

Special Specification 7255

Pump Station Upgrade



1. DESCRIPTION

Work includes the replacement of the existing pump with a new dual pump system and a new electrical. Finish all materials, labor, tools, equipment, transportation, etc. as required for a complete electrical installation.

Furnish and install all items, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work must include, but are not limited to, materials, labor supervision, supplies, equipment, transportation, hoisting or rigging, storage, utilities, and all required permits and licenses.

Consideration will not be granted for misunderstanding of the scope or amount of work to be performed. Tender of a proposal conveys full contractor agreement of the items and conditions specified and indicated, scheduled, or implied on the Contract Documents, or required by the nature of this work.

Contractor must pay for all temporary power.

Contractor must provide all materials, labor and equipment as required to complete the project within design intent at no additional cost to the Owner or Tenant. Contractor must request additional information in cases of doubt.

All work must be in strict accordance with all applicable sections of the Electrical Specifications and Standards, and in strict accordance with the most recently revised versions of all applicable portions of all national, state, and local codes and standards. Modifications required by the above said authorities must be made without additional charge to the Owner. Where alterations to and deviations from the Contract Documents are required by said authority, report the requirements and secure approval before starting work. Where the Contract Documents are in excess of code requirements, the Contract Documents must govern. If there is a conflict between the Contract Documents and applicable codes, the latter must govern. Contractor must obtain a copy of the base building specifications and owners building standards before start of work.

2. MATERIALS

All materials must be new and conform to the applicable standards of recognized testing and approval agencies and must be UL listed.

Refer to the conditions of the Contract (general and supplementary) and the most recent edition of Department Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges General Requirements and Covenants Items 1–9: Abbreviations and Definitions, Instructions to Bidders, Award and Execution of Contract, Scope of Work, Control of Work, Control of Materials, Legal Relations and Responsibilities, Prosecution and Progress, and Measurement and Payment.

2.1. Grounding.

Grounding electrodes must be solid copper, 3/4 in. diameter by 10 ft.

2.2. Raceways.

Feeders and exposed conduit must be rigid galvanized steel. Intermediate metal conduit (IMC conduit may be used in interior dry locations.

Electrical metallic tubing (EMT) may be used where work is concealed in walls or ceiling spaces inside the building. Fittings must be steel set screw.

All transitions to above grade or out of the floor slab must be made with rigid steel conduit.

2.3. **Electrical Boxes.**

All boxes must be rigidly and securely fastened to the structural surface to which they attach. All boxes must be supported from a structural portion of the building independent of the raceway system.

Surface mounted boxes must be fastened by means of wood screws to wood, expansion bolts on concrete, toggle bolts on hollow masonry units, and machine screws on metal construction.

Exposed boxes must be supported by means of all-thread rods 1/4 in. diameter minimum. The all-thread rods must be secured to the structure.

Boxes concealed in walls must be secured to the wall stud with a minimum of two fasteners. Use wood screws in wood and machine screws in metal. Boxes that attach to metal studs must be fastened to a second wall stud by means of a backing brace or rod.

Boxes embedded in concrete or masonry boxes must have integral metal ears that embed into the concrete or masonry grout.

2.4. **Wiring Devices.**

Device cover plates must be impact resistant nylon plastic (stainless steel). The cover plate must match the style of wiring device and finish color of the wiring device.

2.5. **Lighting.**

Metal channels must be used as required to attach to the building structure and support the light fixtures as required. Lay in light fixtures must be supported from the building structure with 12-gauge galvanized carbon steel (ASTM-A-641) soft temper hanging wires.

3. **EQUIPMENT**

3.1. **Control Panels.**

Provide Weil No. 8111 Simplex, Three Phase, 230 V, type 4x enclosure. Panel must include LED lights mounted on door and switches inside, lockable pump disconnects, padlocking hasp, overload protection, control transformer, pump run switch, and power indicator. Floats must be Weil No. 8230.

The acceptable manufacturers listed in this Specification are used to establish standards of design, performance, quality, and serviceability and not to limit competition, not discriminate against an "approved equal" product of another manufacturer. Equipment of equal design to that specified will be acceptable upon approval by the Engineer. Written request for substitution will be considered if received one week before bid date. After bid date, requests for substitution will be considered only in cases of product unavailability or other circumstances beyond the control of the Contractor. Contractor must be responsible to:

- investigate the proposed substitute product to determine that it has the same accessories and is equal or superior in all respects to the specified product,
- provide the same guarantee for the substitute product as the specified product, and
- coordinate the installation of the equipment that is proposed to be a substitute with all other trades and include the cost of any changes required to complete the installation. Prepare shop drawings when required by the Engineer.

