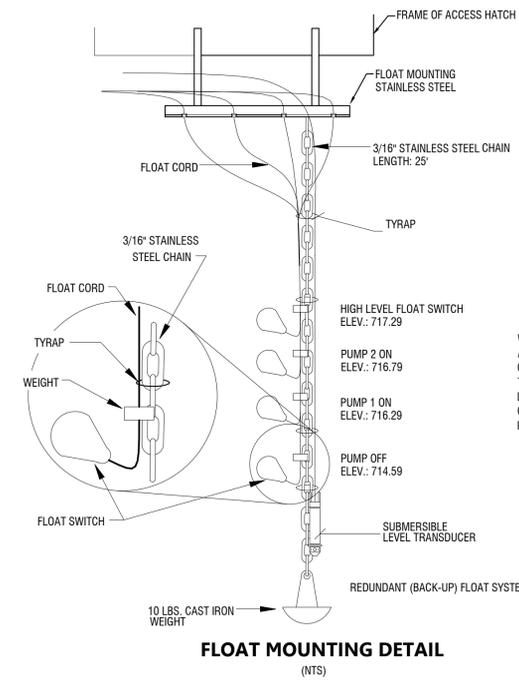
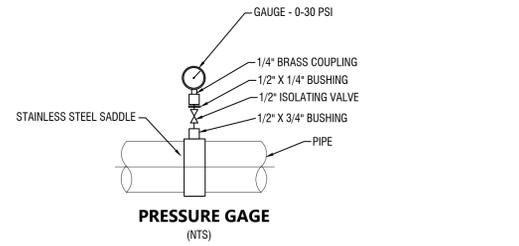


NOTES:

- LIFT STATION TO BE INSTALLED BY AN EXPERIENCED AND QUALIFIED CONTRACTOR.
- ALL CONCRETE WORK IS THE RESPONSIBILITY OF THE CONTRACTOR. PC CONCRETE MIX DESIGN 28 DAY AT 4000 PSI.
- CONTRACTOR TO VERIFY ALL DIMENSIONS, ELEVATIONS, PIPING LAYOUT, AND ORIENTATION OF INLET(S), DISCHARGE AND CONDUIT(S).
- ALL PIPING & VALVES, STRUCTURES, ELECTRIC, ETC. ARE TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- ALL CABLE IN THE WET WELL SHALL BE SUPPORTED FROM THE HATCH COVER FRAME WITH STAINLESS STEEL, OPEN WEAVE, MESH TYPE, KEELLESS (OR EQUAL) CABLE GRIPS.
- CONTRACTOR TO ORDER CONTROL AND POWER CORDS OF SUFFICIENT LENGTH TO REACH CONTROL PANEL FROM POINT OF ORIGIN ON PUMPS WITHOUT SPLICING.
- ALL FASTENERS, BOLTS, ETC. WITHIN THE WET WELL SHALL BE 304 OR 316 STAINLESS STEEL.
- ALL ELECTRICAL EQUIPMENT IN WET WELL SHALL CONFORM TO NE REQUIREMENTS FOR CLASS 1, DIVISION 1, GROUP D HAZARDOUS AREA.
- ELECTRICAL CONDUITS ARE AS FOLLOWS:
 (1) 4" FOR EACH PUMP POWER CORD
 (1) 4" PUMP SENSORS CABLES
 (1) 2" TRANSDUCER CABLE
 (1) 2" BACK-UP FLOAT CABLES
 (1) 1" VALVE SUMP PUMP POWER
 ALL CONDUITS TO BE SCHEDULE 40 PVC. PROVIDED WITH SEAL TIGHT CONNECTORS.
- COAT OUTSIDE SURFACE OF CONCRETE STRUCTURES WITH AN EMULSION WATER PROOF COATING.
- CONCRETE WET WELL AND VALVE VAULT STRUCTURAL DESIGN BY SUPPLIER. PLANS STAMPED BY A ILLINOIS REGISTERED PROFESSIONAL ENGINEER SHALL BE PROVIDED. CONCRETE LIDS FOR BOTH STRUCTURES SHALL BE DESIGNED TO SUPPORT VEHICLE LOADING. CONTRACTOR SHALL CONFIRM ALL VAULT AND PIPE DIMENSIONS PRIOR TO ORDERING. PROVIDE SHOP DRAWING FOR REVIEW AND APPROVAL.
- INSTALL TWO (2) 10 FOOT LONG 1/2" DIAMETER COPPER, OR COPPER CLAD STEEL, DRIVEN GROUND ROD WITH A #6 BARE COPPER MAIN GROUNDING WIRE CONNECTED FROM IT TO THE BONDED NEUTRAL LUG IN THE MAIN SERVICE ENCLOSURE.
- ALL CONDUITS, WHERE THEY ENTER THE OPEN BOTTOM OF THE CONTROL ENCLOSURE, SHALL HAVE AN INSULATED THROAT GROUNDING BUSHING THAT IS BONDED TO GROUND WITH A #6 COPPER WIRE.
- LIFT STATION PIPE SHALL BE BITUMINOUS COATED, CEMENT LINED DUCTILE IRON PIPE, CLASS 53 OR PRESSURE CLASS 350, CONFORMING TO ANSI A-21.10 (AWWA C150) AND ANSI A-21.51 (AWWA C151). CEMENT MORTAR LINING SHALL CONFORM TO ANSI A-21.4 (AWWA C-104). JOINTS SHALL BE FLANGED (ANSI CL 150) DIP CONFORMING TO ANSI A-21.11 (AWWA C-110).
- LIFT STATION FITTINGS SHALL BE FLANGED (ANSI CL 150) DIP, DUCTILE IRON WITH CEMENT MORTAR LINING CONFORMING TO ANSI A-21.10 (AWWA C-110).
- USE LINK SEALS AT ALL PIPE WALL PENETRATIONS.
- THE HATCH SUPPLIER IS TO BE CONTACTED AT THE TIME THE WET WELL AND VALVE VAULT HATCH LOCATIONS ARE CAST TO CONFIRM EXACT HATCH LOCATIONS.
- THE LIFT STATION PUMP SUPPLIER SHALL PROVIDE OPERATIONAL CONTROL SPECIFICATIONS AND DESIGN, WHICH WILL BE SUBMITTED AS A SHOP DRAWING FOR APPROVAL AS PART OF THEIR CONTRACT.
- THE CONTRACTOR SHALL CONFIRM THE AVAILABLE POWER SUPPLY TO THE LIFT STATION PRIOR TO ORDERING EQUIPMENT.
- THE CONTRACTOR SHALL COORDINATE ALL UTILITY INSTALLATION AS REQUIRED FOR THE LIFT STATION INSTALLATION.



WHEN CHANGING FLOAT LEVELS, PULL CHAIN, ANCHOR, AND FLOATS OUT OF WET WELL. CUT NECESSARY TYRAPs AND READJUST THE LEVEL OF THE FLOAT. WHEN PROPER LEVEL IS ACHIEVED, RE-FASTEN FLOAT CORD TO CHAIN WITH NEW TYRAPs. PLACE ENTIRE UNIT BACK INTO WET WELL.



Dillon Reynolds

LIFT STATION DETAILS - 1
FOUNDER'S POINTE APARTMENTS
 UPPER SHELBYVILLE ROAD
 FRANKLIN, IN 46131

CONSULTING ENGINEERS
 SITE DEVELOPMENT ENGINEERS
 LAND SURVEYORS



FILENAME: 11582DET
 DATE: 11/01/2021
 JOB NO. 11582
 SHEET **C8.4**
 20 OF 26

SANITARY LIFT STATION

6.01 General

Furnish and install a complete lift station system. The system shall include two submersible pumps with quick disconnect system, 4" base elbows, stainless steel guide rails, discharge piping, upper & lower guide rail supports, aluminum access frame with cover for each pump, wiring bracket as required, all installed in a pre-cast concrete basin. The system shall also include a pre-cast valve vault, which shall house the discharge piping, gate valves, check valves, and sump pump. The duplex control system is to be housed in a pad mounted NEMA-3R stainless steel traffic enclosure. Structure and dimensions to be as shown on drawing.

All stations shall be designed for and operate on three (3) phase 240 volt power. The contractor shall confirm the available power prior to ordering the equipment.

6.02 General Requirements

A. All of the mechanical and electrical equipment shall be an integral package supplied by the pump manufacturer with local representation so as to provide undivided responsibility.

The package shall be furnished by Flygt Pump, or approved equal.

B. The Contractor shall submit for review and approval two (2) sets of shop drawings, detailed specifications, pump warranty and performance characteristics for all of the equipment and fixtures to be furnished and installed. The shop drawings and equipment data shall be submitted with a cover letter or Contractor's stamp of approval, indicating that he has reviewed, checked and approved the data submitted. The Engineer will review the submittal and render a decision in writing as to the acceptability of the equipment.

C. Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by the Engineer prior to proceeding with the work.

D. All components of the lift station that are exposed to weather shall be constructed of material that is resistant to corrosion and will not require surface protection throughout the expected life of the lift station. In general, these materials are stainless steel, aluminum, fiberglass reinforced polyester (FRP) and ultraviolet stabilized PVC.

E. All valves and piping coming in contact with sewage or installed in the pump or valve chambers shall be coated as follows:

1. Primer - Aromatic Urethane Zinc-Rich 2.5 - 3.5 mil
2. Field Coats - Aliphatic Acrylic Polyurethane
- 2 coats @2.0 - 4.0 mil per Coat

6.03 Operating Conditions

A. Pump Manufacturer: FLYGT

B. Submersible Pump Model: Concorcer XPC N80-1450

C. Pump Capacity in Gallons Per Minute:
140 gpm

D. Total Dynamic Head (TDH) and Operating RPM:
26.6' TDH
1750 RPM

E. Motor Horsepower:
5.0 H.P.

F. Motor RPM:
1750 RPM

G. Motor Voltage, Phase and Cycle:
230V, 3-Phase, 60 HZ

6.04. Pump Design

A. Pump Construction

Major pump components shall be of gray cast iron, ASTM A 48, Class 30, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI Type 304 stainless steel or brass construction. All fasteners coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of alkyl primer with a chlorinated rubber paint finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

B. Cooling System

Motors shall be sufficiently cooled by the surrounding environment or pumped media. A water cooling jacket is not required.

C. Cable Entry Seal

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal.

D. Motor

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air or oil filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 311 F (155 C). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 104 F (40 C) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 260 F (125 C) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall be designed for operation up to 104 F (40 C) ambient and with a temperature rise not to exceed 176 F (80 C).

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be chloroprene rubber. The motor and cable shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

E. Bearings

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently greased lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable. The seal on the impeller hub will not be acceptable.

F. Mechanical Seal

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the oil chamber, shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper, secondary seal unit, located between the oil chamber and the motor housing, shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional seal mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to prevent overflowing and to provide oil expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

G. Pump Shaft

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be AISI Type 420 stainless steel.

H. Impeller

The impeller(s) shall be of gray cast iron, Class 30, dynamically balanced, double shrouded non-clogging design having a long throw let without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other debris in contact by its own spring system. Wherever possible, a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be retained with an Allen Head bolt and shall be capable of passing a minimum 3-inch diameter solid. All impellers shall be coated with alkyl resin primer.

I. Wear Rings

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impellers. The wear ring shall be stationary and made of brass, which is drive fitted to the volute inlet.

J. Volute

Pump volute(s) shall be single-piece grey cast iron, Class 30, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

K. Rail/Removal System

The pump mounting base shall include adjustable guide rail supports and a discharge connection with a one hundred twenty-five (125) pound standard flange. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc. or equal.

