### SECTION 0 - GENERAL REQUIREMENTS

### PART 1 – GENERAL OVERVIEW

## For the purposes of these Lift Station and Force Main Specifications

- ("Specifications"), the following definitions shall apply:

  "HSEU" shall mean Hamilton Southeastern Utilities, Inc., the public utility that provides sanitary sewer service in the Project (as hereafter defined) area. HSEU's address is 11901 Lakeside Drive
- Fishers, Indiana 46038, and HSEU's phone number is (317)577-2300. "Engineer" shall mean the engineer for HSEU, which is Sanitary Management & Engineering Company, Inc. ("SAMCO") or SAMCO's engineers. SAMCO's inspector shall be Engineer's representative during construction of the Project. SAMCO's address is 11905. Drive, Fishers, Indiana 46038, and SAMCO's nh
- Subscriber" shall mean those signatories identified as Subscribers subscriber shall mean those signatories identified as subscribers under a Special Contract for extension of Sewer Mains and Facilities with HSEU 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 HSEU to construct, install, maintain, repair, and remove public o private sanitary sewer facilities within the HSEU service area. Thi definition is intended to include all employees, sub-contractor nd/or agents acting for or on behalf of Contractor's company
- "Design Engineer" shall mean the engineer sealing the Construction Plans, as opposed to Engineer for HSEU who is also defined under these Specifications. This definition is intended to include all employees, sub-contractors and/or agents acting for or on behalf of Design Engineer's compara:
- Design 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 i conformity with the HSEU approved Construction Plans and the standards, specifications, and details of HSEU.
- 'Sanitary Sewer Facilities" shall mean any pines, manholes, flow samitarly sewer ractionises shall mean any pipes, mannoises, now nonitoring/metering manholes, clean-outs, grease traps, grit traps, ii/water separators, neutralization tanks, wyes, laterals, and any ther appurtenances which convey or process sanitary sewage Conveyed! "with regards to sanitary sewer facilities means Projects with the control of the control of
- or which HSEU has received title. Private" with regards to Projects shall mean Projects from which sewage flows into HSEU's sanitary sewer facilities, but for which the
- title for sanitary sewer facilities is not to be Conveyed to HSEU. "Completed" with regards to Projects shall mean any Projects which are acceptably constructed, tested, and through which customer ervice has been authorized by HSEU, but for which HSEU has not eived title. All applicable fees must be paid to HSEU prior to a
- g deemed completed. n Plans" shall mean primary plats, secondary plats, sets of "Construction Hans" shall mean primary piasts, sectionary piasts, sets or 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 HSEU'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 HSEU's "Sanitary Sewer Completion Specifications," Completion Documentation must meet the applicable standards in effect at the time the documents are

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 . HSEU's service area.

## 1.03

Applicability
These Specifications are applicable for all Public and Private sanitary

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 HSEU, Engineer or Engineer's inspectors.

- Standards, Specifications and Details HEEU's Gravity Sanitary Sewer Details sheet, Gravity Sanitary Sewe Specifications sheet, 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, Mast Plan, and Design Specifications for Sanitary Sewer Facilities are integral parts of these Specifications for Sanitary Sewer Facilities are sewer facilities within HSEU's service area.
- necifications. Lift Station and Force Main Details sheet, and HSELI's Design Specifications for Sanitary Sewer Eacilities are ntary in nature and should not be interpreted individually
- These Specifications and HSEU's Lift Station and Force Main Details sheets, Master Plan, and other standards, specifications and 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 the Project. These documents are also subject to revision at any be during construction when, in Engineer's opinion, those revisio sterially affect the maintenance, operation or life of the Project. such revised documents must replace the corresponding cuments in the Construction Plans at the time provided to
- rves the right to modify or waive any of these pecifications, 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 HSEU's service area. Depending s and the composition and characteristics of 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

Drawing Discrepancies and Omissions
Prior to starting construction, Contractor must notify Engineer of
any conflicts between the Construction Plans, any supplemental

- nformation supplied by HSEU, and/or these Specifications. Resolution of any such conflict will be at Engineer's sole disc Any items which are not covered in these Specifications, the Construction Plans or HSEU's other standards, specification. details, but are required for construction of the Project, must be approved by Engineer prior to installation and must be made part
- ractices are not described but, in Engineer's opinion, will affect the are not described out, in Engineer opinion, will affect the quality of construction or long-term maintainability of sanitary sewer facilities, Engineer must a any construction practices proposed by Contractor.

### Governing Laws, Codes, and Regulations

Construction practices must meet all applicable laws, codes, or regulations and be in accordancewith the requirements of all governmental agencies and public entities having jurisdiction. These Specifications shall not be considered as a substitute, nor hall supersede any state or federal law, code, or regulation re 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

All notices required by these Specifications must be given to both

- These Specifications cover all work necessary for the installation of lift station wet wells and valve vaults, backup electrical power generator, lift station piping, force mains, manholes, valves and ralve boxes, submersible pumps and controls, control panel, alari levices, level control systems, electrical wire in conduit from w vell to control panel, vents, slide rails, wet well and valve vault access doors with fall protection and safety ladders, fittings, thrust blocks, door control and ventilation, asphalt access drive, fending, facility and site lighting and other miscelaneous items (lift station from thain infrastructure) to convey sewage from the lift station pumps to the receiving sewer infrastructure in an acceptable and operable manner. Contractor must provide all necessary work to install Lift Station/Force Main Infrastructure in a Complete manner in accordance with the Construction Plans. All electrical work (condult, wiring, panel installation, etc.) shall be performed by a livered electrical work.
- All nine, fittings, valves, and appurtenances must be the size, type. ration, and grade shown on the Construction Plans and must meet all requirements of these Specifications.
  Contractor must not substitute materials which differ from the
- Contractor must not substitute materials which other from the approved Construction Plans unless approved by Engineer. All pipe, fittings, 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.

- THITEALS

  Tractor must submit only one model number or type per it 
  approval. Multiple submittals of model number or type fo 
  le item will be cause for rejection of the shop drawing. Before delivery of products to the site (for standard yard stocked tems) or before fabrication (for items which are not standard yar stocked items), Contractor must provide submittals and obtain acceptance from Engineer. Submittals must be thoroughly review by Contractor and certified to meet these Specifications (with all exceptions explicitly indicated) prior to submission to Engineer. Acceptance by Engineer does not exempt Contractor from compliance of these specifications.
- compilance 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 pre-
- Where required by applicable manufacturing standards, provide a copy of the manufacturer's inspection or test report and a certified tatement by manufacturer that the material has been sampled ested, and inspected in accordance with applicable standards All factory inspections, tests, and record keeping identified as
- le manufacturing standards, are not required unless ie specifically indicated in the Construction Plans or these An authorized agent of the manufacturer or distributor must sign
- each certification and report.

  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.
- head curve plotted with the proposed curv eflect the motor service factor. 2. Efficiency and other performance data must be based or
- performance with an uncoated impeller. Attempts to improve reported efficiency by coating impeller will not be accepted. Catalog cuts with product data, including details of manufacture, for all manufactured items. Manufacturer's recommendations on all materials and methods of
- ms of warranty.
- Warrant equipment free from manufacture and installation . Warrant equipment free from manufacture 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 the pump station functions without failure due to defects in workmanship or materials.

  2. Warrant fence and appurtnanness free from manufacturing and installation defects for a period of three (3) years from the date HSEU deems the fence and appurtnances complete.

  Operation and maintenance instructions for all mechanical and
- r must provide to HSEU copies of all contracts, invoices statements, material lists, payment requests and all other related documents pertaining to construction cost of the Project. The above documents must be provided monthly, unless otherwise

### Initiation of Construction 2.03

- Plan approval will be authorization to proceed with construction of the Project, however, it shall not be construed as authority to violate, cancel, or set aside any of HSEU's requirements or the laws, codes, regulations, and permit processes of governmenta agencies or public entities. Approval will be evidenced by an Approved Hamilton Southeastern Utilities, Inc." stamp on the
- Plan approvals will be valid for a period of six (6) months from the date of 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 starting construction, Design Engineer must receive formal

written approval from Engineer. At this time, Design Engineer

- must supply Engineer with a PDF and an AutoCAD file of complete set of Construction Plans. Contractor will not be permitted to initiate construction until the onstruction Plans are formally approved, and Subscriber has entered into all necessary agreements and authorizations with.
- and all required fees have been haid to HSELL applicable permits have been approved by and obtained from all affected governmental agencies and public entities. Copies of the
- ermits must be submitted to Engineer for review.

  ontractor will not be permitted to initiate construction until all off-site easements have been reviewed, approved, and recorded by Engineer.
- Pine layers and foreman (superintendent) assigned to the Project must be approved by HSEU prior to starting construction.

  Notice must be provided to Engineer twenty-one (21) days prior to
- the initiation of construction. A nre-construction meeting is required between Engineer and ontractor prior to starting construction. The pre-constru meeting must be completed no more than fourteen (14) days prior to starting 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 starting construction on Sanitary Sewer Facilities

### Continuity of Construction

- Once construction has commenced, the Project must be Completed promptly as directed by Engineer. Contractor cannot discontinue work on the Project, except for weather delays, without written approval from Engineer. No anitary sewer structures including wet wells, valve vaults, or nanholes can be left open and incomplete.
- If wet well excavation requires dewatering well installation, it shall ne a minimum of 10-inch diameter with stainless steel wire wound well screen appropriately sized for formation retention. The well is to be available for future supply of non-potable lift station wash

## 2.05

All persons, including but not limited to Subscribers, Contractors, sub-contractors. Design Engineers, and surveyors must abide by the nost recent IOSHA confined space entry standards

The Project site must at all-time be kept free of trash, rubbish, unsightly materials, and other nuisances.

### 2 07 Product Delivery, Handling, and Storage Contractor is responsible for the delivery, handling, and storage o

- Deliver products with manufacturer's tags and labels intact Handle products in accordance with manufacturer's recommendations and with extreme care not to damage or shock Load and unload all products by hoists or skidding. Do not drop roducts. Do not skid or roll products on or against other
  - 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 tore products in a manner that will protect them from free Store electronics and electrical products in a manner that will protect them from freezing and weather. Do not stack products nless allowed by the manufacturer's requirements. Store gasket nd other products affected by sunlight in a cool location out of direct sunlight. Gaskets must not come in contact with petroleun products. Use gaskets on a first-in/first-out basis.
  - Promptly remove damaged or defective products from the Project
  - Contractor is responsible for verifying materials are free of defect and are the proper type, classification, grade, etc. complying with tion Plans and/or HSEU's standards, specific

### 2.08 Quality Assurance

- Contractor must test and perform quality assurance requirement on all Lift Station/Force Main Infrastructure in accordance with these Specifications.
- Execute work in conformance with applicable sections of the latest ublished editions of American National Standards Institute (ANS) erican 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 electrical materials and products installed by Contractor must 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. Line and grade requirements

- 1. Contractor must provide assurance to Engineer the force main is laid to the required line and grade as shown on the Construction Plans. Contractor must constantly check horizontal alignment of
- 2. Contractor must coordinate verification of the force main with Engineer to provide an as-built record set as described later in se 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/or grade as shown on the Construction Plans are cause for the force main to be rejected and re-laid in compliance with the
- Contractor's survey equipment (level, transit, GPS, etc) shall bear calibration certification documentation by the manufacturer's oved service facility within six (6) months of it being in use
- Initial Performance Tests A hydrostatic pressure test may be required on the first six hundred (600) feet of force main materia installed. This test will be required when, in Engineer's opinion naterials or techniques unproven with HSEU 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 in of each size and type of material has satisfactorily passed the initial performance tests or a waiver is received.
- 2. Subsequent Performance Testing As work progresses, Engineer nay designate additional sections for subsequent perfo Contractor of the location(s) where subsequent performance test(s) are to be required not later than fifteen (15) days after the force main has been installed. Unless otherwise authorized performance test(s) within fifteen (15) days after the force mair has been installed or fifteen (15) days after receiving notification by Engineer, whichever date is later.
- Performance Testing for Completion All Lift Station/Force Main Infrastructure must pass all applicable test requirements of these Specifications.

### 2.09

- Inspection and Rejection of Materials
  The quality of all materials, process of manufacture, and finished product are subject to inspection and acceptance by Engineer ection may be made at the place of manufacture and/or on the work site after delivery. Products are subject to rejection at any time for failure to meet any of the manufacturers' specifications even though samples may have otherwise been accepted as satisfactory.
- nmediately prior to being incorporated into the Project, each product must be carefully inspected, and those not meeting these Specifications and HSEU's Lift Station/Force Main Details sheets nust 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.

