LIFT STATION AND FORCE MAIN SPECIFICATIONS SECTION 0 - GENERAL REQUIREMENTS PART 1 – GENERAL OVERVIEW

- 1.01 Definitions For the purposes of these Lift Station and Force Main Specifications ("Specifications"), the following definitions shall apply:
- "HSF" shall mean Hamilton Southeastern Utilities Inc. the public utility which provides sanitary sewer service in the Project (as hereafter defined) area. HSE's address is 11901 Lakeside Drive, Fishers, Indiana 46038, and HSE's phone number is (317) 577-2300. "Engineer" shall mean the engineer for HSE, which is Sanitary Management &
- Engineering Company, Inc. ("SAMCO") or SAMCO's engineers. SAMCO's inspector shall be the Engineer's representative during construction of the Project. SAMCO's address is 11905 Lakeside Drive, Fishers, Indiana 46038, and SAMCO's phone number is (317) 577-1150.
- "Subscriber" shall mean those signatories identified as Subscribers under a Special Contract for Extension of Sewer Mains and Facilities with HSE through which the Project is being undertaken. Subscriber is generally the Owner under a construction contract. This definition is intended to include all employees and/or agents acting in the interest of Subscriber.
- "Contractor" shall mean any construction contractor approved by HSE to construct. install, maintain, repair and remove public or Private sanitary sewer facilities within the HSE service area. This definition is intended to include all employees, sub-contractors and/or agents acting for or on behalf of the Contractor's company.
- "Design Engineer" shall mean the engineer sealing the Construction Plans, as opposed to the Engineer for HSE and the Record Drawing Engineer, both of whom are also defined under these Specifications. This definition is intended to include all employees, subcontractors and/or agents acting for or on behalf of the Design Engineer's company. "Record Drawing Engineer" shall mean the engineer who will certify the record drawings, as opposed to the Engineer for HSE and the Design Engineer, both of whom
- are also defined under these Specifications. The Record Drawing Engineer and Design Engineer may be the same person or represent the same company. This definition is intended to include all employees and/or agents acting for or on behalf of the Record Drawing Engineer's company. "Project" shall mean any sanitary sewer facilities constructed under a distinct set of
- contract documents and shall include all work necessary for the Complete (as hereafter defined) and operable installation of all sanitary sewer infrastructure and appurtenances in conformity with the HSE approved Construction Plans and the standards, specifications and details of HSE. "Conveyed" with regards to sanitary sewer facilities means Projects for which HSE has
- received title. "Private" with regards to Projects shall mean Projects from which sewage flows into HSE's sanitary sewer facilities, but for which title for the sanitary sewer facilities is not to be Conveyed to HSE. "Completed" with regards to Projects shall mean any Projects which are acceptably
- constructed, tested and through which customer service has been authorized by HSE, but for which HSE has not received title. All applicable fees must be paid to HSE prior to a Project being deemed Completed
- "Construction Plans" shall mean primary plats, secondary plats, sets of construction drawings, architectural plans, shop drawings, landscaping plans, record drawings, easements, deeds, covenants and restrictions and any other documentation to be submitted under these Specifications and HSE's "Design Specifications for Sanitary Sewer Facilities". Construction Plans must meet the applicable standards in effect at the time the documents are submitted.
- "Completion Documentation" shall mean record drawings and other documentation to be submitted under HSE's "Sanitary Sewer Completion Specifications". Completion Documentation must meet the applicable standards in effect at the time the documents are submitted
- 1.02 Purpose The purpose of these Specifications is to define the standards for engineering design, construction specifications and construction practices related to the Project which will allow for the orderly and proper installation of sanitary sewer facilities constructed within HSE's service area.
- 1.03 Applicability These Specifications are applicable for all public and Private sanitary sewer facilities which will be connected to HSE's sanitary sewer system. This includes Private Projects which will not initially be connected to HSE's sanitary sewer system but at some future date may be connected to the system.
- 1.04 Liability and Costs for Project No direction, field directive or other instruction contemplated by these Specifications and/or conducted by others shall accrue any liability, charge or cost to HSE, Engineer or Engineer's inspectors
- 1.05 Standards, Specification and Details HSE's Gravity Sanitary Sewer Details sheet, Gravity Sanitary Sewer Specifications sheet. Duplex/Initial Triplex/Triplex Lift Station Plan sheets, Lift Station and Force Main Details sheet, Lift Station and Force Main Specifications sheets, Standards for Design and Construction of Building Sewers, Rules and Regulations, Master Plan, Design Specifications for Sanitary Sewer Facilities and Sanitary Sewer Completion Specifications are integral parts of these Specifications. The Contractor should become familiar with these documents prior to construction of any sanitary sever facilities within HSE's service area.
- These Specifications, HSE's Duplex/Initial Triplex/Triplex Lift Station Plan sheets, Lift Station and Force Main Details sheet (jointly called HSE's "Lift Station/Force Main Details sheets") and HSE's Design Specifications for Sanitary Sewer Facilities are complementary in nature and should not be interpreted individually.
- These Specifications and HSE's Lift Station/Force Main Details sheets, Master Plan and other standards, specifications and details are subject to revision at any time prior to the start of construction of the Project. These documents are also subject to revision at any time during construction when, in Engineer's opinion, those revisions materially affect the maintenance operation or life of the Project. All such revised documents must replace the corresponding documents in the Construction Plans at the time when provided to the Contractor. HSE reserves the right to modify or waive any of these Specifications and/or its Maste
- Plan and other standards, specifications and details in its best interest. These Specifications are intended to define the construction requirements of sanitary sewer facilities which are constructed and operated under typical conditions in HSE's service area. Depending on field conditions and the composition and characteristics o the sanitary sewer flow, different or unusual conditions may occur which cannot be anticipated in a document of this nature. Engineer may impose additional or special construction requirements under these circumstances.
- 1.06 Drawing Discrepancies and Omissions
- Prior to the start of construction, the Contractor must notify Engineer of any conflicts between the Construction Plans, any supplemental information supplied by HSE and/or these Specifications. Resolution of any such conflict will be at the Engineer's sole Any items which are not covered in these Specifications, the Construction Plans or HSE's
- other standards, specifications and details, but are required for construction of this Project, must be approved by Engineer prior to installation and must be made a part of this contract. In the event construction practices are not described, but in the Engineer's opinion, will
- affect the auglity of construction or long term maintainability of the sanitary sewer facilities, the Engineer must approve any construction practices proposed by the
- 1.07 Governing Laws, Codes and Regulations Construction practices must meet all applicable laws, codes or regulations and be in accordance with the requirements of all governmental agencies and public entities having These Specifications shall not be considered as a substitute, nor shall supersede any state
- or federal law, code or regulation related to the Project. In the event of a conflict between any state or federal law, code or regulation governing the Project and these Specifications, the more stringent requirement will apply.
- All persons on site must abide by all Indiana Occupational Safety and Health Administration ("IOSHA") standards including but not limited to "General Construction Practices" and "Trench Safety Standards".
- 1.08 Notices All notices required by these Specifications must be given to both HSE and Engineer at their respective business offices.
- PART 2 GENERAL CONSTRUCTION REQUIREMENTS 2.01 General
- These Specifications cover all work necessary for the installation of lift station wet wells and valve vaults, lift station piping, force mains, air/vacuum release manholes, clean-out manholes, flow monitoring/metering manholes, valves and valve boxes, submersible pumps and controls, control panel, alarm devices, float system, electrical wire in conduit from wet well to control panel, vents, slide rails and hoist system, wet well and valve vault access doors, fittings, thrust blocks, odor control, asphalt access drives, fencing and other miscellaneous items ("Lift Station/Force Main Infrastructure") to convey sewage from the lift station pumps to the receiving sewer in an acceptable and operable manner.
- Contractor must provide all necessary work to install the Lift Station/Force Main nfrastructure in a Complete manner in accordance with the Construction Plans. All electrical work (conduit, wiring, panel installation, etc.) shall be performed by a licensed electrician. All pipe, fittings, valves and appurtenances must be the size, type, classification and
- grade shown on the Construction Plans and must meet all requirements of these Contractor must not substitute materials which differ from the approved Construction Plans unless approved by Engineer.
- All pipe, fittings and valve sizes and all references to pipe diameter on the Construction Plans or in these Specifications are intended to be nominal size or diameter and must be interpreted as such.
- If a material type is shown on the Construction Plans, the material type must describe a general category of materials meeting these Specifications. 2.02 Submittals
- Before delivery of products to the site (for standard vard stocked items) or before fabrication (for items which are not standard yard stocked items). Contractor must provide submittals to, and obtain acceptance from. Engineer, Submittals must be thoroughly reviewed by Contractor and certified to meet these Specifications (with all exceptions explicitly indicated) prior to submission to Engineer. Acceptance by the engineer does not exempt the contractor from compliance of these specifications.
- Manufacturer's certificate of compliance, signed by an authorized agent of the manufacturer or seller, certifying that the pumps and control panels meet these Specifications. Certified copies of test reports on factory tests. . Factory test each submersible pump according to Hydraulic Institute standards. During
- factory operational hydraulic pressure tests, test pump power and control circuits under load. Verify operation of all monitoring circuits and alarms. Refer to Testing Punch Lists and Cleaning within these Specifications for further information 2 Where required by the applicable manufacturing standards, provide a copy of the
- manufacturer's inspection or test report and a certified statement by the manufacturer that the material has been sampled, tested, and inspected in accordance with the applicable standards. 3. All factory inspections, tests and record keeping identified as mandatory or required
- under the applicable standards for each product are required under these Specifications. Factory inspections and tests, which are identified as optional under the applicable manufacturing standards, are not required unless otherwise specifically indicated in the Construction Plans or these Specifications. 4. An authorized agent of the manufacturer or distributor must sign each certification and
- Shop drawings with performance data, field measurements, details of fabrication, details of installation and physical characteristics for mechanical products, including valves, controls, pumps, etc.

- Shop drawings for control and other electrical wiring must comply with component manufacturer and electrical code requirements stated in these specifications. system head curve plotted with the proposed pump curve. he plot must also indicate the pump efficiency, solids handling capacity and reflect the
- motor service factor. Efficiency and other performance data must be based on performance with an un-coated impeller. Attempts to improve reported efficiency by coating impeller will not be Catalog cuts with product data, including details of manufacture, for all manufactured
- Manufacturer's recommendations on all materials and methods of installation. Forms of warranty. Warrant equipment free from manufacturing and installation defects for a period of three
- (3) years from date of successful operation. Successful operation date will be the first day of the initial thirty (30) day period where pump station functioned without failure due to defects in workmanship or materials. Warrant fence and fencing appurtenances free from manufacturing and installation
- defects for a period of three (3) years from the date HSE deems the fence and appurtenances Complete. Operation and maintenance instructions for all mechanical and electrical equipment.
- Contractor must provide to HSE copies of all contracts, invoices, statements, material lists, payment requests and all other related documents pertaining to the construction cost of the Project. The above documents must be provided monthly, unless otherwise determined by HSE. If requested by Engineer, mill reports on steel.
- Submit any other items required by the Engineer.
- 2.03 Initiation of Construction Plan approval will be an authorization to proceed with construction of the Project. however, it shall not be construed as authority to violate, cancel or set aside any of HSE's requirements or the laws, codes, regulations and permit processes of governmental agencies or public entities. Approval will be evidenced by an "Approved Hamilton
- Southeastern Utilities, Inc." stamp on the Construction Plans. Plan approvals will be valid for a period of six (6) months from the date of the approval stamp. Extensions of this time limit may be requested from Engineer if extenuating circumstances exist. Engineer's decision regarding time extensions will be final. Prior to the start of construction, Design Engineer must receive formal written approval from Engineer. At this time, Design Engineer must supply Engineer with PDF and AutoCAD
- file of complete set of Construction Plans. Contractor will not be permitted to initiate construction until the Construction Plans are formally approved and the Subscriber has entered into all necessary agreements and
- authorizations with, and all required fees have been paid to. HSE, Contractor will not be permitted to initiate construction until all applicable permits have been obtained from and approved by all affected government agencies and public entities.
- Copies of the permits must be submitted to Engineer for review Contractor will not be permitted to initiate construction until all off-site easements have been reviewed, approved and recorded by Engineer.
- The pipe layers and foreman (superintendent) assigned to the Project must be approved by HSE prior to the start of construction.
- Notice must be provided to Engineer twenty—one (21) days prior to the initiation of construction. A pre-construction meeting is required between the Engineer and Contractor prior to the
- initiation of construction. The pre-construction meeting must be completed no more than fourteen (14) days prior to the start of construction. ALL Rough grading (on and off site) must be finished to within one (1) foot
- of final grade and verified by Engineer prior to the start of construction of the Sanitary Sewer Facilities.
- 2.04 Continuity of Construction Once construction has commenced, the Project must be Completed promptly and in a
- timely manner as directed by the Engineer. Contractor cannot discontinue work on the Project, except for weather delays. without written approval from the Engineer and in this case no sanitary sewer structures including wet wells, valve vaults, air/vacuum release manhole, clean-out manholes, flow monitoring/metering manholes, etc. ("Lift Station/Force Main Manholes") can be left open and incomplete.
- Confined Space Entry All persons, including but not limited to Subscribers, Contractors, sub-contractors, Design Engineers, Record Drawing Engineers and surveyors must abide by HSE's "General Procedures for Manhole Opening and Entry" or the most recent IOSHA confined space entry standards, whichever is more stringent.
- 2.06 Cleanlines The Project site must at all-time be kept free of trash, rubbish, unsightly materials and other nuisances.
- All streets, alleys, pavement, parkways and private property must be thoroughly cleaned each day of all surplus materials, earth and rubbish placed thereon by the Contractor Project site must be cleaned at the end of each workday. Trash receptacles must be
- provided as necessary to dispose of waste items. Product Delivery, Handling and Storage
- The Contractor is responsible for the delivery, storage and handling of products. Deliver products with manufacturer's tags and labels intact. Handle products in accordance with manufacturer's recommendations and with extreme
- care so as to not damage or shock. Load and unload all products by hoists or skidding Do not drop products. Do not skid or roll products on or against other products. Slings, hooks and pipe tonas must be padded. Keep stored products safe from damage or deterioration in accordance with
- manufacturer's recommendations. Keep the interior of products free from dirt or foreign matter. Drain and store products in a manner that will protect them from damage by freezing. Store electronic and electrical products in a manner that will protect them from freezing and weather. Do not stack products unless allowed by the manufacturer's requirements. Store gaskets and other products affected by sunlight in a cool location out of direct sunlight. Gaskets must not come in contact with petroleum products. Use on a first-in, first-out basis. Promptly remove damaged or defective products from the Project site. Replace damaged
- or defective products with acceptable products. The Contractor is responsible for verifying that the materials are free of defects and are the proper type, classification, grade, etc. complying with the Construction Plans and/or HSE's standards, specifications and details.
- 2.08 Quality Assurance
- A. The Contractor must test and perform auality assurance requirements on all Lift Station/Force Main Infrastructure in accordance with these Specifications. Execute work in conformance with applicable sections of the latest published editions of American National Standards Institute ("ANSI"). American Society of Mechanical Engineers ("ASME"). American Society for Testing and Materials ("ASTM"). American Water Works Association ("AWWA"), American Welding Society ("AWS") and
- National Electrical Manufacturers Association ("NEMA") standards or as indicated in these Specifications and/or the Construction Plans, whichever is more stringent. All materials and products installed by Contractor must be of the type approved by the National Electric Code ("NEC"), Uniform Building Code and Underwriters Laboratories
- Inc. ("UL"). All Lift Station/Force Main Infrastructure must be new and unused. The Contractor must provide assurance to the Engineer that the force main is laid accurately to the required line and arade as shown on the Construction Plans. Th Contractor must constantly check horizontal alignment of the force main. The Contractor must coordinate verification of the force main with the Record Drawing Engineer so as to provide an as-built record set as described later in these Specifications. Verification is defined as certification by an appropriately registered Indiana professional as to actual elevation and horizontal location of the force main. Variations from line and arade as
- shown on the Construction Plans are cause for the force main to be rejected and re-laid in compliance with the Construction Plans. Test Sections Initial Performance Tests — A hydrostatic pressure test may be required on the first six hundred (600) feet of force main of each size and type of force main material installed.
- This test will be required when, in Engineer's opinion, materials or techniques unproven with HSE are proposed, when Contractor cannot show adequate experience with the materials or techniques to be used, or when field conditions warrant. No additional force main can be installed until the first section of force main of each size and type of material as satisfactorily passed the initial performance tests or a waiver is received. Subsequent Performance Testing - As work progresses, the Engineer may designate
- additional sections for subsequent performance testing as conditions in his opinion warrant. The Engineer will notify the Contractor of the location where subsequent performance test(s) are to be required not later than fifteen (15) days after the force main is installed. Unless otherwise authorized, the Contractor must arrange to commence the subsequent performance test(s) within fifteen (15) days after the force main has been installed or fifteen (15) days after receiving notification by the Engineer, whichever date
- Final Performance Testing for Completion All Lift Station/Force Main Infrastructure must pass all applicable test requirements of these Specifications. Inspection and Rejection of Materials
- The quality of all materials, the process of manufacture and the finished product are subject to inspection and acceptance by the Engineer. Such inspection may be made at the place of manufacture and/or on the work site after delivery. The products are subject to rejection at any time for failure to meet any of the manufacturer's specifications even though samples may have otherwise been accepted as satisfactory. Immediately prior to being incorporated into the Project, each product must be carefully
- inspected, and those not meeting these Specifications and HSE's Lift Station/Force Main Details sheets must be rejected, immediately removed from the site and replaced at Contractor's sole expense.
- Contractor must not repair, or permit manufacturer to repair, any pre-cast concrete structures with exposed steel or welded wire fabric reinforcement. 2.10 Relation to Wells and Water Supplies
- Force mains must be laid at least ten (10) feet horizontally from any existing or proposed water main. The distance is to be measured edge to edge. Should specific conditions prevent this separation, the Contractor must notify the Engineer for specific instructions. Whenever the force main crosses a water main, it should be laid at least eighteen (18)
- inches below the main. Sewer/water supply separations and pipe classifications must conform with the latest edition of the Ten States Standards, Indiana State Board of Health's ("ISBH") "On-Site Water Supply and Wastewater Disposal for Public and Commercial Establishments
- Bulletin S.E. 13" and Indiana Department of Environmental Management (IDEM) 2.11 All existing utility systems which conflict with the construction of the Project herein,
- which can be temporarily removed and replaced, must be accomplished at the expense of the Contractor. Work must be done by the respective utility unless the utility approved in writing that the Contractor can do the work. Permanent Relocation of Utilities
- Except as otherwise noted on the Construction Plans, it is the responsibility of the Contractor to move or pay for moving all utility appurtenances, including but not limited to, water mains, storm sewer inlets, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light and traffic standards, cable ways, signals, etc. located in the public right-of-way or private easement which would permanently interfere with the Project.
- It is understood and agreed that the Contractor has considered in his bid all of the permanent and temporary utility appurtenances shown or otherwise indicated on the Construction Plans. It is also understood and aareed that no additional compensation will be allowed for any delays, inconvenience or damage sustained by the Contractor due to any interference from said utility appurtenances or the operation of moving them either by the respective utility company or the Contractor.