A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The system shall require a man to enter the wet well to remove the pump and motor assembly. Two (2) rails of two (2) inch stainless steel pipe shall be provided for each pump. The guide rails shall be positioned and oriented by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by attachment to the access hatch frame. One (1) intermediate guide rail support is required for each fifteen (15) feet of guide rail length for pipe.

The pumps shall be equipped with sliding brackets or rail guides. To insure easy removal of the pumps, the rail guides attached to each pump shall not contact the rails. The stainless steel rail guides shall be attached to a removal system (similar to the Flygt Lift) of adequate length for the basin depth shall be provided for each pump. Each pump shall be equipped with a permanent, stainless steel lifting handle with a minimum clearance of 12" between the top of pump and bottom of handle.

The rails and the rail guides shall function to allow the complete weight of the pumping unit to be lifted on top of the rail guides. A man entering the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable. The actual sealing of the discharge interface may be of the hydraulically sealing diaphragm type assembly with removable Buna-N diaphragm as supplied by Hydromatic Pump or may be of the metal-to-metal contact as provided by Flygt Pump.

L. Pump Warranty

Pump warranty shall be provided by the pump manufacturer and shall warrant the units being supplied to the Owner against defects in workmanship and materials for a period of one (1) year under normal use, operation, and service. The warranty shall be in print and form apply to all similar units. A copy of the warranty statement shall be submitted with the approval drawings.

6.05 Protection

All stations shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 260 F (125 C) the thermal switches shall open, stop the motor and activate an alarm.

A leakage sensor shall be provided to protect water in the stator chamber. The Float Leakage Sensor (FLS) shall be a small float switch to detect the presence of water in the stator chamber. When activated, the FLS shall stop the motor and send an alarm. USE OF THE FOLLOWING SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 260 F (125 C) SHALL NOT BE ALLOWED.

6.06 Wet Well and Valve Pit

A. General

The walls of the pump station and valve pit structures shall be constructed of reinforced concrete pipe which shall conform to the latest ASTM Specifications C-76, with a minimum compressive strength of concrete equal to 4000 psi. Reinforcement of the pipes shall be of circular type. All of the pipe for the pump chambers and the access tubes shall be Class III and of the diameter shown on the Plans. Handling or lifting lugs and/or devices shall be provided in the pipe shells for each pipe section to be installed in place. All joints between pipes and between ends of pipes and concrete slabs shall be made watertight.

The pipes utilized for the pump station wet well or valve pit shall be jointed with a rubber O-ring type seal conforming to the ASTM Standard C-443 (latest revision). The joint shall be designed to provide a maximum infiltration limit of 1.58 gallons (20) gpd/in-mile. The interior and exterior joint spaces shall be grouted to a smooth surface using a sand-cement mixture mortar. The mortar-grout shall have one part cement to two parts sand mix ratio. The completed interior and exterior joints shall have a smooth troweled waterproof finish.

The top concrete slab of the pump station and valve pit shall have cast into it a socket for receiving the end of each concrete pipe. The joint shall be made watertight. An access ladder shall be provided with rungs spaced 12 inches on center from top to bottom of the station and shall be of welded steel construction, and hot-dipped galvanized after fabrication or aluminum.

Concrete for the foundation and roof slabs shall be made of Class A concrete.

B. Access Hatches

The Contractor shall furnish and install for both the wet well and valve pit aluminum access doors complete with frames, hinged and hasp-equipped covers, upper guide holders, drain hole and cable holder. The frames shall be securely mounted above the pumps. The doors shall be torsion bar loaded for ease of lifting and shall have safety locking handles in the open position. The access doors shall be capable of withstanding a 300 lb. live load per square foot. The lift station wet wells are to be provided with two (2) separate access hatches or a two (2) door hatch. The valve pit access hatches are to be single door type.

Fall-Through Prevention System (Safety Grate):

The wet well access openings shall be fitted with a permanently installed fall through prevention SAFETY GRATE for access to the opening below. The system shall be Hatch Safety Grate as manufactured by USF Fabrication, Inc. or equal. The system shall consist of the following components:

- Hatch Safety Grate rotates 90 degrees.
- Safety Grate designed for 300 p.s.f., loading.
- Hold Open Rods
- Aluminum Grate has an OSHA safety orange finish
- Hardware components are made of stainless steel to resist corrosion.

C. Pipe, Valves and Fittings

The suction and discharge pipe and fittings shall be ductile and cast iron Class 150. Inside pipe and fittings shall be flanged. Bell and pipes or fittings with mechanical joints shall be provided at or near the outside face of the station well. Piping shall be supported independent of the sewage flanges. All inside plug valves shall be provided with handwheels. All check valves shall be rubber flapper type.

All metal piping other than cast or ductile iron and copper tubing shall be galvanized steel pipe.

A. Rubber Flapper Check Valve

Manufacturers:
- DeZurik/APCO - Rubber Flapper Swing Check Valve
- Val-Matic - Surgebuster Check Valve
- GA Industries - Rubber Flapper Swing Check Valve
- Or approved equal

Provide seating surface at a 45 degree angle such that the flapper travels a maximum of 35 degrees from full closed to full open position.

Materials

Body and Cover: Ductile Iron ASTM A536 Grade 65-42-12
Removable Body Seat: ASTM A276, Type 304 stainless steel
Rubber Flapper: Buna N 70 Durometer ASTM 2000-BG encapsulating an ASTM A36 steel plate.
Disc arm and external levers shall be ductile iron.
Provide valves with a full pipe size flow area.
Provide valves 4-in and larger capable of passing a 3 inch sphere.
A threaded connection with bronze plug on cover and on the bottom of the valve
Working Pressure: 2-in thru 24-in: 250 psi
Ends: Flanged ANSI B16.1, 150-lb

Provide a valve with cover designed for removal of the valve internals without removing the valve from the pipeline.

A mechanical indicator to provide disc position.
A screw-type backflow actuator to allow opening of the valve during low-flow conditions.

Buna-N seals shall be used to seal the stainless steel stem in a Lead-Free bronze bushing. The backflow device shall be of the rising-stem type to indicate position. A stainless steel T-handle shall be provided for ease of operation.

B. Eccentric Plug Valves

Manufacturers:

- Mueller
- DeZurik
Or approved equal

Type: Non-lubricated, eccentric.Body Working Pressure:
Cast Iron, ASTM A126 Class B or Ductile Iron, ASTM A536, Grade 64-45-12
Valves 4-in. through 12-in: 175 psi.
Ends: Flanged: ANSI B16.1 125-lb for cast iron valves.
Valve Ports: Provide rectangular openings for piping services.
Valve Seats: Coat plug with seat material or held by means of Type 316 stainless steel seat ring and attach to the valve with self-locking Type 316 stainless steel screws.
Seat Material:
Neoprene or Buna-N synthetic rubber.

Provide valves with coated plugs with mating seats of 90 percent, minimum, pure nickel welded into the body of valves.
Provide valves with studs clamped to valve with mating seat of 90 percent, minimum, pure nickel welded to the valve body.

Manual Operators:
Gear shall be operated with handwheels. Levers are not acceptable. Operators shall be mounted as shown on the plans.
Provide gear operators rated for bi-directional shutoff at the valve working pressure rating as specified.

6.07 Disconnect Switch

A. A single main fusible or breaker disconnect switch of adequate size to provide power for the "control center" and its related components shall be provided by the Contractor.

B. The disconnect switch shall be housed in a NEMA 4X stainless steel enclosure with an external operation handle capable of being locked in the ON position.

6.08 Control Center

A. The control center shall be built in a free standing NEMA 4X stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock.

Inside shall be a separate hinged panel to protect all electrical components. H-O-A switches, run lights, circuit breakers, etc. shall be mounted such that only the faces protrude through the inside swing panel and no wiring is connected to the back side of the inside swing panel.

All of the pilot-devices, operators, interfaces and indicators shall be installed on the face of the door as listed:

- A door-Interlocked main power disconnect-switch
- A door-Interlocked main power selector interface panel.
- A 3-position control-mode selector switch.
- A Hand-Off-Automatic selector switch for each pump.
- A Pump-Running indicator-light for each pump.
- A Seal-Failure indicator-light for each pump.
- A Motor-Over-Temperature indicator-light for each pump.
- An Elapsed-Time-Meter for each pump.

A terminal strip shall be provided for connecting pump and control wires. The panel shall include a GFI convenience outlet. The PLC shall include a DC power supply with battery back-up. The enclosure shall be protected from condensation through the use of a pre-wired thermostatically-controlled anti-condensation heater. The control components shall be mounted on a 12-gauge painted steel subpanel. Individual electrical components shall be mounted in accordance with the manufacturer's recommendations. Wiring within the enclosure shall be run through plastic wiring duct or tied and bundled to prevent strain and abrasion. All customer connections shall be wired to individually numbered terminals and wires shall be numbered at both ends for ease of trouble shooting. The control panel manufacturer shall be listed with underwriters laboratories under UL508 (type I) listing category for the manufacture of control equipment. The control panel shall contain UL listed components wherever practical. The entire control panel assembly shall be approved by UL and labeled to that effect.

The control center shall include a manual transfer switch and generator receptacle, a dual 120-volt AC GFI convenience outlet. A meter socket shall be supplied and mounted by the contractor.

B. A circuit breaker and magnetic starter with three (3) leg overload protection and manual reset shall be provided for each pump. Starters shall have auxiliary contacts to operate both pumps on override condition. A separate circuit breaker shall be supplied for power to the control circuit.

The control center shall include an extra circuit breaker of adequate size to provide 115 volt, single (1) phase power for a future remote monitor panel. The control center shall include a control voltage transformer to reduce supply voltage to 115 volt, single (1) phase to be used for all control functions except the level circuit and associated relays which shall be provided with 24 volt control voltage. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. A green run light and H-O-A switch shall e provided for each pump. A terminal strip shall be provided to make field connections of pump power leads, float switches, sensor leads, heat sensor leads, and remote monitor panel interconnections.

C. A time delay relay shall be provided to delay start of second pump should power outage occur.

D. The control system shall incorporate the level monitoring system.

E. The control center shall incorporate connections for heat sensors which are installed in the pumps. The connection shall disconnect the starter upon high temperature signal and will automatically reconnect when condition has been corrected.

F. The control center shall incorporate connections for seal failure sensors which are installed in the pumps. The panel will have a seal failure alarm light for each pump. This alarm indicates failure of the lower mechanical seal in the pump. This will be an alarm light only and will not shut down the pump.

G. The control center shall include an hour meter for each pump to register the elapsed operating time of each pump.

H. The control center shall have a high and low water alarm built into the main enclosure. The alarms shall consist of flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted on top of the enclosure such that it is visible from all directions. An alarm horn shall be mounted on the side of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure.

I. The control center shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control center.

J. The control center shall include lightning protection and a phase monitor relay to shut down the control circuit and protect the equipment due to loss of phase or phase reversal. The three phase sequence voltage relay shall be of the 8-pin connector type.

K. The control center shall incorporate an alternator selector switch to allow selection of automatic alternation or manual selection of the lead pump.

L. The control center shall include a GFI convenience outlet with 20 amp breaker and suitable transformer or power supply to provide 110 volt single (1) phase power to the convenience outlet.

M. Section not used

N. Section not used.

O. A minimum four (4) inch PVC Schedule 40 wall conduit shall be provided from the wet well basin to the control center which will allow the pump power cables, sensor cables and level monitoring cables to be pulled through without difficulty and allow the use of one (1) piece cables from the pump and level system to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.

P. The control center and associated components shall be mounted on a concrete pad. The control center shall be located so as to provide safe access to the panel while wet well hatch doors are opened, and shall be positioned so as not to be between the access drive and the wet well.

