PART 2 PACKAGE

TECHNICAL SPECIFICATIONS

ISSUED FOR BID
VOLUME IV-B

Rivertown Water Treatment Plant
Well Nos. 1, 2, and Backup Well No. 3
Part 2 –Wellhead Mechanical and Facilities

JEA Project No. 8003981

JEA
Jacksonville, FL

December 2020

CDM Smith JACOBS

JEA

JACKSONVILLE, FLORIDA

Technical Specifications

for the construction of the

RIVERTOWN WATER TREATMENT PLANT
WELL NOS. 1, 2, AND BACKUP WELL No. 3

PART 2 –WELLHEAD MECHANICAL AND FACILITIES

JEA Project No. 8003981

ISSUED FOR BID

CDM Smith, Inc.
Jacobs Engineering Group, Inc.
Jacksonville, FL
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JEA

JACKSONVILLE, FLORIDA

RIVERTOWN WATER TREATMENT PLANT
WELL NOS. 1, 2, AND BACKUP WELL NO. 3

PART 2 –WELLHEAD MECHANICAL AND FACILITIES
JEA Project No. 8003981

SIGN AND SEAL SHEET

TECHNICAL SPECIFICATIONS

Lawrence Bradley Gunn, P.E. No. 65967

DIVISION 9—FINISHES
09 90 00
DIVISION 40—PROCESS INTEGRATION
40 27 00, 40 27 00.08, 40 27 02, 40 90 01, 40 90 11
DIVISION 44—POLLUTION CONTROL EQUIPMENT
44 42 56.03

JEA

JACKSONVILLE, FLORIDA

RIVERTOWN WATER TREATMENT PLANT
WELL NOS. 1, 2, AND BACKUP WELL NO. 3

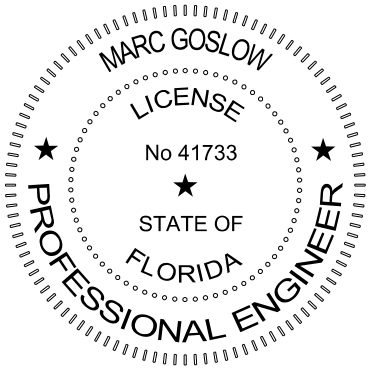
PART 2 –WELLHEAD MECHANICAL AND FACILITIES
JEA Project No. 8003981

SIGN AND SEAL SHEET

TECHNICAL SPECIFICATIONS

Marc Goslow, P.E. No. 41733

DIVISION 26—ELECTRICAL
26 05 02, 26 05 04, 26 05 26, 26 05 33, 26 05 70,
26 08 00, 26 20 00



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RIVERTOWN WATER TREATMENT PLANT
WELL NOS. 1, 2, AND BACKUP WELL NO. 3

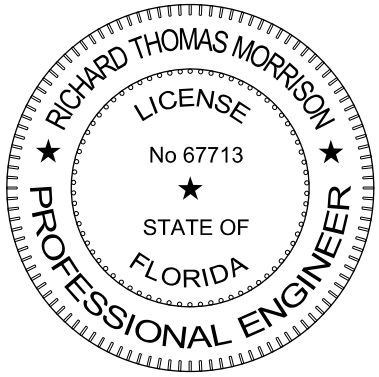
PART 2 –WELLHEAD MECHANICAL AND FACILITIES
JEA Project No. 8003981

SIGN AND SEAL SHEET

TECHNICAL SPECIFICATIONS

Richard Thomas Morrison, P.E. No. 67713

DIVISION 31—EARTHWORK
31 10 00, 31 23 13, 31 23 16, 31 23 19, 31 23 23, 31 23 23.15
DIVISION 32—EXTERIOR IMPROVEMENTS
32 11 23, 32 12 16, 32 31 13, 32 92 00



END OF SECTION

TABLE OF CONTENTS

VOLUME IV-A RIVERTOWN WTP

SPECIFICATIONS GROUP

General Requirements Subgroup

Facility Construction Subgroup

Facility Services Subgroup

In the master Table of Contents within each specification, Volumes IV-A, IV-B, and IV-C, the specifications that pertain to the respective Volume (example, Volume IV-A-Rivertown Water Treatment Plant) are in black font, and the remaining specifications volumes not included in that volume set are in grey font.

END OF VOLUME IV-A TABLE OF CONTENTS

TABLE OF CONTENTS

VOLUME IV-B WELLHEAD MECHANICAL AND FACILITIES

TECHNICAL SPECIFICATIONS

DIVISIONS 33 THROUGH 39 (NOT USED)

DIVISION 40—PROCESS INTEGRATION

DIVISION 44—POLLUTION CONTROL EQUIPMENT

DIVISIONS 45 THROUGH 49 (NOT USED)

END OF VOLUME IV-B TABLE OF CONTENTS

TABLE OF CONTENTS

VOLUME IV-C RAW WATER PIPELINE

TECHNICAL SPECIFICATIONS

END OF VOLUME IV-C TABLE OF CONTENTS

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SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)).
   b. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

1.02 DEFINITIONS

A. Optimum Moisture Content: As defined in Section 31 23 23, Fill and Backfill.

B. Prepared Ground Surface: Ground surface after completion of clearing and grubbing, excavation to grade, and scarification and compaction of subgrade.

C. Relative Compaction: As defined in Section 31 23 23, Fill and Backfill.

D. Subgrade: Layer of existing soil after completion of clearing, grubbing prior to placement of fill, roadway structure or base for floor slab.

E. Proof-Rolling: Testing of subgrade by compactive effort to identify areas that will not support the future loading without excessive settlement.

1.03 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Section 31 10 00, Site Clearing; and Section 31 23 16, Excavation, prior to subgrade preparation.

1.04 QUALITY ASSURANCE

A. Notify Engineer when subgrade is ready for compaction or proof-rolling or whenever compaction or proof-rolling is resumed after a period of extended inactivity.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Keep subgrade free of water, debris, and foreign matter during compaction or proof-rolling.

B. Bring subgrade to proper grade and cross-section and uniformly compact surface.

C. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.

D. Maintain prepared ground surface in finished condition until next course is placed.

3.02 COMPACTION

A. Under Earthfill: Compact upper 12 inches to minimum of 95 percent relative compaction as determined in accordance with ASTM D1557.

B. Under Pavement Structure, Floor Slabs On Grade, or Granular Fill Under Structures: Compact the upper 12 inches to minimum of 95 percent relative compaction as determined in accordance with ASTM D1557.

3.03 MOISTURE CONDITIONING

A. Dry Subgrade: Add water, then mix to make moisture content uniform throughout.

B. Wet Subgrade: Aerate material by blading, discing, harrowing, or other methods, to hasten drying process.

3.04 TESTING

A. Proof-roll subgrade with equipment specified in Article Compaction to detect soft or loose subgrade or unsuitable material, as determined by Engineer.

3.05 CORRECTION

A. Soft or Loose Subgrade:

1. Adjust moisture content and recompact.
2. Over excavate as specified in Section 31 23 16, Excavation, and replace with suitable material from the excavation, as specified in Section 31 23 23, Fill and Backfill.

B. Unsuitable Material: Over excavate as specified in Section 31 23 16, Excavation, and replace with suitable material from the excavation, as specified in Section 31 23 23, Fill and Backfill.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Excavation Plan, Detailing:
   a. Methods and sequencing of excavation.
   b. Proposed locations of stockpiled excavated material.
   c. Proposed onsite and offsite spoil disposal sites.
   d. Numbers, types, and sizes of equipment proposed to perform excavations.
   e. Anticipated difficulties and proposed resolutions.
   f. Reclamation of onsite spoil disposal areas.

1.02 QUALITY ASSURANCE

A. Provide adequate survey control to avoid unauthorized overexcavation.

1.03 WEATHER LIMITATIONS

A. Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as fill or backfill until material completely thaws.

B. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.04 SEQUENCING AND SCHEDULING

A. Clearing, Grubbing: Complete applicable Work specified in Section 31 10 00, Site Clearing, prior to excavating.

B. Dewatering: Conform to applicable requirements of Section 31 23 19, Dewatering, prior to initiating excavation.

C. Excavation Support: Install and maintain as necessary to support sides of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, sod, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.

B. Do not overexcavate without written authorization of Engineer.

C. Remove or protect obstructions as shown and as specified in Section 01 50 00, Temporary Facilities and Controls, Article Protection of Work and Property.

3.02 UNCLASSIFIED EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

3.03 TRENCH WIDTH

A. Minimum Width of Trenches:

1. Single Pipes, Conduits, Direct-Buried Cables, and Duct Banks:
   a. Less than 4-inch Outside Diameter or Width: 18 inches.
   b. Greater than 4-inch Outside Diameter or Width: 18 inches greater than outside diameter or width of pipe, conduit, direct-buried cable, or duct bank.
2. Multiple Pipes, Conduits, Cables, or Duct Banks in Single Trench: 18 inches greater than aggregate width of pipes, conduits, cables, duct banks, plus space between.
3. Increase trench widths by thicknesses of sheeting.

B. Maximum Trench Width: Unlimited, unless otherwise shown or specified, or unless excess width will cause damage to existing facilities, adjacent property, or completed Work. Pipe of greater strength or superior pipe bedding, when approved in writing by Engineer, may be used in lieu of maintaining the pipe widths shown or specified.

3.04 EMBANKMENT AND CUT SLOPES

A. Shape, trim, and finish cut slopes to conform with lines, grades, and cross-sections shown, with proper allowance for topsoil or slope protection, where shown.

B. Remove stones and rock that exceed 3-inch diameter and that are loose and may roll down slope. Remove exposed roots from cut slopes.

C. Round tops of cut slopes in soil to not less than a 6-foot radius, provided such rounding does not extend offsite or outside easements and rights-of-way, or adversely impacts existing facilities, adjacent property, or completed Work.

3.05 STOCKPILING EXCAVATED MATERIAL

A. Stockpile excavated material that is suitable for use as fill or backfill until material is needed.

B. Confine stockpiles to within easements, rights-of-way, and approved work areas. Do not obstruct roads or streets.

C. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could induce excessive settlement.

3.06 DISPOSAL OF SPOIL

A. Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite.

B. Dispose of debris resulting from removal of organic matter, trash, refuse, and junk as specified in Section 31 10 00, Site Clearing, for clearing and grubbing debris.

END OF SECTION

SECTION 31 23 23
FILL AND BACKFILL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
   b. C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
   c. D75, Standard Practice for Sampling Aggregates.
   d. D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   e. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   f. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.02 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D1557.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Engineer.

B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.

D. Completed Course: A course or layer that is ready for next layer or next phase of Work.

E. Lift: Loose (uncompacted) layer of material.

F. Geosynthetics: Geotextiles, geogrids, or geomembranes.

G. Well-Graded:

1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

H. Influence Area: Area within planes sloped downward and outward at 45-degree angle from horizontal measured from:

1. 2 feet outside outermost edge at base of foundations or slabs.
2. 1 foot outside outermost edge at surface of roadways or shoulder.
3. 0.5 foot outside exterior at spring line of pipes or culverts.

