

SECTION 15000

BASIC MECHANICAL REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes basic mechanical requirements to complete the work as shown on the Contract Drawings and as specified herein. Provide all work and miscellaneous items, not specifically mentioned by reasonably inferred for complete operable systems.

1.02 DESIGN REQUIREMENTS

- A. Design anchorage and secure mechanical equipment in accordance with applicable code. In addition, design anchorage and secure equipment to withstand a lateral force of 0.6 times the weight of the equipment, if such requirement is more stringent.

1.03 SUBMITTALS

- A. General: The following are in addition to the submittal requirements in the individual Division 15 Sections.
 - 1. Material list
 - 2. Manufacturer's data: Certified by the factory's corporate officer
 - 3. Shop drawings: As required under the general requirements specified in this Section and as required under individual Division 15 Sections.
 - 4. Calculations: Structural calculations showing that equipment anchorage will withstand applicable lateral force. Submit other calculations as specified in individual Sections. Calculations shall be signed and sealed by professional engineer licensed in the State of California.
- B. Material List:
 - 1. Submit a complete list of material and equipment proposed for the job, including manufacturer's name.
 - 2. Reference all listings to paragraphs to which they are applicable.
 - 3. List only name of manufacturer. Catalog numbers and performance data not to be included at this time.
 - 4. Submit complete list of materials and equipment, even if same as specified or shown on the Contract Drawings.

- C. Manufacturer's Data:
 - 1. Submit after review of material list. Include data for all material and equipment that will be installed.
 - 2. Include complete catalog information such as construction, capacity, types, pump curves, sizes, finish, mounting methods and operating noise levels. Provide factory certified submittals.
 - 3. Reference all listings to paragraphs to which they are applicable and submit in brochure form.
 - 4. For any material specified as ASTM, Federal Specifications, or industry standards, furnish the manufacturer's certification that the material furnished for the work does in fact equal or exceed such requirements.
- D. Submittals shall be factory or manufacturer certified.
- E. Shop Drawings: Submit the following at 3/8 inch scale or larger, in order to show all pertinent features of the equipment and method of installation and connection to the work. These requirements are in addition to those specified in Section 01300, Submittals and Deliverables.
 - 1. Equipment layout drawings to scale, including equipment, ductwork, piping, including plumbing, accessories, showing clearance for operating and servicing. Indicate bottom elevations for all equipment. Indicate all existing equipment and ductwork, piping, and point of connection of new work.
 - 2. Piping diagrams of all major systems, showing all equipment, accessories, and sizes.
 - 3. Wiring diagrams shall include all low and line voltage wiring and equipment.
- F. Submit Operations and Maintenance Manuals (O&M Manuals) as specified in Sections 01730, Operations and Maintenance Manuals, all mechanical equipment and systems in.

1.04 COORDINATION

- A. Perform Work in cooperation with all other trades in order to secure the best arrangement of the Work. Make no changes in the work without the written approval of the Engineer.
- B. Verify that utility requirement characteristics of operating equipment are compatible with utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work, which are indicated diagrammatically on the Contract Drawings. Follow

routing shown for pipes, ducts, and conduit as closely as practicable. Place runs parallel.

- D. Scaled and figured dimensions are approximate. Before proceeding with any work, carefully check and verify dimensions.
- E. Equipment size and locations shown on the Contract Drawings are based on the dimensions of a particular manufacturer or dimensions of typical equipment of class indicated. Check the Contract Drawings, as well as actual equipment dimensions, and ensure that the equipment will fit into the spaces provided. If required for coordination with other work or if requested by the Engineer, prepare shop drawings indicating a suitable arrangement of proposed equipment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. For exterior storage of fabricated products, place on sloped supports, above ground.
- B. Provide off-site storage and protection when site does not permit on-site storage or protection.
- C. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

PART 2 – PRODUCTS

2.01. MATERIALS - GENERAL

- A. Provide materials, including auxiliary equipment, unless otherwise noted.
- B. Materials shall be of the quality specified. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new material.
- C. Verify that items specified by manufacturer's name and product number meet the requirements of the Specifications. Do not assume when a manufacturer's name and product name or number appears in these Specifications that the manufacturer and standard catalogue item meets the requirements of the Specifications.
- D. Equipment installed as part of the Work shall have local representation, local factory authorized service, and a local stock of repair parts, unless an exception is approved by the Engineer.
- E. Manufacturer for each type of material shall be the same throughout the Work.