### Relation to Wells and Water Supplies Force mains must be laid at least ten (10) feet horizontally from

- any existing or proposed water main, distance is to be measured Contractor must notify Engineer for specific instructions. When the force main crosses a water main, the force main should
- be laid at least eighteen (18) inches below the water 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 Disnosal for Public and Commercial Establis

sulletin S.E. 13" and Indiana Department of Environmental

### 2.11 Utilities

- All existing utility systems which conflict with the construction of the Project, which can be temporarily removed and replaced, must be accomplished at the expense of Subscriber. Work must be done by the respective utility, unless the utility approved in writing ontractor may perform the work.
- Permanent relocation of Utilities 1. Except as otherwise noted on the Construction Plans, it is the responsibility of Subscriber to move or pay for moving all utility appurtenances, including but not limited to, water mains, storm sewer inlets, gas lines, electrical 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
- 2. It is understood and agreed Contractor has considered, in his bid, all the permanent and temporary utility appurtenances shown or otherwise indicated on the Construction Plans. It is also understood and agreed that when contracted by HSEU, no additional compensation will be allowed for any delays, inconvenience, or damage sustained by Contractor due to any interference from said utility appurtenances or the operation of moving them. Costs incurred due to the respective utility company moving the utilities shall be that of Subscriber. 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 it is Complete

### 2.12 Installation Service

- Provide services of a factory-trained representative(s), if request by Engineer, for a 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 maintenance,
- 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 Subscriber if requested by Engineer

- Representative must be on site during initial installation and testing of the Lift Station/Force Main Infrastructure, when stallation problems arise, or when requested by Engineer to
- resolve installation problems.

  Manufacturer of the Lift Station/Force Main Infrastructure may be required to provide installation advice on bedding, haunching, and packfill to Contractor's workforce. Engineer will determine t during construction

- Install all products in strict accordance with manufacturer's mendations and these Specifications in a neat and workmanlike manner.
- Bring all conflicts between the manufacturer's rec and these Specifications to the attention of Engineer and obtain direction from Engineer as to the resolution of any conflict in installation directives

- Contractor must maintain, during the Project, an up-to-date digital plan set which accurately reflects the as-built dimension ontal location and vertical elevation), materials of ruction, and other relevant information, necessary to de a set of as-built record drawing. As-built horizontal locations and vertical elevations are required on
- all fittings (including ells, tees, valves, and adapters), the force main (at a maximum interval of 500 feet), the top and bottom of the wet well and valve vault, and inverts into the wet well and air/vacuum release manholes. Failure to provide as-built information may require e

### 2.15 Completion Documentation

- Contractor must provide HSEU and Engineer, in Subscriber's name the necessary Completion Documentation for the Project. Costs associated with the final as-built documentation review by Engineer and its inclusion to update HSEU's GIS infrastructure database shall be at Subscriber's expense. Any Field Changes made which, in Engineer's opinion, materially affect the infrastructure are to be made by Design Engineer and amended digital plan sheets provided prior to completion of sanitary sewe infrastructure installation and operation
- submit a HSEU Lift Station Progress Log. Contractor must complete all outstanding items detailed in
- ngineer's correspondence and supply all necessary information ncluding construction cost documentation, with all applicable change orders). Sanitary Sewer Inventory form, Lift Station Progress Logs, video logs, etc. are the responsibility of Inspector who shall provide them to Engineer.

  If a Lift Station/Force Main Air-Release manhole top of casting is
- adjusted after as-builting, Contractor must supply Engineer with new measure down from the top of casting to flow line. If new easure down is not provided to Engineer Contractor must na Engineer, at their current rate, for all time required obtaining this
- Contractor must provide HSEU copies of all contracts, invoices, Contractor must provide macro topics or an contract, so the contract of the co

### 2.16 Inspection and Reimbursement

- 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 Contractor and manufacturer. Failure to comply will be ground: for removal from the HSEU Approved Contractor List.

  If, for any reason, construction work is delayed or canceled, Contractor shall notify Engineer's inspector assigned to the Projec
- and Engineer's chief inspector at least one hour (1) prior to the normal scheduled start time on the day the work is delayed or canceled. Contractor will be charged the prevailing rate for failure to notify Engineer's inspector and/or inspector's supervisor per Contractor must pay Engineer for all inspector's overtime cost Contractors will be charged overtime costs at the prevailing rate per hour outside of Engineer's normal business hours on weekday
- and all day on Saturdays. The rate for Sundays and holidays will b wice the hourly rate. Rates are subject to change without notice contact Engineer prior to starting construction for current rates. If, at the sole discretion of Engineer, construction volume is less than what is deemed acceptable. Contractor may be required to
- pay for additional inspection services.
  Engineer's decision on field changes or construction practices is final. Failure to comply is grounds for removal from the HSEU Approved Contractor List.

General Testing Requirements (Except Pump Factory Test) sting must be conducted at Contractor's exp of Engineer.

Notification must be provided at least three (3) days prior to any

- testing. All lines must be clean and free of any debris At HSEU's option, all testing of Lift Station/Force Main Infrastructure within HSEU's service area may be perform either Contractor, HSEU or their agent. Contractor shall reimburse HSEU or its agent at HSEU's current rate for all testing related
- services performed by either HSEU or its agent.

  All testing (except air release manhole vacuum testing) must be conducted after all other in-ground utilities have been installed All concrete thrust blocks must have been in place for a period o
- at least ten (10) days prior to testing. At Engineer's discretion, testing may be delayed, or additiona testing may be required, based upon weather conditions (inadequate precipitation to allow for adequate settlement, etc.).

- Testing may also be delayed, or additional testing may be required. due to installation of site improvements (including but not limited o fencing, signage, landscaping, site lighting, and other sub-
- If Subscriber requires sanitary sewer service prior to testing, a preliminary test may be performed, however. Subscriber must provide, in writing, a guarantee that all cleaning and testing will be performed per the Construction Plans and HSEU's then current standards, specifications, and details.

### Pump Factory Test

3 02

- Factory testing of the pump/motor systems is required.
  Pump must be visually inspected to confirm that it is built in accordance with manufacturer's specifications as to horsepower,
- voltage, phase, frequency, and impeller size. Motor seal and housing chambers must be metered for infinity to test for moisture content or insulation defects and equipped with seal failure and motor over temperature sensor outputs. Pumn must be allowed to run dry to check for proper rotation
- Discharge piping must be attached, 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, stator windings must be checked with a bridge to determine if an imbalance exists. If so, stator must be replaced and warrantee remains effective.
- Pump must be removed from the water and metered again In addition to the above factory test, a special megger test must be performed and include the following:

  1. Pump must be submerged in water and allowed to run at
- maximum load for fifteen (15) minutes.
- 2. A written report must be prepared by test engineer, certified, and submitted to Engineer.

  A non-witnessed Hydraulic Institute performance test may be
- required to be performed by Engineer. This must include the L. Pump must be tested at the design point as well as 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. Pump must be tested at shut off, but not be plotted, and only used as a reference point when plotting the
- performance curve. 3. Thorough records must be kept of all information relevant to the test, including pump manufacturer's serial number, type, and size of pump, as well as impeller modifications made to meet the design conditions.
- 4. A written test report must be prepared, signed, certified, and dated by 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 be submitted to

## Force Main Testing

- Perform hydrostatic pressure and leakage tests on all force mains luding piping within the lift station. The following requirement
- are applicable to both tests. 1. Lift station piping must be tested to the discharge elbow (with a blind flange on the discharge)
- System will not be considered Complete until all leaks have been repaired and all tests have been passed to the satisfaction of Engineer. During filling of the nine and before application of the specified.
- test pressure, all air must be expelled from the force main by means of the air/vacuum release valves, and if necessary, by additional taps at points of highest elevation. After the test is finished, the taps must be tightly plugged, unless otherwise specified.

  4. 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. 6. Contractor must furnish and install test plugs, including all anchors, braces, and other temporary or permanent devices to withstand
- 7. Contractor is responsible for any damage caused by failure of the Lift Station/Force Main Infrastructure during testing of the Project. 8. Refit and replace pipe not meeting leakage or pressure
- Repair all visible leaks regardless of the amount of leakage Hydrostatic Pressure Test Hydrostatic pressure test must conform to ANSI/AWWA C600 and
- C605 procedures except as modified by these Specifications.

  2. Conduct test at a pressure of at least one hundred (100) psi or one and a half (1.5) times the operating pressure, whichever is greater Maintain pressure for a minimum of eight (8) consecutive hours. 4. Test Pressure must not vary by more than five (5) +/- psi.
- Leakage Test performing the leakage test. 2. Maintain pressure for a minimum of eight (8) consecutive hours
- 3. Leakage test will be acceptable when leakage does not exceed that value (L) determined by the following formula:
- I = (NxDxSart(P))/7400
- L=Maximum permissible leakage in gallons per hour, N = Number of pipe joints in segment being tested, = Nominal internal diameter of pipe being tested in inches,
  = Average test pressure, psig.
- 4. Repeat hydrostatic pressure and leakage tests, as necessary a. After location of leaks and repair or replacement of defective

- b. Until satisfactory test results are obtained Open all air/vacuum release valves and verify proper operation
- Test locator wire for continuity. For force main boring, test both wires for continuity.

### 3.04

- or modification. Test to be performed by Contractor or HSEU appointed agent and witnessed by Engineer's Inspector prior to adjustment ring(s) and casting placement.

  Manhole boots must be secured to prevent m
- or 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

10ft or less >10ft but <15ft 15ft but <25ft 105 sec 120 sec >30ft but <35f

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

## Test resistance to ground of ground system or grounding network at a point where equipment, raceways, and conductors are to be nnected. Measurement must be made with a vibro-ground

- Test one hundred-twenty (120) volt to six hundred (600) volt
- 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 manufacturer's specifications and similar readings not to deviate by more than five (5) nercent

After all testing has been successfully completed, Engineer will perform an inspection of the Lift Station/Force Main Infrastructure nd provide Contractor a written summary of items, or punch list,

## Flush internals of Lift Station/Force Main Infrastructure with water

### earth, trash, rubbish, unsightly materials, and other such nuisances from the Project Site.

to person, including but not limited to, Subscribers, mainten workers, Contractors, sub-contractors, and engineers shall, directly or indirectly, allow flow to occur from any Project which is not a Completed Project, HSEU shall be responsible for operation and tenance of these facilities once sanitary flow is permitted

## Vet well must be cleaned by high pressure washer and vacto

After 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 sixty (60) days from date of issuance of the punch list. If, after the sixty (60) day period, and in sole opinion of Engineer, punch list item e not been corrected, Contractor and/or Subsc required to pay HSEU additional inspection fees until the items are corrected

### Manhole Testing

- All air/vacuum release and flow monitoring/metering manholes must be vacuum tested per ASTM C1244 after installation, repair,
- vacuum is drawn. Installation and operation of vacuum equipment and indicating
- devices must be in accordance with ASTM C1244.
  With the vacuum tester in place, draw a vacuum of ten (10) inches of mercury and close the valve.
- rate for a four (4) foot diameter manhole must be in accordance

with the following: Minimum Flansed time for a Manhole Depth

For manholes five (5) feet in diameter, add an additional fiftee additional thirty (30) seconds to the time requirements for four (4) foot diameter manholes. If manhole fails the test, necessary epairs must be made and the vacuum test and repairs must be epeated until manhole passes the test.

## Electrical Testing (must be performed by licensed electrician)

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

circuits. Test cables with megger voltage to be determined by

- Punch Lists
- which require corrective action. Contractor must complete all punch list items within twenty-one (21) days of issuance. If, in opinion of Engineer, the punch list has not been completed, Contractor must pay HSEU additional nspection fees per re-inspection (inclusive of associated management costs) until Engineer deems punch list complete
- of sufficient velocity and quantity that will dislodge sediment or dirt that has accidentally entered the system Remove surplus/waste materials, including but not limited to,

## PART 4 - OPERATION, CLEANING, AND FINAL INSPECTION PRIOR TO

enter the system and continue through conveyance

## prior to conveyance.

4 03 Within six (6) months prior to conveyance, Engineer will conduct an inspection (Final Inspection) at Subscriber's expense. Final nspection will consist of a walk-through of the Project to identify any defects. Final Inspection may also consist of pumping tests, various motor analyses and force main hydrostatic pressure tests as determined by Engineer.