Q. All components of the control center shall be available from local sources. In particular, items such as circuit breakers, overload protection, relays, etc. shall be available and in stock by local sources.

R. In order to maintain unit responsibility and warranty on the pumping equipment and control center, the control center must be furnished by the pump manufacturer as suitable for operation with the pumping equipment.

6.09 Level Monitoring System

A. Components

The wet well level shall be monitored using an Integrated Level Management Pump Control System. The microprocessor based electronic control system shall be installed within the control panel. The level-management system shall be furnished as a complete factory assembled unit requiring only field installation and required electrical and sensor connections. The level-management system shall sequence the pumps automatically, in response to changing wet well levels. The control system shall be a complete automatic control package consisting of pump sequencing logic, operator interface terminal, and discreet operator controls. The system shall operate completely unattended and shall provide annunciation of abnormal conditions. The entire assembly shall be completely pre-wired and function-tested at the factory prior to shipment.

The management system shall receive an analog signal proportional to the level in the wet-well and sequence the pumps as required in order to maintain the desired level set-point. The level management system shall provide totally automated sequencing of the pumps and shall be easily configured for pump-down applications. The analog input shall be provided for wet well level reference, via(1) submersible level-transducer, provided with cords which shall be 50-foot long, or longer if required by jobsite conditions. All cables shall extend the entire distance from the transducers to the control panel terminals, without junction boxes or splices. The input signals shall be 0-5 vdc scalable or 4-20 mA. The transducers shall serve as the primary level-sensor system.

The transducer housing shall be 316 stainless-steel fitted with a stainless-steel cable support bracket. Liquid level shall be sensed by the deflection of a stainless-steel diaphragm having a displacement of less than 5.0 mm from 0 to full scale. The atmospheric pressure side of the diaphragm shall be bonded to a silicon strain sensor coupled to an integral bridge circuit. Atmospheric venting shall be through the signal cable directly to atmosphere. Transmitters requiring separate, sealed, expansion breathing systems shall not be accepted. Electrical connection shall be 2 wire, 4-20 mA, and shall be reverse polarity and surge protected. Accuracy shall be 0.5 percent full scale. Full scale range shall be 0 to 14 feet (or as shown on the plans). Temperature compensated range shall be -20°F to 122°F., maximum operating temperature shall be +40°F to 176°F." The level-transducers shall be field-adjustable from above the wet-well, via the use of a chain & anchor system, consisting of a stainless-steel chain, stabilized by a cast-iron anchor, as shown on the drawings.

The level management system shall alternate the lead pump after each cycle. Pumps which are faulted or out of service shall automatically be omitted from the alternation scheme. The operator shall also be capable of manually selecting the lead pump.

The wet well level shall be displayed on the controller's color touch-screen operator interface terminal. Each pump and alarm set point shall also be displayed accordingly. Pump-on and pump-off set points shall be independently adjustable providing true differential level control. All set points shall be adjusted via the LMS-II operator-interface color touch-screen.

The programmable logic controller (PLC) shall include integral processor, power supply, input and output circuits and communications ports. This specification requires the use of a non-proprietary, commercially available PLC and touch screen operator interface device. Universal, proprietary controllers and/or displays with separate function buttons, indicators and complex multi-level function trees will not be considered equal or acceptable. A built-in real-time clock shall provide reference for time-based control applications. The unit shall include a memory module for backup and portability of user program. Processor on board memory shall be non-volatile. The unit shall provide a minimum of 4K user program space, 4K user data space, 128K data logging and up to 64K for recipe. The processor shall function as specified over an ambient temperature range of +4°F to +140°F with a relative humidity up to 95%, non-condensing. The PLC shall be UL listed for industrial control equipment. To facilitate inter-connectivity the PLC shall include two communications channels, an isolated RS-232/C485 communication port and an Ethernet/IP port.

The operator interface panel shall show system status and shall provide the operator with convenient soft screen touch keys for the entry of pass codes, set points, and control functions. Screen menu keys shall produce instructional screens that will guide the operator in set point entry and alarm diagnosis. Multi-level password protection shall be available to prevent unauthorized set point changes. All information displayed on the screen shall be in plain English and simple graphic representations of the system components. An alarm log shall be provided at the operator interface. This screen shall allow the user to view a summary of all alarm occurrences. The screen shall show the time and date at the onset of the alarm.

The operator interface shall consist of an 800 x 600-pixel, color transmissive, TFT active-matrix, LCD view-matrix. The viewing area shall be a minimum of 5.55" x 4.16". The touch panel shall be sealed from dirt & moisture and shall not exhibit parallax within the viewing angle.

Statistical Display Screen:
Pump Status (Off/Running/Alarm) (Each Pump)
Pump Running Hours (Each Pump)

- Wet-Well Level
- Alarm Conditions
- Transducer Failure

Set-Point Screens:
- Level Set-Points
- Alarm Set-Points

A back-up high level mechanical type float switch shall be provided for high level alarm.

LEVEL MONITORING SYSTEMS

1. Flexible bulb electrode type level controller by Warrick, or equal.
2. Electrode probe and controller by Multi Trode Model MTDPC or equal.
3. Transducer by KPSI and controller by Metropolitan Industries Model LMS II or equal.

Level transducer shall be field adjustable from above the wet well via the use of a chain & anchor.

B. System Operation

On sump level rise, the lower level 1 shall first be energized, then the upper level 2 shall next energize and start the lead pump. With the lead pump operating, sump level shall lower to lowest switch and turn off the pump. The alternating relay in the control center shall index on stopping of the pump so that the lag pump will start on the next operation. If sump level continues to rise when lead pump is operating, the level 3 shall energize and start the lag pump.

Both lead and lag pumps shall operate together until low level turns off both pumps. If level continues to rise when both pumps are operating, alarm level 4 shall energize and signal the alarm. If one pump should fail for any reason, the second pump shall operate on the override switch. All levels shall be adjustable for level setting from the control panel.

BACK-UP FLOAT OPERATING SYSTEM

Provide "Float/Off/Auto" selector switch.

On "Auto" position, the pump will be operated using the level transducer as the primary control. If the HWL Alarm float activates, the backup float mode should latch in and control the pump operation until the "Reset" push button is pressed.

In "Float" position, operate the pumps based on float switches, bypassing the level transducer and PLC control.

In "Off" position, the backup float control is deactivated.

Both the transducer and mechanical floats shall incorporate intrinsically safe barriers to maintain a class 1 division 1 safe operation.

6.10 Remote Monitoring Panel

A cloud based alarm/messaging system to be included as part of the lift station control package. The system shall monitor and report statuses by sending email and text messages through an Internet connection. This alarm system shall include the modem that uses a private VPN to establish a secure connection from the modem through wireless private data network. An antenna shall be included for connecting to the network. The system shall allow the client access from personal devices and include up to three users with additional users optional. It shall be capable of report generation, including historical trends and include DNP3.

The system shall include Verizon or Sprint Private Network for cellular communications. The communications shall be as part of the control package.

6.11 Operation and Maintenance Manuals

A. Two (2) operation and maintenance manuals shall be submitted to the Owner.

B. Manuals shall include, at a minimum:

1. Operation Instructions
2. Maintenance Instructions
3. Recommended Spare Parts List
4. Lubrication Schedules
5. Structural Diagrams
6. As-Built Wiring Diagrams
7. Bill of Materials

6.12 Spare Parts

Section not used.

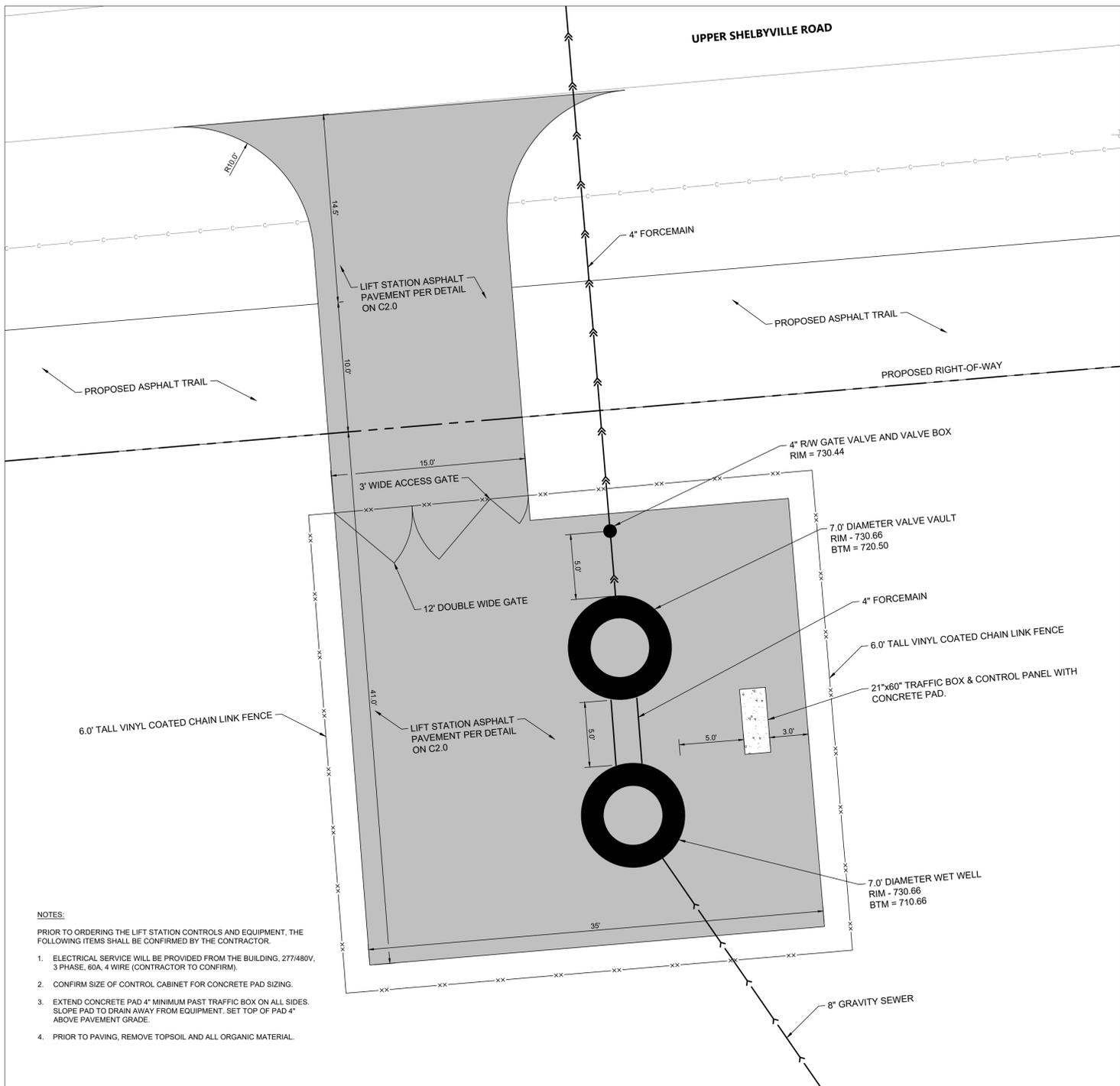
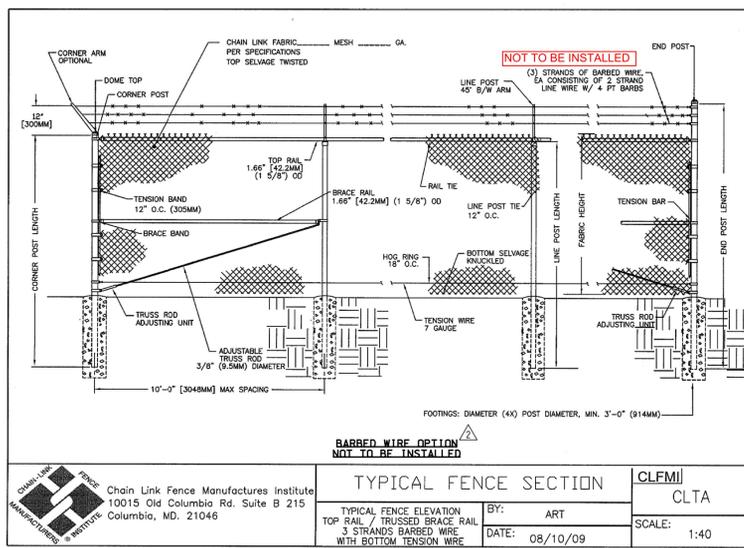
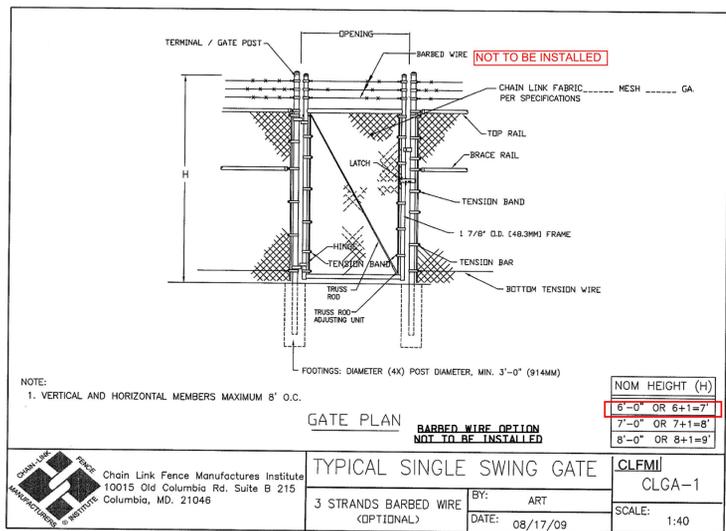
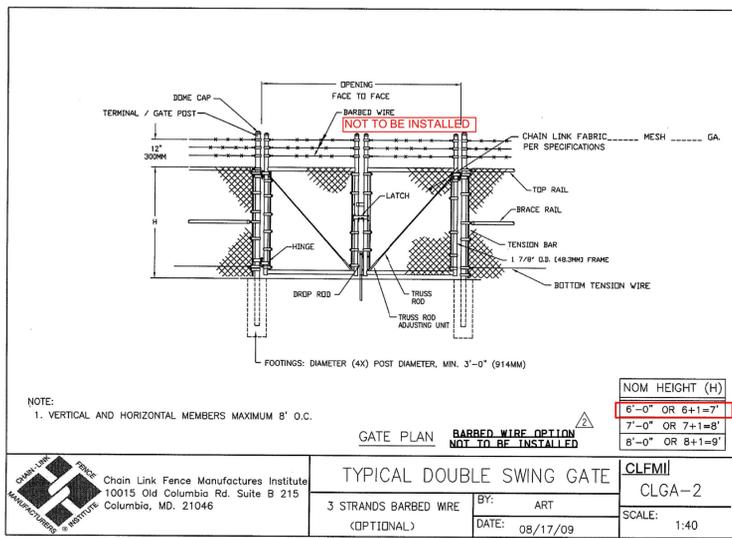
6.13 Design Requirements