I. Borrow Material: Material from required excavations or from designated borrow areas on or near Site.

J. Selected Backfill Material: Materials available onsite that Engineer determines to be suitable for specific use.

K. Imported Material: Materials obtained from sources offsite, suitable for specified use.

L. Structural Fill: Fill materials as required under structures, pavements, and other facilities.

M. Embankment Material: Fill materials required to raise existing grade in areas other than under structures.

1.03 SUBMITTALS

A. Informational Submittals:

1. Manufacturer’s data sheets for compaction equipment.
2. Certified test results from independent testing agency.

1.04 QUALITY ASSURANCE

A. Notify Engineer when:

1. Structure or tank is ready for backfilling, and whenever backfilling operations are resumed after a period of inactivity.
2. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
3. Fill material appears to be deviating from Specifications.

1.05 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Section 31 10 00, Site Clearing; Section 31 23 16, Excavation; and Section 31 23 13, Subgrade Preparation, prior to placing fill or backfill.

B. Backfill against concrete structures only after concrete has attained compressive strength. Obtain Engineer's acceptance of concrete work and attained strength prior to placing backfill.

C. Do not place granular base, subbase, or surfacing until after subgrade has been prepared as specified in Section 31 23 13, Subgrade Preparation.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Gradation Tests:

1. As necessary to locate acceptable sources of imported material.
2. During production of imported material, test as follows:
   a. Granular Fill: One test per 750 tons.
   b. Sand: One test per 750 tons.
   c. Base Course Rock: One test per 1500 tons.
   d. Foundation Stabilization Rock: One test per 1500 tons.

2.02 GRANULAR FILL

A. Imported sand classified as SP in accordance with the Unified Soil Classification System with maximum 8 percent by weight passing No. 200 sieve.

B. Free from dirt, clay balls, and organic material.

2.03 WATER FOR MOISTURE CONDITIONING

A. Free of hazardous or toxic contaminates, or contaminants deleterious to proper compaction.

2.04 BASE COURSE ROCK

A. As specified in Section 32 12 16, Asphalt Paving.

2.05 FOUNDATION STABILIZATION ROCK

A. Crushed rock or pit run rock.

B. Uniformly graded from coarse to fine.

C. Free from excessive dirt and other organic material.

D. Maximum 2-1/2-inch particle size.

PART 3 EXECUTION

3.01 GENERAL

A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.

B. Place and spread fill and backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.

C. During filling and backfilling, keep level of fill and backfill around each structure and buried tank even.

D. Do not place fill or backfill, if fill or backfill material is frozen, or if surface upon which fill or backfill is to be placed is frozen.

E. If pipe, conduit, duct bank, or cable is to be laid within fill or backfill:

1. Fill or backfill to an elevation 2 feet above top of item to be laid.
2. Excavate trench for installation of item.
3. Install bedding, if applicable, as specified in Section 31 23 23.15, Trench Backfill.
4. Install item.
5. Backfill envelope zone and remaining trench, as specified in Section 31 23 23.15, Trench Backfill, before resuming filling or backfilling specified in this section.

F. Tolerances:

1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.

G. Settlement: Correct and repair any subsequent damage to structures, pavements, curbs, slabs, piping, and other facilities, caused by settlement of fill or backfill material.

3.02 BACKFILL UNDER AND AROUND WELLHEAD SLAB AND DRIVEWAY

A. Under Facilities: Within influence area beneath slabs, pavements, piping, conduits, duct banks, backfill with granular fill, unless otherwise shown. Place granular fill in lifts of 12-inch maximum thickness and compact each lift to minimum of 95 percent relative compaction as determined in accordance with ASTM D1557.

3.03 WELLHEAD AND DRIVEWAY AREA GENERAL FILL

A. Outside Influence Areas under and around Pavements, Slabs, Piping: Unless otherwise shown, place earthfill as follows:

1. Allow for thickness of sod where required.
2. Maximum 12-inch thick lifts.
3. Place and compact fill across full width of embankment.
4. Compact to minimum 90 percent relative compaction as determined in accordance with ASTM D1557.
5. Dress completed embankment with allowance for sod, crest surfacing, and slope protection, where applicable.

3.04 SITE TESTING

A. Maximum dry density, Optimum moisture content, Gradation, and Plasticity:

1. One sample from each type of finished product or more often as determined by Engineer, if variation in gradation is occurring, or if material appears to depart from Specifications.
2. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.
3. Remove material placed in Work that does not meet Specification requirements.

B. In-Place Density Tests: In accordance with ASTM D1556. During placement of materials, test as follows:

1. Granular Fill: One test per lift per 1,000 sf plan area.
2. Base Course Rock: As specified in Section 32 11 23, Aggregate Base Courses.
3. Foundation Stabilization Rock: One test per lift per 1,000 sf plan area.

3.05 GRANULAR BASE, SUBBASE, AND SURFACING

A. Place and Compact as specified in Section 32 12 16, Asphalt Paving.

3.06 REPLACING OVEREXCAVATED MATERIAL

A. Replace excavation carried below grade lines shown or established by Engineer as follows:

1. Beneath Footings: Granular fill.
2. Beneath Fill or Backfill: Same material as specified for overlying fill or backfill.
3. Beneath Slabs-On-Grade: Granular fill.
4. Trenches:
   a. Unauthorized Overexcavation: Either trench stabilization material or granular pipe base material, as specified in Section 31 23 23.15, Trench Backfill.
   b. Authorized Overexcavation: Trench stabilization material, as specified in Section 31 23 23.15, Trench Backfill.
5. Permanent Cut Slopes (Where Overlying Area is Not to Receive Fill or Backfill):
   a. Flat to Moderate Steep Slopes (3:1, Horizontal Run: Vertical Rise or Flatter): Earthfill.
   b. Steep Slopes (Steeper than 3:1):
      1) Correct overexcavation by transitioning between overcut areas and designed slope adjoining areas, provided such cutting does not extend offsite or outside easements and right-of-ways, or adversely impacts existing facilities, adjacent property, or completed Work.
      2) Backfilling overexcavated areas is prohibited, unless in Engineer’s opinion, backfill will remain stable, and overexcavated material is replaced as compacted earthfill.

3.07 ACCESS ROAD SURFACING

A. Place and compact as specified in Section 32 12 16, Asphalt Paving.

END OF SECTION

SECTION 31 23 23.15
TRENCH BACKFILL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Public Works Association (APWA): Uniform Color Code.
2. ASTM International (ASTM):
   a. C33/C33M, Standard Specification for Concrete Aggregates.
   b. C94/C94M, Standard Specification for Ready-Mixed Concrete.
   c. C117, Standard Test Method for Materials Finer than 75 Micrometer (No. 200) Sieve in Mineral Aggregates by Washing.
   d. C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   e. C150/C150M, Standard Specification for Portland Cement.
   f. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
   g. C1012/C1012M, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution.
   h. D1140, Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75 micrometer) Sieve.
   i. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   j. D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   k. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   l. D4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
3. National Electrical Manufacturers Association (NEMA): Z535.1, Safety Colors.

1.02 DEFINITIONS

A. Base Rock: Granular material upon which manhole bases and other structures are placed.

B. Bedding Material: Granular material upon which pipes, conduits, cables, or duct banks are placed.

C. Imported Material: Material obtained by Contractor from source(s) offsite.

D. Lift: Loose (uncompacted) layer of material.

E. Pipe Zone: Backfill zone that includes full trench width and extends from prepared trench bottom to an upper limit above top outside surface of pipe, conduit, cable or duct bank.

F. Prepared Trench Bottom: Graded trench bottom after excavation and installation of stabilization material, if required, but before installation of bedding material.

G. Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either as-compacted field dry density or maximum dry density, as determined by Engineer.

H. Selected Backfill Material: Material available onsite that Engineer determines to be suitable for a specific use.

I. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes producing a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids. Satisfying both of the following requirements, as defined in ASTM D2487:

1. Coefficient of Curvature: Greater than or equal to 1 and less than or equal to 3.
2. Coefficient of Uniformity: Greater than or equal to 4 for materials classified as gravel, and greater than or equal to 6 for materials classified as sand.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Manufacturer’s descriptive literature for marking tapes and tracer wire.

B. Informational Submittals:

1. Catalog and manufacturer’s data sheets for compaction equipment.
2. Certified Gradation Analysis: Submit not less than 30 days prior to delivery for imported materials or anticipated use for excavated materials, except for trench stabilization material that will be submitted prior to material delivery to Site.
3. Controlled Low Strength Material: Certified mix design and test results. Include material types and weight per cubic yard for each component of mix.

PART 2 PRODUCTS

2.01 MARKING TAPE

A. Nondetectable:

1. Inert polyethylene, impervious to known alkalis, acids, chemical reagents, and solvents likely to be encountered in soil.
2. Thickness: Minimum 5 mils.
3. Width: 6 inches.
4. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.
5. Manufacturers and Products:
   a. Reef Industries; Terra Tape.
   b. Mutual Industries; Non-detectable Tape.
   c. Presco; Non-detectable Tape.

B. Detectable:

1. Solid aluminum foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.
2. Foil Thickness: Minimum 0.35 mils.
3. Laminate Thickness: Minimum 5 mils.
4. Width: 6 inches.
5. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.
6. Joining Clips: Tin or nickel-coated furnished by tape manufacturer.
7. Manufacturers and Products:
   a. Reef Industries; Terra Tape, Sentry Line Detectable.
   b. Mutual Industries; Detectable Tape.
   c. Presco; Detectable Tape.

C. Color: In accordance with APWA Uniform Color Code.

Color*	**Facility**
Red	Electric power lines, cables, conduit, and lightning cables
Orange	Communicating alarm or signal lines, cables, or conduit
Yellow	Gas, oil, steam, petroleum, or gaseous materials
Green	Sewers and drain lines
Blue	Potable water
Purple	Reclaimed water, irrigation, and slurry lines
*As specified in NEMA Z535.1, Safety Color Code.	

2.02 TRACER WIRE

A. Material: Minimum 12-gauge solid copper or copper jacket with a steel core, with high-density polyethylene (HDPE) or high-molecular weight polyethylene (HMWPE) insulation suitable for direct bury.

B. Splices: Use wire nut or lug suitable for direct burial as recommended by tracer wire manufacturer.

C. Manufacturers:

1. Copperhead Industries, LLC.
2. Performance Wire & Cable Inc.
3. Pro-line Safety Products Company.

2.03 TRENCH STABILIZATION MATERIAL

A. Base Rock:

1. Clean, hard, durable 3-inch minus crushed rock or gravel, or pit run, free from clay balls, other organic materials, or debris.
2. Uniformly graded from coarse to fine, less than 8 percent by weight passing the 1/4-inch sieve.

B. Granular Backfill:

1. Clean gravel or crushed rock, reasonably well-graded from coarse to fine.
2. Maximum Particle Size: 1 inch.
3. Dry sand, accepted by Engineer, may be provided for trenches above maximum groundwater level.