3.2. **Insulated Conductors.**

Acceptable manufacturers of Copper Conductor are as follows:

- American Insulated Wire,
- Encore Wire Ltd.,
- Southwire,
- Senator Wire & Cable Company, and
- United Copper Industries.

All wires must be copper with THHN-THWN, 600V insulation. Minimum size of wire must be 12 AWG. Conductor size 10 AWG and smaller be solid. Conductor size 8 AWG or larger must be stranded.

Wire must be color coded as required by local code. Conductors Number 10 and smaller must have colored insulation. Conductors Number 8 and larger must be color coded by means of field applied tape.

3.3. **Grounding.**

Provide electrical grounding conductors for grounding system connectors that match power supply wiring materials and are sized according the NEC with a green jacket.

3.4. **Raceways.**

Acceptable raceways are rigid galvanized steel (RGS), intermediate metal conduit (IMC) and electrical metallic tubing (EMT). Metallic conduit manufacturers must be allied tube and conduit Cop., Maverick Tube Corp., Western Tube and Conduit Corp, and Wheatland.

Flexible metal conduit (FMC) and liquid-tight flexible metal conduit (LFMC) conduit manufacturers must be as follows:

- Afflex,
- Electriflex, and
- Anamet Corp.

Polyvinyl chloride (PVC) conduit Manufacturers must be as follows:

- Carlon,
- Condux, and
- Cantex Industries.

Minimum size conduit is 3/4 in.

3.5. **Electrical Boxes.**

Acceptable manufacturers must be as follows:

- Appleton,
- Bowers,
- Cooper,
- Crouse Hinds,
- Race, and
- Thomas Betts.

Provide galvanized flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with

threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Plastic boxes are not acceptable.

Cast boxes must be used for all exterior locations and for exposed interior locations. Provide shallow cast-device boxes (FS) or deep cast-device boxes (FD) boxes as shown in the plans or as directed by the Engineer.

3.6.

Panelboards.

Acceptable manufacturers must be as follows:

- Eaton,
- General Electric,
- Schneider Electric, and
- Siemens Energy and Automation.

Each panelboard must have a short circuit current rating equal to or greater than the rating shown on the panelboard schedule or on the one-line diagram. The rating must be per underwriter's laboratories standard UL 67. The short circuit rating must be based solely on the ratings of the branch breakers in the panel. Series rating of standard ampere interrupting capacity (AIC) branch breakers with high ampere interrupting capacity (AIC) integral or remote main or feeder breakers is not acceptable. Panelboards must be marked with their maximum short circuit current rating at the supply voltage and must be UL listed. 240 V maximum panels must be rated 10,000 ampere interrupting capacity (AIC) root mean square symmetrical minimum. 480 V maximum panels must be rated 14,000 ampere interrupting capacity (AIC) root mean square symmetrical minimum.

Provide all spaces specified on the schedules complete with all breaker mounting accessories required to accommodate the breaker frame size specified.

All panelboards must be supplied with a separate dedicated ground bus. All bussing must be copper.

Provide full size neutral bus bars in all panels as required by the panel schedule and one line diagram.

Circuit breakers must be bolt-on thermal magnetic, molded case circuit breakers.

Panelboard bus structure and main lugs or main circuit breaker must have current ratings as shown on the panelboard schedule. Such ratings must be established by heat rise tests, conducted in accordance with UL standard 67. Bus structure must be insulated. Bus bar connections to the branch circuit breakers must be the "Distributed Phase" or phase sequence type. All current carrying parts of parts of the bus structure must be plated.

The panelboard bus assembly must be enclosed in a NEMA 1 (3R) lockable steel cabinet. The rigidity and gauge of steel to be as specified in UL standard 50 for cabinets. Wiring gutter space must be in accordance with UL standard 67 for panelboards. A circuit directory frame and card with a clear plastic covering must be provided on the inside of the door.

All wiring in the panelboards gutters must be neatly laced using "Ty-wraps" as manufactured by Panduit, or approved equal.

3.7.

Wiring Devices.

Acceptable manufacturers must be as follows:

- Arrow Hart,
- Hubbell,
- Leviton, and
- Pass & Seymour.

Provide heavy-duty AC quiet switches, the switches must be Hubbel 1221 (CS1221) or equal (120–277 V, 20 amps (amperes)). Switches must be single pole, double pole, three way, four way, key operated as required by the drawings. Switch must be self-grounding.