A. Sizing of Wet Basin

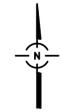
1. The wet well storage below the lowest inlet shall be a minimum of 5'0" and shall also meet the following criteria:

2. OFF level to be set at the pump manufacturer's recommended level but no less than 1'0" from the bottom of the wet well.
a. The distance between the OFF level and the lead pump ON level shall be set to provide storage capacity equal to:

15 x Rated Pump GPM/4
(i.e. 15 minute cycle minimum)



LIFT STATION SITE PLAN
1" = 5'



NO.	DATE	REMARKS



Dillon Reynolds

LIFT STATION DETAILS - 4
FOUNDER'S POINTE APARTMENTS
UPPER SHELBYVILLE ROAD
FRANKLIN, IN 46131

CONSULTING ENGINEERS
LAND SURVEYORS
SITE DEVELOPMENT ENGINEERS

3850 Priority Way South Drive, Suite 110
Indianapolis, Indiana 46240
Phone: (317) 779-2184



FILENAME:	11582DET
DATE:	11/01/2021
JOB NO.	11582
SHEET	C8.7
	23 OF 26

EARTHWORK:

A. GENERAL

- 1. EARTHWORK INCLUDES CLEARING, GRUBBING, SUBGRADE PREPARATION, REMOVAL OF TREES AND VEGETATION (INCLUDING STUMPS), PROTECTION OF TREES TO REMAIN, STRIPPING AND STORAGE OF TOPSOIL, FILL, COMPACTION AND ROUGH GRADING OF ENTIRE SITE AS INDICATED ON DRAWINGS.
2. THE CONTRACTOR SHALL NOTIFY ENGINEER IN WRITING OF ANY CHANGES, ERRORS, OR OMISSIONS FOUND ON THE PLANS OR IN THE FIELD, BEFORE WORK IS STARTED OR RESUMED.
3. CONTRACTOR SHALL PROVIDE AND PLACE ANY ADDITIONAL FILL MATERIAL FROM OFF THE SITE AS MAY BE NECESSARY TO PRODUCE THE GRADES REQUIRED AS SHOWN ON THE DRAWINGS. FILL OBTAINED FROM OFF SITE MUST BE SUITABLE SOIL AS DEFINED IN THE SPECIFICATIONS OR AS OTHERWISE APPROVED BY OWNER.
4. THE CONTRACTOR SHALL ACCEPT THE SITE IN ITS CURRENT STATE AND SHALL REMOVE ALL TRASH, RUBBISH, AND DEBRIS FROM THE SITE PRIOR TO STARTING EXCAVATION.
5. EXCEPT FOR STRIPPED TOPSOIL AND OTHER MATERIALS INDICATED TO BE STOCKPILED OR OTHERWISE REMAIN OWNERS PROPERTY, CLEARED MATERIALS SHALL BECOME CONTRACTORS PROPERTY AND SHALL BE REMOVED FROM PROJECT SITE.
6. DO NOT CLOSE OR OBSTRUCT STREETS, WALKS, DRIVES, FACILITIES, ETC. WITHOUT OWNER PERMISSION OR AUTHORITY HAVING JURISDICTION.
7. ALL EROSION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO COMMENCING EARTHWORK AND CLEARING OPERATIONS. EROSION CONTROL MEASURES SHOULD BE PROTECTED AND MAINTAINED THROUGHOUT CONSTRUCTION.
8. CONTRACTOR SHALL CAREFULLY MAINTAIN ALL BENCHMARKS, MONUMENTS, AND OTHER REFERENCE POINTS. IF DISTURBED, CONTRACTOR SHALL ENGAGE LICENSED LAND SURVEY FOR REPLACEMENT OF REFERENCE POINTS.
9. WHERE THESE SPECIFICATIONS CONFLICT WITH THE CITY OF FRANKLIN STANDARDS, THE STANDARDS OF THE JURISDICTION HAVING AUTHORITY SHALL PREVAIL.

B. MATERIALS

- 1. CONTRACTOR TO PROVIDE BORROW SOIL MATERIALS WHEN SUFFICIENT SATISFACTORY SOIL MATERIALS ARE NOT AVAILABLE FROM EXCAVATIONS.
2. SATISFACTORY (OR SUITABLE) SOILS: SOIL CLASSIFICATION GROUPS GW, GP, GM, SW, SP, SM ACCORDING TO ASTM D2487, OR A COMBINATION OF THESE GROUPS; FREE OF ROCK OR GRAVEL LARGER THAN 3 INCHES IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION AND OTHER DELETERIOUS MATERIALS.
3. UNSATISFACTORY (OR UNSUITABLE) SOILS: SOIL CLASSIFICATION GROUPS GC, SC, CL, ML, OL, CH, MH, OH, AND PT ACCORDING TO ASTM D 2487, OR A COMBINATION OF THESE GROUPS. UNSATISFACTORY SOILS ALSO INCLUDES SATISFACTORY SOILS NOT MAINTAINED WITHIN 2 PERCENT OF OPTIMUM MOISTURE CONTENT AT TIME OF COMPACTION.
4. CONTRACTOR SHALL LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP UTILITIES INDICATED TO BE REMOVED OR ABANDONED IN PLACE. DO NOT INTERRUPT UTILITIES SERVING FACILITIES OCCUPIED BY OWNER UNLESS PERMISSION IS GRANTED. NOTIFY OWNER AT LEAST TWO DAYS IN ADVANCE OF PROPOSED UTILITY INTERRUPTIONS.

C. EXECUTION

- 1. CONTRACTOR SHALL LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP UTILITIES INDICATED TO BE REMOVED OR ABANDONED IN PLACE. DO NOT INTERRUPT UTILITIES SERVING FACILITIES OCCUPIED BY OWNER UNLESS PERMISSION IS GRANTED. NOTIFY OWNER AT LEAST TWO DAYS IN ADVANCE OF PROPOSED UTILITY INTERRUPTIONS.
2. REMOVE OBSTRUCTIONS, TREES, SHRUBS, AND OTHER VEGETATION AS REQUIRED FOR NEW CONSTRUCTION, STRIP TOPSOIL TO DEPTH AS REQUIRED IN THE FIELD TO PREVENT INTERMIXING WITH UNDERLYING SUBSOIL, OR OTHER WASTE MATERIALS. STOCKPILE TOPSOIL AWAY FROM EXCAVATIONS WITHOUT INTERMIXING WITH SUBSOIL AND GRADE STOCKPILES TO DRAIN SURFACE WATER.
3. REMOVE EXISTING ABOVE AND BELOW-GRADE IMPROVEMENTS AS INDICATED AND NECESSARY TO FACILITATE NEW CONSTRUCTION.
4. PROTECT SUBGRADES AND FOUNDATION SOLS FROM FREEZING TEMPERATURES, FROST, AND PONDING WATER.
5. EXCAVATE TO INDICATED ELEVATIONS AND DIMENSIONS FOR ALL STRUCTURES, WALKS, PAVEMENTS, AND UTILITY TRENCHES.
6. CONTRACTOR SHALL FURNISH AND OPERATE ALL DEWATERING MEASURES REQUIRED TO FACILITATE NEW CONSTRUCTION AND IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
7. PROOF ROLL SUBGRADE BELOW BUILDING PAVEMENTS WITH A PNEUMATIC-TIRED DUMP TRUCK TO IDENTIFY SOFT POCKETS AND AREAS OF EXCESS YIELDING. DO NOT PROOF ROLL WET OR SATURATED SUBGRADES. RECONSTRUCT SUBGRADES DAMAGED BY FREEZING TEMPERATURES, FROST, RAIN, ACCUMULATED WATER, OR CONSTRUCTION ACTIVITIES AS DIRECTED BY ENGINEER OR OWNER REPRESENTATIVE, WITHOUT ADDITIONAL COMPENSATION.
8. BACKFILL ALL UTILITY TRENCHES BENEATH PAVEMENT (AND WITHIN 5') WITH GRANULAR MATERIAL.
9. SOIL FILL: USE SATISFACTORY SOIL MATERIAL UNDER ALL WALKS, PAVEMENTS, STEPS, RAMPS, BUILDING SLABS, FOOTINGS, AND FOUNDATIONS.
10. UNIFORMLY MOISTEN OR AERATE SUBGRADE AND EACH SUBSEQUENT FILL OR BACKFILL SOIL LAYER BEFORE COMPACTION TO WITHIN 2 PERCENT OF OPTIMUM MOISTURE CONTENT. DO NOT PLACE BACKFILL OR FILL SOIL MATERIAL ON SURFACES THAT ARE MUDDY, FROZEN, OR CONTAIN FROST OR ICE. REMOVE AND REPLACE, OR SCARIFY AND AIR DRY, OTHERWISE SATISFACTORY SOIL MATERIAL THAT EXCEEDS OPTIMUM MOISTURE CONTENT BY 2 PERCENT AND IS 100 WET TO COMPACT TO SPECIFIED UNIT WEIGHT.
11. COMPACTION OF SOIL BACKFILLS AND FILLS ARE TO BE IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS. WHERE NO GEOTECHNICAL REPORT EXISTS, COMPACT ALL FILL MATERIAL BELOW STRUCTURES, PAVEMENTS, WALKS, UTILITY TRENCHES AND STEPS (AND WITHIN 3 FEET OF SAID AREAS) TO 98 PERCENT OF THE MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D-698 (STANDARD PROCTOR DENSITY) OR 95 PERCENT OF THE MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D-1557 (MODIFIED PROCTOR DENSITY). COMPACT ALL FILL MATERIALS BELOW TURF OR UNPAVED AREAS TO 90 PERCENT OF THE MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D-698 (STANDARD PROCTOR DENSITY) OR 85 PERCENT OF THE MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D-1557 (MODIFIED PROCTOR DENSITY). ALL FILL MATERIALS TO BE COMPACTED IN MAXIMUM 8-INCH LIFTS.
12. SITE ROUGH GRADING, SLOPE GRADES TO DIRECT WATER AWAY FROM BUILDINGS AND TO PREVENT PONDING. FINISH SUBGRADES TO REQUIRED ELEVATIONS WITHIN THE FOLLOWING TOLERANCES:
i. TURF OR UNPAVED AREAS: PLUS OR MINUS 1/4 INCH
ii. WALKS: PLUS OR MINUS 1/2 INCH
iii. PAVEMENTS: PLUS OR MINUS 1/2 INCH
iv. INSIDE BUILDING LINES: FINISH SUBGRADE TO A TOLERANCE OF 1/2 INCH WHEN TESTED WITH A 10-FOOT STRAIGHTEDGE.
13. QUALITY CONTROL: QUALIFIED GEOTECHNICAL ENGINEER TO BE ENGAGED AS TESTING AGENCY AS DIRECTED BY OWNER.
14. 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