C. The Contractor must provide, at Contractor's expense, all electrical and gas energy, water service (including water for flushing and testing) and telephone service required for the Project until the Project is Completed. 2.12 Installation Service

maintenance and certify proper installation. e Engineer to resolve installation problems.

2.13 Product Installation Install all products in strict accordance with manufacturer's recommendations and these Specifications in a neat and workmanlike manner. Bring all conflicts between the manufacturer's recommendations and these Specifications to the attention of Engineer and obtain direction from Engineer as to the resolution of any

conflict in installation directives 2.14 As-Built Record Set Contractor must maintain during the course of the Project an up-to-date plan set which accurately reflects the actual, as-built dimensions, materials of construction, horizontal location, vertical elevation and other relevant information necessary to develop a set o as-built record drawings in accordance with HSE's "Sanitary Sewer Completion

- Specifications' and air/vacuum release manholes.
- 2.15 Completion Documentation
- be met prior to the time the Project is placed into service. delivered by Contractor and Record Drawing Engineer in the name of Subscriber to
- Drawing Notification Contractor must Complete all outstanding items detailed in Engineer's correspondence
- ittings, etc.
- 2.16 Inspection and Reimbursement
- contractor list.
- If, at the sole discretion of Engineer, construction volume is less than what is deemed
- inspection services. comply is grounds for removal from the HSE approved contractor list.
- General Testing Requirements (Except Pump Factory Test) its agent at HSE's current rate for all testing.
- prior to testing.
- cleaning and testing will be performed per the Construction Plans and HSE's then current standards, specifications and details.

content or insulation defects.

submitted to the Engineer.

3.02 Pump Factory Test

he following:

(30) minutes.

3.03 Force Main Testing

Hydrostatic Pressure Test

value (L) determined by the following formula:

P = Average actual leakage test pressure, psig.

Leakaae Test

L = (N*D*√P)/7400

Provide services of factory-trained representative for minimum period of eight (8) hours each on two (2) separate occasions, one (1) month apart, to perform inspection of the pump station, perform the dry test and wet test of the pumping and control system. provide initial start-up, instruct Engineer's personnel in pump station operation and

The service of an experienced installation representative of the manufacturer must be provided for a minimum of ten (10) days at no additional cost to the Subscriber. The representative must be on the job site during initial installation and testing of the Lift Station/Force Main Infrastructure when installation problems arise or when requested by The manufacturer of the Lift Station/Force Main Infrastructure may be required to

provide installation advice on bedding, haunching and backfill to the Contractor's work force. Engineer will determine the need for these services based on the experience of the Contractor's work force or field conditions encountered during construction.

As-built horizontal locations and vertical elevations are required on all fittings (including ells, tees, values and adapters), the force main (at a maximum separation of 500 feet), the top and bottom of the wet well and valve vault and inverts into the wet well, clean-outs

Failure to provide as-built information as specified in HSE's "Sanitary Sewer Completion Specifications" may require excavation by the Contractor to obtain this information.

HSE's "Sanitary Sewer Completion Specifications" specify the requirements which must Contractor and Record Drawing Engineer must provide to HSE and Engineer in Subscriber's name the necessary Completion Documentation for the Project, including record drawings and a digital file. At the end of construction, Engineer will provide a Record Drawing Notification to the Subscriber and Record Drawing Engineer Completion Documentation, including record drawings in a digital file format, must be

Engineer within fourteen (14) days of the date of this notification. If the Completion Documents have not been provided within thirty (30) days of the date of this notification, HSE will procure the services necessary to generate or otherwise acquire the record drawings and other Completion Documentation at Subscriber's expense. Record Drawing Engineer must also submit Sanitary Sewer Record Drawing Information sheets for all Lift Station/Force Main Manholes that have not been previously as-built. These sheets must be submitted to Engineer within seven (7) days of the Record

and supply all necessary information (including, construction cost documentation, with all applicable change orders, Sanitary Sewer Inventory form, etc.) to Engineer in a timely manner. Contractor must also provide timely responses to Record Drawing Engineer for questions associated with constructed conditions including, pipe sizes, pipe types, horizontal location of concrete encasement/capping and bores, water tight castings,

If a Lift Station/Force Main Manhole top of casting is adjusted after as-builting, then the Contractor must supply Engineer with a new measure down from the flow line to the top of casting. If the new measure down is not provided to Engineer, then the Contractor must pay Engineer, at their current rate, for all time required obtaining this information.

Full time inspection by Engineer is required for all repairs, maintenance or construction to Lift Station/Force Main Infrastructure. Engineer must approve, in writing, all methods of repair to Lift Station/Force Main Infrastructure as recommended by the Contractor and manufacturer. Failure to comply will be grounds for removal from the HSE approved

Contractor must pay Engineer for all inspector's overtime cost. Contractors will be charged overtime costs at the prevailing rate per hour prior to 7:00 a.m. and after 3:30 p.m. on weekdays and all day on Saturdays. The hourly rate for Sundays and holidays will be twice the hourly rate. The above rates are subject to change without notice. Contact Engineer prior to starting construction for current rates.

acceptable, then the Contractor may be required to pay \$595 per day for additional The Engineer's decision on field changes or construction practices is final. Failure to

PART 3 - TESTING. PUNCH LISTS AND CLEANING

All testing must be conducted at the Contractor's expense in the presence of the Engineer Notification must be provided at least five (5) days prior to any testing. At HSE's option, all testing of Lift Station/Force Main Infrastructure within the HSE service area may be performed by HSE or their agent. Contractor shall reimburse HSE or

All testing (except manhole vacuum testing) must be conducted after the final backfill has been in place for at least thirty (30) days and after all other utilities have been installed. All concrete thrust blocks must have been in place for a period of at least ten (10) days

At the Engineer's discretion, testing may be delayed or additional testing may be required, based upon weather conditions (inadequate precipitation to allow for adequate settlement, etc.) Also, testing may be delayed or additional testing may be required due to the installation of site improvements (including but not limited to fencing, signage, landscaping, site lighting and other sub surface improvements). If the Subscriber requires sanitary sewer service prior to final testing, a preliminary test may be performed, however, Subscriber must provide, in writing, a guarantee that all

Factory testing of the pump/motor systems is required.

The pump must be visually inspected to confirm that it is built in accordance with manufacturer's specification as to the horsepower, voltage, phase and frequency. The motor seal and housing chambers must be metered for infinity to test for moisture

Pump must be allowed to run dry to check for proper rotation. Discharge piping must be attached, the pump submerged in water and ampere readings

shall be taken in each leg to check for an imbalanced stator winding. If there is a significant difference in readings. the stator windings must be checked with a bridge to determine if an unbalance exists. If so, the stator must be replaced. he pump must be removed from the water, metered again,

In addition to the above factory test, a special megger test must be performed and include The pump must be submerged in water and allowed to run at maximum load for thirty

À written report on the above must be prepared by the test engineer, certified and A non-witnessed Hydraulic Institute performance test may be required to be performed

by the engineer. This must include the following: The pump must be tested at the design point as well as at four (4) other points to develop a pump curve. Data must be collected to plot the performance (head-capacity) curve as

well as kilowatt input and amperage curves. In making this test, no points on the curve shall be less than the specified design condition with respect to capacity, total head or efficiency. Pump must be held within a tolerance of ten (10) percent of the rated capacity or at rated capacity with five (5) percent of rated head. The pump must be tested at shut-off, but not be plotted, and only used as a

reference point when plotting the performance curve. Thorough records must be kept of all information relevant to the test, as well as the pump manufacturer's serial number, type and size of pump, as well as any impeller modifications made to meet the design conditions. A written test report must be prepared, signed, certified and dated by the test engineer

incorporating three (3) curves (head-capacity, kilowatt input and amperage) along with the pump serial number, test number, date, speed, volts, phase, impeller diameter and certification number. This report must then be submitted to the Engineer.

Perform hydrostatic pressure and leakage tests on all force mains, including piping within the lift station. The following requirements are applicable to both tests. Lift station piping must be tested to the discharge elbow (with a blind flange on

The system will not be considered Complete until all leaks have been repaired and all tests have been passed to the satisfaction of the Engineer. During filling of the pipe and before the application of the specified test pressure, all air must be expelled from the force main by means of the air/vacuum release valves and, i necessary by additional taps at points of highest elevation. After the test is finished, the taps must be tightly plugged, unless otherwise specified. Limit fill rate of force main to available venting capacity. Fill rate must be regulated to

limit velocity in force main when flowing full to not more than one (1) foot per second. Test separately in segments between isolation valves, between an isolation valve and a test plug, or between test plugs. Contractor must furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs. Contractor is responsible for any damages caused by failure of the Lift Station/Force

in Infrastructure during testing of the Project. Refit and replace all pipe not meeting the leakage or pressure requirements. Repair all visible leaks regardless of the amount of leakage.

The hydrostatic pressure test must conform to ANSI/AWWA C600 and C605 procedures except as modified by these Specifications. Conduct test at pressure of at least one hundred (100) psi or one and an half (1.5) times

the operating pressure, whichever is greater. Maintain pressure for a minimum of eight (8) consecutive hours. Test pressure must not vary by more than five (5) + / - psi.

Close all inlet valves of the air/vacuum release valves before performing the hydrostatic Maintain pressure for a minimum of eight (8) consecutive hours. Leakage test will be acceptable when maximum permissible leakage does not exceed that

L = Maximum permissible leakage in gallons per hour, N = Number of pipe joints in segment under test, D = Nominal internal diameter of pipe being tested in inches

Test locator wire for continuity. For force mains installed by boring test both wires for continuity. 3.04 Manhole Testina A. All closed bottom air/vacuum release, clean-out and flow monitoring/metering manholes must be vacuum tested after installation, repair or modification. Engineer may require additional vacuum tests if the manhole casting is not bolted to the structure prior to the test. Manhole boots must be secured to prevent movement while the vacuum is drawn. Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications that have been provided by the manufacturer and accepted by Engineer. With the vacuum tester set in place: Inflate the compression band to forty (40) psi to effect a seal between the vacuum base and the structure. Connect the vacuum pump to the outlet port with the valve open. Draw a vacuum of ten (10) inches of mercury and close the valve. Acceptance standards for leakage will be established from the elapsed time for a negative pressure change from ten (10) inches to nine (9) inches of mercury. The maximum allowable leakage rate for a four (4) foot diameter manhole must be in accordance with the following: Minimum Flapsed time for a Manhole Depth Pressure Change of 1 Inch Mercury >25 feet but <30 feet 105 seconds 10 ft or less 60 seconds >10 feet but <15 feet >30 feet but <35 feet 120 seconds 75 seconds >15 feet but <25 feet 90 seconds

Repeat hydrostatic pressure and leakage tests as necessary

Open all air/vacuum release valves and verify proper operation

Until satisfactory test results are obtained

After location of leaks and repair or replacements of defective joints, pipe or fittings

For manholes five (5) feet in diameter, add an additional fifteen (15) seconds and for manholes six (6) feet in diameter, add an additional thirty (30) seconds to the time requirements for four (4) foot diameter manholes. For all manholes deeper than twentyfive (25) feet, Engineer will determine the applicable minimum elapsed time.

If the manhole fails the test, necessary repairs must be made and the vacuum test and repairs must be repeated until the manhole passes the test. If manhole joints are pulled out during the vacuum test, the manhole must be disassembled and the joints replaced

Manholes will be subject to visual inspection with all visual leaks being repaired.