> HAMILTON SOUTHEASTERN UTILITIES, INC. GRAVITY SANITARY SEWER SPECIFICATIONS

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ruck at Subscriber's expense prior to any testing and at least once

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SHEET SHEET 1 OF 4

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

### General Requirements

- Under general laying conditions, force mains are to be Polyvinyl Chloride (PVC), or Polyethylene (PE) pipe materials specified in these Specifications and of material pipe type and standard indicated on the Construction Plans
- All pipe, fittings, and valves must be clearly marked in accordance with the various standards under which they are manufactured Pine must be marked with durable printing according to ASTM/AWWA standards. Water grade fittings may be substituted for sanitary fitting due to material shortage or special interconnection needs provided marker tape is provided indicating
- 2. A marking must be provided on the spigot of each pipe utilizing bell joints to indicate when the pipe is driven home

### Polyvinyl Chloride ("PVC") Pipe

sanitary application.

- 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 c 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 nine of aller. Design and manufacture of pipe must meet m requirements of a working pressure of one hundred-fifty (150) ps plus one hundred (100) psi surge and a safety factor of two (2) a the depth of cover indicated on the Construction Plans.
- Provide push-on joints with bell integrally cast into pipe. Joint must comply with ASTM F 477 and the physical requirements of Uni-Bell PVC Pipe Association's UNI-B-1 "Recommended Specifications for Thermoplastic Pipe Joints, Pressure and Nonssure Applications"
- Use elastomeric gaskets, as provided in ANSI/AWWA C900 or ASTM D 3139.
- PVC AWWA C900 and C905 pine shall only be white in color.

## Polyethylene ("PE") Pipe

- 1. Materials used for manufacture of PE pipe and fittings must be extra high molecular weight, high density PE 3408 polyethyle resin. The pipe must be extruded from virgin resin meeting the specification of ASTM D 3350 with a minimum cell classification o PE 345434C. Fittings must be manufactured from the same resin e and cell classification as the pipe itself.
- 2. Pipe and fittings must contain no recycled compound except the generated in the manufacturer's own plant from resin of the same
- 3 Material must be listed by PPI (Plastics Pine Institute, a division of technical report (TR 4) with a seventy-three (73) degree Fahrenheit hydrostatic design basis of one thousand-six hundred (1.600) psi and a one hundred-forty (140) degree Fahrenheit hydrostati
- 4. Manufacturer must conform to ISO 9001

## 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 tolerance: set forth in ASTM D 3035 with a cell class of PE 3408
- Fittings must be manufactured by injection molding, a combination of extrusion and machining, or fabricated from PE pipe conforming to this specification.
- 3. Fittings must be fully pressure rated and provide a working pressure equal to that of the adjacent pipe with a two (2) to one (1) safety factor.
- (1) safety raccur, A. Pipe and fittings must be homogenous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects the may affect the wall integrity.
- 5. Pipe and fittings for horizontal directional drilling must be a minimum of DR 9. Pipe and fittings used in open cut installations must be a minimum of DR 11.

  6. PE pipe shall be black in color with a green stripe.

- 1. No person may join PE pine unless Engineer has approved that
- The butt fusion process should be used to join sections of PE pipe into continuous lengths at the job site. Joining method must be the heat fusion method and must be performed in strict accordance with pipe manufacturer's recommendations. Heat fusion equipment used in the joining procedure must be capable of meeting all conditions recommended by pipe manufacturer.
- 3. Properly executed electrofusion fittings may be used. Extrusion welding, hot gas welding, or threading and gluing of PE
- 5. MJ adapters are required to mechanically connect PE pipe to main
- line valves three (3) inches or larger. Two (2) inch valves and procedures.
- 7. Fused segments of pipe must be handled 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 bar are recommended when lifting long fused sections. Precautions
- During the heat fusion process, equipment and pipe products ma reach temperatures in excess of four hundred (400) degrees
- Fahrenheit. Caution should be taken to prevent burns 2. Static electricity charges are generated on PE pipe by friction particularly during 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 reas where there is leaking gas or a flammable/exp
- 3. Coiled PE pipe may contain energy as in a spring. Uncontrolled elease by cutting straps, etc. can result in dangerous uncontrolled orces. Exercise appropriate safety precautions and use proper PE pipe is impact resistant. Hitting pipe with an instrument, such
- as a hammer, may result in uncontrolled rebound. tions to Lift Station/Force Main manholes must not be completed until all PE materials have reached equilibrium condition (average ground temperature, etc.).

- Eccentric Plug Valve
- testing of 4 in (100 mm) through 60 in (1500mm) 100% Port Eccentric Plug Valve suitable for wastewater service.
- 2. Standards, Approvals, and Verification
- nm) through 60 in (1500mm) plug valves shall be designed, manufactured, and tested in accordance with American Water Works Association Standard ANSI/AWWA C517.
- b. All Plug Valves shall be certified Lead-free in accordance with c. Manufacturer Shall have a quality management system that is
- certified to ISO 9001 by an accredited, certifying body.
- a. Flanged valves shall be flanges with drilling to ANSI B16.1, Class
- b. Mechanical Joint valves shall fully comply with ANSI/AWWA C111/A21.11.

- a. Port areas shall be 100% for uninterrupted flow path. b. Plug valves shall have a raised valve nickel seat machined to a both finish. Seats shall be 1/8-inch thick of not less than 95%
- oure nickel and ½-inch wide. c. Plug valves shall have shaft seals which consist of adjustable
- multiple V-type packing design. Packing replacement can be done while the valve is in service.

  d. Bearings are heavy duty corrosion resistant 316 stainless steel unless larger than 42-inch. Bearings shall be sleeve-type and
- made of sintered, oil impregnated permanently lubricated type 316 stainless steel, ASTM A743 Grade CE8M.
- e. Valves are to be installed to avoid accumulation of grit in bearing journals. Resilient plug facing shall be Chloropren 5. Materials
- a. 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
- terior 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

### 6. Actuators

- a. Valves 4 in to 8 in (100mm to 200 mm) 100% ported shall be operation. The packing gland shall include a friction collar and an open position memory stop. The friction collar shall include a on sleeve to provide support without exerting pressure on the valve packing.
- b. When specified, valves 4 in (100mm) and larger shall include a totally enclosed and sealed worm gear actuator with position ndicator (above ground service only) and externally adjustable open and closed stops. The worm segment gear shall be ASTIV 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 hardenec
- c. All gear actuators shall be designed to withstand, without nage, a rim pull of 200 lbs. on the hand wheel and an input
- d. Buried service actuators shall be packed with grease and sealed for temporary submergence to 20 feet of water. Exposed worm shafts shall be stainless-steel.
- Interior and exterior of the valve shall be coated with an NSF/ANSI 61 approved fusion body epoxy.
- experience in the manufacture of plug valves. When requested manufacturer shall provide test certificates, dimensional drawings, parts lists drawings, and operation/maintenance
- b. Valve shall be marked with serial number, manufacturer, size. cold working pressure (CWP), and the direct and reverse
- actuator pressure ratings on a corrosion resistant nameplat Plug valve shall be manufactured by Val-Matic & Mfg. Corp. DeZurik or approved equal.

## Swing-Flex Check Valve

- a. This specification covers the design, manufacture, and testing of Swing-Flex Check Valves suitable for cold working pressures up to 250 psig (1725 kPa) in water, wastewater, abrasive, and slurry
- b. The check valve shall be full flow body type, with a domec access cover and only one moving part, the flexible disk.
- Standards and Approvals
   A. Valves shall be designed, manufactured, tested, and certified to
- ANSI/AWWA C508. b. Manufacturer shall have a quality management system that is
- a. Valves shall be provided with flanges in accordance with ANSI B16.1. Class 125

- 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 angle to minimize disc travel.
- b. Top access port shall be full size, allowing removal of the disc without removing the valve from the line. Access cover sha domed in shape to provide flushing action over 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 of a mechanical disc position indicate. Disc shall be one-piece construction, precision molded with an
- integral O-ring type sealing surface and reinforced with alloy steel. The flex portion of the disc contains nylon reinforcemen and shall be warranted for twenty-five (25) years. Non-slam closing characteristics shall be provided through a short 35degree disc stroke and a memory disc return action to provide cracking pressure of 0.25 psig.
- d. Valve disc shall be cycle tested 1,000,000 times in accordance ith ANSI/AWWA C508, and show no signs of wear, cracking, or distortion of the disc or seat and remain drop tight at both high and low pressures
- a. Valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron or ASTM A126 Class B gray iron for 30 in (800mm) and larger.
- b. Disc shall be precision molded Buna-N. ASTM D2000-RG.
- a. A screw-type backflow actuator shall be provided to allow opening of the valve during no-flow conditions. Buna-N seals hall he used to seal the stainless-steel stern in a lead-free onze bushing. Backflow device shall be the rising-stem type indicate position. A stainless-steel T-handle shall be provided for ease of operation.
- b. A mechanical indicator shall be provided to indicate disc under all operating conditions to assure accurate disc position
- A pre-wired limit switch will be provided to indicate open/close position to a remote location. Mechanical type of limit switch shall be activated by the mechanical indicator. Switch shall be rated for NEMA 4, 6, or 6P and shall have UL rated 5 amp, 125 or 250 VAC contacts inings to be rubber for abrasive or corrosive fluids.
- e. A welded nickel seat.
- 7. Manufacture
- a. Manufacturer shall demonstrate five (5) years' experience in the nanufacture of resilient, flexible disc check valves with hydraulic
- b. All valves shall be hydrostatically tested, and seat tested to demonstrate zero leakage. When requested, manufacturer shall rovide test certificates, dimensional drawings, parts list
- drawings, and operation/maintenance manuals.
  c. Exterior and interior of the valves shall be coated with an NSE/ANSI 61 approved fusion bonded epoxy coating
- d. Swing-Flex Check Valves shall be Series #500 (7800) as manufactured by Val-Matic & Mfg. Corp, Elmhurst, IL USA or

### approved equal. Wastewater Air Release Valve

- a. This specification is intended to cover the design, manufacture and testing of Wastewater Air Release Valves suitable for pressure up to 150 psig (1000 kPa).
- . Wastewater Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system in operation and under pressure. Capacity and pressure rating of the valve is dependent on diameter of the precision orifice in e cover. A large inlet connection is required for proper air an water exchange.
- 2. Standards, Approvals, and Verification
- a. Valves shall be manufactured and tested in accordance with ΔWWΔ Standard C512
- certified to ISO 9001 by an accredited, certifying body.
- Valves shall have full size NPT inlets and outlets equal to the nominal valve size. Body inlet connection shall be hexagonal for a wrench connection. Body shall have a 3-inch NPT cleanout and a 1-inch drain connection on the sides of the casting. Cover shall e holted to the valve body and sealed with a flat gasket. aded, adjustable orifice button shall provide tight shut off to the valve pressure rating.
- b. 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
- 4. Materials a. Valve body and cover shall be constructed of Type 316 stainless-
- b. Orifice, float, and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic float or linkage echanisms are not acceptable. Orifice button shall be Buna-N
- Backwash accessories shall be furnished and consist of an inlet shut-off valve, a blow-off valve, a clean water inlet valve, rubbe pply hose, and quick-disconnect couplings. Accessory valves hall be quarter-turn, full ported bronze ball bearing.
- Manufacturer shall demonstrate a minimum of five (5) years experience in the manufacture of wastewater air valves. When equested, manufacturer shall provide test certificates, limensional drawings, parts list drawings, and
- b. Exterior of the valves shall be clear of blemishes and/or evidence of mishandling.
  c. Wastewater Air Release Valves shall be Series 48A and 49A as

operating/maintenance manuals

manufactured by Val-Matic & Mfg. Corp, Elmhurst, IL USA or

### Lift Station/Force Main Manholes

- Manholes must be constructed of monolithic concrete or pre-cast manhole sections. Pre-cast manhole sections must conform to t requirements of ASTM C478 and manhole joints to ASTM C443. Materials for Lift Station/Force Main Manholes and miscellaneous
  - oncrete structures must comply with the following: Concrete for pre-cast manhole section and monolithic manholes must use four thousand (4000) psi concrete. Ready-mix concrete. must conform to ASTM C94, alternate 2. Maximum size aggregate must be one and a half (1.5) inches. Water/Cement ratio must be no more than 0.53 by weight. Mix design to include ConBlock CDA Red by ConSeal or XYPEX C-1000 RED by Xypex Chemical
  - Corporation. 2. Reinforcing steel must conform to ASTM A615, Grade 40 deformed hars or ASTM A616. Grade 40 deformed har
  - Mortar materials:
     a. Sand ASTM C144, passing a #8 sieve. b. Cement - ASTM C150, Type 1.
  - Water must be potable Joints on pre-cast manhole sec meeting the requirements of ASTM C443 and these Specifications the more stringent will apply. Joints must be further sealed as oted on HSEU's Lift Station and Force Main Details sheet.
  - 5. Except lift station wet wells which must be field cored, manufacturer of pre-cast manholes must provide factory cut openings to produce a smooth, uniform, cylindrical hole of prope nmodate a resilient connector. Resilient conn can alternately be embedded by manufacturer. All pipes entering and leaving Lift Station/Force Main manholes must have a resilient connector meeting the requirements of ASTM C923 firmly clamped round the nine Resilient connectors must be PSX gasket or Pres-/edge II as manufactured by Press-Seal Gasket Corp. or simila
  - exible manhole sleeves as manufactured by Kor-N-Seal or equal. 6. Without prior written consent of Engineer, pre-cast manhole ections must be steam cured and cannot be shipped from point of nanufacture for at least five (5) days after having been cast. Upor written consent of Engineer, pre-cast manhole sections can be shipped prior to five (5) days if they were manufactured of high early strength concrete and are verified through testing to hav
  - ved a strength acceptable to Engineer 7. Lift Station/Force Main manhole casting must be East Jorda composite casting and cover.
  - 8 Lift Station/Force Main manhole stens must be made from stee reinforcing encapsulated in a copolymer polypropylene resin.