2.04 BEDDING MATERIAL AND PIPE ZONE MATERIAL

A. Unfrozen, friable, and no clay balls, roots, or other organic material.

B. As specified for Granular Fill in Section 31 23 23, Fill and Backfill.

2.05 EARTH BACKFILL

A. Soil, loam, or other excavated material suitable for use as backfill.

B. Composed of approved on site excavated material or imported fill material that is composed of durable soil free of debris, organic matter, or other deleterious materials.

C. Do not contain stones larger than 6 inches in largest diameter.

D. Have a maximum of 50 percent passing the No. 200 sieve.

E. Have a maximum dry density of at least 90 pounds per cubic foot (pcf) as determined by ASTM D1557.

F. Do not contain granite blocks, broken concrete, masonry rubble, or other similar materials and shall have physical properties such that it can be readily spread and compacted during filling.

2.06 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

A. Select and proportion ingredients to obtain compressive strength between 50 psi and 150 psi at 28 days in accordance with ASTM D4832.

B. Materials:

1. Cement: ASTM C150/C150M, Type I or Type II.
2. Aggregate: ASTM C33/C33M, Size 7.
3. Fly Ash (Pozzolan): Class F fly ash in accordance with ASTM C618, except as modified herein:
   a. ASTM C618, Table 1, Loss on Ignition: Unless permitted otherwise, maximum 3 percent.
   b. Test in accordance with ASTM C1012/C1012M to verify sulfate resistance is acceptable.
4. Water: Clean, potable, containing less than 500 ppm of chlorides.

2.07 SOURCE QUALITY CONTROL

A. Perform gradation analysis in accordance with ASTM C136 for:

1. Earth backfill, including specified class.
2. Trench stabilization material.
3. Bedding and pipe zone material.

B. Certify Laboratory Performance of Mix Designs:

1. Controlled low strength material.
2. Concrete.

PART 3 EXECUTION

3.01 TRENCH PREPARATION

A. Water Control:

1. Promptly remove and dispose of water entering trench as necessary to grade trench bottom and to compact backfill and install manholes, pipe, conduit, direct-buried cable, or duct bank. Do not place concrete, lay pipe, conduit, direct-buried cable, or duct bank in water. As specified in Section 31 23 19, Dewatering.
2. Remove water in a manner that minimizes soil erosion from trench sides and bottom.
3. Provide continuous water control until trench backfill is complete.

B. Remove foreign material and backfill contaminated with foreign material that falls into trench.

3.02 TRENCH BOTTOM

A. Firm Subgrade: Grade with hand tools, remove loose and disturbed material, and trim off high areas and ridges left by excavating bucket teeth. Allow space for bedding material if shown or specified.

B. Soft Subgrade: If subgrade is encountered that may require removal to prevent pipe settlement, notify Engineer. Engineer will determine depth of overexcavation, if any required.

3.03 TRENCH STABILIZATION MATERIAL INSTALLATION

A. Rebuild trench bottom with trench stabilization material.

B. Place material over full width of trench in 6-inch lifts to required grade, providing allowance for bedding thickness.

C. Compact each lift so as to provide a firm, unyielding support for the bedding material prior to placing succeeding lifts.

3.04 BEDDING

A. Furnish imported bedding material where, in the opinion of Engineer, excavated material is unsuitable for bedding or insufficient in quantity.

B. Place over full width of prepared trench bottom in two equal lifts when required depth exceeds 8 inches.

C. Hand grade and compact each lift to provide a firm, unyielding surface.

D. Minimum Thickness: As follows:

1. Pipe 15 Inches and Smaller: 4 inches.
2. Pipe 18 Inches to 36 Inches: 6 inches.
3. Pipe 42 Inches and Larger: 8 inches.
4. Conduit: 3 inches.
5. Direct-Buried Cable: 3 inches.
6. Duct Banks: 3 inches.

E. Check grade and correct irregularities in bedding material. Loosen top 1 inch to 2 inches of compacted bedding material with a rake or by other means to provide a cushion before laying each section of pipe, conduit, direct-buried cable, or duct bank.

F. Install to form continuous and uniform support except at bell holes, if applicable, or minor disturbances resulting from removal of lifting tackle.

G. Bell or Coupling Holes: Excavate in bedding at each joint to permit proper assembly and inspection of joint and to provide uniform bearing along barrel of pipe or conduit.

3.05 BACKFILL PIPE ZONE

A. Upper limit of pipe zone shall not be less than following:

1. Pipe: 12 inches, unless shown otherwise.
2. Conduit: 3 inches, unless shown otherwise.
3. Direct-Buried Cable: 3 inches, unless shown otherwise.
4. Duct Bank: 3 inches, unless shown otherwise.

B. Restrain pipe, conduit, cables, and duct banks as necessary to prevent their movement during backfill operations.

C. Place material simultaneously in lifts on both sides of pipe and, if applicable, between pipes, conduit, cables, and duct banks installed in same trench.

1. Pipe 10-Inch and Smaller Diameter: First lift less than or equal to 1/2 pipe diameter.
2. Pipe Over 10-Inch Diameter: Maximum 6-inch lifts.

D. Thoroughly tamp each lift, including area under haunches, with handheld tamping bars supplemented by "walking in" and slicing material under haunches with a shovel to ensure voids are completely filled before placing each succeeding lift. Compact each lift to a minimum of 95% relative compaction as determined by ASTM D1557.

E. Do not use power-driven impact compactors to compact pipe zone material. After full depth of pipe zone material has been placed as specified, compact material by a minimum of three passes with a vibratory plate compactor only over area between sides of pipe and trench walls.

3.06 MARKING TAPE INSTALLATION

A. Continuously install marking tape along centerline of buried piping, shown on Drawings. Coordinate with piping installation drawings.

1. Detectable Marking Tape: Install with nonmetallic piping and waterlines.
2. Nondetectable Marking Tape: Install with metallic piping.

3.07 TRACER WIRE INSTALLATION AND TESTING

A. Install tracer wire continuously along centerline of nonmetallic buried piping.

B. Attach wire to top of pipe using tape at maximum of 10-foot intervals. In areas where depth of cover is excessive for allowing detection of tracer wire with electronic pipe locator, install tracer wire within pipe backfill directly above pipe centerline at a minimum depth of 3 feet.

C. Install splices in accordance with manufacturer's instructions for direct bury applications. Tie ends of wire to be joined in a knot as required to reduce tension on splice.

D. Bring tracer wire to surface at each valve box, curb box, vault, air valve, blowoff valve, hydrant, and pipeline marker. Tracer wire shall be brought to surface at least every 1,000 feet. If distance between pipe appurtenances exceeds 1,000 feet, install valve box to allow access to tracer wire. Mark valve box cover with the word "TRACER". Coil enough excess tracer wire at each appurtenance to extend wire 12 inches above ground.

E. Test continuity of tracer wire using electronic pipe locator in presence of Engineer prior to paving.

3.08 BACKFILL ABOVE PIPE ZONE

A. General:

1. Process excavated material to meet specified gradation requirements.
2. Adjust moisture content as necessary to obtain specified compaction.
3. Do not allow backfill to free fall into trench or allow heavy, sharp pieces of material to be placed as backfill until after at least 2 feet of backfill has been provided over top of pipe.
4. Do not use power driven impact type compactors for compaction until at least 4 feet of backfill is placed over top of pipe.
5. Backfill to grade with proper allowances for sod, crushed rock surfacing, and pavement thicknesses, wherever applicable.
6. Backfill around structures with same class backfill as specified for adjacent trench, unless otherwise shown or specified.

B. Backfill Outside of Facilities or Roadways:

1. Backfill with earth backfill in lifts not to exceed 6 inches. Compact each lift to a minimum of 90 percent relative as determined by ASTM D1557.
2. Leave trench with backfill material neatly mounded across the entire trench width, but not more than 6 inches above the adjacent ground surface.
3. In lawn, garden, or similar type areas, maintain trench level with the existing adjacent grade.
4. At Other Locations:
    a. Estimate and provide amount of backfill material required so that after normal settlement, settled surface will match adjacent ground surface.
    b. Neatly windrow material over trench, and remove excess.
    c. Correct excess or deficiency of backfill material apparent after settlement and within correction period by regrading, and disposing of excess material or adding additional material where deficient.

C. Backfill Under Facilities and Roadways: Backfill trench above pipe zone with granular backfill in lifts not exceeding 6 inches. Compact each lift to a minimum of 95 percent relative compaction prior to placing succeeding lifts.

D. Concrete Backfill:

1. Place above bedding.
2. Minimum Concrete Thickness: 6 inches on top and sides of pipe.
3. Do not allow dirt or foreign material to become mixed with concrete during placement.
4. Allow sufficient time for concrete to reach initial set before additional backfill material is placed in trench.

5. Prevent flotation of pipe.
6. Begin and end concrete backfill within 4 inches of a pipe joint on each end.
7. Do not encase pipe joints except within the limits of the concrete backfill.

E. Controlled Low Strength Material:

1. Discharge from truck mounted drum type mixer into trench.
2. Place in lifts as necessary to prevent uplift (flotation) of new and existing facilities.
3. In traveled areas fill entire trench section to pavement finish grade for a temporary driving surface, and screed off excess and finish with a float.
4. In other areas fill trench section as shown.

3.09 MAINTENANCE OF TRENCH BACKFILL

A. After each section of trench is backfilled, maintain surface of backfilled trench even with adjacent ground surface until final surface restoration is completed.

B. Gravel Surfacing Rock: Add gravel surfacing rock where applicable and as necessary to keep surface of backfilled trench even with adjacent ground surface, and grade and compact as necessary to keep surface of backfilled trenches smooth, free from ruts and potholes, and suitable for normal traffic flow.

C. Concrete Pavement: Replace settled slabs.

D. Asphaltic Pavement: Replace settled areas or fill with asphalt as specified in Section 32 12 16, Asphalt Paving.

E. Other Areas: Add excavated material where applicable and keep surface of backfilled trench level with adjacent ground surface.

3.10 SETTLEMENT OF BACKFILL

A. Settlement of trench backfill, or of fill, or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill.

END OF SECTION

SECTION 40 90 01
PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS)

PART 1 GENERAL

1.01 SUMMARY

A. Contractor is responsible for providing timely coordination with Owner, so as to maintain Project Schedule.

B. Work Includes:

1. Installing, calibrating, adjusting, testing, documenting, and starting up for all Installing Contractor furnished equipment to makeup a complete Process Instrumentation and Control System for the well site.
   a. Installing Contractor furnished items includes one (1) SCADA panel and well pump instrumentation including primary elements, transmitters, and control devices.
   b. Testing: Installing Contractor shall perform testing as specified.
2. Furnishing, installing, calibrating, adjusting, testing, documenting, starting up well instrumentation including primary elements, transmitters, and control devices. See Drawings for additional information.
   a. Testing: Installing Contractor shall perform testing as specified.
3. Coordination with JEA to ensure instrumentation and control panel components meet current JEA standards.
4. Additional well control functions and requirements are described in the Specifications and Drawings found in Volumes 1 of the Contract Documents.

C. Detailed Design: PICS as shown and specified includes functional and performance requirements and component specifications. Complete detailed PICS design.