STORM SEWER:

A. GENERAL

- 1. STORM SEWER INCLUDES ALL PIPES, FITTINGS, MANHOLES, CLEANOUTS, TRANSITION COUPLINGS, CATCH BASINS, INLETS, END SECTIONS, AND OUTLETS.
2. THE CONTRACTOR SHALL NOTIFY ENGINEER IN WRITING OF ANY CHANGES, ERRORS, OR OMISSIONS FOUND ON THE PLANS OR IN THE FIELD, BEFORE WORK IS STARTED OR RESUMED.
3. CONTRACTOR SHALL LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP UTILITIES INDICATED TO BE REMOVED OR ABANDONED IN PLACE. DO NOT INTERRUPT UTILITIES SERVING FACILITIES OCCUPIED BY OWNER UNLESS PERMISSION IS GRANTED. NOTIFY OWNER AT LEAST TWO DAYS IN ADVANCE OF PROPOSED UTILITY INTERRUPTIONS.
4. COMPLY WITH ASTM C 1173. ELASTOMERIC SLEEVE-TYPE REDUCING OR TRANSITION COUPLING, FOR JOINING UNDERGROUND NON-PRESSURE PIPING, INCLUDE ENDS OF SAME SIZES AS PIPING TO BE JOINED, AND CORROSION-RESISTANT METAL TENSION BAND AND TIGHTENING MECHANISM ON EACH END.

B. PRODUCTS

- 1. PE PIPE AND FITTINGS: PE DRAINAGE PIPE AND FITTINGS NP 3 TO NPS 10, AASHTO M 252M, TYPE S, WITH SMOOTH WATERWAY FOR COUPLING JOINTS. PE DRAINAGE PIPE AND FITTINGS NPS 12 TO NPS 60, AASHTO M 294M, TYPE S, WITH SMOOTH WATERWAY FOR COUPLING JOINTS.
2. PVC PIPE AND FITTINGS: PIPE: ASTM F 949, PVC, OR ASTM D-3034, F-1336, F-679, CORRUGATED PIPE WITH BELL AND SPOGOT ENDS FOR GASKETED JOINTS. FITTINGS: ASTM 949, PVC MOLDED OR FABRICATED, SOCKET TYPE. GASKETS: ASTM F 477, ELASTOMERIC SEALS.
3. CONCRETE PIPE AND FITTINGS: REINFORCED CONCRETE SEWER PIPE AND FITTINGS MEETING ASTM C 76 WITH BELL AND SPOGOT ENDS AND GASKETED JOINTS WITH ASTM C 443 RUBBER GASKETS. PIPE TO BE CLASS II UNLESS OTHERWISE INDICATED ON PLANS.
4. COMPLY WITH ASTM C 1173. ELASTOMERIC SLEEVE-TYPE REDUCING OR TRANSITION COUPLING, FOR JOINING UNDERGROUND NON-PRESSURE PIPING, INCLUDE ENDS OF SAME SIZES AS PIPING TO BE JOINED, AND CORROSION-RESISTANT METAL TENSION BAND AND TIGHTENING MECHANISM ON EACH END.
5. CLEANOUTS: CAST IRON CLEANOUTS: ASME A112.36.2M ROUND, GRAY-IRON HOUSING WITH CLAMPING DEVICE AND ROUND, SECURED, SCORIATED, GRAY-IRON COVER. HEAVY DUTY TOP LOADING IS REQUIRED. PLASTIC CLEANOUTS: PVC BODY WITH PVC THREADED PLUG.
6. MANHOLES AND CATCH BASINS: STANDARD REINFORCED PRECAST CONCRETE MANHOLES MEETING ASTM C 478. MINIMUM 48-INCH DIAMETER UNLESS OTHERWISE INDICATED. BASE SECTION TO BE MINIMUM 6-INCH THICKNESS AND 4-INCH THICKNESS FOR WALLS AND BASE RISER SECTION, REINFORCED CONCRETE GRADE RINGS, 8-INCH TOTAL THICKNESS, TO MATCH DIAMETER OF MANHOLE FRAME AND COVER. MANHOLE FRAMES AND COVERS AS INDICATED ON DRAWINGS. PIPE CONNECTORS SHOULD BE PROVIDED TO MEET ASTM C293, RESILIENT, OF SIZE REQUIRED, FOR EACH PIPE CONNECTING TO THE BASE SECTION.
7. CONCRETE: CAST-IN-PLACE CONCRETE ACCORDING TO ACI 318 AND ACI 309.550R AND IN ACCORDANCE WITH THE FOLLOWING:
i. CEMENT: ASTM C 150, TYPE II
ii. FINE AGGREGATE: ASTM C 33, SAND
iii. COURSE AGGREGATE: ASTM C-33, CRUSHED GRAVEL
iv. WATER: POTABLE
8. PORTLAND CEMENT DESIGN MIX: 4,000 PSI MINIMUM WITH 0.45 MAXIMUM WATER/CEMENTIOUS MATERIALS RATIO, REINFORCING FABRIC TO MEET ASTM A 185/A 185M, STEEL, WELDED WIRE FABRIC, PLAIN, REINFORCING BARS TO MEET ASTM A 615/A 615M, GRADE 60 DEFORMED STEEL.
9. MANHOLE CHANNELS TO BE FORMED WITH AN INVERT SLOPE OF 2 PERCENT THROUGH THE MANHOLE AND BENCHES AT 4 PERCENT, SLOPED TO DRAIN INTO CHANNEL.
10. INLETS: PROVIDE INLETS WITH HEAVY DUTY CASTINGS AS SHOWN ON DRAWINGS.
11. OUTLETS: CONCRETE END SECTION SHOULD BE PROVIDED AT ALL PIPE ENDS AND AS INDICATED ON DRAWINGS. RIP RAP APRONS TO BE INSTALLED AT ALL END SECTIONS TO DIMENSIONS INDICATED. AVERAGE RIP-RAP SIZE TO BE 6-INCHES UNLESS OTHERWISE INDICATED ON DRAWINGS.

STORM SEWER (CONT.):

C. EXECUTION

- 1. 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 OTHER COUPLINGS ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS.
2. WHEN INSTALLING PIPE UNDER STREETS OR OTHER OBSTRUCTIONS THAT CANNOT BE DISTURBED, USE PIPE-JACKING PROCESS OF MICRO-TUNNELING.
3. INSTALL PIPING PITCHED DOWN IN DIRECTION OF FLOW. INSTALL PE CORRUGATED SEWER PIPING IN ACCORDANCE WITH ASTM D 2321. INSTALL PVC PIPING ACCORDING TO ASTM D 2321 AND ASTM F 1068. INSTALL REINFORCED CONCRETE SEWER PIPING IN ACCORDANCE WITH ASTM C 1479 AND ACPAS "CONCRETE PIPE INSTALLATION MANUAL."
4. PIPE JOINT CONSTRUCTION: JOIN CORRUGATED PE PIPE ACCORDING TO ASTM D 3212 FOR PUSH ON JOINTS. JOIN PVC CORRUGATED SEWER PIPING IN ACCORDANCE WITH ASTM D 3231 FOR ELASTOMERIC SEAL JOINTS. JOIN REINFORCED CONCRETE PIPE ACCORDING TO ACPAS "CONCRETE PIPE INSTALLATION MANUAL" FOR RUBBER-GASKETED JOINTS. JOIN DISSIMILAR PIPE MATERIALS WITH NON-PRESSURE TYPE FLEXIBLE COUPLINGS.

- 5. CONTRACTOR TO INSPECT INTERIOR OF PIPING AND MANHOLES FOR DEFECTS. DEFECTS REQUIRING CORRECTION INCLUDE THE FOLLOWING:
i. ALIGNMENT: LESS THAN FULL DIAMETER OF INSIDE OF PIPE IS VISIBLE BETWEEN STRUCTURES.
ii. DEFLECTION: FLEXIBLE PIPING WITH DEFLECTION THAT PREVENTS PASSAGE OF BALL OR CYLINDER OF SIZE NOT LESS THAN 92.5 PERCENT OF PIPING DIAMETER.
iii. DAMAGE: CRUSHED, BROKEN, CRACKED, OR OTHERWISE DAMAGED PIPING.
iv. INFILTRATION: WATER LEAKAGE INTO PIPING.
v. EXFILTRATION: WATER LEAKAGE FROM OR AROUND PIPING.
vi. REPLACEMENT DEFECTIVE PIPING USING NEW MATERIALS, AND REPEAT INSPECTION UNTIL DEFECTS ARE WITHIN ALLOWANCES SPECIFIED.
6. TEST NEW PIPING SYSTEMS, AND PARTS OF EXISTING SYSTEMS THAT HAVE BEEN ALTERED, EXTENDED, REPAIRED, FOR LEAKS AND DEFECTS. FOR GRAVITY FLOW STORAGE DRAINAGE PIPING: TEST ACCORDING TO REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION, UN-8-B, AND THE FOLLOWING:
i. EXCEPTION: PIPING WITH SOIL TIGHT JOINTS UNLESS REQUIRED BY AUTHORITIES HAVING JURISDICTION.
ii. OPTION: TEST PLASTIC PIPING ACCORDING TO ASTM F 1471.
iii. OPTION: TEST CONCRETE PIPING ACCORDING TO ASTM C 924.
7. SUBMIT TESTING REPORTS AS REQUIRED BY OWNER OR AUTHORITY HAVING JURISDICTION.