    Manhole steps must equal or exceed IOSHA and ASTM C478 requirements. Manhole steps manufactured by M.A. Industries, ... American Step Company, Inc., or equal are acceptable
  - Any special manholes and miscellaneous concrete structures must be constructed as detailed on the construction drawings. 10. Pre-cast Manhole base must be combination base and first section as a single unit.

## Generally, odor control facilities will be required in lift stations and manholes receiving discharge from a force main with substantial nake the determination as to the need for odor control

ength or lift station with a substantial cycle time. Engineer will

## PART 2 - EXECUTION

## 2.01

- **Handling and Cutting Pipe** 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 Engineer accepts as satisfactory. Pipe and fittings must be handled carefully to avoid cracking or
- abrasion of the coating. Handle in a manner to ensure installation in sound and undamaged condition. Do not drop or hump. Use slings, lifting lugs, hooks, and other devices designed to protect pipe, joint elements, and coatings. Ship, move, and store with provisions to prevent movement or shock contact with adjacent inits. Handle with equipment capable of performing the worl vith an adequate factor of safety against overturning or othe
- unsafe procedures. Any fitting or pipe showing a distinct crack, or which received a evere 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.
- All field cutting of pipe must be done in a neat, trim manner. Field cut nine will only be allowed at Lift Station/Force Main manhole and fittings. The cut end must be beveled 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.
- 1. PVC Pine a. 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 and smoothly tapered to not damage socket gasket.

- Unless approved by Engineer, Contractor must not install different sizes, types, classifications, and grades of pipe between Lift Station/Force Main manholes.
- No construction work will be permitted after 8:00 PM or dusk whichever is earlier. Manhole installation must be planned to be stacked out through cone prior to the end of the day and not ubject to notential flooding by stormwate
- rough grading (on-site and off-site) must be finished to within ne (1) foot of final grade 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 ompliance with the rough grading requirement at least 5-day rior to a scheduled preconstruction meeting for sanitary sew elated work.
- The existing sewer segment downstream from any connection must be inspected for potential debris prior to plug removal and connection of new infrastructure. Engineer may require the downstream pipe to be cleaned by a vactor truck, pending inspection findings.
- Pine must be hedded as described in these Specifications under Bedding and Haunching. Bell holes must be excavated i

### advance of pipe laving so the entire pipe barrel will bear uniformly on the prepared sub-grade

- Pipe must be laid accurately to the required line and grade in the manner prescribed by the pipe manufacturer and appropriate ASTM/AWWA standards. 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 from Engineer of method proposed for transfer of
- line and grade from control of work.
- Survey instruments bearing proof of calibration within prior six (6) months and 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 ensure 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 before the clean spigot of the next pipe is inserted. The joint must be made in a ctory manner in accordance with the reco must be shoved "home" firmly against the back of the bell Experienced personnel must perform all joint work.
- Locate pipe joint to provide for differential movement at change in type of pipe embedment or at changes in trench botton material. Do not locate joint within eight (8) feet of Lift Station/Force Main manhole walls. Clean and lubricate all joint and gasket surfaces with lubricant recommended by many Check joint deflection for specified limits.

  Maximum total deflection in all directions at each joint must be
- less than the manufacturer's recommended maximum deflection No fittings of greater than forty-five (45) degree hend can be used the lift station and receiving manhole
- Thrust Block and Restrained Joints 1. Provide concrete thrust blocks at:
  - a. All horizontal turns utilizing fitting . All tee, end plug, and plugged cross fittings
  - c. All upward vertical bends. d. All buried in-line valves three (3) inches and larger must be anchored as approved by Engineer against the thrust created when 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. Construct to undisturbed edge of trench for bearing.
   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
- 4. If proper compaction, as described by manufacturer, is provided around all fittings and all joints are joined by the heat fusion method, thrust blocks will not be required for PE pipe Contractor must install insulated #10 copper tracer wire
- ediately adjacent to the top of pipe Direct Bury Lug Electrical Insulating Corrosion Resistant Wire Splice
- Eiberglass field markers must be placed at all locations where a force main crosses a street, at all Lift Station/Force Main manholes, valves, fittings, and at distances not to exceed one thousand-two hundred (1,200) feet along straight runs. Markers must be equa to TAPCO SKU#113781C and must indicate "Pressure Sewer Main Do not let water fill trench. Do not lay pipe in water. Include
- provisions to prevent floatation should water control measure rove to be inadequate. rform pipe installation only when weather and trench conditi are suitable. Allow pipe to reach trench air temperature prior to
- installation. Open excavation must be satisfactorily protected at all times. At the end of each workday, open ends of all pipes must be protect against the entrance of animals, children, earth, or debris by bulkheads or stoppers. Provide adequate backfill to prevent floating of the pipe. Any earth or other material that enters the n/Force Main infrastructure through any such open end
- or unplugged branch must be remove Install a temporary watertight 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. An airtight, watertight plug must always be maintained in the Project at the point of connection with the existing sewer from the initiation of struction to the Completion of the Project. At least once a day, tractor must inspect the plug for water tightness and pump out all accumulated water in excess of six (6) inches from the invert of the outgoing pipe. Contractor is to hold HSEU harmless in the event any water, earth, or other material enters the downs treatment, electrical power, equipment repairs, incidental damage cleaning, and any other costs or expenses related to such entry, ncluding legal fees, IDEM action response and fines imposed
- Contractor shall pay HSEU damages per occurrence and all imposed fines and remediation costs. Pipe must be installed to cross storm sewers and other utilities at mately ninety (90) degrees and must maintain a m prizontal separation of ten (10) feet from all storm and utility
- Pipe must be installed as previously stated and per Uni-Bell PVC Pipe Association's UNI-B-3 "Recommended Practices for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nomina Diameters 4-36 Inch)", the more stringent shall apply.

- Casing wall thickness as per Section 716 Trenchless Pipe Installation of the "Indiana Department of Transportation Standard Specifications" latest edition. All work within rights-of-way 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

- Carrier pipe shall be shimmed to proper line and grade with stainless-steel casing spacers. Verify line and grade once shimming
- of the carrier pipe prior to grouting or attachment of end seals. After successful testing, use cellular grout to fill void between the pipes or attach end seals per man
- Upon completion of the bore, Contractor must coordinate with Engineer to verify that the carrier pipe is on line and grade. ractor must submit invert elevations to Eng
- Detail sheet. Contractor may request alternate methods or materials such as the use of directional boring and/or PE pipe. Engineer must approve in writing, use of alternate methods or materials and Contractor

- Concrete Coatings Interior Lift Station Coating per Engineer requirement 1. Sand blast to dislodge and remove dirt, debris, and other contaminants to enhance adhesion of the coating. Apply either a. Mainstay ML-72 at 1-inch thick, or 927 primer and 125 mils DS-5
- b. Or apply one (1) coat of Sherwin Williams Corobond 100 prime coat followed with one (1) coat of Sherwin Williams CorCoat SC 2. Upon completion, all materials and debris will be placed in

### 2.05 Pipe Bedding and Haunching

Engineer

containers and removed from job site.

- Each pipe section must be laid on a firm foundation of bedding material, haunched, and backfilled with care. These materials must be placed and compacted in accordance with ASTM D2774 Prior to pipe installation, if, in Engineer's opinion, soil con are unstable, trench must be undercut until stable soil is encountered and #2 stone placed below bedding as approved by
- When 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 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 backfilling, haunching, and initial backfill must not have more than n (15) percent of rocks or lumps larger than two and a half (2 1/2) inches in their largest diameter 2. Objects that may cause point loading on the pipe must be
- Care should be taken to not compact directly over the top of pip Where excavation occurs in rock or hard shale, the trench bottom must be undercut and a minimum of six (6) inches of #8 crushed stone must be placed below the bedding zone prior to pipe
- All stone bedding above and below the Lift Station/Force Mair infrastructure must be free of dirt, organic matter, and frozen If more than one (1) foot of unstable material is encountered Contractor shall take additional measures to ensure that additional stabilization is provided such as geotextile fabric wrapping the

## rench section, or as approved by Enginee Concrete, Concrete Caps, and Concrete Cradles

Strength of concrete indicated on all drawings, details, and specifications is twenty-eight (28) day compressive strength.
Concrete caps and cradles must be provided at all locations indicated on the Construction Plans. When ordered by Engineer, concrete caps and cradles not shown on the Construction Plans oust be installed.

At Engineer's discretion, Contractor must take four (4) cylinders

per five (5) cubic yards of concrete and provide certified test

- Lift Station/Force Main Manholes and Other Structure All Lift Station/Force Main manholes must be constructed in accordance with HSEU's Lift Station/Force Main Details sheet
- All flow monitoring/metering manholes must be five (5) feet in 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 backfilling. Apply

Specifications

- Cored holes, penetrations, etc. 1. Any holes cut in the field must be smoothly and cleanly drilled with a core-drill or in a manner acceptable to Engineer. All pipes entering and exiting Lift Station/Force Main manholes must utilize a resilient connector as previously described in these
- manholes, an internal separation of greater than eighteen (18) inches between the outer edges of the openings is recommended If a separation of less than eighteen (18) inches exists, a larger diameter manhole may be required. 3. All cored holes, penetrations, and/or other openings thr manholes must have a minimum internal separation of eight (8)

For cored holes, penetrations, and/or other openings through

inches from the outer edge of the openings.
Contractor must install steps with a minimum horizontal separation of twelve (12) inches from all pipes entering and exiting 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 manhole. All Lift Station/Force Main manhole frames must be securely

in length to nenetrate the structure

anchored to the structure with bolts or concrete anchors adequate

Engineer may, for inspection or testing purposes, take samples of ncrete after it has been mixed or as it is being placed in the

### 2.08 Stubs, Connections, Bulkheads, and Miscellaneous Item Where existing sewers carrying sanitary sewage are encoun Contractor must provide and maintain a temporary or redu

Where called for on the Construction Plans, stubs for future sewe connections must be provided. The upstream end of stubs must be field marked with a two by four (2" X 4"), wrapped with #10 tracer wire. The depth of the stub must be indicated on the

### 2.09

- All improvements, including but not limited to, poles, trees, fences sewer, gas, water or other pipes, wires, conduits, manholes, railroad tracks, buildings, structures, property, etc. along the route of the Lift Station/Force Main infrastructure must not be disturbed
- during construction, provided their function is maintained. Place movable items back in their original location immediately after backfilling is finished, unless otherwise shown on the Construction Plans. Any movable items damaged during cons replaced by an item of equal or better quality.

ilities and structures can be determined. Contractor is

reable items such as mailhoves can be temporarily relocated

- esponsible for repair of utilities and structures when broken o otherwise damaged due to construction activity.
- Where pipes or conduits cross the trench, 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 owner of the pipe or conduit. When utility lines must be removed or relocated for the Project,
- the utility's service. Contractor must conduct the work so that no equipment, material or debris will be placed or allowed to fall upon private property in e vicinity of the Project, unless Contractor has first obtain
- and police call boxes, or other utility controls must be left bstructed and accessible during the Project. Contractor must event runoff from stored piles of excavated material fron entering ditches, waterways, gutters, or storm sewers.