- 3.05 Electrical Testing (must be performed by licensed electrician)
- Test resistance to ground of ground system or grounding network at point where equipment, raceways and conductors are to be connected. Measurement must be made with vibro-around instrument manufactured by Associated Research or equal. Value of this resistance to ground cannot exceed five (5) ohms and must be measured from ground being tested to system neutral.
- Contractor equipped to certify tests must perform ground system tests. Test one hundred twenty (120) volt to six hundred (600) volt circuits. Test cables with megger voltage to be determined by Engineer between phases and between each phase and ground, with test maintained until readings are steady for three (3) minutes. Readings to be equivalent to the manufacturer's specifications and similar readings not to deviate more than five (5) percent.
- Punch Lists After all testing has been successfully completed, Engineer will perform an inspection of the Lift Station/Force Main Infrastructure and provide Contractor a written summary of items, or punch list, which require corrective action.
- Contractor must complete all punch list items within twenty-one (21) days of issuance. If, in the opinion of the Engineer, the punch list has not been completed, then the Contractor must pay HSE \$100 per day damages until the Engineer deems the punch list
- Flush internals of Lift Station/Force Main Infrastructure with water of sufficient velocity and augustity that will dislodge sediment or dirt that has accidentally entered the system. Remove surplus/waste materials, including but not limited to, earth, trash, rubbish, unsightly materials and other such nuisances from the Project site.
- PART 4 OPERATION, CLEANING AND FINAL INSPECTION PRIOR TO CONVEYANCE
- 4.01 Operation No person, including but not limited to Subscribers, maintenance workers, Contractors, sub-contractors and engineers shall, directly or indirectly, allow flow to occur from any Project which is not Complete to a Completed Project.
- 4.02 The wet well must be cleaned by high pressure washer and vactor truck at Subscriber's expense at least once prior to conveyance
- This cleaning may be delayed for up to three (3) years (with applicable security deposit) at Engineer's discretion if all lots/parcels served by the Project are not developed and connected within three (3) months prior to conveyance.
- 4.03 Final Inspection Within six (6) months prior to conveyance, Engineer will conduct an inspection ("Final Inspection") at Subscriber's expense. The Final Inspection will consist of a walk-through of the Project to identify any defects. The Final Inspection may also consist of pumping tests, various motor analyses and force main hydrostatic pressure tests as determined l
- After the Final Inspection has been performed. Engineer will provide a written summary. or punch list, of items which require corrective action. Subscriber must complete all punch list items within forty-five (45) days from the date of issuance of the punch list. If, after the above forty-five (45) day period has expired, and in sole opinion of Engineer, the punch list items have not been corrected, then the Contractor and/or Subscriber may be ired to pay HSE \$100 per day damages or working privileges temporarily suspende Subscriber must rectify all defects identified during the Final Inspection in a manner acceptable to Engineer prior to Lift Station/Force Main Infrastructure being conveyed to

SECTION 1 - FORCE MAIN/LIFT STATION MANHOLES, PIPING, VALVES & FITTINGS

PART 1 – PRODUCTS General Requirements

- Under general laying conditions, force mains can be any one of the pipe materials specified in these Specifications provided, the material is that pipe type and standard indicated on the Construction Plans.
- Markinas All pipe, fittings and valves must be clearly marked in accordance with the various standards under which they are manufactured. All pipe must be marked with durable printing according to ASTM/AWWA requirements.
- A marking must be provided on the spigot of each pipe utilizing bell joints to indicate when the pipe is driven home.
- 1.02 Polyvinyl Chloride ("PVC") Pipe A. PVC pipe must meet ANSI/AWWA C900 (DR 18 Class 150) for four (4) to twelve (12) inch pipe, ANSI/AWWA C905 (DR 18 Class 235 or DR 21 Class 200) for fourteen (14) to forty-eight (48) inch pipe or ASTM D 2241 (DR 21 Class 200) for thirty-six (36) inch pipe or smaller. Design and manufacture of pipe must meet minimum requirements of a working pressure of one hundred fifty (150) psi plus one hundred (100) psi surge and a safety factor of two (2)
- at the depth of cover indicated on the Construction Plans. Provide push-on joints with bell integrally cast into pipe. The joint must comply with ASTM F 477 and the physical requirements of Uni-Bell PVC Pipe Association' UNI-B-1 "Recommended Specifications for Thermoplastic Pipe Joints, Pressure and Non-Pressure

Applications. Use elastomeric gaskets, as provided in ANSI/AWWA C900 or ASTM D 3139.

The PVC AWWA C900 and C905 pipe shall only be white in color.

- 1.03 Polyethylene ("PE") Pipe
- Materials Materials used for the manufacture of PE pipe and fittings must be extra high molecular weight, high density PE 3408 polyethylene resin. The pipe must be extruded from virgin resin meeting the specifications of ASTM D 3350 with a minimum cell classification of PE 345434C. Fittings must be manufactured from the same resin type and cell lassification as the pipe itself.
- The pipe and fittings must contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material. The material must be listed by PPI ("Plastics Pipe Institute", a division of the Society of the Plastics Industry) in its pipe grade registry technical report (TR 4) with a seventythree (73) degree Fahrenheit hydrostatic design basis of one thousand six hundred (1,600) psi and a one hundred forty (140) degree Fahrenheit hydrostatic design basis of eight

hundred (800) psi. 4. The manufacturer must conform to ISO 9001. B. Pipe and Fittings

- Pipe having a diameter of three (3) inches and larger must be made to the dimensions and tolerances specified in ASTM F 714 with a cell class of PE 345434C. Pipe with diameters less than three (3) inches must be made to the dimensions and tolerances set forth in ASTM D 3035 with a cell class of PE 3408
- Fittings must be manufactured in accordance with ASTM D 3261. Fittings must be manufactured by injection molding, a combination of extrusion and machining, or fabricated from PE pipe conforming to this specification. Fittings must be fully pressure rated and provide a working pressure equal to that of the
- adjacent pipe with an included two (2) to one (1) safety factor. The pipe and fittings must be homogeneous throughout and free of visible cracks, holes voids, foreign inclusions, or other defects that may affect the wall integrity. The pipe and fittings for horizontal directional drilling must be a minimum DR of 9. Pipe
- and fittings used in open cut installations must be a minimum of DR 11. PE pipe shall only be black in color with a green stripe. Joints
- No person may join PE pipe unless Engineer has approved that person. The butt fusion process should be used to join sections of PE pipe into continuous length at the job site. The joining method must be by the heat fusion method and must be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures must be capable of meeting all conditions recommended by the pipe manufacturer.
- Properly executed electrofusion fittings may be use Extrusion welding, hot gas welding or threading and gluing of PE pipe will not be accepted. MJ adapters are required to mechanically connect PE pipe to main line valves three (3)
- inches or larger. Two (2) inch valves and smaller must be connected by compression fitting
- Refer to the manufacturer's recommendations for proper installation procedures. Fused seaments of pipe must be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections. Precautions
- During the heat fusion process the equipment and pipe product may reach temperatures in excess of four hundred (400) degrees Fahrenheit. Caution should be taken to prevent
- 2. Static electricity charges are generated on PE pipe by friction, particularly during the handling of pipe in storage, shipping and installation. The flow of air or gas containing dust or scale will also build up significant static charges, as will the flow of dry materials through the pipe. These charges are a safety hazard, particularly in areas where there is leaking gas or a flammable/explosive atmosphere.
- Coiled PE pipe may contain energy as in a spring. Uncontrolled release by cutting straps, etc. can result in dangerous uncontrolled forces. Exercise appropriate safety precautions and use proper equipment. PE pipe is impact resistant. Any hitting of the pipe with an instrument, such as a
- hammer, may result in uncontrolled rebound. All final connections to Lift Station/Force Main Manholes must not be completed unti all PE materials have reached equilibrium conditions (average ground temperature, etc.).
- 1.05 VALVES and VALVE BOXES SCOPE - ECCENTRIC PLUG VALVE
- This specification covers the design, manufacture, and testing of 4 in (100mm) through 60 in. (1500mm) 100% Port Eccentric Plug Valve suitable for water or wastewater service with pressures up to 250 psig (1725kPa
- STANDARDS, APPROVALS and VERIFICATION 4 in (100mm) through 60 in (1500mm) plug valves shall be designed, manufactured and tested in accordance with American Water Works Association Standard ANSI/AWWA C517. 2.2 All Plug Valves shall be certified Lead-Free in accordance with NSF/ANSI 372. 2.3 Manufacturer shall have a quality management system that is certified to ISO 9001 by an
- accredited, certifying body. CONNECTIONS
- Flanged values shall be flanges with drilling to ANSIB16.1. Class 125 Mechanical Joint valves shall fully comply with ANSI/AWWA C111/A21.11
- DESIGN 4.1 Port areas on other sizes are 85% on 16 in (400mm) and smaller, 80% on 18 in - 24 in (150mm - 600mm) and 75% on 30 in (800mm) and larger. Plug valves shall have a valve seat that is a welded overlay of 95% pure nickel applied 4.2
- directly to the body on a pre-machined, cast seating surface and machined to a smooth 4.3 Plug valves shall have shaft seals which consist of a V-type packing in a fixed gland with an adjustable follower designed to prevent over compression of that packing and to meet design parameter of the packing manufacturer. Removable POP™ shims shall be
- provided under the follower flanges to provide for adjustment and prevent over tightening. Permanently lubricated, radial shaft bearings shall be supplied in the upper and lower bearing journals. Trust bearings shall be provided in the upper and lower journal areas, except for threaded type which only have upper thrust bearings.
- 4.5 Both the packing and bearings in the upper and lower journals shall be protected by a Grit-Guard™ "drip tight" Buna-N shaft seal located on the valve shaft to minimize the entrance of grit into the bearing journal and shaft seal areas. MATERIALS.
- Valve bodies and covers shall be constructed of ASTM A126 Class B cast iron for working pressures up to 175 psig (1200 kPa) and ASTM A536 Grade 65-45-12 for working pressures up to 250 psig (1725 kPa). The words "SEAT END" shall be cast on the exterior of the body seat end.
- Plugs shall be of one-piece construction and made of ASTM A126 Class B cast iron or ASTM A536 Grade 65-45-12 ductile iron and fully encapsulated with resilient facing per ASTM D2000-BG and ANSI/AWWA C517 requirements. Plugs shall have radial shaft bearings constructed of self-lubricating Type 316 stainless steel. The top thrust bearing shall be Teflon. The bottom thrust bearing shall be
- self-lubrication Type 316 stainless steel. Cover bolts shall be corrosion resistant with zinc ACTUATORS Valves 4 in to 8 in (100mm to 200mm) 100% ported shall be equipped with a 2 in square
- nut for direct quarter turn operation. The packing aland shall include a friction collar and an open position memory stop. The friction collar shall include a nylon sleeve to provide without exerting pressure on the valve packing. 6.2 When specified valves 4 in (100mm) and larger shall include a totally enclosed and sealed worm gear actuator with position indicator (above ground service only) and externally
- adjustable open and closed stops. The worm segment gear shall be ASTM A536 Grade 65-45-12 ductile iron with a precision bore and keyway for connection to the valve shaft. Bronze radial bearings shall be provided for the segment gear and worm shaft. Alloy steel roller thrust bearings shall be provided for the hardened worm. 6.3 All gear actuators shall be designed to withstand, without damage, a rim pull of 200 lbs.
- on the hand wheel and an input torque or 300 ft-lbs. for nuts. 6.4 Buried service actuators shall be packed with arease and sealed for temporary submergence to 20 feet of water. Exposed worm shafts shall be stainless steel REQUIRED OPTIONS
- The valve port area shall have not less than 100% of pipe area. The interior and exterior of the valve shall be coated with an NSF/ANSI 61 approved fusion bonded epoxy. 7.3 The interior of the valve shall be coated with 1/8th inch soft rubber lining.
- MANUFACTURE Manufacturer shall demonstrate a minimum of ten (10) years? experience in the manufacture of plug valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings and operation maintenance manuals.
- Valve shall be marked with the Serial Number. Manufacturer, Size, Cold Working Pressure (CWP) and the Direct and Reverse Actuator Pressure Ratings on a corrosion resistant nameplate. Plug Valve shall be Series # 5600R (100% Port Flanged), 5700R (1005 Port Mechanical Joint) 5800R (Flanged), 5900R (Mechanical Joint) as manufactured by Val-Matic and Mfg. Corp Elmhurst, IL, USA or approved equal.
- SCOPE Swing Flex® Check Valve This specification covers the design, manufacture, and testing. Swing-Flex® Check Valves suitable for cold working pressures up to 250 psig (1725 kPa), in water, wastewater,

2.2 Manufacturer shall have a quality management system that is certified to ISO 9001.

The Valves shall be provided with flanges in accordance with ANSI B16.1, Class 125.

The valve body shall be full flow equal to nominal pipe diameter at all points through the

valve. The 4 in (100mm) valve shall be capable of passing a 3 in. (75mm) solid. The

seating surface shall be on a 45 degree gnale to minimize disc travel. A threaded port

of the backflow actuator or oil cushion device without special tools or removing the

4.2 The top access port shall be full size, allowing removal of the disc without removing the

4.3 The disc shall be of one piece construction, precision molded with an integral O-ring type

with pipe plug shall be provided on the bottom of the valve to allow for field installation

valve from the line. The access cover shall be domed in shape to provide flushing action

sealing surface and reinforced with alloy steel. The flex portion of the disc contains nylon

shall be provided through a short 35 degree disc stroke and a memory disc return action

4.4 The valve disc shall be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508 and

show no signs or wear, cracking, or distortion of the valve disc or seat and shall remain

The valve body and cover shall be constructed of ASTM A 536 Grade 65-45-12 ductile iron

reinforcement and shall be warranted for twenty five years. Non-Slam closing characteristics

over the the disc for operating in lines containing high solids content. A threaded port

with pipe plug shall be provided in the access cover area to allow for field installation

STANDARDS and APPROVALS

CONNECTIONS

valve from the line.

DESIGN

MATERIALS

Association Standard ANSI/AWWA C506.

of a mechanical, disc position indicator.

to provide a cracking pressure of 0.25 psig.

drop tight at both high and low pressures.

or ASTM A126 class B gray iron for 30 in. (800mm) and larger.

The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG

abrasive, and slurry service. 1.2 The check valve shall be the full flow body type, with a domed access cover and only one moving part, the flexible disc.

The valves shall be designed, manufactured, tested and certified to American Water Works

6. REQUIRE / DESIGN

accurate disc position location.

6.1 A screw-type backflow actuator shall be provided to allow opening of the valve during no-flow conditions. Buna-N seals shall be used to seal the stainless steel stern in a Lead-Free bronze bushing. The backflow device shall be one of the rising-stem type to indicate position. A stainless steel T-handle shall be provided for ease of operation. 6.2 A mechanical indicator shall be provided to provide disc position indication. The indicator shall have continuous contact with the disc under all operating conditions to assure

- 6.3 A pre-wired limit switch will be provided to indicate open/closed position to a remote location. The mechanical type limit switch shall be activated by the mechanical indicator The switch shall be rated for NEMA 4, 6, or 6P and shall have U.L. rated 5 amp, 125 or 250 VAC contacts.
- 6.4 Linings to be rubber for abrasive or corrosive fluids.. 6.5 A welded nickel seat
- 7. MANUFACTURE

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- 7.1 Manufacturer shall demonstrate a minimum of five (5) years experience in the manufacture of resilient, flexible disc check valves with hydraulic cushions.
- All valves shall be hydrostatically tested and seat tested to demonstrate zero leakage. When
- requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals. 7.3 The exterior and interior of the valve shall be coated with an NSF/ANSI 61 approved fusion bonded epoxy coatina.
- 7.4 Swing-Flex® Check Valves shall be Series #500 as manufactured by VAL-Matic®& Mfg. Corporation Elmhurst, IL. USA or approval equal.
- SCOPE Wastewater Air Release Valve This specification is intended to cover the design, manufacture, and testing of Wastewater
- Air Release Valves suitable for pressure up to 150 psig (1000kPa). Wastewater Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system is in operation and under pressure. The capacity and pressure rating of the value is dependent on the diameter of the precision orifice in the cover.
- A large inlet connection is required for proper air and water exchange. NOTE: See Wastewater Air/Vacuum Valves for exhausting and admitting large volumes of air and Wastewater Combination Air Release Valves for both air release and air/vacuum functions.]
- STANDARDS, APPROVALS and VERIFICATION The valves shall be manufactured, tested in accordance with American Water Works (AWWA) Standard 2.2 Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited
- certifying body. DESIGN
- 3.1 The valves shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection. The body shall have 2 in. NPT cleanout and a 1 in. drain connection on the sides of the casting. The cover shall be bolted to the valve body and sealed with a flat gasket. A threaded adjustable orifice button shall provide tight shut off to the valve
- 3.2 Floats shall be unconditionally guaranteed against failure including pressure surges. Extended mechanical linkage shall provide suitable mechanical advantage so that the valve will open under full operating pressure
- MATERIALS 4.1 The valve body and cover shall be constructed of ASTM A126 Class B cast iron. 4.2 The orifice, float and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic
- floats or linkage mechanisms are not acceptable. The orifice button shall be Bung-N. Required options Backwash accessories shall be furnished and shall consist of an inlet shut-off valve, a blow-off valve. a clean water inlet valve, rubber supply hose, and a quick disconnect couplings. Accessory valves shall
- be guarter-turn, full ported bronze ball begrings. 5.2 An optional vacuum check on the outlet shall be provided to prevent air from re-entering the system during negative pressure conditions.
- 5.3 Optional body material shall be ASTM A536 Grade 65-45-12 ductile iron. 5.4 Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550.
- MANUFACTURE
- 6.1 Manufacturer shall demonstrate a minimum of five (5) years? experience in the manufacture of
- wastewater air valves. When requested the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals
- 6.2 The exterior of the valve shall be coated with a universal alkyd primer. 6.3 Wastewater Air Release Valves shall be Series 48A and 49A as manufactured by VAL-Matic & Mfa. Corporation Elmhurst, IL. USA or approval equal. Valve Boxes
- Valve boxes for buried valves must be cast iron. Valve boxes must be two piece or three piece type. Each two piece box must include the bottom section, top section, and cover. Each three piece box must include the base, center section, top section and cover.
- Valve boxes must be extension type with slide or screw type adjustment. Each base and bottom section must be the proper size for the valve served. Each valve box assembly must be the proper length for the valve served.
- The minimum thickness of metal must be 3/16 inch. Valve box cover must be lettered "Sewer" and be from Ford Meter Box Company Inc. Buried valve service shall have a valve box adapted as manufactured by Sealing
- Systems Inc. Operating Nut