ASPHALT PAVING:

A. GENERAL

- 1. THE CONTRACTOR SHALL NOTIFY ENGINEER IN WRITING OF ANY CHANGES, ERRORS, OR OMISSIONS FOUND ON THE PLANS OR IN THE FIELD, BEFORE WORK IS STARTED OR RESUMED.
2. USE MATERIALS AND GRADATIONS THAT HAVE PERFORMED SATISFACTORILY IN PREVIOUS INSTALLATIONS.
B. PRODUCTS
1. AGGREGATES
i. COURSE AGGREGATE: ASTM D 692/D62M, SOUND, ANGULAR CRUSHED STONE, CRUSHED GRAVEL, OR CURED, CRUSHED BLAST-FURNACE SLAG.
ii. FINE AGGREGATE: ASTM D 1073 OR AASHTO M 29, SHARP-EDGED NATURAL SAND OR SAND PREPARED FROM STONE, GRAVEL, CURED BLAST-FURNACE SLAG, OR COMBINATIONS THEREOF.
a. FOR HOT-MIX ASPHALT: LIMIT NATURAL SAND TO A MAXIMUM OF 20 PERCENT BY WEIGHT OF THE TOTAL AGGREGATE MASS.
iii. MINERAL FILLER: ASTM D 242 OR AASHTO M 17, ROCK OR SLAG-DUST, HYDRAULIC CEMENT, OR OTHER INERT MATERIAL.
2. ASPHALT MATERIALS
i. ASPHALT BINDER: AASHTO M 320, PG 64-22 (OR AS OTHERWISE RECOMMENDED BY INDOT STANDARDS)
ii. ASPHALT CEMENT: PER INDOT STANDARDS
iii. CUTBACK PRIME COAT: PER INDOT STANDARDS
iv. EMULSIFIED ASPHALT PRIME COAT: PER INDOT STANDARDS
v. TACK COAT: PER INDOT STANDARDS
vi. WATER: POTABLE.
vii. UNDERSEALING ASPHALT: ASTM D 3141; PUMPING CONSISTENCY.
3. AUXILIARY MATERIALS
i. RECYCLED MATERIALS FOR HOT-MIX ASPHALT MIXES: RECLAIMED ASPHALT PAVEMENT; RECLAIMED, UNBOUND AGGREGATE BASE MATERIAL; AND RECYCLED ASPHALT SHINGLES FROM SOURCES AND GRADATIONS THAT HAVE PERFORMED SATISFACTORILY IN PREVIOUS INSTALLATIONS, EQUAL TO PERFORMANCE OF REQUIRED HOT-MIX ASPHALT PAVING PRODUCED FROM ALL NEW MATERIALS.
ii. HERBICIDE: COMMERCIAL CHEMICAL FOR WEED CONTROL, REGISTERED BY THE EPA, AND NOT CLASSIFIED AS "RESTRICTED USE" FOR LOCATIONS AND CONDITIONS OF APPLICATION: PROVIDE IN GRANULAR, LIQUID, OR WETTABLE POWDER FORM.
iii. SAND: ASTM D 1073 OR AASHTO M 29, GRADE NO. 2 OR NO. 3.

C. EXECUTION

- 1. EXAMINATION
i. VERIFY THAT SUBGRADE IS DRY AND IN SUITABLE CONDITION TO BEGIN PAVING.
ii. PROOF-ROLL SUBGRADE WITH HEAVY PNEUMATIC-TIRED EQUIPMENT TO IDENTIFY SOFT POCKETS AND AREAS OF EXCESS YIELDING. DO NOT PROOF-ROLL WET OR SATURATED SUBGRADES. PROOFROLL TO BE PERFORMED BY QUALIFIED GEOTECHNICAL ENGINEER.
a. COMPLETELY PROOF-ROLL SUBGRADE IN ONE DIRECTION UNTIL VEHICLE SPEED TO 3 MPH.
b. PROOF ROLL WITH A LOADED 10-WHEEL, TANDUM-AXLE DUMP TRUCK WEIGHING NOT LESS THAN 15 TONS.
c. EXCAVATE SOFT SPOTS, UNSATISFACTORY SOILS, AND AREAS OF EXCESSIVE PUMPING OR RUTTING, AS DETERMINED BY ENGINEER, AND REPLACE WITH COMPACTED BACKFILL OR FILL AS DIRECTED.
d. PROCEED WITH PAVING ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
2. SURFACE PREPARATION
i. GENERAL: IMMEDIATELY BEFORE PLACING ASPHALT MATERIALS, REMOVE LOOSE AND DELETERIOUS MATERIAL FROM SUBSTRATE SURFACES. ENSURE THAT PREPARED SUBGRADE IS READY TO RECEIVE PAVING.
ii. HERBICIDE TREATMENT: APPLY HERBICIDE ACCORDING TO MANUFACTURERS RECOMMENDED RATES AND WRITTEN APPLICATION INSTRUCTIONS. APPLY TO DRY, PREPARED SUBGRADE OR SURFACE OF COMPACTED-AGGREGATE BASE BEFORE APPLYING PAVING MATERIALS.
a. MIX HERBICIDE WITH PRIME COAT IF FORMULATED BY MANUFACTURER FOR THAT PURPOSE.
iii. CUTBACK PRIME COAT: APPLY UNIFORM COATING OF 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.
a. 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 PAVING IS PLACED AND AFTER VOLATILES HAVE EVAPORATED.
b. PROTECT PRIMED SUBSTRATE FROM DAMAGE UNTIL READY TO RECEIVE PAVING.
iv. TACK COAT: APPLY UNIFORM COATING OF EXISTING PAVEMENT AT A RATE OF 0.05 TO 0.15 GAL./SQ. YD.
a. ALLOW TACK COAT TO CURE UNDISTURBED BEFORE APPLYING HOT-MIX ASPHALT.
b. AVOID SMEARING OR STAINING ADJOINING SURFACES, APPURTENANCES, AND SURROUNDINGS. REMOVE SPILLAGES AND CLEAN AFFECTED SURFACES.
3. PLACING HOT-MIX ASPHALT
i. MACHINE PLACE HOT-MIX ASPHALT ON PREPARED SURFACE, SPREAD UNIFORMLY, AND STRIKE OFF. PLACE ASPHALT MIX BY HAND IN AREAS INACCESSIBLE TO EQUIPMENT IN A MANNER THAT PREVENTS SEGREGATION OF MIX. PLACE EACH COURSE TO REQUIRED GRADE, CROSS SECTION, AND THICKNESS WHEN COMPACTED.
a. PLACE HOT-MIX ASPHALT BASE COURSE IN NUMBER OF LIFTS AND THICKNESSES INDICATED.
b. PLACE HOT-MIX ASPHALT SURFACE COURSE IN SINGLE LIFT.
c. SPREAD MIX AT A MINIMUM TEMPERATURE OF 250 DEG F.
d. BEGIN APPLYING MIX ALONG CENTERLINE OF CROWN FOR CROWNED SECTIONS AND ON HIGH SIDE OF ONE-WAY SLOPES UNLESS OTHERWISE INDICATED.
e. REGULATE PAVER MACHINE SPEED TO OBTAIN SMOOTH, CONTINUOUS SURFACE FREE OF PULLS AND TEARS IN ASPHALT-PAVING MAT.
ii. PLACE PAVING IN CONSECUTIVE STRIPS NOT LESS THAN 10 FEET WIDE UNLESS MINOR EDGE STRIPS OF A LESSER WIDTH ARE REQUIRED.
a. AFTER FIRST STRIP HAS BEEN PLACED AND ROLLED, PLACE SUCCEEDING STRIPS AND EXTEND ROLLING TO OVERLAP PREVIOUS STRIPS. OVERLAP MIX PLACEMENT ABOUT 1 TO 1-1/2 INCHES FROM STRIP TO STRIP TO ENSURE PROPER COMPACTION OF MIX ALONG LONGITUDINAL JOINTS.
b. COMPLETE A SECTION OF ASPHALT BASE COURSE BEFORE PLACING ASPHALT SURFACE COURSE.
iii. 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.
4. JOINTS
i. 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.
a. CLEAN CONTACT SURFACES AND APPLY TACK COAT TO JOINTS.
b. OFFSET LONGITUDINAL JOINTS, IN SUCCESSIVE COURSES, A MINIMUM OF 6 INCHES.
c. OFFSET TRANSVERSE JOINTS, IN SUCCESSIVE COURSES, A MINIMUM OF 4 INCHES.
d. CONSTRUCT TRANSVERSE JOINTS AT EACH POINT WHERE PAVEMENT ENDS. A DAY'S WORK AND RESUMES WORK AT A SUBSEQUENT TIME. CONSTRUCT THESE JOINTS USING EITHER "BULKHEAD" OR "PAPERED" METHOD ACCORDING TO AI MS-22, FOR BOTH "ENDING A LANE" AND "RESUMPTION OF PAVING OPERATIONS".
e. COMPACT JOINTS AS SOON AS HOT-MIX ASPHALT WILL BEAR ROLLER WEIGHT WITHOUT EXCESSIVE DISPLACEMENT.
f. COMPACT ASPHALT AT JOINTS TO A DENSITY WITHIN 2 PERCENT OF SPECIFIED COURSE DENSITY.

CONCRETE PAVING:

A. GENERAL

- 1. CONCRETE PAVING SECTION INCLUDES DRIVEWAYS, ROADWAYS, PARKING LOTS, CURBS AND GUTTERS, WALKS, AND CONCRETE APRONS.
2. ACTION SUBMITTALS
i. PRODUCT DATA FOR EACH TYPE OF PRODUCT INDICATED.
ii. OTHER ACTION SUBMITTALS
a. DESIGN MIXTURES: FOR EACH CONCRETE PAVING MIXTURE INCLUDE ALTERNATE DESIGN MIXTURES WHEN CHARACTERISTICS OF MATERIALS PROTECT CONDITIONS, WEATHER, TEST RESULTS, OR OTHER CIRCUMSTANCES WARRANT ADJUSTMENTS.
b. 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.
3. QUALITY ASSURANCE
i. READY-MIX CONCRETE MANUFACTURER QUALIFICATIONS: A FIRM EXPERIENCED IN MANUFACTURING READY-MIXED CONCRETE PRODUCTS AND THAT COMPLIES WITH ASTM C 94/C 94M REQUIREMENTS FOR PRODUCTION FACILITIES AND EQUIPMENT.
ii. AD PUBLICATIONS: COMPLY WITH ACI 301 (ACI 301M) UNLESS OTHERWISE INDICATED.
iii. HANDICAP STANDARDS: PROVIDE RAISED CURBS FOR HANDICAP ACCESS IN ACCORDANCE WITH ANSI A117 AND FEDERAL AMERICANS WITH DISABILITIES ACT (ADA).
B. PRODUCTS
1. STEEL REINFORCEMENT
i. RECYCLED CONTENT: POST CONSUMER RECYCLED CONTENT PLUS ONE-HALF OF PRECONSUMER RECYCLED CONTENT NOT LESS THAN 25 PERCENT.
ii. PLAIN-STEEL WELDED WIRE REINFORCEMENT: ASTM A 185/A 185M, FABRICATED FROM AS-DRAWN STEEL WIRE INTO FLAT SHEETS.
iii. DEFORMED-STEEL WELDED WIRE REINFORCEMENT: ASTM A 497/A 497M, FLAT SHEET.
iv. REINFORCING BARS: ASTM A 615/A 615M, GRADE 60 (GRADE 420), DEFORMED.
v. PLAIN-STEEL WIRE: ASTM A 602/A 602M, AS DRAWN.
vi. DEFORMED-STEEL WIRE: ASTM A 496/A 496M.
vii. DOWEL BARS: ASTM A 615/A 615M, GRADE 60 (GRADE 420) PLAIN-STEEL BARS; ZINC COATED (GALVANIZED) AFTER FABRICATION ACCORDING TO ASTM A 767/A 767M, CLASS I COATING; CURT BARS TRUE TO LENGTH WITH ENDS SQUARE AND FREE OF BURRS.
viii. BARS SUPPORTS: BOLSTERS, CHAIRS, SPACERS, AND OTHER DEVICES FOR SPACING, SUPPORTING, AND FASTENING REINFORCING BARS, WELDED WIRE REINFORCEMENT, AND DOWELS IN PLACE. MANUFACTURE BAR SUPPORTS ACCORDING TO CRSI'S "MANUAL OF STANDARD PRACTICE" FROM STEEL WIRE, PLASTIC, OR PRECAST CONCRETE OF GREATER COMPRESSIVE STRENGTH THAN CONCRETE SPECIFIED.
2. CONCRETE MATERIALS
i. CEMENTITIOUS MATERIAL: USE THE FOLLOWING CEMENTITIOUS MATERIALS, OF SAME TYPE, BRAND, AND SOURCE THROUGHOUT PROJECT:
a. PORTLAND CEMENT: ASTM C 150, PORTLAND CEMENT TYPE I.
b. FLY ASH: ASTM C 618, CLASS C OR CLASS F.
c. GROUND GRANULATED BLAST-FURNACE SLAG: ASTM C 989, GRADE 100 OR 120.
ii. NORMAL-WEIGHT AGGREGATES: ASTM C 33 UNIFORMLY GRADED, AND AS FOLLOWS:
a. COMBINED AGGREGATE GRADATION: WELL GRADED FROM COARSEST TO FINEST WITH NOT MORE THAN 18 PERCENT AND NOT LESS THAN 8 PERCENT RETAINED ON AN INDIVIDUAL SIEVE, EXCEPT THAT LESS THAN 8 PERCENT MAY BE RETAINED ON COARSEST SIEVE AND ON NO. 50 SIEVE, AND LESS THAN 6 PERCENT MAY BE RETAINED ON SIEVES FINER THAN NO. 50.
b. USE CRUSHED LIMESTONE COARSE AGGREGATE FOR CONCRETE EXPOSED TO WEATHER.
iii. WATER: POTABLE AND COMPLYING WITH ASTM C 94/C 94M.
iv. AIR-ENTRAINING ADMIXTURE: ASTM C 260.
v. CHEMICAL ADMIXTURES: ADMIXTURES CERTIFIED BY MANUFACTURER TO BE COMPATIBLE WITH OTHER ADMIXTURES AND TO CONTAIN NOT MORE THAN 0.1 PERCENT WATER-SOLUBLE CHLORIDE IONS BY MASS OF CEMENTITIOUS MATERIAL.
vi. NOTE: WHERE CLASS A, B, OR C CONCRETE IS REFERENCED IN PLANS OR SPECIFICATIONS, THE CLASS IS AS DEFINED IN ACI 347-04.

C. EXECUTION

- 1. EXAMINATION
i. VERIFY THAT SUBGRADE IS DRY AND IN SUITABLE CONDITION TO BEGIN PAVING.
ii. PROOF-ROLL SUBGRADE WITH HEAVY PNEUMATIC-TIRED EQUIPMENT TO IDENTIFY SOFT POCKETS AND AREAS OF EXCESS YIELDING. DO NOT PROOF-ROLL WET OR SATURATED SUBGRADES. PROOFROLL TO BE PERFORMED BY QUALIFIED GEOTECHNICAL ENGINEER.
a. COMPLETELY PROOF-ROLL SUBGRADE IN ONE DIRECTION UNTIL VEHICLE SPEED TO 3 MPH.
b. PROOF ROLL WITH A LOADED 10-WHEEL, TANDUM-AXLE DUMP TRUCK WEIGHING NOT LESS THAN 15 TONS.
c. EXCAVATE SOFT SPOTS, UNSATISFACTORY SOILS, AND AREAS OF EXCESSIVE PUMPING OR RUTTING, AS DETERMINED BY ENGINEER, AND REPLACE WITH COMPACTED BACKFILL OR FILL AS DIRECTED.
d. PROCEED WITH PAVING ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
2. SURFACE PREPARATION
i. GENERAL: IMMEDIATELY BEFORE PLACING ASPHALT MATERIALS, REMOVE LOOSE AND DELETERIOUS MATERIAL FROM SUBSTRATE SURFACES. ENSURE THAT PREPARED SUBGRADE IS READY TO RECEIVE PAVING.
ii. HERBICIDE TREATMENT: APPLY HERBICIDE ACCORDING TO MANUFACTURERS RECOMMENDED RATES AND WRITTEN APPLICATION INSTRUCTIONS. APPLY TO DRY, PREPARED SUBGRADE OR SURFACE OF COMPACTED-AGGREGATE BASE BEFORE APPLYING PAVING MATERIALS.
a. MIX HERBICIDE WITH PRIME COAT IF FORMULATED BY MANUFACTURER FOR THAT PURPOSE.
iii. CUTBACK PRIME COAT: APPLY UNIFORM COATING OF 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.
a. 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 PAVING IS PLACED AND AFTER VOLATILES HAVE EVAPORATED.
b. PROTECT PRIMED SUBSTRATE FROM DAMAGE UNTIL READY TO RECEIVE PAVING.
iv. TACK COAT: APPLY UNIFORM COATING OF EXISTING PAVEMENT AT A RATE OF 0.05 TO 0.15 GAL./SQ. YD.
a. ALLOW TACK COAT TO CURE UNDISTURBED BEFORE APPLYING HOT-MIX ASPHALT.
b. AVOID SMEARING OR STAINING ADJOINING SURFACES, APPURTENANCES, AND SURROUNDINGS. REMOVE SPILLAGES AND CLEAN AFFECTED SURFACES.
3. PLACING HOT-MIX ASPHALT
i. MACHINE PLACE HOT-MIX ASPHALT ON PREPARED SURFACE, SPREAD UNIFORMLY, AND STRIKE OFF. PLACE ASPHALT MIX BY HAND IN AREAS INACCESSIBLE TO EQUIPMENT IN A MANNER THAT PREVENTS SEGREGATION OF MIX. PLACE EACH COURSE TO REQUIRED GRADE, CROSS SECTION, AND THICKNESS WHEN COMPACTED.
a. PLACE HOT-MIX ASPHALT BASE COURSE IN NUMBER OF LIFTS AND THICKNESSES INDICATED.
b. PLACE HOT-MIX ASPHALT SURFACE COURSE IN SINGLE LIFT.
c. SPREAD MIX AT A MINIMUM TEMPERATURE OF 250 DEG F.
d. BEGIN APPLYING MIX ALONG CENTERLINE OF CROWN FOR CROWNED SECTIONS AND ON HIGH SIDE OF ONE-WAY SLOPES UNLESS OTHERWISE INDICATED.
e. REGULATE PAVER MACHINE SPEED TO OBTAIN SMOOTH, CONTINUOUS SURFACE FREE OF PULLS AND TEARS IN ASPHALT-PAVING MAT.
ii. PLACE PAVING IN CONSECUTIVE STRIPS NOT LESS THAN 10 FEET WIDE UNLESS MINOR EDGE STRIPS OF A LESSER WIDTH ARE REQUIRED.
a. AFTER FIRST STRIP HAS BEEN PLACED AND ROLLED, PLACE SUCCEEDING STRIPS AND EXTEND ROLLING TO OVERLAP PREVIOUS STRIPS. OVERLAP MIX PLACEMENT ABOUT 1 TO 1-1/2 INCHES FROM STRIP TO STRIP TO ENSURE PROPER COMPACTION OF MIX ALONG LONGITUDINAL JOINTS.
b. COMPLETE A SECTION OF ASPHALT BASE COURSE BEFORE PLACING ASPHALT SURFACE COURSE.
iii. 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.
4. JOINTS
i. 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.
a. CLEAN CONTACT SURFACES AND APPLY TACK COAT TO JOINTS.
b. OFFSET LONGITUDINAL JOINTS, IN SUCCESSIVE COURSES, A MINIMUM OF 6 INCHES.
c. OFFSET TRANSVERSE JOINTS, IN SUCCESSIVE COURSES, A MINIMUM OF 4 INCHES.
d. CONSTRUCT TRANSVERSE JOINTS AT EACH POINT WHERE PAVEMENT ENDS. A DAY'S WORK AND RESUMES WORK AT A SUBSEQUENT TIME. CONSTRUCT THESE JOINTS USING EITHER "BULKHEAD" OR "PAPERED" METHOD ACCORDING TO AI MS-22, FOR BOTH "ENDING A LANE" AND "RESUMPTION OF PAVING OPERATIONS".
e. COMPACT JOINTS AS SOON AS HOT-MIX ASPHALT WILL BEAR ROLLER WEIGHT WITHOUT EXCESSIVE DISPLACEMENT.
f. COMPACT ASPHALT AT JOINTS TO A DENSITY WITHIN 2 PERCENT OF SPECIFIED COURSE DENSITY.

ASPHALT PAVING (CONT.):

- 5. COMPACTION
i. GENERAL: BEGIN COMPACTION AS SOON AS PLACED HOT-MIX PAVING WILL BEAR ROLLER WEIGHT WITHOUT EXCESSIVE DISPLACEMENT. COMPACT HOT-MIX PAVING WITH HOT, HAND TAMPERS OR WITH VIBRATORY-PLATE COMPACTORS IN AREAS INACCESSIBLE TO ROLLERS.
a. COMPLETE COMPACTION BEFORE MIX TEMPERATURE COOLS TO 185 DEG F.
ii. BREAKDOWN ROLLING: COMPLETE BREAKDOWN OR INITIAL ROLLING IMMEDIATELY AFTER ROLLING JOINTS AND OUTSIDE EDGE. EXAMINE SURFACE IMMEDIATELY AFTER BREAKDOWN ROLLING FOR INCREASED CROWN, GRADE, AND SMOOTHNESS. CORRECT LAYOUT AND ROLLING OPERATIONS TO COMPLY WITH REQUIREMENTS.
iii. 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.
a. AVERAGE DENSITY: 98 PERCENT OF REFERENCE LABORATORY DENSITY ACCORDING TO ASTM D 6927 OR AASHTO T 245, BUT NOT LESS THAN 94 PERCENT OR GREATER THAN 100 PERCENT.
b. AVERAGE DENSITY: 92 PERCENT OF REFERENCE MAXIMUM THEORETICAL DENSITY ACCORDING TO ASTM D 2041, BUT NOT LESS THAN 90 PERCENT OR GREATER THAN 96 PERCENT.
iv. FINISH ROLLING: FINISH ROLL PAVED SURFACES TO REMOVE ROLLER MARKS WHILE HOT-MIX ASPHALT IS STILL WARM.
v. EDGE SHAPING: WHILE SURFACE IS BEING COMPACTED AND FINISHED, TRIM EDGES OF PAVEMENT TO PROPER ALIGNMENT. BEVEL EDGES WHILE ASPHALT IS STILL HOT. COMPACT THROUGHOUT.
vi. 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.
vii. PROTECTION: AFTER FINAL ROLLING, DO NOT PERMIT VEHICULAR TRAFFIC ON PAVEMENT UNTIL IT HAS COOLED AND HARDENED.
viii. ERECT BARRIAGES TO PROTECT PAVING FROM TRAFFIC UNTIL MIXTURE HAS COOLED ENOUGH NOT TO BECOME MARKED.
6. INSTALLATION TOLERANCES
i. PAVEMENT THICKNESS: COMPACT EACH COURSE TO PRODUCE THE THICKNESS INDICATED WITHIN THE FOLLOWING TOLERANCES:
a. BASE COURSE: PLUS OR MINUS 1/2 INCH
b. SURFACE COURSE: PLUS 1/4 INCH NO MINUS.
ii. PAVEMENT 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.
a. BASE COURSE: 1/4 INCH
b. SURFACE COURSE: 1/8 INCH
c. CROWNED SURFACES: TEST WITH CROWNED TEMPLATE CENTERED AND AT RIGHT ANGLE TO CROWN. MAXIMUM ALLOWABLE VARIANCE FROM TEMPLATE IS 1/4 INCH.