## 2 10

- 3. Operate de-watering equipment ahead of pipe laying to keep the water level below the excavation until structures are secured by
- construction practices to maintain dewatered excavations and safe onstruction conditions.
- encountered during trench work and implement corrective measures. Such an occurrence indicates excessive dewatering wel

Grout used to seal or join structures must be non-shrink grou

- pumping system
- Without written permission from Engineer, Contractor cannot onnect any existing sewers or house service into the Project prior to the Project being deemed Complete by HSEU. Contractor must notify Engineer at least seventy-two (72) hours prior to any construction of storm sewers that may affect

### Existing Utilities, Structures, Property, Etc.

- without the approval of the responsible representative. Follor authorization by the associated owner's representative, the contractor is to support and protect all potentially affected property from damage.
- Contractor must proceed with caution in the excavation and preparation of trenches so the exact location of underground
- Contractor must make explorations and excavations when, in the pinion of Engineer, it is necessary to determine the location of previously marked the area.
- Contractor must notify Engineer and utility line owner in ampl
- property owner's written consent thereto and provided a copy to All excavated material must be piled in a manner that will avoid tructing sidewalks, driveways, and thoroughfares. Hydrant under pressure, valve pit covers, valve boxes, curb stop boxes, fire

- sumps, pumps, hoses, piping, well points, etc. to depress and maintain the groundwater level below the base of the excavation intil all Sanitary Sewer Facilities 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 comply with the regulation of the Environmental Protection Agency (EPA), Indiana Departmen 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. If water enters Completed Lift Station/Force Main infrastructure, Contractor is responsible to HSEU for the costs of sewage treatment, electrical power, equipment repairs, incidental damage, cleaning, and any other costs or expenses related to such entry. In addition, Contractor shall pay HSEU damages per occurrence. Failure to comply with HSEU within 60 days may (at the discretion of HSEU) result in
- 5. De-watering 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 Contractor's responsibility to provide a geotechnical engineer's assessment of corrective action to prevent future post-construction pipe settlement should a sand boil be

SHEET 2 OF 4 HAMILTON SOUTHFASTERN UTILITIES, INC.

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SCALE SCALE THEASTERN 000 Contractor must provide de-watering equipment, shoring, or other ARED HAMI SHEET

5

GRAVITY SANITARY SEWER SPECIFICATIONS

- 6. All wells (potable, non-potable, and de-watering) must be drilled. of sufficient size, spacing and depth for the excavation, and upor completion, abandoned in accordance with the requirements of 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 jurisdiction.

  Contractor may maintain the well casing in-place for all Sanitary Sewer Facilities which will be extended in the future. Trenching
- ion work must incorporate safety measures that compl with all applicable IOSHA regulations and these Specifications. the event of a conflict, the more stringent requirement will apply.
- 2. Trees, boulders, and other surface encumbrances, located to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, must be removed or nade safe before excavation begins.
- 3. Do not open more trench than necessary for the installation of each pipe section while complying with the manufacturer's requirements for optimum installation and performance.
- 4. Contractor must provide sloped side walls (provided that th bottom four (4) feet of trench will not be sloped), sheeting, shoring, or trench boxes as safety measures for all excavations i accordance with all applicable IOSHA regulations. Contractor is esponsible for the determination of the angle of repose of the soil in which the trenching is to be done. Except for areas where solid ock allows for line drilling or pre-slitting or where sheeting eyond the angle of repose, but not steeper than a one (1) foot rise to each half (1/2) foot horizontally.
- 5 Sides slones and faces of all excavations must meet accented 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.
- 5. Flatten the excavation side when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear
- 7. A competent Contractor's representative, as defined under IOSHA measures for the excavation after every rain event or other hazard increasing occurrence.
- 8. Do not store excavated or other material nearer than four (4) fee from the edge of any excavation. Store and retain materials to prevent them from falling or sliding back into excavation. Install substantial stop logs or barricades when mobile equipment is itilized or allowed adjacent to excavation
- ze the amount of excavation around Lift Station/Force Mair
- 10. The width of the trench is predicated upon the diameter of the pipe and depth the pipe is to be installed. If, when performing work for HSEU, the specified trench width is exceeded, Con is responsible for the provision and installation, at his own expense, of all remedial measures required to return site to clean near original conditions. Any requested remediation beyond the preconstruction conditions is the responsibility of HSEU.

  11. Test air in excavations where oxygen deficiency or gaseous
- conditions are possible. Establish controls to ensure acceptable atmospheric conditions. Provide adequate ventilation and eliminate sources of ignition when flammable gases may be present. Emergency rescue equipment, such as a breathing apparatus, a safety harness, and line and basket stretcher, mus be readily available where adverse atmospheric conditions may exist or develop in an excavation
- 12. Provide walkways or bridges with guardrails where employees o equipment are required or permitted to cross over excavations
- 13. Provide ladders where employees are required to be in excavations four (4) feet deep or more. Ladders must extend from floor of 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.
- 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 upor ermination of exploration and similar operations.
- 1. Backfilling must meet the requirements of ANSI/AWWA C605
- unless otherwise specified in these Specifications. 2. Engineer retains the right to delay an excavation backfill to inspect
- workmanship if he deems necessary.

  3. Place and tamp bedding and backfill in a manner that will not
- damage the pipe, pipe coating, wrapping, or encasement 4. Excess dry replacement material without visible fines will not be
- When used in these Specifications, the term "clean backfill" shall mean 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. greater than three (3) inches in rocks or lumps can be larger than two and a half (2 1/2) inches in their largest diameter.
- All job excavated materials which are used for trench backfill above except settlement by water, must be "clean backfill".
- 7. When performing excavation work for HSEU in areas which wil equire tonsoil restoration, material excavated from an one 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 neen specified or shown on the Construction Plans. Where due to the rejection of a part thereof, Contractor, upon direction of Engineer, must remove the rejected material from the site and urnish an additional quantity of "clean backfill" at his own Engineer or Contractor and conditions could not be anticipated HSEU shall be responsible for the cost.
- 8. Excavated material must be placed immediately after the hand packfill in such a manner to prevent the formation of voids a

- potential damage to pipe. The earth backfill must be mounded six (6) inches for settle
- 9. In no case must backfill be dropped from such height or in such volume that its impact damages Sanitary Sewer Facilities. Enginee reserves the right to regulate and control the manner of depositing such backfill. Contractor will be held liable for damage to the Settling of backfill by flooding or puddling will not be permitted
- 11. 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 fina settlement has occurred, and the trench is ready for grading and cleanup. An exception to this would be trenches in traveler ways. Any excess must be hauled off and disposed of or tored by Contractor.
- In established vegetated areas associated with excavation work performed for HSEU, 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

- 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 ents must be in accordance with the directions of the nment agency or public entity having jurisdiction.
- All vegetated areas disturbed or damaged during construction must be re-vegetated with a stand of grass. Agricultural areas and areas purchased for planned development or under construction 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 ettled, 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 thirty-five (35) pounds per one thousand (1,000) nuare feet over the tonsoil by a mechanical spreader at least rty-eight (48) hours before seeding and mixed into the soil for lepth 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 petween 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 1/2) tons per acre. Wood cellulose or cane fiber mulch nust 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 equired by Engineer. Manufactured mulch materials must be stalled according to the manufacturer's reco
  - 5. Seeded areas must be thoroughly watered with a fine spray to prevent washing out of the seed. These areas shall be maintained and patched as directed by Engineer. A satisfactory stand of grass t least one (1) inch in height, without bare spots, will be re Within three (3) months after Project Completion, Contractor mus orrect defective work, such as settled areas, uneven road
    - surfaces, bare spots in grass coverage, erosion, and gullies

## PART 1 - PRODUCTS

Contractor is to provide a complete functional lift station which integrates with HSEU's SCADA system and is compliant with HSEU's overall system communication protocol configuration. The full compliant, operational component must be proved prior to acceptance by HSEU. The pumps must be capable of handling rav unscreened sewage, three (3) inch spherical solids, and stringy materials typical of domestic sewage. Dual cutting action nacerator(s) installed in a receiving wet well should precede lift tation pumping wet well.

## Channel Mounted Macerator

- Macerator(s) are to demonstrate the functional benefit to meet including first flush loading. It shall be capable of grinding up tough solids and rags to protect pumps from damage.
- The separate dual shaft grinder and solids diverter are designed for easy field replacement. When the cutters are worn, replace the grinder with a new unit. If the solids diverter perforated screen ets damaged, replace it with a new unit.
- High-flow solids diverter with perforated screen captures solids and directs them into grinder without compromising flow. The macerator assembly is to be serviceable without requiring
- The macerator shall be capable of fine distance adjustment between the grinder and screen to minimize solids bypass.

  The grinder unit shall be the Channel Monster Flex or approved equal as manufactured by JWC, Santa Anna, CA.

- Submersible Pump
  Pumps are to demonstrate the functional benefit to meet existing or future changing operational conditions.
- Energy savings in projected electricity bill is anticipated to be itely 25% when compared to a similar Hydramatic o nes submersible pump. Energy cost savings less than this amount shall cause acceptance to be contingent upon Engineer'

- With the understanding of the above conditions, the approved pumps for the Project shall be either KSB, Wilo, or approved
- a. Pump(s) to be configured for electrical voltage and power phase available and optimum operating efficiency
- ersible cable sized according to ICEA standards and meets
- c. The submersible power cable shall consist of synthetic rubber omposition on the exterior sheathing.
- Scope
   Electric submersible pump(s) to be supplied with motor, close coupled volute, cast iron discharge elbow and base, guide bar brackets, power cable, and accessories for complete installation
- centrifugal, or chopper type units as required by Engineer, and ssociated with a complete installation designed for raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. b. The pump and motor unit shall be suitable for continuous

a. The pump(s) shall be heavy duty, electric submersible.

- operation at full nameplate load while the motor is completely submerged, partially submerged, or non-submerged. c. The pump, mechanical seals, and motor units provided under this specification shall be from the same manufacturer to chieve standardization of operation, maintenance, spare parts
- a. Submittal data shall be provided to show compliance with these pecifications, plans, or other specifications that will influence
- b. Standard submittal data for approval must consist of
- i. Pump performance curves. ii. Pump outline drawing.
- iv. Electrical motor data. v. Sufficient power/control cable length
- vi. Control drawing and data
- viii. Typical installation guide
- ix. Technical manuals. v Parts list
- i. Manufacturer's equipment storage recommendation xiii. Manufacturer's standard recommended start-up report form.
- c. Lack of the above requested submittal data is cause for

- a. Testing performed upon each pump shall include the following Impeller, motor rating and electrical connections shall be
- checked for compliance with this specification ii. Prior to submergence, each pump shall be run dry to establish correct rotatio iii. Each pump shall be run submerged in water.
- iv. Motor and cable insulation shall be tested for moisture content or insulation defects. b. Upon request, a written quality assurance record confirming the
- c. Each pump (when specified) shall be tested in accordance with the latest test code of the Hydraulic Institute (HI) at the ufacturer to determine head vs. capacity and kilowatt draw
- required. Witness tests shall be available at the factory upon d. The pump(s) shall be rejected if the above requirements are not

## 6. Start-up Service

- a. The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 8 hour vorking days at the site to inspect the installation and instruction of the operation and maintenance of the pumping units. After the pumps have been completely installed and wired. Contractor shall have the manufacturer do the
- ii. Check for proper rotation.
- iii. Check power voltage.
- v. Measure motor operating load and no-load current.
  v. Check level control operation and sequence.

## 7. Factory Service

- Factory-Approved service facilities with qualified factory-trained nechanics shall be available for prompt emergency service
- Warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units nanufactured

- 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
- a. The pump, mechanical seals, and motor manufacturer shall be KSB or Wilo.

Pump Design Configuration (Wet pit installation) Pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars xtending from the top of the station to the discharge conne There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be ccomplished by machined metal to metal watertight contact aling 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 a stainless-steel lifting cable and integral stainless steel lifting bald

per Engineer. The working load of the lifting system shall be 50% greater than the pump unit weight.