2.02 MATERIALS

- A. Sleeves for Walls and Slabs: Schedule 40, galvanized steel pipe.

- B. Protect metallic structures against corrosion. Provide equipment with manufacturer's standard rust-inhibiting treatment and the finish, unless otherwise specified.
- C. Ferrous fittings, such as anchors, bolt rods nuts and miscellaneous parts, except stainless steel fittings, shall be hot dip galvanized.
- D. Sealing Compound: An incombustible, permanently plastic, waterproof non-staining compound leaving a finished smooth appearance.
- E. Backer: An incombustible fibrous glass recommended for specified application.

PART 3 – EXECUTION

3.01 GENERAL

- A. Prior to commencing work of this Section, inspect the installed work of other trades and verify that such work is complete to the point where this installation may commence. Verify that the completed installation will conform with all pertinent codes and regulations, the Contract Drawings, approved submittals, and the referenced standards. In the event of discrepancy, notify the Engineer immediately and proceed as directed.
- B. Follow the manufacturers' published directions in installation of piping, equipment, and material, except when otherwise required in the Contract Documents.
- C. Install and use material and equipment only in a manner for which it is approved and manufactured.
- D. Do not use aluminum in contact with earth and, where connected to dissimilar metal, protect with suitable fittings and treatment.
- E. Provide anchor bolts for all equipment placed on concrete pads and slabs. Anchor bolts shall be the size and number recommended by the equipment manufacturer, complying with structural calculations, and located by means of templates.

3.02 SLEEVES AND OPENINGS

- A. Provide sleeves for each pipe passing through slabs and walls, whether shown or not.
- B. Set all pipe sleeves and inserts in place before concrete is poured. Coordinating the placing of these items to avoid delaying concrete placing operations.
- C. Sleeves for non-insulated pipe shall be two pipe sizes larger than pipe passing through or a minimum of 1/2 inch clearance between inside the sleeve and outside pipe.

D. Length of sleeve as follows:

Sleeve Locations	Sleeve Length
Slabs	Equal to depth of slab construction including finish. Extend minimum of 2 inches above floor level in finished area and in pipe areas.
Roofs	Equal to depth of slab construction including insulation.
Walls	Equal depth of construction and terminated flush with finished surfaces.

E. Seal space between the pipe and the sleeve under all escutcheons with a sealing compound or pack with backer to within 1/2 inch of both wall faces and provide sealing compound on both faces.

3.03 REPAIR AND RESTORATION

A. Repair, grout, refinish, and apply touch-up paint, as necessary to make the facility like new, where structures are affected by the installation of mechanical systems.

3.04 ADJUSTMENT, CLEANING, AND OPERATION PRIOR TO COMPLETION

- A. When mechanical or electrical equipment is operable and with the written permission of the Engineer, the Contractor may operate equipment. Supervise such operation. The warranty period shall, however, not commence until the date specified in General Provisions 4.6, Guaranty of Work.
- B. Regardless of whether equipment has or has not been operated, clean and adjust equipment before Final Acceptance. Replace filters if equipment has been operated and as otherwise required in the Contract Documents.

3.05 TRAINING

A. When training is required under other Sections of Division 15, provide the services of manufacturer’s qualified factory trained field service engineer for a one, eight hour working day session at the site to instruct Owner personnel in the operation and maintenance of the pump units. This eight hour working day session for training is separate and independent of the requirements set forth for the manufacturer’s representative for start-up and testing. Utilize operation and maintenance manuals as text for instruction.

END OF SECTION

SECTION 15150 PLUMBING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section consists of furnishing and the installation of plumbing systems, complete with pipe and fittings, appurtenances, components and other accessories as shown on the Contract Drawings and specified herein.

1.02 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers (ASME):
 - 1. B1.1 Unified Inch Screw Threads
 - 2. B16.1 Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250)
 - 3. B16.3 Malleable Iron Threaded Fittings
- B. American National Standards Institute (ANSI)
 - 1. A13.1 Scheme for for Identification of Piping Systems
- C. American Society for Testing and Materials (ASTM International):
 - 1. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 2. A74 Specification for Cast Iron Soil Pipe and Fittings
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - 1. SEIS Seismic Restraints: Guidelines for Mechanical Systems

1.03 SUBMITTALS

- A. Refer to Section 15000, Basic Mechanical Requirements, for additional submittals.
- B. Product Data: Submit technical literature covering drawings and details of equipment, fixtures and accessories furnished under this Section.