- 7. FIELD QUALITY CONTROL
i. TESTING AGENCY: CONTRACTOR TO ENGAGE A QUALIFIED TESTING AGENCY TO PERFORM TESTS AND INSPECTIONS.
ii. THICKNESS: IN-PLACE COMPACTED THICKNESS OF HOT-MIX ASPHALT COURSES WILL BE DETERMINED ACCORDING TO ASTM D 3549.
iii. SURFACE SMOOTHNESS: FINISHED SURFACE OF EACH HOT-MIX ASPHALT COURSE WILL BE TESTED FOR COMPLIANCE WITH SMOOTHNESS TOLERANCES.
iv. IN-PLACE DENSITY: TESTING AGENCY WILL TAKE SAMPLES OF UNCOMPACTED PAVING MIXTURES AND COMPACTED PAVEMENT ACCORDING TO ASTM D 979 OR AASHTO T 168.
a. REFERENCE MAXIMUM THEORETICAL DENSITY WILL BE DETERMINED BY AVERAGING RESULTS FROM FOUR SAMPLES OF HOT-MIX ASPHALT-PAVING MIXTURE DELIVERED DAILY TO SITE, PREPARED ACCORDING TO ASTM D 2041, AND COMPACTED ACCORDING TO JOB-MIX SPECIFICATIONS.
b. IN-PLACE DENSITY OF COMPACTED PAVEMENT WILL BE DETERMINED BY TESTING CORE SAMPLES ACCORDING TO ASTM D 1188 OR ASTM D 2726.
v. ONE CORE SAMPLE WILL BE TAKEN FOR EVERY 1000 SQ. YD. OR LESS OF INSTALLED PAVEMENT, WITH NOT FEWER THAN THREE CORES TAKEN.
vi. FIELD DENSITY OF IN-PLACE COMPACTED PAVEMENT MAY ALSO BE DETERMINED BY NUCLEAR METHOD ACCORDING TO ASTM C 2950 AND CORRELATED WITH ASTM D 1188 OR ASTM D 2726.
vii. REPLACE AND COMPACT HOT-MIX ASPHALT WHERE CORE TESTS WERE TAKEN.
viii. REMOVE AND REPLACE OR INSTALL ADDITIONAL HOT-MIX ASPHALT WHERE TEST RESULTS OR MEASUREMENTS INDICATE THAT IT DOES NOT COMPLY WITH SPECIFIED REQUIREMENTS.

CONCRETE PAVING:

A. GENERAL

- 1. CONCRETE PAVING SECTION INCLUDES DRIVEWAYS, ROADWAYS, PARKING LOTS, CURBS AND GUTTERS, WALKS, AND CONCRETE APRONS.
2. ACTION SUBMITTALS
i. PRODUCT DATA FOR EACH TYPE OF PRODUCT INDICATED.
ii. OTHER ACTION SUBMITTALS
a. DESIGN MIXTURES: FOR EACH CONCRETE PAVING MIXTURE INCLUDE ALTERNATE DESIGN MIXTURES WHEN CHARACTERISTICS OF MATERIALS PROTECT CONDITIONS, WEATHER, TEST RESULTS, OR OTHER CIRCUMSTANCES WARRANT ADJUSTMENTS.
b. 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.
3. QUALITY ASSURANCE
i. READY-MIX CONCRETE MANUFACTURER QUALIFICATIONS: A FIRM EXPERIENCED IN MANUFACTURING READY-MIXED CONCRETE PRODUCTS AND THAT COMPLIES WITH ASTM C 94/C 94M REQUIREMENTS FOR PRODUCTION FACILITIES AND EQUIPMENT.
ii. AD PUBLICATIONS: COMPLY WITH ACI 301 (ACI 301M) UNLESS OTHERWISE INDICATED.
iii. HANDICAP STANDARDS: PROVIDE RAISED CURBS FOR HANDICAP ACCESS IN ACCORDANCE WITH ANSI A117 AND FEDERAL AMERICANS WITH DISABILITIES ACT (ADA).
B. PRODUCTS
1. STEEL REINFORCEMENT
i. RECYCLED CONTENT: POST CONSUMER RECYCLED CONTENT PLUS ONE-HALF OF PRECONSUMER RECYCLED CONTENT NOT LESS THAN 25 PERCENT.
ii. PLAIN-STEEL WELDED WIRE REINFORCEMENT: ASTM A 185/A 185M, FABRICATED FROM AS-DRAWN STEEL WIRE INTO FLAT SHEETS.
iii. DEFORMED-STEEL WELDED WIRE REINFORCEMENT: ASTM A 497/A 497M, FLAT SHEET.
iv. REINFORCING BARS: ASTM A 615/A 615M, GRADE 60 (GRADE 420), DEFORMED.
v. PLAIN-STEEL WIRE: ASTM A 602/A 602M, AS DRAWN.
vi. DEFORMED-STEEL WIRE: ASTM A 496/A 496M.
vii. DOWEL BARS: ASTM A 615/A 615M, GRADE 60 (GRADE 420) PLAIN-STEEL BARS; ZINC COATED (GALVANIZED) AFTER FABRICATION ACCORDING TO ASTM A 767/A 767M, CLASS I COATING; CURT BARS TRUE TO LENGTH WITH ENDS SQUARE AND FREE OF BURRS.
viii. BARS SUPPORTS: BOLSTERS, CHAIRS, SPACERS, AND OTHER DEVICES FOR SPACING, SUPPORTING, AND FASTENING REINFORCING BARS, WELDED WIRE REINFORCEMENT, AND DOWELS IN PLACE. MANUFACTURE BAR SUPPORTS ACCORDING TO CRSI'S "MANUAL OF STANDARD PRACTICE" FROM STEEL WIRE, PLASTIC, OR PRECAST CONCRETE OF GREATER COMPRESSIVE STRENGTH THAN CONCRETE SPECIFIED.
2. CONCRETE MATERIALS
i. CEMENTITIOUS MATERIAL: USE THE FOLLOWING CEMENTITIOUS MATERIALS, OF SAME TYPE, BRAND, AND SOURCE THROUGHOUT PROJECT:
a. PORTLAND CEMENT: ASTM C 150, PORTLAND CEMENT TYPE I.
b. FLY ASH: ASTM C 618, CLASS C OR CLASS F.
c. GROUND GRANULATED BLAST-FURNACE SLAG: ASTM C 989, GRADE 100 OR 120.
ii. NORMAL-WEIGHT AGGREGATES: ASTM C 33 UNIFORMLY GRADED, AND AS FOLLOWS:
a. COMBINED AGGREGATE GRADATION: WELL GRADED FROM COARSEST TO FINEST WITH NOT MORE THAN 18 PERCENT AND NOT LESS THAN 8 PERCENT RETAINED ON AN INDIVIDUAL SIEVE, EXCEPT THAT LESS THAN 8 PERCENT MAY BE RETAINED ON COARSEST SIEVE AND ON NO. 50 SIEVE, AND LESS THAN 6 PERCENT MAY BE RETAINED ON SIEVES FINER THAN NO. 50.
b. USE CRUSHED LIMESTONE COARSE AGGREGATE FOR CONCRETE EXPOSED TO WEATHER.
iii. WATER: POTABLE AND COMPLYING WITH ASTM C 94/C 94M.
iv. AIR-ENTRAINING ADMIXTURE: ASTM C 260.
v. CHEMICAL ADMIXTURES: ADMIXTURES CERTIFIED BY MANUFACTURER TO BE COMPATIBLE WITH OTHER ADMIXTURES AND TO CONTAIN NOT MORE THAN 0.1 PERCENT WATER-SOLUBLE CHLORIDE IONS BY MASS OF CEMENTITIOUS MATERIAL.
vi. NOTE: WHERE CLASS A, B, OR C CONCRETE IS REFERENCED IN PLANS OR SPECIFICATIONS, THE CLASS IS AS DEFINED IN ACI 347-04.
3. CURING MATERIALS
i. ABSORPTIVE COVER: AASHTO M 182, CLASS 3, BURLAP CLOTH MADE FROM JUTE OR KENAF, WEIGHING APPROXIMATELY 9.02 OZ./SQ. YD. (305 G./SQ. M



LIGHTING PHOTOMETRIC
SCALE : 1/64" = 1FT

Statistics						
Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Car Parking_Grade	✕	1.2 fc	8.9 fc	0.1 fc	89.0:1	12.0:1
Paved Areas_Grade	✕	1.5 fc	8.9 fc	0.1 fc	89.0:1	15.0:1
Property Line	+	0.0 fc	0.2 fc	0.0 fc	N/A	N/A
Site_Grade	+	0.2 fc	10.2 fc	0.0 fc	N/A	N/A

Schedule								
Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lumens Per Lamp	Light Loss Factor	Wattage
□ ○	S1	8	Lithonia Lighting	RSX2 LED P4 50K R3 MVOLT SPA FINISH/ 17'- 6" POLE	RSX Area Fixture Size 2 P4 Lumen Package 5000K CCT Type R3 Distribution	25000	0.95	189.54
□ ○	S2	2	Lithonia Lighting	RSX2 LED P4 50K R5 MVOLT SPA FINISH/ 17'- 6" POLE	RSX Area Fixture Size 2 P4 Lumen Package 5000K CCT Type R5 Distribution	25667	0.95	189.54
□ ○	S3	1	Lithonia Lighting	RSX1 LED P2 50K R5 MVOLT SPA FINISH/ 17'- 6" POLE	RSX Area Fixture Size 1 P2 Lumen Package 5000K CCT Type R5 Distribution	10106	0.95	72.95

GENERAL NOTES

- GENERAL PLAN NOTES:
- MH: AS NOTED
 - POINTS CALCULATED AT: GRADE
 - LIGHT LOSS FACTOR: AS NOTED

No.	Revision/Issue	Date

Firm Name and Address

LIGHTSOURCE
THE LIGHTING & CONTROL EXPERTS

8719 CASTLE PARK DRIVE
INDIANAPOLIS, IN 46256
WWW.LIGHTSOURCEINDIANA.COM
p.317-598-6900

Project Name and Address

FOUNDERS POINT

SITE LIGHTING PHOTOMETRIC

Drawn By: ARH

Scale: As Noted

Date: 10/28/21

Drawing #: LS-21-2132 SITE

Sheet No.: **E101**

Disclaimer: This lighting submittal is strictly based on the information provided by LSI/Source, and is provided without warranty as to accuracy, completeness, reliability or otherwise. If the information (including but not limited to floor plans, reflected ceiling plans, electrical plans and specifications) provided by LSI/Source is incomplete or not current (i.e., recent revisions exist), the accuracy of proposed design may be adversely affected. Once this lighting submittal is received by the customer or architect (or contractor) it is the obligation of the customer or architect to coordinate in detail with a professional engineering advisor to determine whether the proposed design meets the applicable project requirements for lighting system performance, code compliance, safety, suitability and effectiveness for use in a particular application. In no event will LSI/Source be responsible for any loss resulting from any use of any information contained in this lighting submittal.