Najor pump components shall be of grey cast iron, ASTM A48 Class 35, with smooth surfaces devoid of blow holes or othe rregularities. The lifting handles and exposed holts shall be ess-steel All metal surfaces enco ystem, other than stainless-steel or brass, shall be protected by a factory applied 2-component epoxy resin spray coating. Sealing design shall incorporate metal to metal between machined surfaces. Critical mating 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 on four sides without the ement of a specific torque limi

- Cooling System (Non-cooling Jacket Equipped) Each pump motor shall be sufficiently cooled by the surrounding nent 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 stato using, 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 shall have one fill port and one drain port integral to the system. The cooling system shall provide for continuous pum
- Cable entry seal design shall preclude specific torque requirement to ensure a watertight and submersible seal. Cable entry shall consist of dual cylindrical elastomer grommets, flanked by ashers, all having a close tolerance fit against the cable entry unit, thus providing a strain relief function. The assembly shal provide ease of changing the cable when necessary, using the ame entry seal. Cable entry junction chamber and motor shall be ealed 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

ration in liquid or ambient temperatures up to 104°F (40°C)

- Pump motor shall be a NEMA G design, induction type with a squirrel cage rotor, shell type design, housed in an air or oil 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%.
- rmal 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 onnected to the motor control panel. The motor service factor combined effect of voltage, frequency, and specific gravity) shall be 1.15. Motor shall have a voltage tolerance of +/- 10%. 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 nance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.
- Bearings The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently lubricated with high temperature grease. The upper motor bearing shall be a ingle 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 double mechanical seals in tandem with elastomer bellows. The pump side seals are to be silicon carbide/silicon carbide and the bearing side carbon/silicon carbide. A lubricant chamber for the shaft sealing system. The al system shall not rely upon the pumped media for lubrication
- The pump shaft is one-piece stainless-steel extension of the moto
- II C 15% CrMo-Hc (JN3029)) and include the hardened casing wear ring. The impeller shall be dynamically balanced, closed, single of multi-vane, non-clog design and 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
- /olute / Suction co The pump volute shall be a single piece gray cast iron, ASTM A48, Class 35, non-concentric design with smooth passages of sufficient size to pass the industry required solids that may enter the npeller. Minimum inlet and discharge size shall be as specified.
- Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal eakage chamber and will activate if leakage into the chamb reaches 50% capacity, signaling the need to schedule an inspection. Phase protection is to be provided along with ground

## tation and Control Specification

Summary – The control system is to be compatible and integrate

- 2. Related Section "Basic Electrical Materials and Methods" for general component identification and support requirement
- b. LED Light Emitting Diode
- d IAN Local Area Networ
- f. CMF Central Monitoring Facility
- 4. Submittals a. General – Submit items in this Article according to the
- b. Product Data for monitoring and control of 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
- iring Diagrams detailing the installation of the equipment and differentiating between factory-installed and field-installed wiring shall be commensurate with HSEU's numbering and ed electrical schematics. 5. Quality Assurance
- a. Electrical Component Standard Provide components that comply with NFPA 70 and that are listed and labeled by UL Listing and Labeling – Provide products specified in this Section
- that are listed and labeled i. The terms "Listed" and "Labeled" as specified in the "National Flectrical Code" Article 100
- Listing and Labeling Agency Qualifications a "Nation Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- General Warranty The special warranty specified in this Article shall not deprive the Owner of other rights he may have unde other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by Contractor under requirements of the Contract Documents.
  b. Warranty Period – Two (2) years from the date of Substantial
- Completion and Acceptance unless otherwise indicated in other sections of this Specification. Manufacturers – Subject to compliance with requirement
- manufacturers offering products that may be incorporated in the Work include, but are not limited to the following
- Pump Control Equipment:

  a. MPE Level control probe and transducer
- b. KSB or Wilo recommended motor protection mor
- c. Products of other manufacturers assembled to provide al cified functions including reliability equal to or that of the manufacturer listed in (a) above.
- Products Approved for Use (or upgraded replacements) are listed in the associated Lift Station Details along with the required electrical power distribution diagram format illustration Computer Communication and Co.
- 1. IFIX (most current version) Win-911 Industrial Alarm Notification Software Proficy Historian HMI/SCADA Interface (Most recent version
- Installation Install equipment according to manufacturer's written instruction Mount control equipment according to manufacturer's instructio and Division 16 Section "Basic Electrical Materials and Methods".
- 3. Install wiring between control devices as specified in Division 16 Section "Wires and Cables". Bundle, train, and support wiring in 4. Identify components along with power and control wiring

LED interior panel lighting around sides and top.

# according to HSEU Standard

- Horizontal Access Door Specification 1. Work included: Furnish and install factory fabricated vault access doors, fall protection grating and access safety ladder to valve
- Products 1. Manufacturer - El Group, Inc., 301 Spring Street, East Jordan, M. 49727, (800)874-4100, <a href="https://www.ejco.com">www.ejco.com</a>; Halliday Products, 6 Edgewater Drive, Orlando, FL 32810, (800)298-1027; or USF
- rication Inc, Hialeah, FL (or approved equal) 2. Access Door a Furnish and install where indicated on plans acress door(s) size The vault access door shall be pre-assembled from the
- manufacturer with fall protection grating and aluminum safety b. Performance characteristics: i. Cover: Shall be reinforced to support a minimum live load of
- 300 psf (1464 kg/m2) with a maximum deflection of 1/150th of Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and
- otion of the cover shall not be affected by temperature v. Entire door, including all hardware components, shall be highly
- c. Cover: Shall be ¾" aluminum diamond plate. d. Frame: Channel frame shall be extruded aluminum with
- inuous 1 ½" anchor flange around the perimeter e. Hinges: Cover hinges shall be of recessed heavy-duty design Materials shall be grade 316 stainless-steel. Hinges shall be fastened to an angle and diamond plate with grade 316
- f. Drain Coupling: Provide a 1 % drain coupling located within the channel frame g. Lifting Mechanisms: Manufacturer shall provide the appropriate

- provide smooth, easy, and controlled operation and act as a check in retarding downward motion of the cover when closing
- h. Each hatch shall be equipped with an aluminum lift handle. The lift handle shall be flush with the top of the ¼" diamond plate integral locking mechanism in frame or hatch. No padlock type
- Unit shall be supplied with a hinged safety ladder grate to provide fall protection.

  j. Unit shall be equipped with a built-in gasket to limit the
- transmission of odors.
- k. Material shall be T5 or T6 aluminum for extrusions. \" diamond plate, bars, and angles shall be T6 aluminum
- i. Hinges: Heavy-duty grade 316 stainless-steel hinges, each
- having a minimum 3/8" diameter hinge pin.

  ii. Each door of the cover shall be equipped with a hold open arm
  Door(s) shall lock open in the 90° position. Hold open shall be fastened to the frame with a 1/2" grade 316 Stainless-steel bolt.
- iii. Each hatch shall be supplied with a grade 316 stainless-steel slam lock, with keyway protected by threaded plug. Plug shal be flush with the top of the 1/4" diamond plate. Slam lock shal be fastened with four, grade 316 stainless-steel bolts and
- . Hardware: Shall be grade 316 stainless-steel thro m. Frame Coatings: A bituminous coating shall be applied where the frame comes in contact with concrete
- rspection Verify that the vault access door installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to
- a. Submit product design drawings for review and approval to the architect or specifier before fabrication.
- b. The installer shall check as-built conditions and verify the manufacturer's vault access door details for accuracy to fit the operation prior to fabrication. The installer shall comply with the vault access door manufacturer's installation instructions . The installer shall furnish mechanical fasteners consistent with

### 1.06 Pump Guide System

must be provided for easy removal of the pump and assembly for inspection and service. The system must permit ground level removal of the pumps for inspection and service vithout a person entering the wet well to remove the pump and notor assembly. System must also permit removal of each pump without de-watering the wet well or interrupting operation of other pumps.

1 A rail system or manufacturers stainless steel cable guide system

- 2. Guide cable systems must be tensioned for proper pump utilization and Operational Staff instructed on correct procedures for pump removal and installation. Contractor to furnish any special pump removal equipment recommended by the pump manufacture
- 3. Two (2) stainless steel nine rails, sized per manufacturer's instruction, must be positioned and supported by the pum mounting base. Guide rails must be aligned vertically and supported at the top by attachment to the access hatch frame Intermediate rail support bracket spacing must not exceed 8 feet and prevent bowing of rails during pump removal and installation
- I-beams will not be accepted. 4. For pumps greater than twenty (20) horsepower, Contractor mus submit shop drawings to Engineer for review and approval Pumps must be equipped with sliding brackets or guides connecting to the rails. To ensure easy removal of the pumps,
- guides attached to each pump cannot encircle the rails. Pump Control Equipmen
- rump controller system shall provide user-ready automatic control of pumps with an intuitive HMI interface. The pump controller

pump alteration

- shall contain HSEU operational parameters that are selected and configured via the user interface (HMI). The minimum available in the pump controller shall include: Pump control of up to 4 pumps; including pump grouping and
- ntelligent Hand-Off-Auto Control: Hand Mode (semi-automatic, non-maintained manual mode), the pump switches off at the deactivation set point and resets to Auto mode for the next nump 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 failsafe control.
- Level set point adjustment for pump activation, deactivation, and Level device input capability shall include: 4-20mA analog signal, conductive probe, a transducer, and high/high level control floats Engineer will stipulate minimum electrodes and spacing
- ndant level device input capability with automatic input fault Selectable charge (fill) or discharge (empty) modes Pre-configured station optimization features shall include
- Maximum pump off time 2. Maximum pumps to run 3. Maximum starts per hou
- 4. Inter-pump start and stop time delay:
- 5. Blocked pump detection 7. Pump operation control capability "Locked Level" alarm function to indicate a level device fault
- User-defined % change within a specified time period.
   Different set point values for low use or high use time per (user-defined). Pump alternation modes shall include:
  - Fixed lead pump assignmen
  - Normal alternation
     User defined alternation using N:1 ratio
  - 4. Run most efficient pump using N:1 ratio 5. Alternation by number of hours run or the number of starts within

- Pump decommissioning modes shall include: 1. Decommissioned pump is automatically removed from the pump
- Internal remote monitoring data shall flag the decom status of a pump. Up to six (6) unique user defined profiles of set point shall be
- evailable to control pumps during specific site conditions are specific site conditions. 1. Automatic profile change based on date and time
- 2. Profile selection option from SCADA (remote control), digital input. logic tag, or local display HMI.

  A data logger for user-defined faults and events shall include:
- 1. Recording of up to 50,000 events to internal flash memory 2. Download capability of up to 10,000,000 events by writing directly
- TP data transfer and download data capability of event and fault
- logs in the form of a (csv) file for Microsoft Excel analysis 3-phase supply voltage monitoring and supply fault management
- for the following conditions . Under-voltage
- 3. Phase fail . Phase rotation
- Monitoring of DC power supply, battery voltage, and interna controller temperature. Energy, power, and pump efficiency monitoring:
- 1. kW. kVA. power factor, kWHr. KVAH calculation for each pump
- Motor protection feature: 1. 3-phase current monitoring for each pump 2 Over-current and under-c

2. Over-voltage

- 4. Current phase imbalance fault 5. I2T fault
- 6. Insulation resistance testing for motor windings Flow measurement – Calculated flow via liquid level draw dow
- VFD speed control capability Fault module capability as follows: Pump hold out function
   Automatic restart function after fault condition is no longer
- 3 Manual reset of fault required (if user intervention of fault reset is
- Remote control via remote telemetry monitoring to include the Changing the mode of pumps (hand/off/auto operations
- Reset of pump faults and station faults
   Changing pump and alarm set points 4. Changing operational profile
- areas in the cont
- Automatic data logging of personnel who have entered the programming area omatic logging of all unsuccessful login attempts with a date
- 4. Digital input option for controlled access to programming areas USB type access ports shall be available for the following

and time stamp

- irmware upgrades 2. Save and load pump controller configuration 3. Download data logs
  - 1. Export/Import MODBUS and DNP3 points list Advanced Programming Functions

    1. Pump controller shall have the option of interfacing with Allen Bradley compliant PLC programming languages to enhance
- functionality or interact with the pump controller.