1.04 COORDINATION

- A. Coordination: Coordinate plumbing with the other mechanical work, and all underground piping work in accordance with the requirements of this Section. Coordinate plumbing with concrete work and masonry work where pipe sleeves may be required.

- B. Codes and Regulations: Where larger sizes are required by the applicable code, the more stringent requirements shall prevail.
- C. Should field conditions or other causes necessitate rearrangement of plumbing work, obtain Engineer's approval of the proposed arrangement before work is started.
- D. Space Limitation: Keep plumbing work within the spaces indicated in the design to receive such work. Conceal piping in finished spaces. Should other openings or spaces be necessary, notify the Engineer and make such openings or spaces.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Furnish and install materials and accessories as shown on the Contract Drawings and as required, complete with components, trims and miscellaneous facilities.
- B. Threads: Conforming to ASME B1.1.

2.02 PIPE

- A. Pipe: ASTM A74, cast iron, Class 150
- B. Pipe: ASTM A53, galvanized or black iron pipe, threaded
- C. Flanges: ASME B16.1, cast iron, Class 125, threaded
- D. Fittings: ASME B16.3

2.03 GATE VALVES

- A. Iron Body, Bronze Trim, Rising Stem and Handwheel, OS&Y, Single Wedge, Flanged Ends, Class 125.

2.04 CHECK VALVES

- A. Iron Body, Bronze Trim, Swing Disc, Renewable Disc and Seat, Flanged Ends, Class 150.

2.05 DIELECTRIC CONNECTIONS

- A. Joints between ferrous and non-ferrous piping shall be made with dielectric insulating unions, suitable to withstand the pressure, temperature and characteristics of service. Where flanged dielectric joints are required, special insulating gaskets, sleeves, and washers shall be provided to ensure proper connection.

2.06. HANGERS AND SUPPORTS

- A. Hangers and supports shall be capable of adjustment after piping is erected. Hanger and support shall be standard product and type best suited for the

service or condition required, as manufactured by Superstrut, Grinnell, or Engineer approved equal.

- B. Hanger spacing and seismic restraints shall be as required in SMACNA SEIS.

2.07 PIPING IDENTIFICATION

- A. Band or Tape: Permanent type linear polyethylene, fiberglass or mylar snap-on bands or pressure-sensitive, color-coded tapes with contrasting lettering to identify each piping service per ANSI A13.1.
- B. Flow arrow shall be of the same color as pipe service.

2.08 UNDERGROUND CORROSION PROTECTION

- A. Corrosion Protective Tape: Type suitable for application specified. Furnish in widths as recommended by the manufacturer as best suited for pipe size being wrapped.
- B. Primer: As required by tape manufacturer.

PART 3 – EXECUTION

3.01 GENERAL PIPING WORK

- A. Arrange and provide for the necessary openings in walls and the proper roughing-in of the plumbing work. Rough in shall be exact to measurements furnished by the manufacturer.
- B. Clean pipe, fittings, and valves of grease, dirt, and scale before installation. Keep temporary pipe openings closed during the performance of the Work. Ream pipe ends smooth and remove all burrs before installation.
- C. Cut pipe accurately to measurements taken on the job. Install offset connections for alignment of vertical to horizontal piping and where required to make a true connection. Bent or sprung pipe is not acceptable. Piping connections shall have unions where necessary for replacement and repair of equipment. Install gate valves where shown and where necessary for proper operation and service. Install vertical piping plumb and horizontal piping parallel to walls of the storm water lift system structure and similar structures. Support piping as required to prevent vibration. Coordinate anchor supports with pre-cast concrete structure fabrications.
- D. Provide venting of plumbing work as required by applicable code and as shown on the Contract Drawings.
- E. Threaded joints shall be full and clean cut. Ream ends of pipe to the full inside diameter, and not more than three threads exposed beyond fittings. Make-up joints tight with graphite joint compound. Use manufacturer approved pipe compound on screwed joints.

- F. Factory prepare as much of the plumbing system internal to the storm water lift system as possible. Field install plumbing system in accordance with manufacturer's recommendations and this Section.
- G. Finally adjust hangers, both in the vertical and horizontal directions.
- H. Coordinate the plumbing system with the electrical work other trades associated with the installation and operation of mechanical equipment.
- I. Sleeves: As specified in Section 15000, Basic Mechanical Requirements.