1.02 DEFINITIONS

A. Signal Types:

1. Analog Signals, Current Type:
   a. 4 to 20 mA dc signals conforming to ISA S50.1.
   b. Unless otherwise indicated for specific PICS Subsystem components, use the following ISA 50.1 options:
      1) Transmitter Type: Number 2, two-wire.
      2) Transmitter Load Resistance Capacity: Class L.
      3) Fully isolated transmitters and receivers.

2. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
3. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
4. Pulse Frequency Signals:
   a. Direct current pulses whose repetition rate is linearly proportional to process variable.
   b. Pulses generated by contact closures or solid state switches as indicated.
   c. Power source less than 30V dc.
5. Special Signals: Other types of signals used to transmit analog and digital information between field elements, transmitters, receivers, controllers, and digital devices.

B. Instrument Tag Numbers:

1. A shorthand tag number notation is used in the Loop Specifications. For example: RID AI-1-2(2)(3)[pH]

Notation	Explanation
ID	Site Designator – (Coordinate specific Site Designator with JEA)
I	Unit Process Number
AI	ISA designator for Analysis Indicator
2	Loop number
(2)	First unit number; number of same component types in a given loop; -1 and -2 in this example
(3)	Second unit number; number of same component types with same first unit number in a given loop; -1, -2, and -3 in this example
[pH]	Same notation shown at 2 o'clock position on ISA circle symbol on P&ID

2. In this Example, RID1AI-1-12(2)(3)[pH] is Shorthand for:

   RID 1AI-1-12-1-1[pH], RID 1AI-1-12-1-2[pH], RID 1AI-1-12-1-3[pH]
   RID 1AI-1-12-2-1[pH], RID 1AI-1-12-2-2[pH], RID 1AI-1-12-2-3[pH]

1.03 DELIVERY, STORAGE, AND HANDLING

A. Provide site and warehouse storage facilities for PICS equipment.

B. Prior to installation, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.

C. Cover panels and other elements that are exposed to dusty construction environments.

1.04 SEQUENCING AND SCHEDULING

A. Activity Completion: The following is a list of key activities and their completion criteria:

1. Hardware Delivery: Hardware delivered to Site.
2. Performance Acceptance Test (PAT): Completed and required test documentation accepted.

B. PICS Substantial Completion: When Owner issues Certificate of Substantial Completion.

1. Prerequisites:
   a. PICS has successfully completed PAT.
   b. All spares, expendables, and test equipment have been delivered to Owner.

C. PICS Acceptance: When Owner issues a written notice of Final Payment and Acceptance.

1. Prerequisites:
   a. Certificate of Substantial Completion issued for PICS.
   b. Punch-list items completed.

PART 2 PRODUCTS

2.01 ELECTRICAL REQUIREMENTS

A. In accordance with Division 26, Electrical, as specified in the Drawings.

B. I&C and Electrical Components, Terminals, Wires, and Enclosures: UL recognized or UL listed.

C. Wires within Enclosures:

1. AC Circuits:
   a. Type: 300-volt, Type MTW stranded copper.
   b. Size: For current to be carried, but not less than No. 18 AWG.
2. Analog Signal Circuits:
   a. Type: 300-volt stranded copper, twisted shielded pairs.
   b. Size: No. 18 AWG, minimum.
3. Other dc Circuits.
   a. Type: 300-volt, Type MTW stranded copper.
   b. Size: For current carried, but not less than No. 18 AWG.
4. Special Signal Circuits: Use manufacturer's standard cables.
5. Wire Identification: Numbered and tagged at each termination.
   a. Wire Tags: Snap-on or slip-on PVC wire markers with legible machine printed markings and numbers. Adhesive or taped-on tags are not acceptable.

D. Wires entering or leaving enclosures, terminate and identify as follows:

1. Analog and discrete signal, terminate at numbered terminal blocks.
2. Special signals, terminated using manufacturer's standard connectors.
3. Identify wiring in accordance with Section 26 05 04, Conductors.

E. Terminal Blocks for Enclosures:

1. Quantity:
   a. Accommodate present and spare indicated needs.
   b. Wire spare PLC I/O points to terminal blocks.
   c. One wire per terminal for field wires entering enclosures.
   d. Maximum of two wires per terminal for No. 18 AWG wire for internal enclosure wiring.
   e. Spare Terminals: 20 percent of all connected terminals, but not less than 10 per terminal block.
2. General:
   a. Connection Type: Screw compression clamp.
   b. Compression Clamp:
      1) Complies with DIN-VDE 0611.
      2) Hardened steel clamp with transversal groves that penetrate wire strands providing a vibration-proof connection.
      3) Guides strands of wire into terminal.
   c. Screws: Hardened steel, captive and self-locking.
   d. Current Bar: Copper or treated brass.

e. Insulation:
    1) Thermoplastic rated for minus 55 to plus 110 degree C.
    2) Two funneled shaped inputs to facilitate wire entry.
f. Mounting:
    1) Standard DIN rail.
    2) Terminal block can be extracted from an assembly without displacing adjacent blocks.
    3) End Stops: Minimum of one at each end of rail.
g. Wire preparation: Stripping only permitted.
h. Jumpers: Allow jumper installation without loss of space on terminal or rail.
i. Marking System:
    1) Terminal number shown on both sides of terminal block
    2) Allow use of preprinted and field marked tags.
    3) Terminal strip numbers shown on end stops.
    4) Mark terminal block and terminal strip numbers as shown on Panel Control Diagrams and Loop Diagrams.
    5) Fuse Marking for Fused Terminal Blocks: Fuse voltage and amperage rating shown on top of terminal block.
j. Test Plugs: Soldered connections for 18 AWG wire.
    1) Pin Diameter: 0.079 inch.
    2) Quantity: 10.
    3) Manufacturer and Product:
        a) Weidmuller, Type PS.

3. Spare Fuse Holder:
    a. Provide spare fuse holder(s) for all enclosures containing fuses.
    b. Quantity: As required to hold all spare fuses for each enclosure.
    c. DIN Rail Mountable.
    d. Manufacturer and Product: Weidmuller, 7914760001.
4. Terminal Block, General-Purpose:
    a. Rated Voltage: 600V ac.
    b. Rated Current: 30 amp.
    c. Wire Size: 22 AWG to 10 AWG.
    d. Rated Wire Size: 10 AWG.
    e. Color: Grey body.
    f. Spacing: 0.25 inch, maximum.
    g. Test Sockets: One screw test socket 0.079-inch diameter.
    h. Manufacturers and Products:
        1) Weidmuller WDU4 series; 1020100000 with 0280600000.
5. Terminal Block, Ground:
    a. Wire Size: 22 AWG to 12 AWG.
    b. Rated Wire Size: 12 AWG.
    c. Color: Green and yellow body.
    d. Spacing: 0.25 inch, maximum.

e. Grounding: Ground terminal blocks electrically grounded to the mounting rail.
f. Manufacturers and Products:
1) Weidmuller WDU4 series; 1010100000.

6. Terminal Block, Blade Disconnect Switch:
a. Rated Voltage: 600V ac.
b. Rated Current: 10-amp.
c. Wire Size: 22 AWG to 12 AWG.
d. Rated Wire Size: 12 AWG.
e. Color: Grey body, orange switch.
f. Spacing: 0.25 inch, maximum.
g. Manufacturers and Products:
1) Weidmuller WDU4 series; 7910210000.

7. Terminal Block, Diode:
a. Rated Voltage: 24V dc.
b. Rated Current: 30 ma.
c. Wire Size: 16 AWG.
d. Manufacturers and Products:
1) Weidmuller WDU4 series.

8. Terminal Block, Fused, 24V dc:
a. Rated Voltage: 600V dc.
b. Rated Current: 16-amp.
c. Wire Size: 22 AWG to 10 AWG.
d. Rated Wire Size: 10 AWG.
e. Color: Grey body.
f. Fuse: 0.25 inch by 1.25 inches.
g. Indication: LED diode 24V dc.
h. Spacing: 0.512 inch, maximum.
i. Manufacturers and Products:
1) Weidmuller WDU4 series 1880410000.

9. Terminal Block, Fused, 120V ac:
a. Rated Voltage: 600V ac.
b. Rated Current: 16-amp.
c. Wire Size: 22 AWG to 10 AWG.
d. Rated Wire Size: 10 AWG.
e. Color: Grey body.
f. Fuse: 0.25 inch by 1.25 inches.
g. Indication: Neon Lamp 110V ac.
h. Leakage Current: 1.8 mA, maximum.
i. Spacing: 0.512 inch, maximum
j. Manufacturers and Products:
1) Weidmuller WDU4 series 1880420000.

10. Terminal Block, Fused, 120V ac, High Current:
    a. Rated Voltage: 600V ac.
    b. Rated Current: 35 amps.
    c. Wire Size: 18 AWG to 8 AWG.
    d. Rated Wire Size: 8 AWG.
    e. Color: Grey.
    f. Fuse: 13/32 inch by 1.5 inches.
    g. Spacing: 0.95 inch, maximum.
    h. Manufacturers and Products: Weidmuller WDU4 series 7940029428.

F. Grounding of Enclosures:

1. Furnish isolated copper grounding bus for signal and shield ground connections.
2. Ground bus grounded at a common signal ground point in accordance with National Electrical Code requirements.
3. Single Point Ground for Each Analog Loop:
    a. Locate at dc power supply for loop.
    b. Use to ground wire shields for loop.
4. Ground terminal block rails to ground bus.

G. Analog Signal Isolators: Furnish signal isolation for analog signals that are sent from one enclosure to another. Do not wire in series instruments on different panels, cabinets, or enclosures.

2.02 ELECTRICAL TRANSIENT PROTECTION

A. Surge Suppressors:

1. General:
    a. Construction: First-stage high-energy metal oxide varistor and second-stage bipolar silicon avalanche device separated by series impedance; includes grounding wire, stud, or terminal.
    b. Response: 5 nanoseconds maximum.
    c. Recovery: Automatic.
    d. Temperature Range: Minus 20 degrees C to plus 85 degrees C.
2. Suppressors on 120V ac Power Supply Connections:
    a. Occurrences: Tested and rated for a minimum of 50 occurrences of IEEE C62.41 Category B test waveform.
    b. First-Stage Clamping Voltage: 350 volts or less.
    c. Second-Stage Clamping Voltage: 210 volts or less.
    d. Continuous Operation: Power supplies for one four-wire transmitter or receiver: 5 amps minimum at 130V ac. All other applications: 30 amps minimum at 130V ac.