Provide heavy-duty duplex receptacles, Hubbell 5362 (5262) 2-pole, 3-wire, grounding, 20 amps (amperes), specification grade 125-V with metal plaster ears, design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated.

Provide “feed-thru” type ground-fault circuit interrupters, with heavy-duty duplex receptacles, Hubbell GF5362 (GF5262) capable of protecting connected downstream receptacles on single circuit, and of being installed in a 2-3/4 in. deep outlet box without adapter, grounding type UL-rated class A, Group 1, rated 20 amps (amperes), 120 V, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; with NEMA configuration 5-20R. All GFCI receptacles located exterior to the building must be weather resistant. The device must trip if the line or load side wiring connections are incorrectly installed.

Weatherproof outlets must have a Taymac cover that meets UL 514 for continuous use in a wet location.

Device cover plates must be impact resistant nylon plastic (stainless steel). The cover plate must match the style of wiring device and finish color of the wiring device.

Provide wiring devices and cover plates in finish colors as selected by the Architect.

3.8.

Overcurrent Protective Devices.

Acceptable circuit breaker manufacturers must be as follows:

- Eaton,
- General Electric,
- Schneider Electric, and
- Siemens Energy and Automation.

Acceptable fuse manufacturers must be as follows:

- Cooper Bussman and
- Mersen.

Provide molded-case thermal magnetic circuit breakers. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole. Two and three pole breakers must be common trip. The minimum short circuit rating of the circuit breakers must meet the short circuit rating of the panelboard as shown on the plans. Provide arc fault interrupting circuit breakers as shown on the plans and in locations required by the NEC.

Provide ground fault interrupting circuit breakers for heat trace cables and other similar systems. The breakers must have a 30MA trip rating.

Fuses rated up to 600 amps (amperes) must be UL class RK1. Fuses above 600–6,000 amps (amperes) must be UL Class L.

3.9.

Enclosed Switches.

Acceptable manufacturers must be as follows:

- Eaton,
- General Electric,
- Schneider Electric,
- Siemens Energy, and

■ Automation.

Provide heavy-duty safety switches. All safety switches must be NEMA type HD and be UL listed. Switches must be furnished with NEMA 3R enclosures.

The operating handle must be suitable for padlocking the handle in the off position with as many as three padlocks. The cover must be interlocked with the operating mechanism to prevent the opening of the cover when the switch is in the on position.

Provide the switches with fuses as shown on the plans or directed by the Engineer. Provide grounding lugs in each switch. Provide full rated neutral terminal blocks for switches with a neutral conductor.

Provide the switches with an engraved nameplate.

Lighting fixtures are specified on the plans. Substitutions must comply as shown on the plans and specifications. Submit complete product data with each fixture type.

Provide LED light sources as shown on the plans.

LED light fixtures must consist of an assembly that uses LEDs at the light source complete with a housing, reflector, LED array, electronic driver (ballast) and integral controls as specified on herein and on the light fixture schedule. The fixtures must be designed to operate in an average 25°C ambient temperature and be capable of operating in a 1–25°C environment. The lumen output must not decrease by more than 20% over an operational life of 50,000 hr.

Individual LEDs must be electrically connected so that the failure of one LED does not affect the other LEDs in the array. The LED boards must be serviceable form below the ceiling and plug in connector must be used so that the LED boards are field replaceable.

The color rendering index (CRI) must be 80 or greater. The correlated color temperature (CCT) must be as specified in the fixture shown on the plans.

Provide Accudrive, 120-277 V, UL listed, CSA certified drives. The drivers must be over 80% efficient and sound rated A. The driver must be capable of full range dimming without flicker over a range of 100% to 5% of rated lumen output. Provide a driver disconnecting means.

4. CONSTRUCTION

4.1. General.

All work must be in accordance with the NEC, local codes, state codes, and any other authority with lawful jurisdiction.

All work must be arranged in a neat, well organized manner. All services must be routed parallel and perpendicular to the primary lines of the building. Locate all operating and control equipment properly to provide easy access and arrange entire work with adequate access for operation and maintenance, and for proper code and manufacturers clearances.

4.2. Design and Performance Data.

Before the submitting of bids, Contractor must visit the jobsite and familiarize himself with all conditions affecting the proposed installation and must make provisions as to the cost thereof. Failure to comply with the intent of this paragraph will in no way relieve the Contractor of performing all necessary work shown on the plans.