3.02 PIPING IDENTIFICATION

- A. Apply piping identification bands or tapes to identify each piping service per ANSI A13.1.
- B. Point arrow in the direction of flow and apply at location with maximum visibility.

3.03 UNDERGROUND CORROSION PROTECTION

- A. Spiral wrap carbon steel and copper pipe installed underground or below concrete slabs with corrosion protective tape to a 20 mil thickness. Thoroughly clean, dry, and remove sharp points, and then prime before wrapping.
- B. Apply tape tightly with 1/2 inch minimum overlap, free from wrinkles and voids. Use wrapping machine as recommended by tape manufacturer.

END OF SECTION

SECTION 15550

STORM WATER LIFT STATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for packaged storm water pump lift stations.

1.02 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM International):
 - 1. C443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - 2. C478 Specification for Precast Reinforced Concrete Manhole Sections
- B. State of California Department of Transportation Bridge Design Specifications (Caltrans)
- C. Standard Specifications for Public Works Construction (SSWPC):
 - 1. Section 208-6 Pipe to Manhole Flexible Couplings

1.03 DEFINITIONS

- A. H-20 loading: As defined in Caltrans Bridge Design Specifications.
- B. NEMA: National Electrical Manufacturers Association.

1.04 PERFORMANCE REQUIREMENTS

- A. Operating Conditions: Each pump shall be capable of delivering scheduled flow at scheduled dynamic head. All openings and passages shall be large enough to permit the passage of a sphere three (3) inches in diameter.

1.05 SUBMITTALS

- A. Refer to Section 15000, Basic Mechanical Requirements, for additional submittals.
- B. Product Data:
 - 1. Dimensional drawings of lift station drawn to scale indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, and power requirements.

3. Certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include net positive suction head (NPSH) curve and total dynamic head (TDH) calculations.
 4. Include a performance chart for motor showing curves for torque, current, power, factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.
 5. Mass moment of inertia calculations for the impellers upon the Engineer's request.
 6. Indicate materials of construction.
 7. Electrical characteristics and connection requirements.
- C. Shop Drawings: The shop drawings shall include the following:
1. Dimensions of sump manhole, equipment, anchors, steps or ladders, pipe supports, attachments, lifting points, tappings, drains, piping, valve, fittings, float switches and access cover and locking hardware.
 2. Structural calculations and shop drawings for precast reinforced concrete valve vault manhole and other precast drainage structure components.
 3. Any fabricated items not detailed on Contract Drawings.

1.06 DELIVERABLES

- A. Submit certificates of factory and manufacturer's representative's on-site inspection, testing, and approval to the Engineer.
- B. Operation and Maintenance Data: Submit as specified in Sections 01700, Contract Closeout, and 15000, Basic Mechanical Requirements. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.07 QUALITY ASSURANCE

- A. Notify the Engineer prior to and perform all testing during progress of the work in the presence of the Engineer.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum ten years experience.
- C. Structural calculations and shop drawings for precast reinforced concrete valve vault manhole and other precast drainage structure components shall be sealed and signed by a registered structural engineer licensed in the State of California.

1.08 WARRANTY

- A. Warranty: Submit five year manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Equipment and appurtenances for each packaged storm water lift station shall include two pumps; valves; internal piping; central control panel with circuit breakers; motor starters; level controls; electrical controls and wiring; electrical service connection; precast concrete valve pit vault; concrete work; and miscellaneous appurtenances.
- B. Provide pumps with manufacturer's name, model number, and rating/capacity clearly identified.
- C. Provide pumps complete with the following features and appurtenances:
 - 1. Submersible, centrifugal, duplex arrangement, non-clog pumps.
 - 2. Precast reinforced concrete valve vault manhole structure, galvanized steel steps, pipe supports, and similar items.
 - 3. Pump guide rails shall be custom stainless steel construction and shall allow pump lift-out assembly and pump to move from bottom of guide to top of guide without binding. The lift-out assembly shall be easily removable from the top of rail.
 - 4. Liquid level sensors, control panel complete with starters, alternator, controls, and alarm lights.
 - 5. Plumbing: Provide each pump discharge with a check valve and a gate valve.
 - 6. The motor and pump shall be designed and assembled by the same manufacturer.
 - 7. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity.