3. Suppressors on Analog Signal Lines:
    a. Test Waveform: Linear 8 microsecond rise in current form 0 amps to a peak current value followed by an exponential decay of current reaching one-half the peak value in 20 microseconds.
    b. Surge Rating: Tested and rated for 50 occurrences of 2,000-amp peak test waveform.
        1) dc Clamping Voltage: 20 percent to 40 percent above operating voltage for circuit.
        2) dc Clamping Voltage Tolerance: Less than plus or minus 10 percent.
        3) Maximum Loop Resistance: 18 ohms per conductor.
4. Physical Characteristics:
    a. Mounted in Enclosures: Encapsulated inflame retardant epoxy.
    b. For Analog Signals Lines: Citel DLAW-24D3.
    c. For Profibus DP (RS-485) Signal Lines Citel DLAW-06D3.
    d. For 120V ac Lines: Citel DS41S-120.
    e. For 24V dc Lines: Citel DS210-24DC.
    f. Field Mounted at Two-Wire Instruments: Encapsulated in stainless steel pipe nipples. EDCO SS64 series or equivalent Citel or Phoenix Contact.
    g. Field Mounted at Profibus DP (RS-485) Instruments: With 120V ac surge suppressor, ac switch, and signal line surge suppressor, all in enclosure.
        1) Enclosure:
            a) NEMA 4X Type 316 stainless steel with door.
            b) Maximum Size: Coordinate size of each unit to fit within the transmitter hood.
        2) Custom build enclosure with devices using the appropriate Citel surge suppressors for power and Profibus DP listed above.
    h. Field Mounted at Four-Wire Instruments: With 120V ac surge suppressor, ac switch, and signal line surge suppressor, all in enclosure.
        1) Enclosure:
            a) NEMA 4X Type 316 stainless steel with door.
            b) Maximum Size: Coordinate size of each unit to fit within the transmitter hood.
        2) Custom build enclosure with devices using the appropriate Citel surge suppressors for power and Analog signals listed above.

B. Installation and Grounding of Suppressors: As shown. See Surge Suppressor Installation Details. Grounding equipment, installation of grounding equipment, and terminations for field mounted devices are provided under Division 26, Electrical, as specified in the Drawings.

2.03 WIRING

A. Wiring within PICS Panels:

1. Restrain by plastic ties or ducts or metal raceways.
2. Arrange wiring neatly, cut to proper length, and remove surplus wire.
3. Abrasion protection for wire bundles which pass through holes or across edges of sheet metal.
4. Connections to Screw Type Terminals:
   a. Locking-fork-tongue or ring-tongue lugs.
   b. Use manufacturer's recommended tool with required sized anvil to make crimp lug terminations.
   c. Wires terminated in a crimp lug, maximum of one.
   d. Lugs installed on a screw terminal, maximum of two.
5. Connections to Compression Clamp Type Terminals:
   a. Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.
   b. Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two.
6. Splicing and tapping of wires, allowed only at device terminals or terminal blocks.
7. Separate analog and dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.
8. Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.

PART 3 EXECUTION

3.01 EXAMINATION

A. For equipment not provided by PICS, but that directly interfaces with the PICS, verify the following conditions:

1. Proper installation.
2. Calibration and adjustment of positioners and I/P transducers.
3. Correct control action.
4. Switch settings and dead bands.
5. Opening and closing speeds and travel stops.
6. Input and output signals.

3.02 INSTALLATION

A. Material and Equipment Installation: Retain a copy of manufacturers' instructions at site, available for review at all times.

B. Wiring connected to PICS components and assemblies, including power wiring in accordance with requirements as specified in Division 26, Electrical as specified in the Drawings.

C. Mechanical Systems:

1. Drawings for PICS Mechanical Systems are diagrammatic and not intended to specifically define element locations or piping and tubing run lengths. Base materials and installations on field measurements.
2. Copper and Stainless Steel Tubing Support: Continuously supported by an aluminum tubing raceway system.
3. Plastic Tubing Supports: Except as shown on Drawings, provide continuous support in conduits or by aluminum tubing raceway system.
4. Install tubing conduit for plastic tubing and tubing raceways parallel with, or at right angles to, structural members of buildings. Make vertical runs straight and plumb.
5. Tubing and Conduit Bends:
    a. Tool-formed without flattening, and all of same radius.
    b. Bend Radius: Equal to or larger than conduit and tubing manufacturer's recommended minimum bend radius.
    c. Slope instrument connection tubing in accordance with installation details.
    d. Do not run liquid filled instrument tubing immediately over or within a 3-foot plan view clearance of electrical panels, motor starters, or mechanical mounting panel without additional protection. Where tubing must be located in these zones, shield electrical device to prevent water access to electrical equipment.
    e. Straighten coiled tubing by unrolling on flat surface. Do not pull to straighten.
    f. Cut tubing square with sharp tubing cutter. Deburr cuts and remove chips. Do not gouge or scratch surface of tubing.
    g. Blow debris from inside of tubing.
    h. Makeup and install fittings in accordance with manufacturer's recommendations. Verify makeup of tube fittings with manufacturer's inspection gauge.
    i. Use lubricating compound or TFE tape on stainless steel threads to prevent seizing or galling.

j. Run tubing to allow, e.g., clear access to doors, controls, and control panels; and to allow for easy removal of equipment.
k. Provide separate support for components in tubing runs.
l. Supply expansion loops and use adapters at pipe, valve, or component connections for proper orientation of fitting.
m. Keep tubing and conduit runs at least 12 inches from hot pipes.
n. Locate and install tubing raceways in accordance with manufacturer's recommendations. Locate tubing to prevent spillage, overflow, or dirt from above.
o. Securely attach tubing raceways to building structural members.

6. Enclosure Lifting Rings: Remove rings following installation and plug holes.

3.03 FIELD QUALITY CONTROL

A. Startup and Testing Team:

1. Thoroughly inspect installation, termination, and adjustment for components and systems.
2. Complete onsite tests.
3. Provide startup assistance.

B. Phase I: Operational Readiness Inspections and Calibrations: Prior to startup, inspect and test to ensure that entire PICS is ready for operation.

1. Loop/Component Inspections and Calibrations:
   a. Check PICS for proper installation, calibration, and adjustment on a loop-by-loop and component-by-component basis.
   b. Prepare component calibration sheet for each active component (except simple hand switches, lights, gauges, and similar items).
      1) Project name.
      2) Loop number.
      3) Component tag number.
      4) Component code number.
      5) Manufacturer for elements.
      6) Model number/serial number.
      7) Summary of Functional Requirements, for Example:
         a) Indicators and recorders, scale and chart ranges.
         b) Transmitters/converters, input and output ranges.
         c) Computing elements' function.
         d) Controllers, action (direct/reverse) and control modes (PID).
         e) Switching elements, unit range, differential (fixed/adjustable), reset (auto/manual).

8) Calibrations, for Example:
a) Analog Devices: Actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling.
b) Discrete Devices: Actual trip points and reset points.
c) Controllers: Mode settings (PID).
9) Space for comments.

c. Check signal integrity from field sensor all the way up to field I/O points.
d. These inspections and calibrations will be spot checked.

C. Performance Acceptance Tests (PAT):

1. General:
a. Test all PICS elements to demonstrate that PICS satisfies all requirements.
b. Test Format: Cause and effect.
1) Person conducting test initiates an input (cause).
2) Specific test requirement is satisfied if correct result (effect) occurs.
c. Procedures, Forms, and Checklists:
1) Conduct tests in accordance with, and documented on, Owner accepted procedures, forms, and checklists.
2) Describe each test item to be performed.
3) Have space after each test item description for sign off by appropriate party after satisfactory completion.
d. Required Test Documentation: Test procedures, forms, and checklists. All signed by Owner.
e. Conducting Tests:
1) Provide special testing materials, equipment, and software.
2) Wherever possible, perform tests using actual process variables, equipment, and data.
3) If it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation.
4) Define simulation techniques in test procedures.
f. Coordinate PICS testing with Owner.
2. Test Requirements:
a. Once facility has been started up and is operating, perform a witnessed PAT on complete PICS to demonstrate that it is operating as required. Demonstrate each required function on a paragraph-by-paragraph and loop-by-loop basis.
b. Perform local and manual tests for each loop before proceeding to remote and automatic modes.

c. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality. Test verification by means of disconnecting wires or measuring signal levels is acceptable only where direct operation of plant equipment is not possible.
d. Make updated versions of documentation required for PAT available to Owner at site, both before and during tests.
e. Make one copy of O&M Manuals available to Owner at the site both before and during testing.
f. Refer to referenced examples of PAT procedures and forms in Article SUPPLEMENTS.

3.04 SUPPLEMENTS

A. Supplements listed below, following "END OF SECTION," are part of this Specification.

1. Instrument Calibration Sheet: Provides detailed information on each instrument (except simple hand switches, lights, and similar items).
2. Performance Acceptance Test Sheet: Describes the PAT for a given loop. The format is mostly free form.
   a. Lists the requirements of the loop.
   b. Briefly describes the test.
   c. Cites expedited results.
   d. Provides space for check off by witness.

END OF SECTION

jacobs

INSTRUMENT CALIBRATION SHEET

Rev.06.05.92

COMPONENT	MANUFACTURER	PROJECT
Code:	Name:	Number:
Name:	Model:	Name:
	Serial #:	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? Y / N	CONTROL? Y / N
Indicate? Y / N	Chart:			Describe:	Action? direct / reverse Modes? P / I / D
Record? Y / N	Scale:				SWITCH? Y / N Unit Range:
Transmit/	Input:				Differential: fixed/adjustable
Convert? Y / N	Output:				Reset? automatic / manual

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
Input	Indicated	Output	Increasing Input		Decreasing Input	
			Indicated	Output	Indicated	Output
CONTROL MODE SETTINGS:			P:	I:	D:	

DISCRETE CALIBRATIONS

REQUIRED			AS CALIBRATED		Note No.
Number	Trip Point	Reset Pt.	Trip Point	Reset Pt.	
	(note rising or falling)		(note rising or falling)		
1.					
2.					
3.					
4.					
5.					
6.					
7.					

#	NOTES:	Component Calibrated and Ready for Startup
		By:
		Date:
		Tag No.:

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INSTRUMENT CALIBRATION SHEET

Rev.06.05.92

EXAMPLE - ANALYZER/TRANSMITTER

COMPONENT	MANUFACTURER	PROJECT
Code: *A7*	Name: *Leeds & Northrup*	Number: *WDC30715.B2*
Name: *pH Element & Analyzer/Transmitter*	Model: *12429-3-2-1-7*	Name: *UOSA AWT PHASE 3*
	Serial #: *11553322*	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? N	CONTROL? N
Indicate? Y Record? N	Chart:			Describe:	Action? direct / reverse Modes? P / I / D
	Scale:	*1-14*	*pH units*		SWITCH? N Unit Range:
Transmit/	Input:	*1-14*	*pH units*		Differential: fixed/adjustable
Convert? Y	Output:	*4-20*	*mA dc*		Reset? automatic / manual

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
Input	Indicated	Output	Increasing Input		Decreasing Input	
			Indicated	Output	Indicated	Output
1.0	*1.0*	*4.0*	*1.0*	*4.0*	*1.0*	*3.9*
2.3	*2.3*	*5.6*	*2.2*	*5.5*	*2.3*	*5.6*
7.5	*7.5*	*12.0*	*7.5*	*11.9*	*7.5*	*12.0*
12.7	*12.7*	*18.4*	*12.7*	*18.3*	*12.6*	*18.3*
14.0	*14.0*	*20.0*	*14.0*	*20.0*	*14.0*	*20.0*
CONTROL MODE SETTINGS:			P: *N.A.*	I:	D:	

DISCRETE CALIBRATIONS

REQUIRED			AS CALIBRATED	
Number	Trip Point (note rising or falling)	Reset Pt.	Trip Point (note rising or falling)	Reset Pt.
1.	*N.A.*		*N.A.*	
2.				
3.				
4.				
5.				
6.				
7.				

