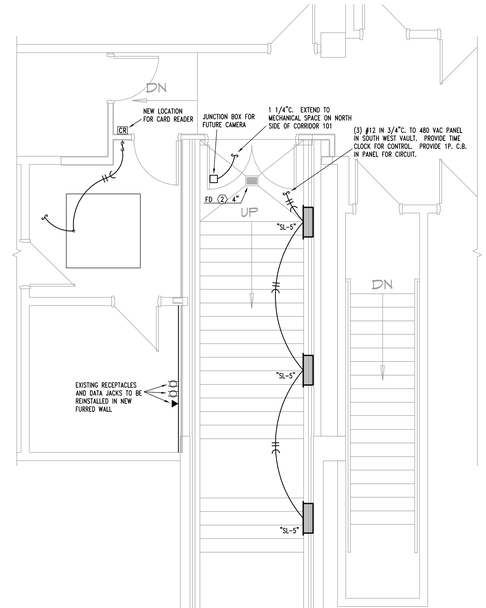

A2 Floor plan - Capitol Stair
1/4"=1'-0" Mech/Elec
N.

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900 S. KANSAS AVE. TOPEKA, KANSAS 66612 P. 785-266-5373
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WILLIAM R. BASSETT LICENSED 10530
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BUILDING NUMBER 173000-00038

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DATE: 4-15-15

NEW CAPITOL STAIR PLAN - MECHANICAL AND ELECTRICAL

A-012651

NEW SHEET — ME401

CONSTRUCTION DOCUMENTS

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- ME401_New Capitol Stair Plan - Mechanical and Electrical.dwg 1 05/07/15 GTC - Mechanical and Electrical.dwg 1 05/07/15 GTC - Mechanical and Electrical.dwg 1 05/07/15 GTC - Mechanical and Electrical.dwg 48 05/07/15 GTC