2.02 SUBMERSIBLE CENTRIFUGAL NON-CLOG PUMPS

- A. Pumps: Submersible centrifugal non-clog type for wet pit installation, capable of continuous submergence to the maximum depth indicated in the Contract Documents.
- B. When lowered on its guide rail, each pumping unit shall be automatically and firmly connected to a discharge fitting permanently mounted on the discharge pipe. Sealing of the discharge connection by means other than metal to metal contact of the pump discharge flange and the discharge fitting will not be acceptable. The guide rail system shall be furnished, complete by the lift station manufacturer or in accordance with manufacturer's recommendations. Each pump shall be equipped with a lifting chain and power cable of sufficient strength and length to permit easy removal for inspection or repair.

2.03 MOTOR

- A. Pump Motor: Induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 311 degrees F. The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The motor shall be designed for continuous duty handling pumped media of 104 degrees F 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 degrees F 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.
- B. The combined service factor shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10 percent. The motor shall be designed for operation up to 104 degrees F ambient and with a temperature rise not to exceed 144 degrees F.
- C. Motors shall be sufficiently cooled by the surrounding environment or pumped media. A water cooling jacket shall not be required.
- D. 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. Motors shall be capable of continuous submergence to a depth of 65 feet without loss of watertight integrity.

2.04 ELECTRICAL CABLE AND PROTECTION

- A. Size power cable in accordance with the National Electric Code (NEC) and Insulated Cable Engineers Association (ICEA) standards with sufficient length to reach the junction box above sump pit without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber.
- B. The cable entry seal design shall include specific torque requirements to ensure 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.
- C. All starters shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 260 degrees F, the thermal switches shall open and stop the motor.

2.05 BEARINGS

- A. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease 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.

2.06 MECHANICAL SEAL

- A. Provide each pump 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 ceramic seal ring and one positively driven rotating carbon seal ring. Each seal interface shall be held in contact by its own spring system. Each pump shall be provided with an oil chamber for the shaft sealing system.

2.07 PUMP SHAFT

- A. Pump motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Coupling shall not be acceptable. The pump shaft shall be stainless steel.

2.08 IMPELLER

- A. Impellers: Gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long through outlet without acute turns. The impellers shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in storm water. Impellers 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 alkyd resin primer.

2.09 WEAR RINGS

- A. 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.

2.10 VOLUTE

- A. Pump Volute: Single-piece gray cast iron, Class 30, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

2.11 PIPING

- A. Piping associated with the plumbing system of the storm water lift station and its discharge pipe shall be ductile iron with mechanical joints for buried service and galvanized steel for exposed service in the sump and the valve vault. Piping shall be in accordance with the requirements specified under Section 15150, Plumbing, and the manufacturer's recommendations.
- B. The pump discharge piping embedded in concrete shall be welded steel with flanged ends, hot dip galvanized after fabrication.

- C. Size and type of inlet and outlet pipe varies. Refer to Contract Drawings and Section 02630, Storm Drainage System, for the requirements of inlet and outlet piping at sump manhole.

2.12 ELECTRICAL CONTROLS

- A. Design standard duplex control panel to operate two submersible pumps based on wet well level monitored by level sensors. There shall be three (3) level sensors required for automatic operation of duplex pump station and (1) level sensor for high level alarm. The controls shall be float operated, duplex, with corrosion resistant floats to alternate operation of pumps and cut-in the second pump on rising level or lead pump failure. Provide additional set of wired terminals for future wiring of a remote alarm circuit.
- B. The NEMA 1 control pump panel shall include the following:
 - 1. Integral fused main switch
 - 2. Pump short circuit protection
 - 3. Pump overload protection
 - 4. Pump direct on-line contactors
 - 5. Two (2) sets start capacitors and two (2) sets run capacitors
 - 6. Control transformer
 - 7. Control transformer primary and secondary protection
 - 8. Electromechanical and solid state logic components for interface with wet well level sensors, built-in pump sensors and selected standard options.
 - 9. Pump and control terminal blocks
 - 10. Panel mounted pilot lights and operators
 - 11. NEMA 1 padlock enclosure and mounting components
 - 12. Intrinsically safe relays for float circuits
 - 13. High water alarm: Flashing light (red), pump No. 1 operating light (green), and pump No. 2 operating light (green) to be mounted on controller enclosure door.
 - 14. H-O-A switches and status transformer type pilot lights
 - 15. Utility 120 volts duplex receptacle fed from separate internal 1 Kva transformer