  2. Pump controller shall have the option of using a simple logic engine to enhance functionality or interact with the pump
- Input/Output Characteristics pump controller inputs and outputs shall be modular and shall be expandable. Available I/O types shall include:
- 2. Digital Outputs (240V, 5A resistive . Analog Inputs (10bit) 4. Analog outputs (10bit) 5. User defined digital inputs
- i. Digital inputs shall be configurable based on specific pump sensor a. Seal sensor (conductive) b. PTC Thermistor

8. Level Device support

- Conductive probe (for liquid level sensing) d. Dedicated pump monitoring inputs
  7. Pump controller shall provide support for the following pump monitoring inputs:
- a. Insulation resistance test (IRT) with user selectable test voltage up to 1000VDC b. 3-phase current monitoring, derived from external current
- Pump controller shall have an internal atmospheric pro sensor to allow for atmospheric pressure sensing and signal correction when used in conjunction with pressure transducer level nsing device Configuration program backup, restore, and firmware upgrade:
- a. Pump controller configuration interface shall allow user to save and restore pump controller configurations onto a portable USB torage device b. Pump controller shall allow for import of DNP3, MODBUS point lists, and custom logic scripts via USB ports. c. Pump controller configuration interface shall allow user to
- backup system log files, alarm and events log files, and custom scripts via USB ports.
  d. Firmware upgrades shall be possible by using a firmware upgrade file on a portable USB storage device

SHEET 3 OF 4 HAMILTON SOUTHEASTERN UTILITIES, INC. GRAVITY SANITARY SEWER SPECIFICATIONS THE DOCUMENT AND THE IDEAS, DESIGNS AND CONCEPTS CONTAINED HERON ARE THE EXCLUSIVE INTELECTUAL REPORTY OF SANTAWAY MANAGEMENT & ENGINEERING COMPANY, INC. AND ARE NOT TO BE USED OR REPORTOUGED IN WHOLE OR IN PART, IN THOUT THE WRITTEN CONESTI OF SANTARY MANAGEMENT & ENGINEERING COMPANY, INC. Q'2022 BY SANTARY MANAGEMENT & ENGINEERING COMPANY, INC. Q'2022 BY SANTARY MANAGEMENT & ENGINEERING COMPANY, INC.

transformer devices with a 0.5% input resolution tolerance.

UPDATED FOR 2022

1. Digital Inputs (voltage free input), also configurable as counter

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3

- 1. Pump controller shall include the following data communication
- a. (2) Ethernet ports (min. 10Mbit/s)
- b. (2) RS232 ports (min. 115kBit/s)
- c. (2) RS485 ports (min. 115kBits/s) d. (1) USB device port
- roller shall support the following communication type:
- b. UDP
- c. RS232
- f. PSTN
- g. Wireless LAN h. Cellular dat
- i. Cellular voice
- 3. Pump controller shall support DNP3 (master & slave, level 2 compliant), including:
- a. Change of state rep
- . Native date/time and quality stamps for each data poin c. Event buffering for different classes of data
- d. Support for multiple masters and slaves to be configured on the e. DNP Security (for securing communications between maste
- station and RTU). 4. Pump controller shall support MODBUS (master & slave) including:
- a. Modbus TCP
- c. Modbus ASCII d. Support for multiple masters and slaves
- Pump controller shall meet the following performance and
- a. Central Processing Unit Speed: min. 566MH
- b. Central Processing Unit RAM: min. 256 Mbyte c. Central Processing Unit Flash Memory: min. 64 Mbyte
- e. Working temperature -10°C to +60°C
- f. Storage temperature -40°C to + 90°C 5% to 95% (no
- h. IP Rating controller base unit: IP20, NEMA 1
  i. Display interface IP65, NEMA 4
- 6. Pump controller shall be provided with a 5-year limited manufacturer's warranty.

### Level Control System and High-Water Alarm System Backup Float Switch

- Furnish backup float switch assembly in polygrethane o polypropylene housing with an adequate amount of cable for
- continuous length to control panel.

  2. Furnish polypropylene cord grips and polypropylene mounting hardware for switch assemblies
- . Furnish air-break box for installation prior to control pane 2. Stainless steel materials conforming to specifications for NEMA
- Type 4X 304 stainless-steel enclosure Seal entrance of all conduits entering control panel to exclud sewer gases. (3M Products or better)
- Backup High-Water Alarm Light
- Furnish separate float switch assembly, signal relay, for back-up
- (12) VDC circuit for external alarm light. Electrical or mechanical indicator, visible on the front of interior control panel, must indicate high wet well levels exist, must energize alarm light, and must cause PLC to indicate alarm sequence. Signal relay must maintain alarm signal until wet well level has been lowered and circuit has been manually reset.

## Backup Control System (level Control Relays)

- Description Backup control system shall consist of one or more level sensing relays. Backup level control relays shall be
- Level sensing relays shall be supplied with the following specification: Relay shall accept 2 or 3 level inputs from a conductive level probe as approved by Engineer.
- Mounting and Installation: Din rail Base Mount
- Description A multi-stage level sensing device designed to detect liquid level at specified intervals in tanks and interface with an electronic controller for pump control and liquid level display.
- Level sensing equipment shall be an MPElectronics probe.

  2. Construction Where the level sensing technique utilizes a sensing device inserted into the liquid, all cavities within each sensor uni assembly shall be PVC injected to seal the unit and prevent any
- moisture from entering the sensor assembly.

  3. Cable Flexible cable used for the level sensing probe shall be comprised of PVC/PVC multi-conductor construction with a common over-sheath that is water and oil resistant. 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 suspended cable connected to the probe. Cable
- shall be continuous to control panel.

  4. Mounting and Installation Mounting connections shall be stainless-steel. Mounting assemblies for probes shall include a device available to maintenance personnel to clean the level sing probe at desired maintenance intervals.
- i. Failsafe Functionality Probe shall contain an integral transducer to serve as additional backup to the level control system. The transducer is mounted on bottom of the probe. When used with a controller, it will provide failsafe functionality (monitoring the

## Control Panel Construction and Assembly

- Manufacturers Subject to compliance with requirems manufacturers offering products that may be incorpora Work include, but are not limited to the following:
- Control Panel Equipment as previously stated. 2. LED interior lighting along the side and top.

- 1. Control panels shall be manufactured in accordance with ISO 9000-2001 specifications and shall be constructed for the application of an UL Listing Label by an approved UL Control Panel Assembly
- 2. All electrical connections shall be properly inspected and torqued in compliance with ISO specifications. External connections to the rol 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 log shall be supplied with the ontrol panel
- Control panels shall be supplied from a UL approved control panel assembly facility with all the required labels properly attached. Control Panel Enclosure Environmental Rating
- 1. Control panel enclosure rating shall be specified in accordance with (stainless-steel).

### 1.11 Electrical Equipment

- Control Panel Control system of initial tripley lift stations must ncorporate all wiring, controls, relays and components necessary to place a future third pump into service with only the connectio of the pump power cable in the junction box. Power distribution ystem and control system of duplex and triplex lift stations must be sized adequately to allow 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
- horsepower rating above the larger pumps.

  L. Control Panel shall have a minimum of 25% free space on back plate for each low and high voltage side for operational separation 2. Control Panel must be supplied with 277/480-volt, three (3) phase.
- our (4) wire, sixty (60) cycle power, 3. 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. a. All electrical and electronic components of the Control Panel shall be protected against damage due to electrical transient induced in interconnecting lines from lightning discharges and
- ent surge protector shall be rated for 25kA per phase or
- c. All devices shall be provided with protection per device manufacturer's requirements. 4. Integral within the Control Panel must be an open network device

surges in nearby electrical systems.

- control bus with back-to-back trunk cable connections, tee nnections and terminating resistors. 5. Triplex lift stations must include VFD sized for the next larger
- epower voltage motor and built-in electronic overload
- All enclosures of the Control Panel must be weatherproof NEMA Type 4X fabricated of 14 gauge stainless-steel mounted near the wet well. Sections must be joined to form a free standing completely enclosed assembly maintaining a safe access distan-from the lift station wet well.
- 7. The dead-front panel must have a piano hinge and a latching device for HSEU padlocks (purchased from HSEU).
- Interior Control Panel must be painted steel, laser cut sized to cover wiring and components mounted on back of panel; with Allen Bradley push button, hand-off-automatic (H/O/A) switches and LED compatible control function lights, and instrumentation as
- 9. Back panel must be a 12-gauge removable steel panel sized to mount starters, control equipment, and instrumentation 10. Stainless-steel, continuous vertical hinge to provide one hundred-
- ixty-five (165) degree swing. 11. Contractor must make all appropriate modifications, with written approval from Engineer, to ensure control panel is suitable for approvant into Tigniters, to restate Control patients statistics for operation with the pumping equipment.

  12. All panel conduit penetrations are to be sealed with a removable non-collapsing, putty-like material (3M or better).
- Cabinet Heater sized as required by cabinet dimensions to allow for a minimum interior temperature of sixty (60) degrees renheit when exterior ambient temperature is n
- 1. There shall be a 115 VAC, 299-watt enclosure heater inside the control panel.
- Cabinet heater shall be Hoffma
- The cooling fan kit shall be Rittal SK243.110 or approved equal. Line voltage thermostat, Dayton model 2E206 or equal Telemetry
- Control system must provide for remote shut-down of the pump tation via Sierra Wireless Cellular modem – Airlink RV50 (DC)NA.
- 2. The unit must be supplied with an external lightning/surge protection package.
- Pilot Lights Run (green), Call (amber), Fail (red) supplied w/LED
- 2. Digital elapsed time meters must be configurable to each motor arter to indicate total run time in hours and tenths of an hou and programmed to be six (6) digit non-resettable 3. H/O/A, three (3) position switch manufactured by Allen Bradley.
- 4. One hundred-twenty-five (125) volt, twenty (20) ampere, two (2) oole, three (3) wire grounding NEMA configuration: 5-20R, 5-20P.
  Ground Fault Interrupting (GFI) specification grade receptacle as
- manufactured by Arrow-Hart, Bryant, General Electric, or Engineer approved equal. Grounding

  1. Entire installation to be grounded in accordance with requirements
- 2. Equipment grounding must be provided for, but not limited to, the
- following items: panel enclosure, motor frames, receptacles, and
- Ground must be insulated wire conductors, green color coded, sized according to code and bonded to grounding rod.
- Control panel enclosure shall be properly grounded in accordance with the National Electrical Code and local code requirements and have a HSEU required three-point grounding rod configuration in indisturbed or cohesive soil.
- Each analog signal loop shall only have its shield wire connected to

- control panels where signals are input to the receiving device and not at the source of the transmitting device.
- Battery Backup

  Twelve (12) volt DC lithium-ion battery with automatic one hundred-twenty (120) volt charging system.
- Must provide eight (8) hours of continuous operation of alarm
- Alarm Apparatus
- 1. Alarm signal must be initiated by level control system, backup high
- level signal or power failure relay.

  Motor temperature shutdown as previously discussed in these Specifications. Report failure on pump control panel and through
- . Seal failure shutdown. Report failure on SCADA system and pum
- control panel.