Note No
1.

#	NOTES:
	1. Need to recheck low pH calibration solutions.

Component Calibrated and Ready for Startup

By: *J.D. Sewell*

Date: *Jun-6-92*

Tag No.: AIT-12-6[pH]

Jacobs **PERFORMANCE ACCEPTANCE TEST SHEET** ***Rev.06.05.92***

Project Name:	Project No.:
Demonstration Test(s): For each functional requirement of the loop: (a) List and number the requirement. (b) Briefly describe the demonstration test. (c) Cite the results that will verify the required performance. (d) Provide space for signoff.	

Forms/Sheets Verified	By	Date	**Loop Accepted By OWNER**
Loop Status Report			By:
Instrument Calibration Sheet			Date:
I&C Valve Calibration Sheet			
Performance Acceptance Test	By	Date	
Performed			
Witnessed			Loop No.:

Jacobs **PERFORMANCE ACCEPTANCE TEST SHEET** **Rev.06.05.92**
EXAMPLE

Project Name: *SFO SEWPCP Plant Expansion*	Project No.: *SFO12345.C1*

Demonstration Test(s): For each functional requirement of the loop:
(a) List and number the requirement. (b) Briefly describe the demonstration test.
(c) Cite the results that will verify the required performance. (d) Provide space for signoff.

1. MEASURE EFFLUENT FLOW

1.a With no flow, water level over weir should be zero and

FIT indicator should read zero. *Jun-20-92 BDG*

2. FLOW INDICATION AND TRANSMISSION TO LP & CCS

With flow, water level and FIT indicator should be related by expression

*Q(MGD) = 429*H**(2/3) (H = height in inches of water over weir).*

Vary H and observe that following.

2.a Reading of FIT indicator. *Jun-6-92 BDG*

2.b Reading is transmitted to FI on LP-521-1. *Jun-6-92 BDG*

2.c Reading is transmitted and displayed to CCS. *Jun-6-92 BDG*

H(measured)	*0*	*5*	*10*	*15*
Q(computed)	*0*	*47.96*	*135.7*	*251.7*
Q(FIT indicator)	*0*	*48.1*	*137*	*253*
Q(LI on LP-521-1)	*0*	*48.2*	*138*	*254*
Q(display by CCS)	*0*	*48.1*	*136.2*	*252.4*

Forms/Sheets Verified	By	Date	**Loop Accepted By OWNER**
Loop Status Report	*J.D. Sewell*	*May-18-92*	By: *J.D. Smith*
Instrument Calibration Sheet	*J.D. Sewell*	*May-18-92*	Date: *Jun-6-92*
I&C Valve Calibration Sheet	*N.A.*		
Performance Acceptance Test	By	Date	
Performed	*J. Blow MPSDC Co.*	*Jun-6-92*	
Witnessed	*B.deGlanville*	*Jun-6-92*	Loop No.: *30-12*

SECTION 40 90 11
COMPONENTS AND PANELS SUBSYSTEM (CPS)

PART 1 GENERAL

1.01 DEFINITIONS

A. Abbreviations:

1. FDT: Factory Demonstration Test.
2. MTS: Manual Transfer Switch.
3. PLC: Programmable Logic Controller.
4. RVSS: Reduced Voltage Soft Starter.

B. Rising/Falling: Terms used to define actions of discrete devices about their set points.

1. Rising: Contacts close when an increasing process variable rises through set point.
2. Falling: Contacts close when a decreasing process variable falls through set point.

C. Signal Types:

1. Analog Signals, Current Type:
   a. 4 to 20 mA dc signals conforming to ISA S50.1.
   b. Unless otherwise indicated for specific CPS Subsystem components, use the following ISA 50.1 options:
      1) Transmitter Type: Four wire.
      2) Fully isolated transmitters and receivers.
2. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
3. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
4. Pulse Frequency Signals:
   a. Direct current pulses whose repetition rate is linearly proportional to process variable.
   b. Pulses generated by contact closure or solid state switches as indicated.
   c. Power source less than 30V dc.
5. Special Signals: Other types of signals used to transmit analog and digital information between field elements, transmitters, receivers, controllers, and digital devices.

D. CPS Components: Equipment listed under Component Specifications reference in Article Supplements.

1.02 SYSTEM DESCRIPTION

A. This section covers requirements for Components and Panels Subsystem (CPS).

B. Work includes engineering, fabrication, testing, and documenting for complete control panels as specified herein and on the Drawings.

C. After the first panel is fabricated and tested to JEA's satisfaction, the panel shall be available for field testing to be performed by JEA. Production of the remaining panels shall begin when written approval of modifications is received from JEA.

D. Detailed Design: CPS as shown and specified includes functional and performance requirements and Component Specifications. Complete detailed CPS design. The Drawings are a part of the functional requirements of this CPS specification. They are modified versions of the drawings created by the past standard supplier of JEA's well SCADA panels. These Drawings do not necessary comply with the drawing format/content specification included herein.

1. Component numbering (e.g. terminal block numbers, relay numbers) from the previous drawings have been retained, but the new panels do not need to match these designations.
2. Panel Interior and Exterior Door Layouts: Panel layout shall generally follow the layout shown on the Drawings.
3. Processor Connections and Panel Bill-of-Materials: A surge arrestor between the Profibus DP cable entry and the OLM module has been added. The CPU, digital input and output modules and SINAUT have been revised for RIO. This shall be included with the panel. The bill-of-materials specifies the components to be used. Substitutions will be considered on a case-by-case basis. The bill of materials is supplemented by functional specifications for some components.

1.03 SUBMITTALS

A. Shop Drawings:

1. Bill-of-Materials: List of required CPS equipment.
   a. Group equipment items as follows:
      1) CPS Components: By component identification code.
      2) Other CPS Equipment: By equipment type.

b. Data Included:
    1) Equipment tag number.
    2) Description.
    3) Manufacturer, complete model number and all options not defined by model number.
    4) Quantity supplied.
    5) Component identification code where applicable.

2. Catalog Cuts: CPS components, electrical devices, and mechanical devices:
    a. Catalog information.
    b. Descriptive literature.
    c. External power and signal connections.
    d. Scaled drawings showing exterior dimensions and locations of all electrical and mechanical interfaces.
3. Component Data Sheets: Data sheets for all CPS components.
    a. Format and Level of Detail: In accordance with ISA-S20.
    b. Include component type identification code on data sheet.
    c. Specific features and configuration data for each component:
        1) Location or service.
        2) Manufacturer and complete model number.
        3) Size and scale range.
        4) Set points.
        5) Materials of construction.
        6) Options included.
    d. Name, address, and telephone number of manufacturer's local office, representative, distributor, or service facility.
4. Sizing and Selection Calculations:
    a. Primary Elements: Complete calculations plus process data used. For example, for flow elements: Minimum and maximum values, permanent head loss, and assumptions made.
    b. Controller, computing, and Function Generating Modules: Actual scaling factors with units and how they were computed.
5. Panel Construction Drawings:
    a. Scale Drawings: Show dimensions and locations of panel mounted devices, doors, louvers, subpanels, internal and external.
    b. Panel Legend: List front of panel devices by tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.
    c. Bill of Materials: List devices mounted within panel that are not listed in panel legend. Include tag number, description, manufacturer, and model number.

d. Construction Details: NEMA rating, materials, material thickness, structural stiffeners and brackets, lifting lugs, mounting brackets and tabs, door hinges and latches, and welding and other connection callouts and details.
e. Construction Notes: Finishes, wire color schemes, wire ratings, wire, terminal block numbering, and labeling scheme.

6. Panel Control Diagrams: For discrete control and power circuits.
   a. Diagram Type: Ladder diagrams. Include devices, related to discrete functions, that are mounted in or on the panel and that require electrical connections. Show unique rung numbers on left side of each rung.
   b. Item Identification: Identify each item with attributes listed.
      1) Wires: Wire number and color. Cable number if part of multi-conductor cable.
      2) Terminals: Location (enclosure number, terminal junction box number, or MCC number), terminal strip number, and terminal block number.
      3) Discrete Components:
         a) Tag number, terminal numbers, and location ("FIELD," enclosure number, or MCC number).
         b) Switching action (open or close on rising or falling process variable), set point value and units, and process variable description (e.g. Sump Level High).
      4) I/O Points: PLC or microprocessor base number, I/O tag number, I/O address, terminal numbers, and terminal strip numbers.
      5) Relay Coils:
         a) Tag number and its function.
         b) On right side of rung where coil is located, list contact location by ladder number and sheet number. Underline normally closed contacts.
      6) Relay Contacts: Coil tag number, function, and coil location (ladder rung number and sheet number).
   c. Show each circuit individually. No "typical" diagrams or "typical" wire lists will be allowed.
   d. Ground wires, surge protectors, and connections.
7. Panel Wiring Diagrams: Show point-to-point and terminal-to-terminal wiring within panels.
8. Panel Power Requirements and Heat Dissipation: For control panels tabulate and summarize:
   a. Required voltages, currents, and phases(s).
   b. Maximum heat dissipations Btu per hour.
   c. All calculations.

9. Interconnecting Wiring Diagrams:
    a. Diagrams, device designations, and symbols in accordance with NEMA ICS 250.
    b. Show each circuit individually. No “typical” wiring diagrams will be allowed.

B. Quality Control Submittals:

1. Testing Related Submittals:
    a. Unwitnessed Factory Test: No Submittals required.
    b. Factory Demonstration Test:
        1) Preliminary Test Procedures: Outlines of proposed tests, forms, and checklist.
        2) Final Test Procedures: Proposed test procedures, form, and checklist. Approved test procedure submittal is a prerequisite to conducting factory test.
        3) Test Documentation: Copy of signed off test procedures when tests are completed.
2. O&M Manuals:
    a. Refer to paragraph Shop Drawings for the following items:
        1) Bill-of-Materials.
        2) Catalog cuts.
        3) Component data sheets.
        4) Panel wiring diagrams, one reproducible copy.
        5) Loop diagrams, one reproducible copy.
        6) Interconnecting wiring diagrams, one reproducible copy.
    b. Device O&M manuals for CPS components, electrical devices, and mechanical devices shall include:
        1) Operations procedures.
        2) Installation requirements and procedures.
        3) Maintenance requirements and procedures.
        4) Troubleshooting procedures.
        5) Calibration procedures.
        6) Internal schematic and wiring diagrams.
    c. List of spares and expendables required and recommended.

PART 2 PRODUCTS

2.01 CPS COMPONENTS

A. Components: Furnish all equipment that is necessary to achieve required performance.

2.02 NAMEPLATES AND TAGS

A. Component Nameplates-Panel Face: Component identification located on panel face under or near component.

1. Location and Inscription: As shown on panel Drawing.
2. Materials: Adhesive backed, laminated plastic.
3. Letters: 3/16-inch black on white background, unless otherwise noted.
4. In addition to adhesive backing, fasten nameplate to panel using Type 316 stainless steel self-tapping screws.