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- The operating nut for all valves must be extended to between 1 and 2 feet of Final grade. 1.06 Lift Station/Force Main Manholes
- Manholes must be constructed of monolithic concrete or pre-cast manhole sections. Precast manhole sections must conform to the requirements of ASTM C 478 and manhole joints must conform to the requirements of ASTM C 443, except that the joint design of the pre-cast sections must consist of a bell or groove on one end of the unit of pipe and a spigot or tongue on the adjacent end of the joining section. Materials for Lift Station/Force Main Manholes and miscellaneous concrete structures
- must comply with the following: Concrete for pre-cast manhole sections and monolithic manholes must use four thousand (4000) psi concrete. Ready-mix concrete must conform to ASTM C 94, Alternate 2. Maximum size of agaregate must be one and a half (1.5) inches. Slump must be between
- two (2) and four (4) inches. Reinforcing steel must conform to ASTM A 615, Grade 40 deformed bars or ASTM A 616, Grade 40 deformed bars. Mortar Materials:
- Sand ASTM C 144, passing a #8 sieve. Cement - ASTM C 150, Type
- Water Must be potable. Joints on pre-cast manhole sections must utilize rubber aaskets meeting the requirements of ASTM C 443 and these Specifications, the more stringent will apply. O-ring gaskets must be confined in a groove in the spigot end of the pre-cast manhole section. Profile
- gaskets must bear on a lateral face of the tongue so as to provide positive positioning. The joint must be further sealed as noted on the Air/Vacuum Release Manhole Detail of HSE's Lift Station and Force Main Details sheet Except lift station wet wells which must be field cored, the manufacturer of the pre-cast manholes must provide factory cut openings to produce a smooth, uniform, cylindrical hole of the proper size to accommodate the resilient connector. Resilient connectors can alternately be pre-cast-in-place by the manufacturer. All pipes entering and leaving Lift
- Station/Force Main Manholes must have a resilient connector meeting the requirements of ASTM C 923 firmly clamped around the pipe. The resilient connectors must be PSX gasket or Press Wedge II as manufactured by Press-Seal Gasket Corp. or similar flexible manhole sleeves as manufactured by Kor-N-Seal or equal. Without prior written consent of Engineer, pre-cast manhole sections must be steam cured and cannot be shipped from the point of manufacture for at least five (5) days after
- having been cast. Upon written consent of Engineer, pre-cast manhole sections can be shipped prior to five (5) days if they were manufactured of early high strength concrete and are verified through testing to have achieved a strength acceptable to Engineer. Lift Station/Force Main Manhole castings must be of good quality cast iron conforming to ASTM A 48 or DI conforming to ASTM A 536, Grade 65-45-12 with concealed pick hole. Refer to HSE's Gravity Sanitary Sewer Details sheet for detailed information. Lift Station/Force Main Manhole steps must be made from a steel reinforcing rod
- encapsulated in a copolymer polypropylene resin. The manhole steps must equal or exceed IOSHA requirements. Manhole steps manufactured by M.A. Industries, Inc., American Step Company, Inc., or equal, are acceptable. Any other special manholes and miscellaneous concrete structures must be constructed as
- detailed on the construction drawings. Lift Station/Force Main Manhole bases must be cast-in-place concrete, reinforced as shown on HSE's Lift Station and Force Main Details sheet, or combination pre-cast concrete base and first section. Detailed drawings must be submitted to the Engineer prior to castina or manufacture.
- No interior surface applied materials can be used. Concrete manhole joints are to be sealed by Infi-Shield Gator Wrap. Riser rings are to be sealed by use of Infi-Shield Uni Band per manufacturer?s instructions. 1.07 Odor Control
- Generally, odor control facilities will be required in lift stations and manholes receiving discharge from a force main with a substantial length or lift station with a substantial cycle time. Engineer will make the determination as to the need for odor control.
- Bioxide Chemical Feed System A building will need to be constructed for the bioxide chemical feed system
- within ten (10) feet of the valve vault. Refer to the Odor Control Facilities Detail on HSE's Lift Station
- and Force Main Details sheet. Odor control system shall be manufactured by Evoqua Water Technologies, LLC.
- Hydroxyl Radical Fog System Odor control system shall be manufactured by Vapex
- Nozzle creates micron size water particles.
- No foul air extraction is required Carbon Medium Based Systems
- Stainless steel tankage by Calgon or equal.
- Corrosion resistant fan for H_S by Cincinnati Fan Co. or Greenheck. Midas Carbon Media by Evoqua or Calgon equivalents.

PART 2 - EXECUTION

- 2.01 Handling and Cutting Pipe A. Each product to be incorporated into the Project must be handled into its position, placed and supported only in such manner and by such means as the Engineer accepts as
- Pipe and fittings must be handled carefully to avoid cracking or abrasion of the coating. Handle in a manner to insure installation in sound and undamaged condition. Do not drop or bump. Use slings, lifting luas, hooks and other devices desianed to protect pipe. joint elements and coatings. Ship, move and store with provisions to prevent movement or shock contact with adjacent units. Handle with equipment capable of performing the work with an adequate factor of safety against overturning or other unsafe procedures. Any fitting showing a crack and any fitting or pipe which has received a severe blow which could have caused an incipient fracture, even though no such fracture can be seen, must be marked as rejected and removed at once from the site.

- D In any pipe showing a distinct crack and in which it is believed there is no incinient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut must be made in the barrel at a point at least twelve (12) inches from the visible limits of the crack.
- E. All field cutting of pipe must be done in a neat, trim manner. Field cut pipe will only be allowed at Lift Station/Force Main Manholes and fittings. The cut end must be beyeled using a file or a wheel to produce a smooth bevel of approximately fifteen (15) degrees and a minimum depth of 1/3 of the pipe wall thickness. PVC Pipe
- PVC pipe must be cut with either a hand saw or power saw. b. Smooth cut by power grinding to remove burrs and sharp edges.
- 2.02 Laying Pipe
- Unless approved by the Engineer, Contractor must not install different sizes, types, classifications and arades of pipe between Lift Station/Force Main Manholes. All rough grading (on-site and off-site) must be finished to within one (1) foot of final arade prior to the start of construction of the Lift Station/Force Main Infrastructure. Contractor must provide and protect survey grade stakes that enable Engineer to verify
- compliance with the rough grading requirement. The sewer segment downstream from any connection made to an existing sewer must be cleaned by a jet-rodder with vactor truck immediately after the connection to the existing
- sewer and plugging of the connection is finished. All pipe must be bedded as described in these Specifications under Pipe Beddina and Haunching and according to the Force Main Trench Detail on HSE's Lift Station and Force Main Details sheet. Bell holes must be excavated in advance of pipe laying so the
- entire pipe barrel will bear uniformly on the prepared sub-arade. All piping must be installed utilizing equipment, methods and materials insuring nstallation to accurate lines and grades and must be supported, guided or anchored as shown, as specified or as necessary. Accomplish horizontal and vertical curve alignments
- of pipe with fittings and deflected joints. All pipe must be laid accurately to the required line and grade in the manner prescribed by the pipe manufacturer and appropriate ASTM/AWWA specifications. Each section of pipe must be laid to form a close, concentric joint with the adjoining pipe at an elevation conforming to the required grade. Obtain approval of Engineer of method proposed for transfer of line and grade from
- ontrol to the work. Survey instruments capable of third order accuracy must be used for checking alignment and grade throughout the Project. It is the Contractor's responsibility to regularly test all equipment to assure compliance with manufacturer's specifications.
- Clean interior of all pipe and fittings prior to installation When bell and spigot pipe is laid, the bell of the pipe must be cleaned of mud, sand and other obstructions and wined out before the clean spigot of the next pipe is inserted into it. The joint must be made in a satisfactorily manner in accordance with the recommendations of the manufacturer of that particular type of joint and the direction of the Engineer. The new pipe must then be shoved "home" firmly against the back of the ell and securely held until the joint has sealed. Experienced personnel must perform al
- Locate pipe joint to provide for differential movement at changes in type of pipe embedment or at changes in trench bottom material. Do not locate joint within eighteen (18) inches of Lift Station/Force Main Manhole walls. Clean and Jubricate all joint and aasket surfaces with lubricant recommended by manufacturer. Check joint deflection for specified limits. Maximum total deflection in all directions at each joint must be the lesser of the
- manufacturer's recommended maximum deflection or four (4) degrees. Use short specials preceding fittings as required.
- No fittings of greater than forty-five (45) degree bend can be used outside the lift station and receiving manhole.
- Thrust Blocks and Restrained Joints Provide concrete thrust blocks at:
- All horizontal turns utilizing fittings All tee, end plug and plugged cross fittings.
- All upward vertical bends.
- All buried in-line valves three (3) inches and larger must be anchored as approved by Engineer against the thrust created when the valve is closed. Area of undisturbed soil that braces the thrust block must be large enough to withstand the thrust in whatever direction it is exerted.

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- Construct to undisturbed edge of trench for bearing. Provide minimum bearing area and configuration as specified on the Force Main Thrust
- Blocking Detail of HSE's Lift Station and Force Main Details sheet. Restrained joints must be installed on all vertical turns or where adequate bearing
- surfaces are not available. Joints can be restrained by flanged or restrained joint type fittings or by rodding as approved by Engineer.
- If proper compaction, as described by the manufacturer, is provided around all fittings and all joints are joined by the heat fusion method, then thrust blocks will not be required Contractor must install insulated #10 copper tracer wire immediately adjacent to the top
- All lateral tracer wire connections shall be soldered and a DryConn® Direct Bury Lug Electrical
- Insulating Corrosion Resistant Wire Splice kit to be used at ALL spliced locations.

2.02a Manholes and valves.

- A. A "Tempo OMNI MARKER model 162 marker" must be installed directly above the force main no deeper than three (3) feet below finish grade every two hundred fifty (250) feet on straight runs and above all fittings where the direction of the pipe changes. Fiberglass field markers must be placed at all locations where a force main crosses a street, at all Lift Station/Force Main Manholes, valves and fittings, and at distances not to exceed one thousand two hundred (1,200) feet along straight runs. Markers must be
- equal to Carlon, and must indicate ("Sewage Force Main"). Do not let water fill trench. Do not lay pipe in water. Include provisions to prevent flotation should water control measures prove to be inadequate. Perform pipe installation only when weather and trench conditions are suitable. Allo
- pipe to reach trench air temperature prior to installation. Open excavation must be satisfactorily protected at all times. At the end of each work day, open ends of all pipe must be protected against the entrance of animals, children. earth or debris by bulkheads or stoppers. Provide adequate backfill to prevent flotation of
- the pipe. Any earth or other material that enters the Lift Station/Force Main Infrastructure through any such open end or unplugged branch must be removed. Install a temporary water tight plug at the end of the force main whenever installed pipe is left unattended. Contractor must prevent all water, earth or other material from entering
- the Lift Station/Force Main Infrastructure. In the event any water, earth or other material enters the downstream sewer, the Contractor is responsible to HSE for the costs of sewage treatment, electrical power, equipment repairs, incidental damages, cleaning and any other costs or expenses related to such entry. Contractor shall pay HSE damages of \$1000 per occurrence. Failure to comply with HSE within 60 days may (at the discretion of of HSE) result in temporary or permanent suspension from performing work in the utility service area.
- Pipe must be installed to cross storm sewers and other utilities at approximately ninety (90) degrees and must maintain a minimum horizontal separation of ten (10) feet from all storm and utility structures.
- Pipe must be installed as previously stated and per Uni-Bell PVC Pipe Association's UNI-B-3 "Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4 - 36 Inch)", the more stringent shall apply.

2.03 Bores

- Casing wall thickness as per Section 716 Jacked Pipe of the "Indiana Department of ansportation Standard Specifications" latest edition.
- All work within right-of-ways must be in accordance with the requirements of the governmental agency having jurisdiction. Where no procedures for a particular portion of the work are given, the recommendations of the "Indiana Department of Transportation
- Standard Specifications," latest edition, must be followed. At the Engineer's discretion Contractor must fill carrier pipe with water to prevent flotation and misalignment during grouting.
- Engineer recommends preliminary hydrostatic pressure and leakage testing of the carrier pipe prior to grouting. Upon completion of the bore, contact Engineer to verify invert elevations to assure that carrier pipe is on grade.
- For further information refer to the Typical Boring Detail on HSE's Gravity Sanitary Sewer Details sheet. Contractor may request alternate methods or materials such as the use of directional
- boring and/or PE pipe. In this case, Engineer must approve, in writing, the use of alternate methods or materials and the contractor performing the bore. 2.04 Concrete Coatinas

Interior Lift Station Coating

- Cob blast to remove and dislodge dirt, debris and other contaminants to enhance
- adhesion of the coating using high pressure air. After cob blast, thoroughly hand clean all surfaces to be coated.
- Apply one (1) coat of Sherwin Williams Corobond 100 primer coat.
- Apply one (1) coat of Sherwin Williams CorCoat SC topcoat.
- 5. Upon completion, all materials and debris will be removed and placed in containers. 6. Exterior joints shall be wrapped with Infi-Shield Gator Wrap®

HAMILTON SOUTHEASTERN UTILITIES. INC. LIFT STATION AND FORCE MAIN SPECIFICATIONS SHEET 1 OF 3

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- 2.04 Pipe Bedding and Haunching
- Each pipe section must be laid in a firm foundation of bedding material and haunched and backfilled with care. These materials must be placed and compacted in accordance with ASTM D 2321.
- B. Prior to pipe installation, carefully bring bedding material to grade along the entire length of pipe to be installed in accordance with the Force Main Trench Detail on HSE's Lift Station and Force Main Details sheet. If in the opinion of the Engineer soil conditions are
- unstable, then the trench must be undercut until stable soil is encountered and #2 stone must be placed below bedding approved by Engineer. When the bedding material is placed in a "fill" area, all such "fill" must be compacted to
- 95% standard proctor density prior to installing the force main, from undisturbed earth to the crown of the pipe.
- For flexible pipe such as PVC, the placement of embedment material or haunching around the pipe must be done with care. The ability of the pipe to withstand loading in a trench depends upon the method employed in its installation
- 1. For PE pipe, the maximum particle size of materials used for bedding, haunching and initial backfill must be kept to an half (0.5) inch for pipe diameters of eight (8) inches and smaller and a maximum size of one (1) inch for pipe diameters larger than eight (8) Objects that may cause point loading on the pipe must be removed.
- Care should be taken so not to compact directly over the top of the pipe. Where excavation occurs in rock or hard shale, the trench bottom must be undercut and a minimum of six (6) inches of #2 crushed stone must be placed below the bedding zone
- prior to pipe installation. All stone bedding above and below the Lift Station/Force Main Infrastructure must be free of dirt, organic matter and frozen material G. If more than one (1) foot of unstable material is encountered, the Contractor shall take additional measures to ensure that additional stabilization is provided, such as aeotextile
- fabric wrapping the trench section or as approved by the Engineer 2.05 Concrete, Concrete Caps and Concrete Cradles
- The strength of concrete indicated on all drawings, details and specifications is twentyeight (28) day compressive strength
- Concrete caps and cradles must be provided at all locations indicated on the Construction Plans. When so ordered by the Engineer, concrete caps and cradles not shown on the Construction Plans must be installed. All concrete caps must be installed in accordance with the Concrete Cap Detail of HSE's Gravity Sanitary Sewer Details sheet.
- At the Engineer's discretion. Contractor must take four (4) cylinders per five (5) cubic yards of concrete and provide certified test results to Engineer.