  4. Contractor must furnish HSEU's standard alarm system, including remote lift station control capability via approved PLC. Starters – must be NEMA rated for the loads to be powered.
- a. Solid state reduced voltage, ten (10) to fifteen (15) horsepowe and below
- b. Current ramp duration adjustable two (2) to thirty (30) seconds c. Current trip adjustable from fifty (50) to four hundred (400)
- d. End of limit signal to sequence start of motors. e. Must be Allen Bradlev SMC3.
- Triplex Lift Station: a. Solid state variable frequency drive (VFD) shall be Aqua Danfoss with four (4) to twenty (20) milliampere input.
- Software shall be iFIX SCADA and Allen-Bradley PLC operating
- i. Motor starters must be wired to automatically re-energize the pumps when: a) Power is restored after an outage
- c) Controls are in the "Auto" position and the off float indicates the need. ii. Time delay relays must cause the time between multiple pump starts to be greater than the ramp duration of the starter with
- ontrol system interface. Conduit must be non-metallic heavy wall type.
- Circuit Breaker Usage (unless otherwise specified or shown on Construction Plans) Minimum Type of Service I.C. Rating Amps Minimum I.C. Rating 1.13 120/208 volt 15-100 10,000 RMS
- ighting and Power Power circuit breakers shall be thermal magnetic type designed for AC current with a minimum interrupting capacity of 15,000
- 2. Control circuit breakers shall be in accordance with section UL 489 with a minimum interrupting capacity of 10,000 amperes.
  Control Voltage Transformer Fuses - Rated one tenth (1/10) to six hundred (600) amperes, six hundred (600) volts AC or less must be UI 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 Shawm Amp-Trap 11, or equal. All fuse sizes greater than sixty (60)
- amperes to be Silver Link. Control Power Transformers - Control Power Transformers ired to provide control system and accessory power. (Class 10
- Voltage/Phase Monitor 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, (Pump manufacture recommended system shall override preced Control Relays (when used to supplement or backup PLC
- 1. Control relays shall be square base type, 120VAC or 12VDC (based
- n design schematic) Control relays shall be 4PDT (4 Pole, Double Throw) with normally closed/normally open contacts rated at 120VAC, 5 amps minimur 3. Control relays shall include an integrated test button and relay
- energized flag indicator.
  Full Voltage Magnetic Motor Controller

  1. Motor controller shall be a NEMA rated, full voltage, non-
- reversing, across the line contactor and overload relay inverse-time-current characteristics 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. 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 circuits shall be ted by a thermal magnetic circuit breake
- Wire and Cable (up to 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. 3. Conductors #10 or smaller: a. Use stranded conductors for final connections to motors and al
- locations where vibration or movement is present.
  b. Use solid conductors for all other locations. 4. Use double braid, stranded conductor #8 and larger 5. Minimum wire size: General - #12, over one hundred (100) feet
- #10, over one hundred-fifty (150) feet #8, Control #14 or as equired by equipment manufacturer, Signal - #18. 6. Types and uses (75 or 90 degree Celsius) as directed by Engineer Feeders and service entrance conductors: XHHW b. Power circuits above forty (40) amperes: THWN (#8 and larger)

e. Control: To match the pump manufacturer specified size: THW and XHHW 7. Main and feeder cables must be wire tagged in all null boxes, wire

c. Branch lighting, receptacle, and small power circuits: THWN (#12

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.

d. Direct burial feeders and branch circuits: UF

- 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; or equal. c. For wire joints (twist-on): Thomas & Betts: Piggv: Scothlok: Ideal wing-Nut; or equal.
- uctor sizes larger than #8, to include mechanical set screw, or split bolt type connectors: a. For mechanical or set-screw type connector: Thomas & Betts;
- Lugit; Bundy Quiklug; Penn Union EZ; or equal.
  b. For split-bolt type connectors: Thomas & Betts; Burndy Hydent; Penn Union; or equal.
- 3. For compression connections sizes #8 and larger, to include onehole lugs, two lugs, butt splices, H-taps, C-taps, and anti-oxidizing compound: Thomas & Betts; Burndy Hydent; Penn Union; or equal A quick connect coupling generator receptacle must be provided on the control panel that will allow Engineer to utilize HSEU's by power generator. One (1) automatic transfer switch must ovided in the control panel for HSEU'S emergency generator matic transfer switch must
- Spare Parts Furnish one (1) lot spare parts as recommended by station and

1.12

and #10)

- pump manufacturer. At a minimum, spare parts to include the following:
- 1. Two (2) sets of pump seals.
- Two (2) Wear rings.
   Two (2) sets of O-rings and gaskets
- 4. One (1) spare impeller for current ope
- 5. Future impellers (if specified on the Lift Station Plan) 6. Other items defined as expendable by manufactu

### Back-up Power Back-up Power Generator

- Back-up power generator is to be manufactured by MTU, 60 hz, natural gas fuel source for 25kW to 125kW, >125kW diesel with 48hour integral tank
- 2. Size depends on 1.5 SF of FLA. 3. Prepaid two (2) year service and maintenance with HSEU
- designated generator service provider.

  4. As an alternate, a portable generator may be required by Engineer
- 5. Provide battery tender and block heater with associated cable 6. The generator is to have noise suppression enclosure to comply with OHSA and noise ordinance standards.

  Systems less than 100kW shall have a bypass breaker system generator plug hookup and associated connection to generator
- Generator Control (greater than 100kW) shall be MTU provided Display and I/O remote annunciator capability per operation, runtime, RPM, oil pressure (Hot PSI & Cold PSI), engine coolant
- temperature, voltmeter, ammeter, pre-alarms, and emergence 2. Remote start/stop capability.
- 3. Software login for voltage regulation and governing 4. Automatic start with programmed cranking cycl Transfer Switch

  1. Transfer switch is to be ASCO Automatic Transfer Switch — NEMA
- 4X stainless-steel. 2. Must be capable of integrated communication interfacing using hernet or LAN line. ocking Station – TryStar Docking Station sized for generato Following options to be included with docking station: two-wire auto start, battery charger receptacle, block heater receptacle

# 1.14

Odor Control The odor control system shall be approved by Enginee

## PART 2 - EXECUTION

- Excavating 1. De-watering must be provided as described previously in Force Main/Lift Station Manholes, Piping, Valves, & Fittings section of
- these Specifications.
  2. Trenching must comply with the excavation requirements as described previously in Force Main/Lift Station Manholes, Piping Valves, & Fittings section of these Specifications.
- The as-built elevation of the base material must be certified by an appropriately registered Indiana Professional and approved by Engineer prior to the setting or pouring of the wet well base
- All gravity connections to the wet well must be field cored.
   Pour anti-floatation collars (if required) at the time the concrete base is set or poured. Seat structure with expanding grout. 4. Promptly place granular backfill to minimize risk of floating.
- 6. All wall penetrations shall be sealed with non-shrink grout Valve Vault 1. Set pre-cast manhole sections on poured or pre-cast base.
- Provide granular backfill under and around 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 SCADA and backup high water alarm communication system.

- Access Drive and Generator Pad
- 1. An asphalt drive must be constructed from the nearest public street to the concrete interconnecting wet well/valve vault/generator/control system/odor control slab. Asphalt drive
- must be constructed for heavy duty traffic. 2. Lift station site must be situated so vehicles can access the wet well for pump removal without driving over the valve vault or manholes of the influent sewers and have more than adequate maneuvering space for a 14-yard vactor truck to drive directly or
- to public roadway. Support vehicular parking is to also be sufficient to simultaneously have a crane truck, an electrical service van and foreman truck on pavement without obstructing lift station wet well access.
- 4. If a portable generator is approved for use, a level (all directions) fourteen (14) foot by twenty (20) foot generator parking area must be provided as integral to the wet well/valve vault/odor control nnecting concrete slab.
- 5. If a portable generator is approved for lift station application, the control panel generator receptacle must be located within ten (10) feet of the lift station drive so that a portable generator can be

Pump anchoring – Mount base plates using stainless-steel anchor

Assemble guide rails to access frame. Plumb assembly.

### trical 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 rticle 250-94 NEC. Grounding system is to be 3 5/8" X 10' copper ground rods installed in a triangular 10' pattern beyond the over-
- dig area and Cad welded to earth.
- Coordination with electrical energy provider Coordinate with electrical energy provider and verify the limits of responsibility with respect to metering, terminations, and the like.
   In cases where these Specifications do not conform to electrical
- energy provider requirements, the latter must govern the Project Circuit Breakers
- 2. Do not install two (2) poles in single module. 3. Install multiple pole breakers with single operating handle. Do not install external mechanical ties between single pole breakers.

  Conduit installation (must be Schedule 80)
- 1. Conduit system to be electrically continuous and must be grounded in accordance with NEC. Provide grounding conductors (1993 edition).
- 2. All conduit terminations to be equipped with lock nuts and bushings. Conduits one and one quarter (1 %) inch and larger must have insulating bushing and have lock nuts inside and outside the
- Conduits supported by pipe straps must have supports spaced out not more than four (4) feet on center. Secure supports by means 4. Protect conduits during construction with temporary plugs or caps.
- 1. Run all wires of same circuit in same conduit 2. No wire can be pulled until conduit installation is finalized.
  3. Do not pull thermoplastic wire at ambient temperatures lower.
- than thirty-three (33) degrees Fahrenheit. 4. Use approved pull-in compound (similar to Wire-Lube or Y-Er-Fase) to facilitate pulling of wire.
- 5. Splices are not to occur. 6. 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 elow finished grade.
- Wire and Cable Identification 1. Identify control wires at terminations with schematics and number 2. Train and lace wiring inside equipment and panel boards with
- plastic tie wraps for a neat appearance. 3. 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 Use lugs or connectors of approved size for conductor. Lugs or connectors must be installed according to manufacturer's

Fences are optional, developer can install fences if they choose to

## PART 1 - PRODUCTS

- All wood products incorporated into the fence must be select Western Red Cedar graded as #1 Premium Select by the Western
- Board on board 1 ¼" overlap of 1" X 6" pickets of Western Re Cedar is to be attached with stainless-steel, ring shank nails. 8-foot fence is to have 6" X 6" posts set 8 feet apart with 2" X 8" cap boards with decorative top facing boards beneath the top board and the top cap. Gate Posts set 6 feet deep (line posts 4 feet deep) in 18" sonotubes

### 1 02 Ton Rottom and Mid Rails

- Fence must have continuous top, bottom, and mid rails of cedar 2" X 4" for its full length. Except for 2 picket style aluminum
- commercial grade sections provided for cross flow ventilation.
  Rails must be attached to posts with weather coated 4 ½" screws designed for that purpose.

- Gate Posts
  Posts must be 6" square steel powder coated 3/16" tubing.
- Posts must have caps on top to exclude moisture. Gate - aluminum picket style commercial grade by Alumi-Guard with Barrette Estate gate hinge 2 1/2" kit and Y-Latch2.5, black
- gate and hardware. Gate opening must be 16 feet wide
- All metal posts are to be grounded to separate 5/8" X 10' copper

## Line Posts (where called for by Engineer)

- Line posts must be 3" outside diameter galvanized pipe weighing
- 2.72 pounds per lineal foot.
  Roll form sections, schedule 40, or equal

## Posts must have ball caps on top to exclude moisture Tension Bars and Truss Rods (where called for by Engineer)

Tension bars for braces must be hot-dipped galvanized and have nominal size of 3/8" X ¾". Truss rods for braces must be hot-dipped galvanized and be 3/8"

## Fittings (where called for by Engineer)

All caps, beveled tension and brace bands, and connectors must be vanized pressed steel, malleable steel, or cast steel

# Engineer must approve all hardware (latching, hinges, locking

- evices, etc.). Samples or shop drawings must be sub Engineer for approval. All gate hardware must be heavy-duty industrial design. Hardware ubject to movement must be field painted with touch-up paint
- specifically formulated for this purpose.

  Double swing gates must have hold-closed and hold-back devices installed to engage frames in closed and open (minimum 90 degree) positions. Latching devices must have provisions for

## Verify that grading in fence location is finished withou

- irregularities that would interfere with fence installation Do not commence work until unsatisfactory conditions have been
- Measure and layout entire fence line. Measure parallel to surface of ground. Locate and mark position of posts.
- Locate line posts at equal distance spacing, not exceeding 8 feet on Locate comer posts at positions where fence changes direction
- 2.03 Set posts in concrete footings, use 3,500 psi concrete, at least 60
- nches deep for gate posts and at least 48 inches deep for line Slats must be attached in shadowbox configuration and board on
- board configuration.

  Where a new fence joins an old fence at any point, a corner post must be set at the junction (braced and anchored as comer post) Supply viewing access through fence for electric meter. ordinate size and location of access with Enginee

cedar tone stain approved by Engineer

24 hours after the application.

### The bottom of the fence must be a maximum of 4 inches from finished grade.

- Clear Wood Stain
  Stain all wood incorporated into the Project with an oil-based
- Wood must be dry and free of all dirt, oil, grease, and other surface contaminants before staining. Stain wood only when the humidity and temperature are within he manufacturer's recommended application ranges for at least

Provide 2 coats, the first a thin coat by brush, and the second an

### Allow first coat to dry for at least 48 hours before application of second coat

Adjust truss rods, brace rails, and wires for rigid construction

Tighten hardware, fasteners, and accessories

## SECTION 4 - SITE LIGHTING

- Lighting Products 2 pole lights are to illuminate lift station plus 1 for parking area (RAB PS4-11-20D2).
- Provide Base Cover Kit (RAB BCK-S4), Anchor Kit (RAB BOLT4/11), and Commission Tool (RAB WSREM).

  Pole mounting height is to be 20 feet above 2.5 foot-high X 1.5 foot

## The pole lighting heads are to be RAB ALED4T/WS2

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SHEET 4 OF 4