16. Elapsed time meter
 17. Lightning suppresser
 18. Remote light contacts
 19. Individual pump starters with "soft start" modules and breakers
 20. Alternator relay and override relay
 21. Front of panel reset push-button
- C. All of the items shall be UL approved and provided with requirements as specified hereinafter.
- D. Sequence of operation of duplex controls shall be as follows:
1. When water level in pump pit reaches level sensors No. 2 (lead pump start sensor), the alternator provided for charging pump No. 1 and pump No. 2 duty (lead-lag alternating) will change its state and lead pump contactors will be energized. If water level continues to rise and reaches level sensor No. 3 (lag pump start sensor), the lag pump contactors will be energized until water level drops to level sensor No. 1 (pump's stop sensor).
 2. Auxiliary contacts of pump circuit breakers shall be introduced into the circuitry in such a way that pump's contactors will be de-energized if circuit breaker trip condition occurs.
 3. Auxiliary contacts of thermal overload relays shall be introduced into the circuitry so that pump's contactors are de-energized should a motor overload condition occur.
 4. Pump motor windings thermal switch shall be introduced into the circuitry via a control relay so that a pump's contactor is de-energized should high temperature of motor windings occur. It shall not be possible for pump to restart automatically but front of panel reset push-button shall be provided for manual clearing of the fault.
 5. If the inflow to the station is greater than the combined capacity of both pumps, the liquid levels will rise to the High Level Sensor No. 4 and send a signal to red alarm light.
 6. Flashing red light alarm trouble light indicates any trouble or failure of pumps to drain wet well.

2.13 PRECAST REINFORCED CONCRETE VALVE VAULT MANHOLE

- A. Reinforced concrete sump manhole shall conform to ASTM C478 and the applicable material and installation requirements of Sections 02630, Storm Drainage System, and 03300, Cast-in-Place Concrete.

- B. Ground Surface Elevation: As indicated in the Contract Documents.
- C. Ground Water Table Elevation: As indicated in the Contract Documents.
- D. Static Loads & Dynamic (Seismic) Loads: Refer to Geotechnical Investigation Report.
- E. Uplift: Refer to the Buoyancy Safety Factor specified in the Contract Documents and to contract-specific Geotechnical Investigation Report.
- F. Maximum Bearing Pressure: 4000 psf.
- G. Excavate and perform backfill operations for valve vault manhole as specified in Section 02300, Earthwork. Unless otherwise noted, place 18 inch deep crushed gravel over the bearing soil to provide a firm-bearing surface for the manhole foundation.
- H. Pipe to Precast Reinforced Concrete Sump Flexible Couplings: Shall conform to SSWPC Section 208-6. Couplings shall resist mild exposure to petroleum products.
- I. Joints shall be bell and spigot, single rubber O-ring gasketed, conforming to ASTM C443.
- J. Access cover shall be cast iron and designed for H20 loading with lockable hardware.
- K. Exterior surfaces of the manhole structure shall receive two coats, 7 mils per coat of "Kop-Coat" Bitumastic (Coal Tar) Super Service Black Coating System as manufactured by the Carboline Company, or Engineer approved equal.
- L. Provide knockouts in top slab of precast concrete structure to facilitate installation of electrical conduits, vent piping, and similar protrusions. Coordinate number and size of knockout requirements with storm water lift system equipment. Do not use access cover to facilitate the above.

2.14 PUMP CONTROL/ELECTRICAL ROOM

- A. Light for Outside Wall of Electrical Room: Provide exterior red light with vapor proof enclosure. Refer to Electrical Controls Article herein. This light shall flash indicating any trouble or failure of pumps to drain wet well.

2.15 VALVE ACCESS HATCHES

- A. The frame shall be of a single leaf design for H-20 loading and of sizes as shown on the Contract Drawings or the approved shop drawings. .
- B. Hatch: Extruded aluminum with an integral anchor flange and seat. Equip with a flush aluminum drop handle which does not protrude above the cover and an automatic hold open arm with red vinyl grip on a release handle. Hinges shall be all stainless steel with tamper proof stainless steel bolts and nuts, and be removable for maintenance after the access door is cast in place. Access door

shall be furnished with mill finish, cable holder, holes for cable holder and guide bracket. Aluminum surfaces which will be in contact with concrete shall be coated with "Bitumastic 300M" as manufactured by Kop-Coat or Engineer approved equal.