B. Component Nameplates-Back of Panel: Component identification located on or near component inside of enclosure.

1. Inscription: Component tag number.
2. Materials: Adhesive backed, laminated plastic.
3. Letters: 3/16-inch black on white background, unless otherwise noted.

C. Service Legends: Component identification nameplate located on face of component.

1. Inscription: As shown on panel drawing.
2. Materials: Adhesive backed, laminated plastic.
3. Letters: 3/16-inch black on white background, unless otherwise noted.

2.03 PANEL FABRICATION

A. General:

1. Panels with external dimensions and instruments arrangement as specified on Drawings, except as modified in JEA-approved Shop Drawings.
2. Panel Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), state and local codes, and applicable sections of NEMA, ANSI, UL, and ICECA.
3. Fabricate panels, install instruments, wire, and plumb, all at the Manufacturer’s factory.
4. All panels shall bear UL label stating listing per UL 508A.
5. Electrical Work: In accordance with the applicable requirements of NEC.

B. Corrosion Inhibiting Vapor Capsules: Prior to shipment, insert corrosion inhibiting vapor capsules in each panel.

C. Temperature Control:

1. Design Basis:
   a. Ambient temperature range (deg. F): 15 to 100.
   b. Outdoor installation with panel face to north.
   c. Installing contractor will provide solar shield on south side (back).
2. Solar Shields:
   a. Location: Top and sides. Top shield to extend 6 inches beyond front of enclosure.
   b. Air gap: 1 inch.
   c. Material: Same as collar stud. Aluminum can be provided for non-aluminum collar stud if rubber gaskets or washers isolate stud and shield.
   d. Attachment to Enclosure: Welded collar stud, same material as enclosure
3. Temperature Calculations: Perform temperature calculations to ensure the internal panel temperature does not exceed the maximum temperature rating of any panel component. If a component's maximum temperature rating will be exceeded, the Standard supplier may provide a component with a higher rating or increase the panel size with the approval of JEA.
4. Space Heaters:
   a. Thermostatically controlled to maintain internal panel temperatures above dew point.
   b. Required for all panels.

D. Panel Construction:

1. Based on environmental design requirements and referenced in Article Environmental Requirements, provide the following:
   a. For panels:
      1) Enclosure Type: NEMA 4X.
      2) Materials: Aluminum, unless otherwise noted.
2. Doors:
   a. Rubber-gasketed with continuous hinge.
   b. Stainless steel single handle, locking.
   c. Suitable for lock with 3/8-inch shank.
3. Data Pocket:
   a. Provide per bill of materials.
   b. Provide laminated set of panel drawings, updated after functional testing in the field, for insertion into data pocket.

4. Mounting Kit: Provided.
   a. Material: Same as enclosure.
   b. Ingress Protection: Tested by Manufacturer to maintain ingress protection rating of enclosure.
   c. Function: Provides mounting tabs with predrilled hole for mounting to external frame.
5. Manufacturers: Hoffman Engineering Co.

E. Control Panel Electrical:

1. Power Distribution within Panels:
   a. Feeder Circuits:
      1) One or more 120V ac, 60-Hz feeder circuits as shown on Drawings.
      2) Make provisions for feeder circuit conduit entry.
      3) Furnish terminal board for termination of wires.
   b. Power Panel: Furnish main circuit breaker and a circuit breaker on each individual branch circuit distributed from power panel.
      1) Locate to provide clear view of and access to breakers when door is open.
      2) Breaker Sizes: Coordinate such that fault in branch circuit will blow only branch breaker but not trip the main breaker.
         a) Branch Circuit Breakers: 15 amps at 250V ac.
   c. Circuit Wiring: Drawings show function only. Use following rules for actual circuit wiring:
      1) Devices on Single Circuit: 20, maximum.
      2) Multiple Units Performing Parallel Operations: To prevent failure of any single branch circuit from shutting down entire operation, do not group all units on same branch circuit.
      3) Branch Circuit Loading: 12 amperes continuous, maximum.
      4) Panel Lighting and Service Outlets: Put on separate 15-amp 120V ac branch circuit.
      5) Provide 120-volt ac plugmold for panel components with line cords.
      6) Provide 120-volt ac outlet.
2. Signal Distribution:
   a. Within Panels: 4 to 20 mA dc signals may be distributed as 1 to 5V dc.
   b. Outside Panels: Isolated 4 to 20 mA dc only.
   c. All signal wiring shall be twisted, shielded pairs.

3. Signal Switching:
   a. Use dry circuit type relays or switches.
   b. No interruption of 4 to 20 mA loops during switching.
   c. Switching Transients in Associated Signal Circuit:
      1) 4 to 20 mA dc Signals: 0.2 mA, maximum.
      2) 1 to 5V dc Signals: 0.05V, maximum.
4. Relays:
   a. General:
      1) Relay Mounting: Plug-in type socket.
      2) Relay Enclosure: Furnish dust cover.
      3) Socket Type: Screw terminal interface with wiring.
      4) Socket Mounting: Rail.
      5) Provide hold down clips.
   b. Signal Switching Relay:
      1) Type: Dry circuit.
      2) Contact Arrangement: 2 Form C contacts.
      3) Contact Rating: 0 to 5 amps at 28V dc or 120V ac.
      4) Contact Material: Gold or silver.
      5) Coil Voltage: As noted or shown.
      6) Coil Power: 0.9 watts (dc), 1.2VA (ac).
      7) Expected Mechanical Life: 10,000,000 operations.
      8) Expected Electrical Life at Rated Load: 100,000 operations.
      9) Indication Type: Neon or LED indicator lamp.
      10) Seal Type: Hermetically sealed case.
   c. Control Circuit Switching Relay, Non-latching:
      1) Type: Compact general purpose plug-in.
      2) Contact Arrangement: 3 Form C contacts.
      3) Contact Rating: 10A at 28V dc or 240V ac.
      4) Contact Material: Silver cadmium oxide alloy.
      5) Coil Voltage: As noted or shown.
      6) Coil Power: 1.8 watts (dc), 2.7VA (ac).
      7) Expected Mechanical Life: 10,000,000 operations.
      8) Expected Electrical Life at Rated Load: 100,000 operations.
      9) Indication Type: Neon or LED indicator lamp.
      10) Push-to-test button.
5. Power Supplies:
   a. Furnish as required to power instruments requiring external dc power, including two-wire transmitters and dc relays.
   b. Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.

c. Provide output over voltage and over current protective devices to:
   1) Protect instruments from damage due to power supply failure.
   2) Protect power supply from damage due to external failure.
d. Enclosures: NEMA 1.
e. Fuses: For each dc supply line to each individual two-wire transmitter.
   1) Type: Indicating.
   2) Mount so fuses can be easily seen and replaced.

6. Hand Switches and Indicating Lights:
   a. General:
      1) Function: Select, initiate, and display discrete control functions.
      2) Type: Heavy-duty, corrosion-resistant, industrial.
   b. General Features:
      1) Mounting: 30.5 mm, single round hole. Panel thickness 1/16 inch to 1/4 inch.
      2) Legend Plate: Standard size square style laminate with white field and black markings, unless otherwise noted. Markings as shown.
      3) Configuration: Light, pushbutton, or switch as noted or shown.
   c. Light Features:
      1) Lights: 6V ac lamps and integral transformer for operation for operation from 120V ac, unless otherwise noted.
      2) Lens Color: Color as specified under PANEL, STANDARD LIGHT COLOR AND INSCRIPTIONS, or as noted.
   d. Switch Features:
      1) Guard: Full guard with flush button, unless otherwise noted.
      2) Three-position Cylinderlock: Allen-Bradley 800T J44 (H-O-A) with one NO and one NC contact block (800-T-XA). When noted see Instrument List. All locks shall work from a single SJCUD-supplied key.
   e. Pushbutton and Switch Features:
      1) Guard: Full guard with flush button, unless otherwise noted.
      2) Operator: Black pushbutton, black nonilluminated knob on switch, unless otherwise noted.
      3) Boot: None, unless otherwise noted.
   f. Signal Interface:
      1) Contact Block:
         a) Type: Silver-coated butting, unless otherwise noted.
         b) Rating: 10 amps continuous at 120V ac or as noted.
         c) Sequence: Break-before-make, unless otherwise shown.

d) Arrangement: Normally open or normally closed as shown, or to perform the functions noted.
e) Terminals: Screw with strap clamp, unless otherwise noted.

g. NEMA Rating: NEMA 4X, corrosion-resistant.

7. Programmable Logic Controller System:
   a. General:
      1) Function: Used for process monitoring and control by emulating functions of conventional panel mounted equipment such as relays, timers, counters, cur-rent switches, calculation modules, PID controllers, stepping switches, and drum programmers.
      2) Type: Microprocessor based device programmable using ladder logic.
   b. Components: As shown on Drawings.
   c. Manufacturer:
      1) Siemens, 300 series.
      2) No exceptions.
8. Conductor Colors:
   a. 120V ac Control wiring: Red on hot side, white on neutral.
   b. 24V dc: Blue.
   c. Ground: Green.
   d. System Identification: Place a laminated guide to conductor colors within the enclosure.
9. Internal Wire Identification:
   a. Numbered and tagged at each termination.
   b. Wire Tags: Machine printed, plastic sleeves.
10. Internal Panel Lights and Service Outlets for Smaller Panels:
    a. Internal Panel Light: Switched 100-watt incandescent light.
    b. Service Outlet: Breaker protected 120-volt, 15-amp, duplex receptacle:

F. Factory Finishing:

1. Stainless Steel and Aluminum: Not painted.

2.04 ELECTRICAL TRANSIENT PROTECTION

A. General:

1. Function: Protect elements of CPS against damage due to electrical transients induced in interconnecting lines by lightning and nearby electrical systems.

2. Implementation: Provide, install, coordinate, and inspect grounding of surge suppressors at:
   a. Connection of ac power, analog signals and networks (e.g. Profibus DP) to CPS equipment panels.
   b. Surge suppressor for connection of antenna to radio will be supplied and field installed by others into CPS enclosure.
3. Construction: First-stage gas tube and secondary-stage bipolar silicon avalanche device separated by series impedance. Includes grounding wire, stud, and terminal.
4. Response: 5 nanoseconds maximum.
5. Recovery: Automatic.
6. Temperature Range: Minus 20 degrees C to plus 85 degrees C.

2.05 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Components: UPS and enclosure.

1. Enclosure: Provide with adequate clear space for UPS wiring.
   a. Type: NEMA 3R.
   b. Dimensions: Maximum width 30 inches, Maximum height 48 inches
   c. Materials: Type 304 stainless steel, unless otherwise noted.
   d. Metal Thickness: 14-gauge, minimum.
   e. Doors:
      1) Rubber-gasketed with continuous hinge.
      2) Stainless steel single handle, locking.
      3) Suitable for lock with 3/8-inch shank.
   f. Mounting Kit: Provided.
      1) Material: Same as enclosure
      2) Ingress Protection: Tested by Manufacturer to maintain ingress protection rating of enclosure.
      3) Function: Provides mounting tabs with predrilled hole for mounting to external frame.
2. UPS:
   a. General:
      1) Function: Provides isolated, regulated uninterrupted ac output power during a complete or partial interruption of incoming line power.
      2) Major Parts: Inverter, battery charger, sealed battery.
   b. Performance:
      1) Capacity: 50 percent spare capacity above computed maximum panel load.