2.06 Lift Station/Force Main Manholes and Other Structures

- A. All Lift Station/Force Main Manholes must be constructed in accordance with HSE's Lift Station and Force Main Details sheet. All flow monitoring/metering manholes must be five (5) feet in diameter.
- Where applicable, manhole channels or inverts must be formed and poured with concrete to the crown of the connecting pipe in accordance with HSE's Gravity Sanitary Sewer Details sheet. The finished invert must be a semi-circular shaped smooth channel directing the flow to the downstream sewer. Changes in direction in base channels must be accomplished by smooth, constant radius turns in the channel joining the downstream channel tangentially. Concrete must be RE-CRETE twenty (20) minute set or approved equal and must use Dayton Superior's J-40 or R-40 or approved equal liquid bonding agent. Patches over one (1) inch thick must use 3/8 inch Red-Head anchors. Where approved by the Engineer, manholes added to an existing sanitary sewer must be
- constructed per the Sanitary Manhole Detail on HSE's Gravity Sanitary Sewer Details sheet. No 'dog house' or 'saddle' structures will be permitted. The upstream and downstream sanitary sewers between the new manhole and the existing manholes must be low-pressure air tested and deflection tested Also, the new manhole must be vacuum tested while maintaining continuous service. Cast-in-place monolithic concrete Lift Station/Force Main Manholes and other cast-in
- place concrete structures must be cured for a minimum of seven (7) days prior to Cored holes. Penetrations, etc Any holes cut in the field must be smoothly and cleanly drilled with a core-drill or in a
- manner acceptable to the Engineer. All pipes entering and leaving Lift Station/Force Main Manholes must utilize a resilient connector as previously described in these Specifications and indicated on HSE's Lift Station and Force Main Details sheet. For cored holes, penetrations and/or other opening through Lift Station/Force Main
- Manholes, HSE requires a separation of greater than eighteen (18) inches between the outer edge of resilient connectors. If a separation of less than eighteen (18) inches exists, then additional reinforcement must be supplied in the manhole All cored holes, penetrations and/or other opening through Lift Station/Force Main Manholes must have a minimum separation of eight (8) inches from the outer edge of resilient connectors.
- 4. All cored holes, penetrations and/or other opening into a manhole or other sanitary structure must have a minimum separation of six (6) inches from any joint, as measured from the nearest joint shoulder (interior or exterior), to the penetration.
- Contractor must install steps with a minimum horizontal separation of twelve (12) inches from all pipes entering and leaving Lift Station/Force Main Manholes. Finished grade around Lift Station/Force Main Manholes and castings must be set at an elevation to prevent surface water runoff from running over or ponding on top of the
- All Lift Station/Force Main Manhole frames must be securely anchored to the structure with bolts and concrete anchors adequate in length to penetrate into the structure as shown on HSE's Gravity Sanitary Sewer Details sheet.
- The Engineer has the right to cut cores from such pieces of concrete Lift Station/Force Main Manholes as he desires for such inspection and tests as he may wish to apply. Holes left by the removal of cores must be filled in an acceptable manner to form a water tight and structurally sound repair. Engineer may, for inspection or testing purposes, take samples of concrete after it has
- been mixed or as it is being placed in the forms or molds All grout used to seal or join structures must be non-shrink grout.
- 2.07 Stubs Connections Bulkheads and Miscellaneous Items of Project
- Where existing sewers carrying sanitary sewage are encountered, the Contractor must
- provide and maintain temporary connections or redundant pumping systems to prevent a Where called for on the Construction Plans, stubs for future sewer connections must be provided. Stubs must be field marked with a two by four (2" x 4") as shown on the Service Lateral Detail of HSE's Gravity Sanitary Sewer Details sheet. Without written permission from the Éngineer, the Contractor cannot connect any
- existing sewers or house services into the Project prior to the Project being deemed Completed by HSE. 2.08 Existing Utilities, Structure, Property, Etc.
- A. All improvements, including but not limited to, poles, trees, fences, sewer, gas, water or other pipes, wires, conduits and manholes, railroad tracks, buildings, structures, property, etc. along the route of the Lift Station/Force Main Infrastructure must be supported and
- protected from damage by the Contractor. Movable items such as mail boxes can be temporarily relocated during construction, provided their function is maintained. Place movable items in their original location immediately after backfilling is finished, unless otherwise shown on the Construction Plans. Any movable items damaged during construction must be replaced by an item of
- eaual or better auality. The Contractor must proceed with caution in the excavation and preparation of trenches so that the exact location of underground utilities and structures, both known and unknown, can be determined. The Contractor is responsible for the repair of utilities and
- structures when broken or otherwise damaged. The Contractor must make explorations and excavations whenever, in the opinion of the Engineer, it is necessary to determine the location of underground structures.
- Wherever pipes or conduits cross the trench, the Contractor must support said pipes and conduits without damage to them and without interrupting their service. The manner of supporting such pipes, etc. is subject to approval by the owner of the pipe or conduit. When utility lines have to be removed or relocated for the Project, the Contractor must notify the Engineer and utility line owner in ample time for the necessary measures to be
- taken to prevent interruption of the utility's service. The Contractor must conduct the work so that no equipment, material or debris will be placed or allowed to fall upon private property in the vicinity of the Project unless the Contractor has first obtained the property owner's written consent thereto and provided a
- copy to the Engineer. H. All excavated material must be piled in a manner that will avoid obstructing sidewalks, driveways and thoroughfares. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire and police call boxes or other utility controls must be left unobstructed and accessible during the Project. Contractor must prevent runoff from stored piles of excavated material from entering ditches, waterways, autters or storm

2.09 Excavating

- De-watering Keep excavations free from water until all Lift Station/Force Main Infrastructure are Completed. Provide sufficient dikes and de-watering equipment and make satisfactory arrangements for the disposal of the water without undue interference with other work damage to property or damage to the environment. Water disposal must be in compliance with the regulations of the Environmental Protection Agency ("EPA"), Indiana Department of Environmental Management ("IDEM"), Soil Conservation Service ("SCS") and all other applicable agencies.
- Contractor must prevent all water from entering the Lift Station/Force Main Infrastructure. In the event any water enters Completed Lift Station/Force Main Infrastructure, the Contractor is responsible to HSE for the costs of sewage treatment. electrical power, equipment repairs, incidental damages, cleaning and any other costs or expenses related to such entry. In addition, Contractor shall pay HSE damages of \$1000 per occurrence. Failure to comply with HSE within 60 days may (at the discretion of
- of HSE) result in temporary or permanent suspension from performing work in the utility service area. Operate de-watering equipment ahead of pipe laying or to keep the water level below the
- excavation until structures are secured by backfill. Contractor must, at Engineer's discretion, provide de-watering equipment, shoring or other construction practices deemed necessary by Engineer
- Dewatering well spacing is to provide sufficient draw down of the water table to prevent water from entering the trench and sand spoils. It shall be the contractors responsibility to provide a geotechnical engineers assessment of corrective action to prevent future post-construction should a sand boil be entertained during trench work and implement corrective measures.
- All wells (potable, non-potable and de-watering) must be drilled, capped and abandoned in accordance with the requirements of the Engineer, the Indiana Administrative Code, Indiana Department of Natural Resources - Groundwater Section, Hamilton County Health Department and all other governmental agencies and public entities having
- Ás directed by the Engineer, Contractor must maintain the well casing in-place for all Lift Station/Force Main Infrastructure which will be extended in the future and at the lift station site.

B. Trenching

- All excavation work must incorporate safety measures that comply with all applicable IOSHA regulations and these Specifications. In the event of a conflict, the more stringent requirement will apply.
- Trees, boulders and other surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, must be removed or made safe before excavating is begun.
- Unless otherwise directed by the Engineer, do not open more than seventy-five (75) feet of trench in advance of the installed pipe. Unless otherwise directed, excavate the trench within six (6) inches of full depth for a distance of at least thirty (30) feet.
- Contractor must provide sloped side walls (provided that the bottom four (4) feet of trench will not be sloped), sheeting, shoring or trench boxes as safety measures for all excavations in accordance with all applicable IOSHA regulations. Contractor is responsible for the determination of the angle of repose of the soil in which the trenching is to be done. Except for areas where solid rock allows for line drilling or pre-slitting or where sheeting, shoring or trench boxes are to be used, excavate all slopes to beyond the angle of repose, but not steeper than a one (1) foot rise to each half (0.5) foot
- Sides, slopes and faces of all excavations must meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing or other equally effective means. Give special attention to slopes that could be adversely affected by weather or moisture content.
- Flatten the excavation sides when an excavation has water conditions, silty materials, loose boulders and areas where erosion, deep frost action and slide planes appear. A competent Contractor's representative, as defined under IOSHA regulations, must inspect excavations and approve trench safety measures for the excavation after every rain event or other hazard increasing occurrence
- Do not store excavated or other material nearer than four (4) feet from the edge of any excavation. Store and retain materials so as to prevent materials from falling or sliding back into the excavation. Install substantial stop logs or barricades when mobile equipment is utilized or allowed adjacent to excavations.
- Minimize the amount of excavation around Lift Station/Force Main Manholes. 10 The design of the pipe and Lift Station/Force Main Manholes are predicated upon the width of trench as specified by the manufacturer and these Specifications, the more stringent of which will apply. If the specified trench width is exceeded, then the Contractor is responsible for the provision and installation, at his own expense, of all remedial measures required by the Engineer.
- Test the air in excavations in locations where oxygen deficiency or gaseous conditions are possible. Establish controls to assure acceptable atmospheric conditions. Provide adequate ventilation and eliminate sources of ignition when flammable gases may be present. Emergency rescue equipment, such as breathing apparatus, a safety harness and line and basket stretcher, must be readily available where adverse atmospheric conditions may exist or develop in an excavation.
- 12. Provide walkways or bridges with guardrails where employees or equipment are required or permitted to cross over excavations. 1.3. Provide ladders where employees are required to be in excavations four (4) feet deep or
- more. Ladders must extend from the floor of the excavation to at least three (3) feet above the top of the excavation. Locate ladders to provide means of exit without more than twenty-five (25) feet of lateral travel. 14. Provide adequate barriers and physically protect all excavations. Barricade or cover all wells, pits, shafts and similar excavations. Backfill temporary wells, pits, shafts and
- similar excavations upon termination of exploration and similar operations. Backfilling must meet the requirements of ANSI/AWWA C605 unless otherwise
- specified in these Specifications. Do not backfill trenches and excavations until all utilities have been inspected by the Engineer and until all underground utilities and piping systems are installed in accordance with the requirements of the respective utility company, these Specifications and the Project's Construction Plans
- Place and tamp bedding and backfill in a manner that will not damage the pipe, pipe coating, wrapping or encasement. Contractor must insure that all unstable trench bottom material is replaced with suitable naterial and all voids are filled prior to placement of the pipe embedment material.
- Excess dry replacement material without visible fines or mud will not be acceptable. When used in these Specifications, the term "clean backfill" shall mean any backfill material of any type which is free of roots, brush, sticks, debris, junk, cinders, broken concrete or brick, large lumps of clay, frozen material, stones, etc. areater than six (6) inches in their largest dimensions. Not more than fifteen (15) percent of the rocks or lumps can be larger than two and a half (2.5) inches in their largest diameter.
- All job excavated materials which are used for trench backfill above pipe embedment and which are to be compacted by any method except settlement by water, must be "clean backfill." The materials must be of such composition that it can be compacted to ninety (90) percent relative compaction by the compaction method used and with water added, if eeded, to bring it to optimum moisture content.
- Material excavated from an open trench can be used for backfilling from the pipe to six (6) inches below finished grade providing it meets the requirements of "clean backfill" and providing a different type of backfill material has not been specified or shown on the Construction Plans. Where excavated material is used for backfilling and there is a deficiency due to the rejection of a part thereof, the Contractor, upon direction of the Engineer, must remove the rejected material from the site and furnish an additional quantity of "clean backfill" at his own expense.
- Excavated material must be placed immediately after the hand backfill. Such backfilling can be done from the top of the trench by mechanical means or directly from trucks by depositing the backfill on a slope equal to the angle of repose of the material and allowing it to flow progressively forward in such a manner as to prevent the formation of voids. The earth backfill must be compacted to at least ninety-five (95) percent proctor density or mounded six (6) inches for settlement.
- In no case must backfill be dropped from such height or in such volume that its impact damages Lift Station/Force Main Infrastructure. The Engineer reserves the right to regulate and control the manner of depositing such backfill, but in any case, the Contractor will be held liable for damage to the Lift Station/Force Main Infrastructure
- Settling of backfill by flooding or puddling will not be permitted. Excess trench material must be roughly graded over the trench in a timely manner soon after the pipe is installed. This material must be mounded over the trench with a crown height of no more than six (6) inches, feathered to existing grade, until final settlement has occurred and the trench is ready for arading and cleanup. An exception to this would be trenches in traveled pathways. Any excess must be hauled off and disposed of or stored by the Contractor
- 12. After settlement of backfill and immediately before restoration of vegetated areas, grade and remove excess earth in unpaved areas. Remove to a depth of six (6) inches below finished grade. Place six (6) inches of topsoil over entire area to be restored.

2.10 Restoration

- This section pertains to the restoration of the Project site upon Completion of the work. Restoration of improvements on public and private property must be in-kind and acceptable to the owner.
- Restoration of road surfaces, drainage ways and other similar improvements within the public right-of-way or acquired easements must be in accordance with the directions of the government agency or public entity having jurisdiction.
- D. All vegetated areas disturbed or damaged during construction must be re-vegetated with a stand of arass. Agricultural areas and areas currently under construction do not require re-vegetation. Backfills, fills and embankments must be brought to a sub-grade level six (6) inches
- below finished grade. When sub-grades have settled, deposit and spread fine raked
- topsoil ready for seeding to a finished depth of at least six (6) inches. Commercial fertilizer, 6-12-12 or equal, must be uniformly spread at the rate of thirtyfive (35) pounds per one thousand (1,000) square feet over the topsoil by a mechanical spreader at least forty-eight (48) hours before seeding and mixed into the soil for a depth of two (2) inches. 3. A grass seed mixture comprised of thirty-five (35) parts Kentucky Blue Grass, thirty (30)
- parts Perennial Rye, thirty (30) parts Kentucky 31 Fescue and no more than five (5) parts inert matter must be sown on the disturbed areas at a rate of three (3) pounds per one thousand (1,000) square feet. Seeding must be done only between April 1 and June 1 or August 15 and October 15. Seeded areas must be mulched with straw, hay, wood cellulose fiber or cane fiber. Straw
- or hay must be applied at a rate of two and a half (2.5) tons per acre. Wood cellulose or cane fiber mulch must be applied at a rate of one thousand (1,000) pounds per acre. On special areas of high water concentration, unstable soils or sloped surfaces, manufactured mulch materials such as soil retention blankets, erosion control netting or others may be required by Engineer. Manufactured mulch materials must be installed according to the manufacturer's recommendations.
- The seeded areas must be thoroughly watered with a fine spray to prevent wash out the seed. These areas shall be maintained and patched as directed by Engineer. A satisfactory stand of grass at least one (1) inch in height without bare spots will be
- Within three (3) months after Project Completion, the Contractor must correct defective work, such as settled areas, uneven road surfaces, bare spots in grass coverage, erosion and gullies
- 2.11 Valves and Valve Boxes Install valves with stems vertical.
- Tighten all valve glands as valves are installed; add additional gland packing, if required; and again tighten glands after valves are placed in operation and brought up to operating
- pressure. Replace any gland packing which is deteriorated or in unsatisfactory condition Valve boxes must be installed vertical and straight, with the base supported so that it will not bear on the force main. The operating nut is to be extended so that it is with in one (1) to two (2) feet of final grade. The operating nut is to be centered in the box and readily operable with a standard valve wrench. Supply valve wrench as directed by Engineer.