- C, Equip access hatch with locking assembly consisting of self latching stainless slam lock and with a recessed hasp so that it can be locked with a padlock. The assembly shall not create obstruction or hazard for pedestrian traffic.

2.16 PUMP ACCESS HATCH

- A. Access Hatch: Dual leaf design for H2O loading and of a size as shown on the Contract Drawings or the approved shop drawings.
- B. Hatch: Extruded welded steel with an integral anchor flange and seat. Equipped with a flush steel drop handle, which does not protrude above the cover and an automatic hold open arm with red vinyl grip on a release handle. Hinges shall be all stainless steel with tamper proof stainless steel bolts and nuts, and be removable for maintenance after the access door is cast in place. Access door shall be furnished with slip resistant galvanized diamond plate steel, Torsion spring assisted access door with hold open attachments. All parts shall be hot dipped galvanized. The walking surface shall be non-slip and rated for pedestrian service.
- C. Equip access hatch with locking assembly consisting of self latching stainless slam lock and with a recessed hasp so that it can be locked with a padlock. The assembly shall not create obstruction or hazard for pedestrian traffic.

2.17 SOURCE QUALITY CONTROL

- A. Perform tests to verify operation of electrical circuits and devices prior to shipment.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ensure pumps operate at specified system fluid temperature without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of mid-point of published efficiency curve.
- B. Coordinate the size of the precast concrete manhole sump structure with the storm water lift station system equipment, including but not limited to pumps, plumbing and electrical components. Ensure that there is adequate space within the structure to remove both pumps and to access the structure to perform periodical maintenance.
- C. Install plumbing and electrical components of the storm water pump system in accordance with Section 15150, Plumbing, and applicable Sections of Division 16, Electrical.

3.02 START-UP, TESTING AND INSPECTION

- A. Provide services of manufacturer's representative on-site to assist with the start-up, testing, and inspection after the packaged storm water pump system has been installed.
- B. The manufacturer's representative test shall include:
 - 1. Megger starter and power cables.
 - 2. Check seal lubrication.
 - 3. Check for proper rotation.
 - 4. Check power supply voltage.
 - 5. Measure motor operated load and no load current.
 - 6. Check level control operation and sequence.
 - 7. Single pump and dual pump operation test on manual and automatically as directed by the level control system.

3.03 FIELD QUALITY CONTROL AND INSPECTION

- A. Pressure test entire assembly (pump discharge piping) prior to embedding in concrete.
- B. After completion of the work of this Section and with the agreement of the Engineer, place storm water pump system in operation. Acceptance will not be made until the system has operated satisfactorily for a period of not less than 30 days from the date designated by the Engineer. This test period shall be included with the specified contract time. Operation of the system shall not in any way be construed as an acceptance of the system, or any part of it, or as a waiver of any of the provisions of this Contract. The Contractor shall be responsible for the system during this period of operation. Make any adjustments or repairs which may be required and remedy defects or damages which may occur. The Owner will pay the electrical energy cost consumed by the system during this trial operation.

3.04 TRAINING

- A. Provide training for Owner personnel as specified in Section 15000, Basic Mechanical Requirements.

END OF SECTION

SECTION 15750

PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes requirements for roof mounted, self-contained units, with electric cooling, and electric or reverse refrigeration cycle (heat pump) heating and related controls; including:
 - 1. Packaged rooftop unit
 - 2. Controls
 - 3. Remote panel
 - 4. Roof mounting frame and base
 - 5. Maintenance service

1.02 REFERENCES

- A. Air Conditioning and Refrigeration Institute (ARI)
 - 1. 210/240 Performance Rating of Unitary Air-Conditioning and Air-Source Heatpump Equipment
 - 2. 270 Sound Rating of Outdoor Unitary Equipment
- B. National Fire Protection Association (NFPA):
 - 3. 90A Installation of Air-Conditioning and Ventilation Systems

1.03 SUBMITTALS

- A. Product data and schematic layouts showing condensing units, cooling coils, refrigerant piping and accessories required for complete system. Include complete pipe sizing data.
 - 1. Include rated capacities, dimensions, weights, accessories, required clearances, electrical requirements, wiring diagrams and location and size of field connections.
- B. Manufacturer's installation instructions
- C. Operation and maintenance manual (O&M Manual)

1.04 MAINTENANCE SERVICE

- A. Furnish complete service and maintenance of packaged rooftop units for one year from date of substantial completion.