The plans reflect the location, voltage, capacity, size and manner of routing of all utilities shown to be required on this project. It is the responsibility of the Contractor to visit the site to confirm the exact requirements for all electrical utility work required by these documents. Contractor must arrange for and provide electrical service on this site which may be used for temporary construction power.

The electrical drawings shown on the plans are diagrammatic in character and cannot show every connection in detail or every line of conduit in its exact location. These details are subject to the requirements of local ordinances and structural and architectural conditions. Contractor must carefully investigate structural and finish conditions and must coordinate with all other trades to avoid interference between the various phases of work.

Install splices and taps which have equivalent-or-better mechanical strength and insulation ratings than conductors being spliced. Keep conductor splices to a minimum. All splices must be accessible. Do not splice conductors in panelboards. Use splice and tap connectors which are compatible with conductor material.

Field verification of existing conditions must be the responsibility of the Contractor. Contractor must notify the Engineer of any discrepancies found before submission of bid. Contractor must take note that the drawings are schematic in nature and indicate the approximate locations of the electrical systems. Locate all items on-the-job measurements. Coordinate installation with other trades to ensure proper fit and access to all items.

As-built drawings will be required. Throughout the progress of the work of this contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the work transfer these changes to the Contract Documents files. Deliver the files along with a hard copy of the documents to the architect and refer to Division 1 for requirements.

Provide operation and maintenance manuals for all equipment installed under this Contract. The manuals must include product data, shop drawings, manufacturer's installation and operation instructions, and parts lists from the manufacturer. Submit manuals to the Engineer as required in the General Notes.

All equipment must be labeled using engraved phenolic plastic nameplates with 3/16 in. high lettering. Switchgear must be identified by name and voltage characteristics. Identify all loads served.

All panelboards must be provided with a typed circuit directory. The load description along with room numbers must be included. Identify all junction and pull boxes. The identification must indicate the circuits contained within the enclosure.

Guarantee all materials and labor for a period of 1 yr. past the date of beneficial occupancy.

4.3.

Demolition.

Relocate and reconnect active portions of the electrical system outside of the scope of demolition, as required to maintain a complete and operating system that is functionally equivalent to the pre-existing system before demolition.

All existing conduit and conductors serving the area under the Contract must not be re-used and must be terminated at last portion of circuit requiring energization before the demolition area. If a circuit services only the demolition area, remove all conduits and conductors back to the panelboard building grid box and de-energize the circuit breaker, making it a spare. Note "spare" accordingly on panelboard circuit directory for all unused circuitry.

Remove all existing unused electrical equipment, controls, conduit, hangers, wiring, etc. from above ceilings.

Remove all abandoned "Low Voltage" cabling including fire alarm cabling, telephone and data cabling, and security cabling from above ceilings.

Owner must have the option of retaining any items removed during demolition. Items rejected by the Owner must be disposed of offsite by the Contractor.

Items shown on the plans are given as an aid to the Contractor in pricing and are based on visual inspection.

4.4. **Insulated Conductors.**

Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL STD 486 and B.

No more than three current carrying conductors must be installed in a conduit unless so shown on the plans.

4.5. **Grounding.**

Provide a completely grounded system sized in accordance with article 250 of the NEC. Each piece of electrical apparatus must be solidly grounded with separate insulated green ground wire.

The ground electrode system must consist of the following:

- grounded service conductor at the service entrance, the building structural steel must be grounded by means of bonding jumper or conductor connected to the grounding electrode system,
- metal underground water pipe (if available) must be bonded to the ground electrode system,
- concrete encased grounding electrode must be provided, electrode must be installed per Article 250.52 of the NEC, and electrode must be a minimum of 20 ft. of bare copper grounding conductor sized in accordance with Article 250.66 but in no case less than #4 AWG, and
- provide a plate electrode as part of the grounding system in accordance with the NEC, plate electrode must be installed no less than 30 in. below finished grade, and must comply with NEC Article 250.52 (A)(6).

Provide bonding jumpers around insulated pipe joints as required.

Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug or bus.

Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.

Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

Weld grounding conductors to underground grounding electrodes.

Install clamp-on conductors to underground grounding electrodes.

All connections (excluding buried or encased) must be accessible for inspection and testing.

Upon completion of the electrical grounding and bonding system, measure the resistance to earth using the "Fall of Potential Method" with a ground resistance tester. The resistance to ground must be 10 ohms or less. Provide additional grounding electrodes as required to meet 10 ohms maximum resistance requirement.

4.6. **Raceways.**

Contractor to install raceway systems where indicated on the plans, complete with all J-boxes and pull boxes as necessary and noted in plans.