SECTION 2 - LIFT STATION EQUIPMENT

PART 1 PRODUCTS

General Guide Specification A. The contractor is to provide a complete functional lift station which integrates with HSE's SCADA system and is compliant with HSE's overall system communication protocol configuration. The full compliant operational component must be proved prior to acceptance by HSE. The pumps must be capable of handling raw, unscreened sewage, three (3) inch spherical solids and stringy materials typical of domestic sewage.

1.01 Submersible Pump

A. Pumps are to demonstrate the functional benefit of ("N-Technology") by Flygt to hard-iron chopper hydraulics to meet existing or future changing operational conditions. B. Energy saving in projected electricity bills is anticipated to approximate 25% when compared to a comparable Hydramatic or Barnes submersible pump. Energy cost savings less than this amount shall cause acceptance to be contingent upon Engineers approval. C. With the understanding that the conditions stated item (1.) above of this section, the approved pumps for this project shall be either Flygt or Wilo.

1.02 Requirements

1. Pump(s) to be configured for electrical voltage and power phase available and optimum operating efficiency. 2. Submersible cable sized according to ICEA standards and also meet with P-MSHA Approval. 3. The Submersible power cable shall not consist of natural rubber composition on the exterior sheathing.

D. SUBMITTALS F. TESTING following: H. GUARANTEE I. EXPERIENCE

Electric submersible pump(s) to be supplied with motor, close coupled volute, cast iron discharge

elbow, guide bar brackets, power cable and accessories. C. QUALITY ASSURANCE

1. The pump(s) shall be heavy duty, electric submersible, centrifugal or chopper type units as required by Engineer associated with a complete installation designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of 104 Degrees. Since the high temperature of 104 Degrees specified by the National Electrical Manufacturers ssociation (NEMA) and Factory Mutual (FM),motors with a maximum ambient temperature rating below

104 Degrees be acceptable. 2. The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The

use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable 3. The pump, mechanical seals and motor units provided under this specification shall be from

from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

1. Submittal data shall be provided to show compliance with these specifications, plans or other specifications that will influence the proper operation of the pump(s).

2. Standard submittal data for approval must consist of:

- a. Pump Performance Curves b. Pump Outline Drawing.
- c. Station Drawing for Accessories d. Electrical Motor Data.
- e. Control Drawing and Date
- Access Frame Drawing Typical Installation Guides
- Technical Manuals. Parts List.
- Printed Warranty.

Manufacturer's Équipment Storage Recommendations. I. Manufacturer's Standard Recommended Start-Up Report Form

3. Lack of the above requested submittal data is cause for rejection.

B. SCOPE

1. Testing performed upon each pump shall include the following inspections: a. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.

- b. Prior to submergence, each pump shall be run dry to establish correct rotation. c. Each pump shall be run submerged in water. d. Motor and cable insulation shall be tested for moisture content or insulation defects.
- 2. Upon request, a written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the time of shipment.
- 3. Each pump (when specified) shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer to determine head vs. capacity and kilowatt draw required. Witness tests shall be available at the factory upon request.
- 4. The pump(s) shall be rejected if the above requirements are not satisfied.

F. START-UP SERVICE

1. The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 8-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the

a. Megger stator and power cables.

- b. Check seal lubrication.
- c. Check for proper rotation
- d. Check power supply voltage.
- e. Measure motor operating load and no load current. f. Check level control operation and sequence.
- 2. During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel

G., FACTORY SERVICE

- 1. Factory-Approved service facilities with qualified factory-trained mechanics shall be available for prompt emergency and routine service.
- 1. The warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured.

- 1. The pump manufacturer shall have a minimum of 10,000 heavy-duty submersible wastewater pumps installed and operating for no less than 5 years in the United States.
- 1. The pump, mechanical seals and motor shall be from the same manufacturer.
- 2. The pump, mechanical seals and motor manufacturer shall be Flygt or Wilo.

PUMP DESIGN CONFIGURATION (Wet pit installation)

The pump(s) shall be automatically and firmly connected to the discharge connection, auided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with stainless steel lifting cable or integral cast bale. The working load of the lifting system shall be 50% greater than the pump unit weight.

PUMP CONSTRUCTION Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating.

Sealing design shall incorporate metal to metal between machined surfaces. Critical matting surfaces where watertight sealing is required shall be machined and fitted with Nitrile 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.

COOLING SYSTEM

Non-cooling Jacket Equipped Each pump motor shall be sufficiently cooled by the surrounding environment or by submergence in the pumped media.

(Cooling Jacket Equipped)

Each unit shall be provided with an integral motor cooling system. A stainless steel motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

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 dual cylindrical elastomer arommets. flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from

- each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated
- with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NFMA MG1. Part 31. The motor shall be designed for continuous duty while handling pumped media of up to 104°F.
- Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/-10%. The motor shall for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.
- Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of Motor continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

BEARINGS

The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently arease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

MECHANICAL SEALS

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant operation. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

PUMP SHAFT

The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel. Shaft sleeves will not be acceptable

IMPFLLER

The impeller shall be of ASTM A-532 (Alloy III A) 25% chrome cast iron dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the gray iron impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

VOLUTE / SUCTION COVER

The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric desian with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of ASTM A-532 (Alloy III A) 25% chrome cast iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

PROTECTION

Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

1.03 Instrumentation and Control Specification

A. GENERAL 1.0 Summary

a. The control system is to be compatible and integrate with HSE's communication and SCADA system.

2.0 Related Sections

a. "Basic Electrical Materials and Methods" for general component Identification and support requirements. 3.0 Definitions

- LCD: Liquid Crystal Display α. LED: Light Emitting Diode
- COM: Communications
- LAN: Local Area Networ PVC: Poly Vinyl Chloride
- CMF: Central Monitoring Facility

4.0 Submittals

- a. General: Submit items in this Article according to the Conditions of the Contract. b. Product Data for monitoring and control equipment shall include physical dimensions and data on features, components, ratings, and performance. Include wiring diagram and elevation views of the
- front display panel/keypad where applicable. c. Shop Drawings detailing dimensions, components, location and identification of field connections,
- arrangement of components and operational characteristics. d. Wiring Diagrams detailing the installation of the equipment and differentiating between factory-installed
- and field-installed wiring. shall be in commensurate with HSE's numbering and related electrical schematics. 5.0 Quality Assurance
- a. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where applicable.
- b. Listing and Labeling : Provide products specified in this Section that are listed and labeled. 1.) The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100. 2.) Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- 6.0 Warranty
- a. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents
- Warranty Period: Two (2) Years from the date of Substantial Completion and Acceptance unless otherwise indicated in other sections of this specification.
- B. PRODUCTS
- 1.0 Manufacturers
- Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following: 1. Pump Control Equipment:
- a. Multitrode
- b. Flygt c. Motor Protection Electronics, Inc.
- d. Products of other manufacturers assembled to provide all specified functions, including reliability equal to or exceeding that of the manufacturer listed in (a)above.
- C. PRODUCTS APPROVED FOR USE
- 1.) Danfoss AQUA VLT VFD's 20 HP and up
- 2.) Sixnet PLC (controllers) IPMP2 213
- 3.) Sixnet Cell Modems to communicate with our SCADA System. 4.) Sixnet Industrial Modems (and line type)
- 5.) AD2000 Backup Dialers for High/High Float (USP)
- 6.) Allen Bradley (AB) SMC3 Soft Starters 10hp to 20hp
- 7.) AB Relays and Bases 8.) AB - HOA Switches
- 10.) AB Nema Rated Contactors and Overload for Pumps under 10hp
- 11.) Diversified Seal Protection Relays (120v) 12.) Sola 2.5/100 24VDC Power Supplies

20.) Chromalor Silicon Rubber Heaters

D. COMPUTER COMMUNICATION & CO.

"Basic Electrical Materials and Methods"

Bundle, train and support wiring in enclosures.

1.04 Wet Well and Valve Vault Access Cover

HORIZONTAL ACCESS DOOR SPECIFICATION

13.) Phoenix Contact Diodes

19.) AB - Terminals

1.) IFIX 5.5

2.) Win 911

E. EXECUTION

A. GENERAL

SUMMARY

B. PRODUCTS

1. MANUFACTURER

(or approved equal)

REFERENCES

1.1 Installation

3.) Proficy Historian

4.) IGS Comm Control

22.) MPE Mechanical Floats

- 14.) Edwards Control Transformers 480v 1¢ to 120v 1¢ 2.5kva
- 15.) Allen Bradley Control Breakers Din Rail Mount 16.) Pandust Wireways and Din Rail

18.) 2 - 12 volt Batteries 7.ah to Back-up PIC and Controls

21.) ITE or similar - Pressure Transducer 4mA to 20mA output

a. Install equipment according to manufacturer?s written instructions.

b. Mount control equipment according to manufacturer?s instructions and Division 16 Section

c. Install wiring between control devices as specified in Division 16 Section Wires and Cables.

a. Work included: Furnishing and installing factory fabricated vault access doors and Fall Protection grating.

a. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428–2959; (610) 832–9585, fax (610) 832–9555

a. EJ GROUP, INC., 301 SPRING STREET, EAST JORDAN, MI 49727, 800-874-4100, ww.ejco.com

d. Identify components along with power and control wiring according to HSE Standards.