- B. Provide maintenance service with a two month interval as maximum time period between calls. Provide 24-hour emergency service on breakdowns and malfunctions.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data including minimum of six filter replacements, minimum of one fan belt replacement and controls checkout, adjustments and recalibrations.
- D. Submit copy of service call work order or report and include description of work performed.

1.05 EXTRA MATERIALS

- A. Provide one set of filters.

1.06 WARRANTY

- A. Provide five-year manufacturer's material replacement warranty for compressor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Carrier Corp.
- B. AAON, Inc.
- C. Trane Co.
- D. Or Engineer approved equal

2.02 MANUFACTURED UNITS

- A. Provide roof mounted units complete with electric heating elements and electric refrigeration as scheduled.
- B. Provide units which are self-contained, packaged, factory assembled and prewired consisting of insulated cabinet and frame, supply fan, electric heating elements, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.03 MATERIALS

- A. Cabinet: Galvanized steel with baked enamel finish, access doors or removable access panels, with quick fasteners, screwdriver operated flush cam type or locking door handle type with piano hinges. Provide structural members a minimum of 18 gage with access doors or removable panels a minimum of 20 gage.
- B. Insulation: 1 inch thick neoprene coated glass fiber on surfaces where conditioned air is handled. Protect edges from erosion.
- C. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley and rubber isolated hinge mounted motor or direct drive. Isolate complete fan assembly.

- D. Air Filters: 1-inch thick permanent washable.
- E. Roof Mounting Frame: 14-inch high galvanized steel channel frame with gaskets and nailer strips.

2.04 EVAPORATOR COIL

- A. Provide copper or aluminum tube and aluminum fin assembly with galvanized drain pan and connection.
- B. Provide thermostatic expansion valves and alternate row circuiting for units 7-1/2 tons cooling capacity and larger.

2.05 COMPRESSOR

- A. Provide the compressor which is hermetic or semi-hermetic, 3600 rotations per minute maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter dryer.
- B. Delay compressor start with five minute timed off circuit.
- C. Provide outdoor thermostat which will energize compressor control circuit above 35 degrees F ambient.
- D. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve and solid state defrost control utilizing thermistors.
- E. Provide hot gas bypass or cycling compressors for capacity control.

2.06 CONDENSER

- A. Provide coil with copper or aluminum tube and aluminum fin assembly with subcooling rows.
- B. Provide condenser fans which are direct drive propeller fans, resiliently mounted with fan guard, motor overload protection wired to operate with compressor.
- C. Provide heat pressure control by refrigerant pressure switches cycling the condenser fans for unit operation down to 35 degrees F outdoor temperature.

2.07 SUPPLY/RETURN CASING

- A. Dampers: Provide outside, return and relief dampers with damper operator and control package to automatically vary outside air quantity.
- B. Gaskets: Provide tight fitting dampers with edge gasket, maximum leakage 5 percent at 2 inches WC pressure differential.
- C. Damper Operator: Provide 24 volt with gear train sealed in oil with spring return on units 7-1/2 tons cooling capacity and larger.

2.08 OPERATING CONTROLS - SINGLE ZONE UNITS

- A. Electric solid state microcomputer based room thermostat located as indicated in service area with remote sensor located as indicated.
- B. Incorporate the following in room thermostat:
 - 1. Automatic switching from heating to cooling
 - 2. Preferential rate control to minimize overshoot and deviation from set point
 - 3. Set-up for four separate temperatures per day
 - 4. Instant override of set point for continuous or timed period from one hour to 31 days
 - 5. Short cycle protection
 - 6. Programming based on weekdays, Saturday and Sunday
 - 7. Switch selection features including imperial or metric display, 12 or 24-hour clock, keyboard disable, remote sensor, fan ON-AUTO switch
- C. Include room thermostat display as follows:
 - 1. Time of day
 - 2. Actual room temperature
 - 3. Programmed temperature
 - 4. Programmed time
 - 5. Duration of timed override
 - 6. Day of work
 - 7. System model indication: heating, cooling, auto, off, fan auto and fan on
 - 8. Stage (heating or cooling) operation

2.09 PERFORMANCE

- A. Base performance on ARI 210/240 test conditions unless specified otherwise. Sound rating numbers are in accordance with ARI 270.
- B. Rated heating and cooling capacities shall be as scheduled on the Contract Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and NFPA 90A.
- B. Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting frame level.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide initial startup and shutdown during first year of operation including routine servicing and checkout.

END OF SECTION