Polyvinyl chloride (PVC) conduit and fittings may be used for exterior underground work and in the floor slab. Minimum burial depth must be 24 in. below grade to the top of the conduit. All transitions to above grade or out of the floor slab must be made with rigid steel conduit. Transition to rigid steel before the elbow. These elbows must be polyvinyl chloride (PVC) coated or wrapped with tape in the field.

All raceways are to be concealed unless otherwise specifically indicated on the drawings. When exposed, the exact routing must be confirmed in the field with the Engineer before roughin.

All wiring must be in NEC approved raceways sized as shown on the plans, or, if not sized on the plans, in accordance with the NEC. Wiring of each type and system must be installed in separate raceways.

Provide raceway expansion joints for exposed and concealed raceways with necessary bonding conductor at building expansion joints and or structures where required to compensate for raceway or building thermal expansion and contraction.

All conduit systems must be installed complete before conductors are pulled. Metal conduit systems must be electrically continuous throughout. Conduit supported from ceiling, fixture, or mechanical system supports will not be accepted.

All conduits must be installed perpendicular and parallel to the building lines; all breaks and turns in exposed conduit runs must be made with cast fittings with cadmium or hot galvanized covers. All conduit fittings must meet or exceed the recommendations of the manufacturer of the conduit. Approval of the Engineer or Inspector must be obtained for location and aesthetics of every run of exposed raceway before installation.

Minimum size conduit is 3/4 in.

All conduits must be securely fastened in place on maximum of 10 ft. intervals and within 3 ft. of each outlet box, junction box, cabinet or fitting. Hangers supports or fastenings must be provided at each elbow and at the end of each straight run terminating at a box or cabinet.

4.7.

Electrical Boxes.

Provide galvanized flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Plastic boxes are not acceptable.

All boxes must be rigidly and securely fastened to the structural surface to which they attach. All boxes must be supported from a structural portion of the building independent of the raceway system.

Surface mounted boxes must be fastened by means of wood screws to wood, expansion bolts on concrete, toggle bolts on hollow masonry units and machine screws on metal construction.

Exposed boxes must be supported by means of all-thread rods 1/2 in. diameter minimum. The all-thread rods must be secured to the structure.

Boxes concealed in walls must be secured to the wall stud with a minimum of two fasteners. Use wood screws in wood and machine screws in metal. Boxes that attach to metal studs must be fastened to a second wall stud by means of a backing brace or rod.

Boxes embedded in concrete or masonry boxes must have integral metal ears that embed into the concrete or masonry grout.

4.8.

Panelboards.

Panelboard bus structure and main lugs or main circuit breaker must have current ratings as shown on the panelboard schedule. Such ratings must be established by heat rise tests, conducted in accordance with UL Standard 67. Bus structure must be insulated. Bus bar connections to the branch circuit breakers must be the "Distributed Phase" or phase sequence type. All current carrying parts of parts of the bus structure must be plated.

The panelboard bus assembly must be enclosed in a NEMA 1 (3R) lockable steel cabinet. The rigidity and gauge of steel to be as specified in UL standard 50 for cabinets. Wiring gutter space must be in accordance with UL Standard 67 for panelboards. A circuit directory frame and card with a clear plastic covering must be provided on the inside of the door.

Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored. All panels must be mounted plumb and level.

The panelboards circuit directory must be typed indicating what each circuit serves with spares and spaces indicated in pencil.

All wiring in the panelboards gutters must be neatly laced using "Ty-wraps" as manufactured by Panduit, or approved equal.

4.9. **Wiring Devices.**

Test all receptacles with a receptacle tester to assure that all receptacles are properly wired and functional.

4.10. **Lighting.**

Support fixtures from the building structure. Metal channels must be used as required to attach to the building structure and support the light fixtures as required. Lay in light fixtures must be supported from the building structure with 12-gauge galvanized carbon steel (ASTM-A-641) soft temper hanging wires. Provide one hanger at each corner of each lay in light fixture 12 in. and wider. Supporting the fixtures from the ceiling supports is not acceptable.

Fasten surface mounted and pendant fixtures securely to structural supports. All pendant fixtures must be plumb and level.

Clean all lighting fixtures of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.

5. MEASUREMENT

The replacement of the existing pump with a new dual pump system and a new electrical will be measured by the each.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Pump Station Upgrade" of the type specified. This price is full compensation for installing, relocating, and removing existing pump system, placing new pump system; electrical wiring and conduit; and all necessary materials, equipment, labor, tools, and incidentals.