17.) APC - UPS Systems for Back-up to AD2000 Dialer

23.) 2.0k ohm Resistors on ALL Analog inputs to PLC

 ACCESS DOOR Furnish and install where indicated on plans vault access door(s) size 30 in x 30 in fmm for volve vault and as required for wet well. The vault access door shall be pre-assembled from the manufacturer with Full Protection Grating. Performme characteristics: Cover: Shall be reinforced to support a minimum live load of 300 psf (1464 kg/m2) with a maximum devine characteristics: Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc on graining and doording. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc cover. Shall be 1/4' aluminum diamond pattern. Cover: Shall be 1/4' aluminum diamond pattern. Frome: Cover shall be of recessed heavy duty design. Material shall be grade 316 stainless steel. Althings shall be fostened aluminum with continuous 1-1/2' andron flange around the perimeter. Hings shall be fostened aluminum with grade 316 stainless steel balts and ny-lock nuts. Drain Coupling: Provide a 1-1/2' drain coupling located within the channel forme. Lifting whechnaims: Murulcaturer shall provide the appropriate number and size of stainless steel balts and ny-lock nuts. Drain Coupling: Provide a 1-1/2' drain coupling located within the channel forme. Lifting whechnaims: Murulcaturer shall provide the appropriate number ond size of stainless steel balts and ny-lock nuts. Drain Coupling: Provide and plane and plane. Material shall be espipled with a naluminum lift handle . The lift handle shall be flush with the top of the 1/4' dramond plate. Material shall be supplied with a grade 316 stainless steel shall be flush with the top of the 1/4' dramonad plate. Each hatch shall be supplied with a gr	 Advanced Programming Functions The pump controller shall have the option of interfacing with IEC61131-3 and IEC61499 compliant PLC programming languages to enhance functionality or interact with the pump controller. The pump controller shall have the option of using a simple logic engine to enhance functionality or interact with the pump controller. Input /Output Characteristics The pump controller inputs and autputs shall be modular and shall be expandable. Available I/O types shall include: Digital inputs (voltage free input), also configurable as counters Digital outputs (240V, 5A resistive) Analog inputs (10bit) User defined digital inputs d. Digital nupts (voltage free input). digital puts shall be configurable based on specific pump sensor arrangements: ee. Sed sensor (conductive) PTC Thermistor Conductive probe (for liquid level sensing) Deficited pump monitoring inputs The pump controller shall provide support for the following pump monitoring inputs: Insulation resistance test (RT) with user selectable test voltage up to 1000/VCC Insulation resistance test (RT) with user selectable test voltage up to 1000/VCC The pump controller shall provide support for the following pump monitoring inputs: Insulation resistance test (RT) with user selectable test voltage up to 1000/VCC Japtase current monitoring, derived from external current transformer devices with a 0.5% input resolution tolerance Configuration program backp, restore and firmware upgrades 1) The pump controller configuration interface shall allow the user to save and restore pump controller configuration interface shall allow the user to backup system log files, adarm and event log files, and custom scripts via the SD or USB ports. The pump controller configuration interface shall allow the user to backup system	REVISIONS	K NO. BY 1 UPDATED FOR 2017		
inspection and service. The system must permit ground level removal of the pumps for inspection or service without a person entering the wet well to remove the pump and motor assembly. Also, the system must permit removal of each pump without de- watering the wet well or interrupting operation of other pumps.	 a. (2) Ethernet ports (10Mbit/s) b. (2) RS232 ports (115kBit/s) c. (2) RS485 ports (115kBit/s) 		17 CHE		
b. Two (2) rails of two (2) inch stainless steel pipe must be positioned and supported by the pump mounting base. The guide rails must be aligned vertically and supported at the top by attachment to the access hatch frame.	 d. (1) USB device port e. (1) SD card port 2) The nump controller shall support the following communication types: 	NWA	DATE /14/20		
 For pumps greater than twenty (20) horsepower, Contractor must submit shop drawings to Engineer for review and approval. I—beams will not be accepted. The pumps must be equipped with sliding brackets or guides connecting to the rails. To 	a. TCP/IP b. UDP	DR/	f 12	$\left \right $	
insure easy removal of the pumps, the guides attached to each pump cannot encircle the rails.	c. RS232 d. RS485 e. Private radio over RS232	\sum	ΞÅ		K
1.05 Pump Control Equipment The pump controller system shall provide user ready automatic control of pumps with an	f. PSTN g. Wireless LAN h. Cellular data				
intuitive HMI interface. The pump controller shall contain HSE operational parameters that are selected and configured via the user interface (HMI). The minimum features available in the pump controller shall include:	i. Cellular voice 3.) The pump controller shall support DNP3 (master & slave, level 2 compliant), including:				
 a. Pump control of up to 4 pumps; including pump grouping and pump alternation. b. Intelligent Hand-Off-Auto Control: b. Hand made (cemi-automatic, non-maintained manual mode), the pump switches off at the deactivation. 	 a. Change of state reporting b. Native date/time and quality stamps for each data point c. Event buffering for different classes of data 				
 Hand mode (semi-automatic, non-mandalined mondal mode), the pump switches on at the deactivation set point and then resets to Auto mode for the next pump cycle. Hand mode (fully manual, maintained mode). To pump beyond the off (deactivation) set point, the Hand-Off-Auto button must be held down by the user for failedfe control. 	 d. Support for multiple masters and slaves to be configured on the unit e. DNP Security (for securing communications between master station and RTU) 				
 c. Level set point adjustment for pump activation, deactivation and station level alarms. d. Level device input capability shall include: 4-20mA analog signal, conductive probe, a transducer, and high/ 	 a. Modbus TCP b. Modbus RTU 				
high level control. Floats, engineer will stipulate minimum electrodes and spacing. e. Redundant level device input capability with automatic input fault control (input device switching).	c. Modbus ASCII D. Support for multiple masters and slaves				
f. Selectable charge (fill) or discharge (empty) modes. g. Pre-configured station optimization features shall include: • Maximum pump off time	5.) The pump controller shall meet the following performance and environmental characteristics: a. Central Processing Unit Speed: 566MHz b. Output Processing Unit Speed: 566MHz				FIED
 Maximum pumps to run Maximum starts per hour 	 Central Processing Unit RAM Size: 256MByte Central Processing Unit Flash Memory Size: 64MByte Real Time Clock 				CERTIF
 Inter-pump start and stop time delays Maximum pump run time Blocked pump detection 	e. Working temperature -10°C to +60°C f. Storage temperature -40°C to +90°C				$\overline{\langle}$
Well washer control capabilityWell clean out control capability	g. numinity 5% to 95% (non-condensing) h. IP Rating Controller Base Unit: IP20, NEMA 1 i. Display Interface IP65, NEMA 4				
Pump operation control capability h. "Locked level" alarm function to indicate a level device fault.	6.) The pump controller shall be provided with a 5 year limited manufacturer's warranty.				2
 User-defined % change within a specified time period Different set point values for low use or high use time periods (user defined) Pump alternation modes shall include: 	1.06 Level Control System and High Water Alarm System Backup A. Float Switch			C	7–3642
 Fixed lead pump assignment Normal alternation 	 Furnish backup float switch assembly — in polyurethane or polypropylene housing with an adequate amount of cable based on the wet well depth (not less than twenty (20) feet. Furnish polypropylene cord grips and polypropylene mounting hardware for switch 		ent &	iny, Ir 38	17-57
 Oser defined alternation using N:1 ratio Run most efficient pump using N:1 ratio Alternation by the number of hours run or the number of starts within a specified time period 	assemblies. B. Junction Box 1. Furnish junction box for installation at control panel.		ageme	ompc Drive A 4600	Fax 3
 pump decommissioning modes shall include: Decommissioned pump is automatically removed from the pump controller. 	 Non-corrosive materials. Conform to specifications for NEMA Type 4X 304 stainless steel enclosures. Incorporate terminal blocks that are match-marked or otherwise identified to terminals on intrinsically sofe relays. 		Mano	ing C eside I NDIAN	1150
 Internal remote monitoring data tag shall flag the decommissioned status of a pump k. Up to (6) unique user defined profiles of set points shall be available to control pumps during specific site conditions or events. Features shall include: 	 Seal entrance of all conduits entering junction box and control panel to exclude sewer gases. (3M Products or better) Backup High Water Alarm and Light 		G Lary	gineer 05 Lak 1ERS, 1	-577-
 Automatic profile change based on date and time Profile selection option from SCADA (remote control), digital input, logic tag or local display HMI 	D. Furnish separate float switch assembly, signal relay, for backup high water alarm function. Signal relay must complete twelve (12) volt DC circuit for external alarm device. Electrical or mechanical indicator, visible on front of interior		Sar	119 119 119	317
 A data logger for user-defined faults and events shall include: Recording of up to 50,000 events to internal flash memory 	control panel, must indicate high wet well level exists, must energize horn and alarm light, and must cause integral panel alarm dialer to initiate alarm sequence. Signal relay must maintain alarm signal until wet well level has been lowered and circuit has been manually reset.		5		
 Download capability of up to 10,000,000 events by writing directly to an SD card or USB FTP data transfer and download data capability of event and fault logs in the form of a (csv) file for Microsoft Excel analysis 	1.07 Backup Control System (Level Control Relays):		Ş		
 m. 3-phase supply voltage monitoring and supply fault management for the following conditions: Under-voltage 	a. Description: The backup control system shall consist of one or more level sensing relays. The Backup Level Control Relays shall be Motor Protection Electronics "level probe converter w/relays" or Multitrode MTR, MTRA, SAFE—TL or eaual.		ş	I	
 Over-voitage Phase fail Phase rotation 	 b. Specifications: The level sensing relays shall be supplied with the following specifications: 1. The relay shall accept 2 or 3 level inputs from a conductive level probe or ball floats 				\checkmark
n. Monitoring of DC power supply, battery voltage, and internal controller temperature o. Energy, power and pump efficiency monitoring:	as approved by Engineer c. Mounting and Installation: DIN Rail or 2 x #6 screws Base Mount			ALE:	
 kw, kvA, power lactor, kwhr, kvAr calculation for each pump pump efficiency calculation (gallons per KWHr) for each pump p. Motor protection features: 	Level Sensing Equipment (Conductive Type Probe): 1. Description: A Multi-Stage Level Sensing Device designed to detect liquid level at specified intervals in			SC	
 3-phase current monitoring for each pump Over- and under-current trip Crowned careful fault 	in tanks or sumps and interface with an electronic controller for pump control and liquid level display. The Level Sensing Equipment shall be a Motor Protection Electronics or MultiTrode Probel.				<u>с</u>
 Ground/earth fault Current phase imbalance fault I2T fault 	2. Construction: Where the level sensing technique utilizes a sensing device inserted into the liquid, all cavities within each sensor unit assembly shall be PVC injected to seal the unit and prevent any moisture from entering the sensor assembly. Where a sensor unit consists of a multi-sensored probe, each sensor on the probe shall be rotated 90 degrees horizontally from the previous sensor along the probe length to eliminate tracking		(i C.	TION
 Insulation resistance testing for motor windings q. Flow measurement: Calculated flow via liquid level draw down data 	between sensors. Level sensing probes shall be pressure injected with an epoxy resin at final assembly to encapsulate all internal components and connections, thereby creating a rigid, sealed, homogeneous unit.		(IFICA
r. VFD speed control capability s. Fault module capability as follows:	5. Cable: The flexible cable used for the Level Sensing Probe shall be comprised of PVC/PVC multi-conductor construction with a common oversheath that is water and oil resistant. The multi-conductor cable shall be identified with numbering and text along the entire length of the outer sheath at required intervals. Individual conductors of the multi-conductor cable shall be				SPEC
 Pump hold out function Automatic restart function after fault condition is no longer present 	numbered and colored for easy identification, as well as connection to the pump controls. Cables shall be secured to the top of probe bodies by synthetic rubber compression fittings for strain relief. Flexible cables shall be rated to physically support the combined weight of the level sensing probe and any supported a cable cables the probe.				I AIN
 Manual reset of fault required (if user intervention of fault reset is selected) t. Remote control via remote telemetry monitoring to include the following: Changing the mode of pumps (hand/off/auto operations) 	 Mounting and Installation: Mounting connections shall be stainless steel. The mounting assembly for probes shall include a device available to maintenance personnel to clean the level sensing probe at desired 			ASIEP	CE N
 Reset of pump faults and station faults Changing pump and alarm set points Changing operational profiles 	maintenance intervals. 5. Failsafe Functionality: Two wires shall be run across the length of the probe, one red and one black. Each wire shall connect to each other on the bottom of the probe. When used with a MultiSmart Pump			JIHE/	FOF
 User defined password management for access to programming areas in the controller 	Controller or Safe Smart Relay, the connection of these wires to the designated inputs on the controls will provide fail—safe functionality (monitoring for the probe).		لې پې		ANC
 Automatic data logging of personnel who have entered the programming areas Automatic logging of all unsuccessful login attempts with a date and time stamp Divited input option for controlled areas to accurate in a state of the state of the					ATION
 v. SD and USB type access ports shall be available for the following operations: Firmware upgrades 	LIFT STATION AND FORCE MAIN	DJECT	PARE	HAM E	T ST,
 Save and load pump controller configuration Download data logs 	SPECIFICATIONS	PRC	PRE		VLIF
 Export or import MODBUS and DNP3 points list 	SHELIZUF 3		SHEE	Т	
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- 1.08 Control Panel Construction & Assembly
 - Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:
 - Control Panel Equipment:
 a. Multitrode
 - b. Motor Protection Electronics
 - c. Square D
 d. Products of other manufacturers assembled to provide all specified functions, including reliability equal to or exceeding that of the manufacturers listed above.
- General Requirements:
 1. Control Panels shall be manufactured in accordance with ISO 9000-2001 specifications and shall be so constructed for the application of a UL Listing Label by an approved UL Control Panel Assembly Facility.
 2. All electrical connections shall be properly inspected and torqued in compliance with ISO specifications. External connections to the control panel shall be by way of numbered terminal blocks.
 3. Control Panels shall be properly checked and load tested with power applied. A control panel test
- I control ranes shall be properly checked and road tested with power applied. A control panel test log shall be supplied with the control panel.Control Panels shall be supplied from a UL approved control panel assembly facility with all of the
- required labels properly attached. Control Panel Enclosure Environmental Rating:
- 1.) Control Panel Enclosure rating shall be specified in accordance with the project requirements or the contract drawings as either NEMA 3R, 12, 4 or 4X (Stainless Steel).
- Electrical Equipment A. The control system of initial triplex lift stations must incorporate all wiring, controls, relays and components necessary to place a future third pump into service with only the connection of the pump power cable in the junction box. The power distribution system and control system of duplex and triplex lift stations must be sized adequately to allow the installation of planned future larger pumps with only the connection of the pump power cord at the junction box and variable frequency drives sized for the next horse power rating above the larger pumps.
- 1. All Control Panels shall have 25% free space on back plate.
- The control panel must be supplied with 277/480 volt, three (3) phase, four (4) wire, sixty (60) cycle power.
 A lightning arrestor (transient surge protector) must be supplied in the control panel and
- must be connected to each line of the incoming side of the power input terminals. 4. Integral within the control panel must be an open network device control bus with back to
- Triplex lift stations must include VFD sized for the next larger horsepower voltage motor and
- Iriplex lift stations must include VFD sized for the next larger horsepower voltage motor and built-in electronic overload protection.
- 6. All enclosures of the control panel must be weather proof NEMA Type 4X fabricated of 14 gauge 304 stainless steel mounted adjacent to the wet well. The sections must be joined to form a free standing completely enclosed assembly.
- The dead-front panel must be of anodized aluminum with a piano hinge and a latching device for HSE padlocks (purchased from HSE).
- Interior control panel must be painted steel, laser cut sized to cover wiring and components mounted on back of panel; with Allen Bradley push buttons, hand-off-automatic ("H/O/A") switches and LED compatible control function lights, and instrumentation as specified.
 Back panel must be 12 gauge removable steel panel sized to mount starters, control
- equipment and instrumentation. 10. Stainless steel, continuous vertical hinge to provide one hundred sixty-five (165) degree
- swing. 11. Contractor must make all appropriate modifications, with written approval from
- Engineer, to ensure the control panel is suitable for operation with the pumping equipment.
- All panel penetrations are to be sealed with removable non-collapsing putty like material.
 (3M product or better)
- C. Cabinet Heate
- Sized as required by cabinet dimensions to allow for a minimum interior temperature of sixty (60) degrees Fahrenheit when the exterior ambient temperature is minus thirty (-30) degrees Fahrenheit.
- D. Line voltage thermostat, Dayton Model 2E206 or equal.
- Enclosure Condensation Heater:

 There shall be a 120VAC, 50 watt enclosure heater inside the control panel.
- 2.) The heater shall be a silicone rubber, insulated strip type enclosure heater.
- 3.) The heater shall be Chromalox Model #SL-B-2-5-55P, or approved equal.
- . Electrical Transient (Surge) Protection:
- All electrical and electronic components of the Control Panel shall be protected against damage due to electrical transients induced in
- interconnecting lines from lightning discharges and surges in nearby electrical systems.
 2.) The transient surge protector shall be rated for 25kA per phase or larger.
 3.) All devices shall be provided with protection per device manufacture's requirements.
- F. Telemetry
- Contractor must provide a Company dialer system as required by HSE. The dialer system must provide for remote shut-down of the pump station through telephone systems via HSE's Standard Cellular Modem.
- 2. The unit must be supplied with an external lightning/surge protection package.
- G. Instrumentation
 Pilot Lights: Run green; Call amber; Fail red supplied w/ LED bulb
- Pliot Lights: Run green, cuil amber, run red supplied w/ LED build
 Elapsed time meters must be wired to each motor starter to indicate total running time hours and tenths of hours and be six (6) digit non-resettable
- H/O/A, three (3) position switch manufactured by Allen Bradley.
 One hundred twenty-five (125) volt, twenty (20) ampere, two (2) pole, three (3) wire
- grounding NEMA configuration: 5-20R, 5-20P. 5. Ground Fault Interrupting ("GFI") specification grade receptacle as manufactured by:
- a. Arrow-Hart
- b. Bryant c. General Electric
- d. Or Engineer approved equal.
- H. Grounding
- Entire installation to be grounded in accordance with requirements of NEC.
 Equipment grounding must be provided for, but not limited to, the following items; panel
- Equipment grounding must be provided for, but not limited to, the following items; pane enclosure, motor frames, receptacles, junction boxes.
- 3. Ground must be insulated wire conductors, green color coded, sized according to code.
- Control Panel enclosure shall be properly grounded in accordance with the National Electrical Code and local code requirements and have the HSE required three point grounding rod configuration in undisturbed or cohesive soil.
 Each analog signal loop shall only have its shield wire connected to ground at a single point for the loop.
- 5. Each analog signal loop shall only have its shield wire connected to ground at a single point for the loop. Shields shall be grounded at control panels where signals are input to the receiving device and not at the source of the transmitting device.
- I. Battery Backup
- 1. Twelve (12) volt DC lithium ion battery with automatic one hundred twenty (120) volt
- charging system. 2. Must provide eight (8) hour continuous operation of alarm light.
- 3. Must be mounted inside control panel.
- J. Alarm Appurtenances
- 1. Alarm Signal must be initiated by level control system, backup high level signal or power failure
- Motor temperature shutdown as previously discussed in these Specifications. Report
- failure on pump control panel.
- Seal failure shutdown. Report failure on SCADA System. pump control panel.
- Contractor must furnish HSE's standard alarm system, including remote lift station control.
 K. Starters
- 1. All starters must be NEMA rated for the loads to be powered.
- 2. Duplex Lift Stations
- a. Solid state reduced voltage (ten-fifteen (10 15) horsepower and below).
 b. Current ramp duration adjustable two (2) to thirty (30) seconds.
- c. Current trip adjustable from fifty (50) to four hundred (400) percent.
- d. End of limit signal to sequence start of motors. e. Must be Allen Bradley SMC3.
- Must be Allen Bradley SMC3
 Triplex Lift Stations
- a. Solid state variable frequency drive with four (4) to twenty (20) mill ampere input.
 b. Current ramp up and down duration adjustable thirty (30) to one hundred twenty (120)
- seconds. c. Heat sink and ventilation fans must be adequate for continuous operation.
- d. Two (2) Aqua Danfoss adjustable frequency drive units for corrosive environment must be supplied for the submersible pumps (twenty (20) horsepower and above).
- g. Software (1) iFIX SCADA SixNet
- The motor starters must be wired to automatically re-energize the pumps when:
 a. Power is restored after an outage.
- b1. The controls are in the "On" position.
- 5. The controls are in the "Auto" position and when the off float indicates the need.
 5. Time delay relays must cause the time between multiple pump starts to be greater than the ramp duration of the starter with control system interfacing.
- L. Conduit must be non-metallic heavy wall type.
- M. Circuit Breaker Usage (Unless otherwise specified or shown on Construction Plans)
- Minimum Type of Service I.C. Rating Amperes Minimum I.C. Rating 120/208 volt 15–100 10,000 RMS Lighting and power
- Power Circuit Breakers shall be thermal magnetic type designed for AC current with a minimum interrupting capacity of 15,000 amperes.
 Control Circuit Breakers shall be in accordance with section UL 489 with a minimum interrupting capacity of 10.000 amperes.
- N. Control Voltage Transformer Fuses: Rated one tenth (1/10) to six hundred (600) amperes, six hundred (600) volts AC or less must be UL listed as Class RK1, current-limiting time delay with 200,000 amperes RMS interrupting rating as manufactured by Buss model MDA or equal. Primary side fuses must be Little Fuse, model KLDR, Gould Shawmut, model ATQR Amp-Trap 2000 time delay class CC six hundred (600) volt, or equal, based on ability to withstand inrush and spike conditions. Buss: Low Peak; Gould Shawmut: Amp-Trap 11, or equal. All fuse sizes greater than sixty (60) amperes to be silver link.

- 0. Control Power Transformers:
- Control Power Transformers required to provide control system and accessory power shall be machine tool type control transformers with epoxy encapsulated coils or resin impregnated coils, high quality silicon steel laminations, copper magnet wire, molded—in terminals and 55° C rise (Class 10 insulation system).
- P. Voltage/Phase Monitor:
- 1.) The voltage-phase monitor shall continually measure the voltage of each of the three phases of the incoming power to the equipment and provide protection for three phase motors, as well as sensitive electronics, etc. The phase monitor shall sense the following conditions: under- and over-voltage, voltage unbalance, phase loss and phase reversal.
- Q. Control Relays:
 1.) Control relays shall be square base type, 120VAC or 12VDC (based on design schematic).
 2.) Control relays shall be 4PDT (4 Pole, Double Throw) with normally closed/normally
- open contacts rated at 120VAC, 5 amps minimum.Control relays shall include an integrated test button and relay energized flag indicator.
- R. Full Voltage Magnetic Motor Controller
- The motor controller shall be a NEMA rated, full voltage, non-reversing, across the line contactor and overload relay combination.
 The motor overload relay shall be an ambient compensated type with inverse-time-current betracteristic and shall be provided with betractor or persons in each place matched
- characteristic and shall be provided with heaters or sensors in each phase matched to nameplate full load current of the specific motor to which it connects . S. GFCI Convenience Receptacle:
- There shall be a 120VAC, 15 Amp GFCI rated convenience receptacle mounted on the dead front swing door of the control panel. Receptacle circuit shall be protected by a thermal magnetic circuit breaker.
- T. Wire and Cable (Up to six hundred (600) volts)
- 1. Except where otherwise noted in these Specifications, insulation must be color coded
- thermosetting or thermoplastic type rated six hundred (600) volts as approved by Engineer.
- Conductors must be soft drawn copper, each strand individually tinned or coated with approved alloy.
 Conductors #10 and smaller:
- a. Use stranded conductors for final connections to motors and all locations where vibration or movement is present.
- b. Use solid conductors for all other locations.
 4. Use double braid, stranded conductors #8 and larger.
- Minimum Wire Size: General #12; over one hundred (100) feet #10; over one hundred fifty (150) feet #8; Control #14; Signal #18 or as required by equipment
- manufacturer.
 Types and uses (seventy-five (75) or ninety (90) degrees Celsius) as directed by Engineer.
 a. Feeders and service entrance conductors: XHHW
- b. Power circuits above forty (40) amperes; THWN (#8 and larger)
- Branch lighting, receptacle and small power circuits: THWN (#12 and #10) Direct burial feeders and branch circuits: UF
- Control (#14): THWN or XHHW

connectors:

1.09 Spare Parts

1.10 Back-up power

B.

Penn Union EZ; or equal.

Penn Union; or equal.

- 7. Main and feeder cables must be wire tagged in all pull boxes, wire ways and wiring gutters of panels. Tags must identify wire or cable number and/or equipment served as shown on the Construction Plans. Tags must be of flame resisting adhesive material, T & B type WSL or equal.
- W. Cable Terminals and connectors (for Copper Conductors Only) Conductor sizes #8 or smaller to include compression/indenter type is 1
- Conductor sizes #8 or smaller, to include compression/indenter type terminals, splices and wire joints:
- a. For terminals (rings, forks, disconnects): Thomas & Betts; Stakon; Burndy Hydent; Buchanan Press-Sure; or equal.
 b. For splices (butt-type): Thomas & Betts; Stakon; Burndy Hydent; Buchanan Press-Sure;

For wire joints (twist-on): Thomas & Betts: Piaav: Scothlok: Ideal Wina-Nut; or eaual.

Conductor sizes larger than #8, to include mechanical set screw, or split bolt type

For mechanical or set—screw type connector: Thomas & Betts; Lugit; Bundy Quiklug;

For split-bolt type connectors: Thomas & Betts; Burndy Hydent; Penn Union; or eaual.

For compression connections sizes #8 and larger, to include one hole lugs, two lugs, butt

splices, H-taps, C-taps and anti-oxidizing compound: Thomas & Betts; Burndy Hydent:

A quick connect coupling generator receptacle must be provided on the control panel that

switch must be provided in the control panel for HSE's emergency generator. Refer to

will allow Engineer to utilize HSE's standby power generator. One (1) manual transfer

Furnish one (1) lot spare parts as recommended by station and pump manufacturers.

1. Back-up power generator is to be manufactured by Kohler Power Systems or MTU, 60 hz,

Diesel fuel engine and 48 hour fuel storage tank are to be provided for power needs

atural gas fuel source for 25kw to 125kw with diesel back—up integral tank.

The generator is to have noise suppression enclosure to comply with OSHA and

System less than 100kW shall have a bypass breaker system generator plug hookup

1. The control system shall be Kohler Advanced Digital control (ADC) or HTU provided with :

Must be capable of integrated communication interface using Ethernet of LAN line.

1. The back-up power generator unit is to be enclosed in a sound attenuating weather

A. The odor control system shall be either Bioxide chemical system, as provided by Evoqua, or

B. Bioxide AQ Solution sizing for the application is to be capable of reducing hydrogen sulfide

C. The Vapex-0-Mega odor control system is to be sized for the lift station inlet well application

 Protection of the nozzle (s) tubing in freezing conditions is to be provided by installation of the manufacturers "cold weather" package.

1). All applicable Chromalox DL EL Series cable accessories for a weather tight system.

1). Installation is to meet all aspect of manufacturers and engineers requirements and

the complete system is to be warranted foe a period of not less than one (1) year.

a. Water supply lines are to include a "Citizen Utility" approved brass body backflow

c. Fiberglass pipe installation is to be covered with 30mil pvc pipe jacketing with

to maintain a reduced hydrogen sulfide concentration which is less that 0.1 ppm.

1. The unit and chemical feed system are to be protected from freezing by the

b. Heat traced with Chromalox precision heat and control SRL Cable.

2). Ambient sensing integrated temperature control (RTBL-EP)

preformed pipe fitting components by Amerisafe or approved equal.

2). Nozzle(s) are to be readily accessible for routine maintenance.

As an alternate, a portable generator may be required by the Engineer.

HSE's Lift Station and Force Main Details sheet for specific information.

At a minimum, spare parts to include the following

One (1) spare impeller for current operation conditions.

Other items defined as expendable by manufacturers

fuses for each type and size of fuse used in installation.

Engine is to be General Motors or PSI natural gas.

greater than 125kw or where not available.

Provide batter tender and associated cable.

a. Display per operations, runtime and faults,

c. Software login for voltage regulation and governing.

Transfer switch is to be provided by Kohler or MTU.

Hydroxyl Radical Fog technology, as provided by Vapex-o-Mego

1. The engineer will determine which process will be applicable

manufacturers recommended metho

d. Automatic start with programmed cranking cycle.

and associated connection to generator

Future impellers (as specified on the Lift Station Plan), and

Wear rings. Two (2) sets of O—rings and gaskets.

Back—up Sewer Generator (Portable)

noise ordinance standards.

C. Generator Control (greater than 100kW)

Transfer Switch

to less than 0.1 ppm.

prevention device.

E. Packaging

1.11 Odor Control

b. Remote start/stop capability.

Two (2) sets of upper and two (2) sets of lower pump seals.

PART 2 - EXECUTION

Specification

2.01 Site Work

Excavating De-watering must be provided as described previously in the section entitled Force Main/Lift Station Manholes, Piping, Valves & Fittings of these Specifications. Trenching must comply with the excavation requirements as described previously in the Section entitled Force Main/Lift Station Manholes, Piping, Valves & Fittings of these

B. Wet Well

- wet well The as—built elevation of the base material on which the wet well base is to be set must be certified to Engineer by an appropriately registered Indiana professional prior to the
- setting or pouring of the wet well base. All gravity connections to the wet well must be field cored.
- Pour anti-flotation collars (if required) at the same time that the concrete base is set or poured. Seat structure with expanding grout.
- Promptly place backfill to minimize risk of flotation. Protect and support piping during backfill operations.
- All wall penetrations shall be sealed with non-shrink grout.
- Valve Vault Set pre—cast manhole section on poured or pre—cast base.
- Provide granular backfill under valve vault. All wall penetrations shall be sealed with non-shrink grout.
- Contractor is responsible for providing a permanent power supply, telephone lines and all other necessary utilities to the lift station site. Contractor must connect and activate the dialer system.
- Access Drive and Generator Pad An asphalt drive must be constructed from the nearest public street to the wet well. The asphalt drive must be constructed per the Asphalt Access Drive Detail on HSE's Lift
- Station and Force Main Details sheet. The lift station site must be situated such that vehicles can access the wet well for pump
- removal without driving over the valve vault or manholes of the influent sewers.
 A level (all directions) fourteen (14) foot by twenty (20) foot generator parking area must be provided.
- The control panels and generator receptacle must be located within ten (10) feet of the lift station drive so that a portable generator can be readily connected to the generator receptacle.
- 2.02 Pump InstallationA. Pump Anchoring Use base plate as template for drilling individual hole patterns. Mount
- base plates using three quarter (0.75) inch stainless steel red head anchor bolts. Assemble guide rails to access frame. Plumb assembly.
- 2.03 Electrical and Telemetry Installation
- All grounding type receptacles are to have grounding slot connected to outlet box. Service entrance neutral must be grounded in accordance with Article 250–94 NEC. Grounding system is to be 3 - 5/8" x 10' copper ground rods installed in a triangular
- 10' pattern beyond overdig area. Cad Welded to earth. To maintain the switchboard short circuit rating, the Contractor must rope tie the cables
- connected to the switches of the control panel per UL 891. Coordination with Duke Energy
- Coordinate with Duke Energy and verify the limits of responsibility with respect to metering, terminations and the like.
- In such cases that these Specifications do not conform to either Duke Energy's or BrightHouse requirements, the latter must govern the Project. Circuit Breakers
- Provide circuit breakers where indicated of proper sizes for loads served.
- Do not install two (2) poles in single module. Install multiple pole breakers with single operating handle. Do not install external
- mechanical ties between single pole breakers. Conduit Installation (must be Schedule 80)
- Conduit system to be electrically continuous and must be grounded in accordance with
- NEC. Provide grounding conductors in all new raceways sized in accordance with NEC Table 250—95 (1993 edition). All conduit terminations to be equipped with lock nuts and bushings. Conduits one and
- one quarter (1.25) inch and larger must have insulating bushing and have lock nuts inside and outside the enclosure. Conduits supported by pipe straps must have supports spaced not more than four (4) feet
- apart on center. Secure supports by means of toggle bolts, inserts or expansion bolts. Protect conduits during construction with temporary plugs or caps. Wiring
- Run all wires of same circuit in same conduit. No wire can be pulled until conduit installation is finalized.

4.

- Pull no thermoplastic wire at ambient temperatures lower than thirty—three (33) degrees Fahrenheit.
- Use approved pull—in compound (similar to Wire—Lube or Y—Er—Ease) to facilitate pulling of wire. Splice and connect wires only in readily accessible boxes and seal off entry from wet well.
- If indicated on the Construction Plans, run all wiring in conduit, otherwise, run direct bury cable in three (3) inch sand envelope. Conduit and direct bury cable must be at least thirty (30) inches below finished grade.
- Wire and Cable Identification Identify control wires at terminations with schematics and number list will be provided by HSE. Train and lace wiring inside equipment and panel boards with plastic tie wraps for a neat appearance. Make all spare wires in cabinets or panel boards of adequate length for connections.
- Terminate with insulating tape and tag. Wire Connections and Devices Thoroughly clean wires before installing lugs and connectors so that joint will carry full
- capacity of conductors without perceptible rise in temperature. Use lugs or connectors of approved size for conductor. Lugs or connectors must be installed as per manufacturer's recommendations.

- SECTION 3 FENCES
- PART 1 PRODUCTS
- 1.01 Cedar Products
 A. All wood products incorporated into the fence must be select Western Red Cedar graded as #1 Premium Select by the Western Wood Products Association.
 B. The wood must be of the nominal dressed dry size indicated on the Cedar Fence Detail of the control of the nominal dressed dry size indicated on the Cedar Fence Detail of
- HSE's Lift Station and Force Main Details sheet.
 Board on board 1-1/4" overlap of 1"x 6" pickets Western Red Cedar is to be attached with stainless steel, ring shank nails. The eight (8) foot fence is to have 6"x 6" posts set eight(8) feet apart with 2"x 8" cap boards with decorative top facing boards beneath the top board and the top cap.
- Top, Bottom and Mid Rails
 Fence must have continuous top, bottom and mid rails of cedar two by fours (2" x 4") for
- Relies must have contained as top, bottom and mind rais of cedar two by fours (2 x +) for its full length.
 Rails must be attached to posts with a galvanized wood adapter clamp designed for that purpose.
- 1.03 Terminal, Corner and Gate Posts (where called for by Engineer)
 A. Posts must be four (4) inch outside diameter galvanized pipe weighing 5.79 pounds per lineal foot
- B. Roll form sections, schedule 40 or equal.
- Posts must have ball caps on top to exclude moisture.
 Posts must be braced with tension bars and truss rods to adjacent line post.
- E. As an alternate, 6 X 6 inch treated lumber corner posts may be used except on the face of the gate.
- F. All metal posts are to be grounded to separate 5/8" x 10' copper rod and cad welded.
 Gate posts are to have tensionable galvanized cable anchored to corner post to prevent "gate sag".
- 1.04 Line Posts (where called for by Engineer)
- A. Line posts must be three (3) inch outside diameter galvanized pipe weighing 2.72 pounds per lineal foot.
 B. Roll form sections, schedule 40, or equal.
- C. Posts must have ball caps on top to exclude moisture.
- Tension Bars and Truss Rods
 Tension bars for braces must be hot-dipped galvanized and have a nominal size of three eighths (0.375) inch by three quarter (0.75) inch.
 Truss rods for braces must be hot-dipped galvanized and be three eighths (0.375) inch diameter.
- 1.06 Fittings All caps, beveled tension and brace bands and connectors must be galvanized pressed steel, malleable steel or cast steel.
- 1.07 Gate Frames
- A. Gate frames must be constructed of schedule 40 pipe. The minimum pipe diameter for gate frames must be two and an half (2.5) inch; however, larger diameter pipe may be required for gate leaves wider than seven (7) feet. Gate frames must be of welded construction and all welds cleaned and touched up. Bars, fittings, caps and other components used in construction of gates must be the same grade as previously specified.
 B. The minimum width of vehicle access gates must be fourteen (14) feet.
- 1.08
 Appurtenances

 A.
 Engineer must approve all hardware (latching, hinges, locking devices, etc.).
 Samples or
- shop drawings must be submitted to Engineer for approval.
 All gate hardware must be of heavy duty industrial design. Hardware subject to movement must be field painted with touch-up paint specifically formulated for this
- Double swing gates must have hold-closed and hold-back devices installed to engage frames in closed and open (minimum ninety (90) degree) positions. Latching devices must have provisions for HSE's padlocks (purchased from HSE).
- PART 2 EXECUTION
- 2.01 Inspection
- A. Verify that final grading in fence location is finished without irregularities that would interfere with fence installation.
 B. Do not commence work until unsatisfactory conditions have been corrected.
- 2.02 Preparation
- A. Measure and lay out entire fence line B. Measure parallel to surface of around
- C. Locate and mark position of posts.
- D. Locate line posts at equal distance spacing, not exceeding eight (8) feet on center.
 E. Locate corner posts at positions where fence changes direction more than ten (10) degrees.
- 2.03 Fence Installation
 A. Set posts in concrete footings, mix to provide three thousand five hundred (3,500) psi. and to a minimum depth of 36 inches.
- B. Slats must be attached in shadow box configuration (all line runs) and board on board configuration (all gates). Attach to the rails with aluminum screw shank nails.
 C. When new fence joins an old fence at any point, a corner or brace post must be set at the
- Junction and be braced and anchored the same as for corner posts.
 D. Supply viewing access through fence for electric meter. Coordinate size and location of
- access with Engineer. E. The bottom of the fence must be a maximum of four (4) inches from finished grade.
- 2.04 Clear Wood Stain
- A. Stain all wood incorporated into the Project with an oil-based cedar tone stain manufactured by Timber-OX Green, Cicero, Indiana..
 B. Wood must be dry and free of all dirt, oil, grease and other surface contaminants before
- staining.
 C. Stain wood only when the humidity and temperature will be within the manufacturer's recommended application ranges for at least twenty-four (24) hours after the application.
- D. Provide two (2) coats, the first a thin coat by brush, and the second an equivalent minimum dry film thickness of two (2) mils by brush or spray. Allow first coat to dry for at least forty—eight (48) hours before application of the second coat. Product must be equal to Timber Stain Oil Base Clear as manufactured by MAB Paints.
- 2.05 Adjust A. Adjust truss rods, brace rails and wires for rigid installation.

B. Tighten hardware, fasteners and accessories.



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HAMILTON SOUTHEASTERN UTILITIES, INC. LIFT STATION AND FORCE MAIN SPECIFICATIONS SHEET 3 OF 3

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