2) Input Power:
   a) 120 V ac single phase, 60-Hz, unless otherwise noted.
   b) Connections: Manufacturer's standard, unless otherwise noted.
3) Output Power:
   a) 120 V ac single phase, 60-Hz, unless otherwise noted.
   b) Connections: Manufacturer's standard, unless otherwise noted.
4) On-line Efficiency: 85 percent minimum, unless otherwise noted.
5) Backup Runtime:
   a) Full Load: 9 minutes minimum, unless otherwise noted.
   b) Half Load: 20 minutes minimum, unless otherwise noted.
6) Continuous no-break power with no measurable transfer time.
7) Sine-Wave Output Voltage Total Harmonic Distortion (THD): Plus or minus 6 percent or less.
8) Input Voltage Range: Plus 15 percent, minus 20 percent.
9) Output Voltage Regulation: Plus or minus 3 percent nominal.
10) Operating Temperature: 0 degrees to 40 degrees C (32 degrees to 104 degrees F).
11) Operating Relative Humidity: 5 percent to 95 percent without condensation.
12) Lightning and Surge Protection:
   a) Pass lightning standard IEEE C62.41 Categories A and B tests.
   b) 2000 to 1 attenuation of input spike.

c. Features:
   1) Enclosure: Tower, unless otherwise noted.

d. Manufacturers and Products: Refer to SJCUD provided Bill of Material in Supplement 2, Sheet 1 of 4 of this section.

2.06 SOURCE QUALITY CONTROL

A. Factory Demonstration Tests: Demonstrate to JEA that CPS panels and assemblies included in these tests conform to related Submittals and requirements specified.

PART 3 EXECUTION

3.01 FACTORY DEMONSTRATION TEST (FDT)

A. Unwitnessed Factory Test (UFT):

1. Scope: Inspect and test each control panel to ensure it is operational, ready for FDT.
2. Location: CPS Manufacturer's Factory.
3. Integrated Test:
   a. Interconnect and test CPS.
   b. Exercise and test all functions.
   c. Provide stand-alone testing of smaller CPS panels.
   d. Simulate inputs and outputs for primary elements, final control elements, and CPS panels excluded from test.

B. Factory Demonstration Tests (FDT):

1. Scope: Test the CPS panel to demonstrate that it is operational and meets JEA's requirements. Test shall be witnessed by JEA.
2. Location: CPS Manufacturer provided facility within 100 miles of JEA headquarters in Jacksonville, Florida.
3. Tests shall include:
   a. Inspection of panel and components.
   b. Verification of all circuits: Provide a test panel with switches, 4 to 20 ma sources and indicating lights. Prewire test panel to CPS enclosure and label test panel devices. Provide a test program for the PLC. Standard supplier shall provide a test procedure for this portion of factory testing.
      1) No testing of radio communications required.
   c. JEA verification of software function: No test procedure required for this testing. Provide JEA 1 day in factory for testing of JEA's application software. Prewire test panel to CPS enclosure and label test panel devices. If JEA desires to do associated testing, JEA will provide Profibus DP slaves for testing of Profibus networking.
4. Correct deficiencies found in CPS enclosure and complete prior to shipment to Site.
5. Failed Tests:
   a. Repeat and witnessed by JEA.
   b. With approval of JEA, certain tests may be conducted by CPS Manufacturer and witnessed by JEA as part of FDT.

6. Make following documentation available to the JEA at test site both before and during FDT:
    a. All Drawings, Specifications, Addenda, and Change Orders.
    b. Master copy FDT procedures.
    c. List of equipment to be tested including make, model, and serial number.
    d. Shop Drawings hardware Submittals for equipment being tested.

C. Functional Testing:

1. Scope: Test the CPS panel to demonstrate that it is operational and meets SJCUD's requirements. Test shall be witnessed by SJCUD.
2. Location: SJCUD well site within SJCUD service area.
3. Tests shall include:
    a. Verification of all circuits:
        1) Test pump and limit switch interface circuits by actual operation of well pump.
        2) Test power status by removing power.
        3) Test motor over temperature by testing temperature input to starter; not by jumpering starter output signal.
        4) Verify that analog inputs are received and scaled correctly.

END OF SECTION

SECTION 44 42 56.03
VERTICAL TURBINE PUMP

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Iron and Steel Institute (AISI): Type 1045 Carbon Steel.
2. American Water Works Association (AWWA): E101, Vertical Turbine Pumps-Line Shaft and Submersible Types.
3. ASTM International (ASTM):
   a. A48, Standard Specification for Gray Iron Castings.
   b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   c. A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
   d. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   e. B148, Standard Specification for Aluminum-Bronze Sand Castings.
   f. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
4. Institute of Electrical and Electronics Engineers (IEEE): 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
5. National Electrical Manufacturer’s Association (NEMA): MG 1, Motors and Generators.

1.02 DEFINITIONS

A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards and of AWWA E101, American National Standard for Vertical Turbine Pumps.

1.03 SUBMITTALS

A. Action Submittals:

1. Make, model, weight, and horsepower of each equipment assembly.
2. Certification that Contractor has read and is in compliance with JEA Standard Specification for Rotating Machinery Acceptance.
3. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

4. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the impeller trim, head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
5. Pump maximum downthrust or upthrust in pounds.
6. Detailed Shop Drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.
7. Power and control wiring diagrams, including terminals and numbers.
8. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications.
9. Factory finish system and color chart.
10. The pump manufacturer shall provide a signed letter certifying that the column pipe and line shafting have been supplied by the pump manufacturer.
11. The Contractor shall submit the results of the field measurements of the well casing flange as described in paragraph 3.02.A.
12. The pump manufacturer shall submit a statement confirming that there are no critical speeds in the operating range of the pump and motor.

B. Informational Submittals:

1. Performance Test Reports.
2. Manufacturer’s Certification of Compliance that the factory finish system is identical to the requirements specified herein.
3. Special shipping, storage and protection, and handling instructions.
4. Manufacturer’s printed installation instructions.
5. The Contractor’s proposal to conduct the field performance tests, obtain measurements and the qualifications of the personnel that will be performing the tests.
6. Manufacturer’s Certificate of Proper Installation.
7. Suggested spare parts list to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
8. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
9. Operation and Maintenance Data: As specified Section 01 78 23, Operating and Maintenance Data.
10. Procedure for conducting the functional and performance testing.

PART 2 PRODUCTS

2.01 GENERAL

A. The well pumps shall be vertical line shaft turbine type with an electric vertical hollow shaft motor, operating at a nominal 1,800 rpm. The pumps shall be water lubricated type suitable for raw water service in a vertical groundwater well. The pumps and well waters will be initially disinfected by chlorination after installation in accordance with AWWA Standards, and periodically thereafter.

B. All materials and coatings used in the manufacture shall conform to NSF 61 as required by the Florida Department of Environmental Protection, Chapter 62-555 Permitting, Construction, Operation and Maintenance of Public Water Systems.

C. Operating conditions and required flow and pressure performance requirements are provided in the attached Pump Data Sheets.

D. For unit responsibility, the pump manufacturer shall be responsible for supplying the bowl assembly, column, lineshaft, discharge head, wellhead companion flange and motor. No exception will be allowed to this requirement unless an item is furnished by the Owner.

E. Final selection of the pump performance point has not been completed at the time of Bid. Refer to the attached pump and motor data sheets for assumptions to select a pump, column, discharge head and motor to provide a bid price. Pump and motor data sheets are provided for the Base Bid pump and Alternate Bid pump. Bid price shall be based on the Base Bid pump and motor data sheets.

F. Acceptable Manufacturers:

1. Goulds Pumps.
2. Peerless Pump.
3. National Pump Company.
4. American Marsh.

2.02 PUMP, MOTOR, AND ACCESSORIES

A. Discharge Head:

1. The discharge head shall be made of high-grade cast iron, ASTM A48 Class 30. A fabricated steel discharge head will be allowed provided that access to the wellhead is maintained as shown on the wellhead flange and access port arrangement detail in the Drawings.

2. The discharge head shall be manufactured and provided by the pump manufacturer. The outlet shall be abovegrade, flanged, and sized to meet the flanged discharge piping diameter as listed in the operating conditions.
3. A Type 316 stainless steel nameplate with the pump serial number, pump model number, operating conditions, bowl data and impeller data stamped into it shall be attached to the head with noncorrosive fasteners.
4. The stuffing box shall be made of cast iron with Type 316 stainless steel split-type packing gland, studs, and nuts, and furnished with five rings of graphited synthetic fiber packing. The bearing shall be bronze, Type C89835 or equal. A rubber slinger shall be furnished with the stuffing box for securing to the shaft above the packing gland to protect the motor from excess spray. The head shall have a threaded connection in the stuffing box location for connecting a drain pipe.
5. Discharge head base shall be provided with an appropriate wellhead companion flange, see mechanical detail Wellhead Flange and Access Port Arrangement in the Drawings. The wellhead companion flange shall be threaded for the column pipe diameter as listed in the operating conditions.
6. Discharge head shall be configured to allow for direct attachment to the wellhead flange and access port assembly (shown on the process mechanical details) with a watertight gasketed connection.
7. Discharge head baseplate shall be equipped with bolt holes which match the diameter, number, and placement of the wellhead companion flange and access port assembly. The spool piece between the well casing and discharge head shall be ASTM A53 carbon steel Schedule 40.
8. The pump shall be furnished with a two-piece top shaft. The head shaft passing through the stuffing box shall be made of Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms. Its length shall be sized to accommodate the length of top column pipe plus the height of the head through the stuffing box, so that the couplings are easily accessible at the head and the first column pipe joint.

B. Column Assembly:

1. Column pipe shall be furnished in sections not exceeding a nominal 10 feet, connected by threaded sleeve coupling, of nominal diameter listed in the operating conditions supplement.
2. The top and bottom sections shall not be more than 5 feet in length.
3. Column shall be manufactured of ASTM A53 Grade B steel pipe, Schedule 40 (Standard) for nominal diameters 10 inches and less.
4. The column pipe ends shall be threaded, 8 threads per inch with 3/16-inch taper per foot thread and faced parallel to butt against the centering spiders so the assembled sections are accurately aligned.

5. Lineshaft shall be made of Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms. Each shaft length shall be straight, not exceeding 0.005 inch out in total indicator reading per 10-foot section.
6. Lineshaft diameter shall be a minimum 1-3/16-inch.
7. Lineshaft shall be furnished with a stainless steel coupling for section of shaft. Couplings shall be machined from solid stainless steel bar and have left hand threads that will tighten during pump operation. The threads of the lineshaft and coupling shall be compatible. Couplings shall be Type 410 stainless steel.
8. Bearing retainers (spiders) shall be furnished for each column and shaft section. The spiders shall be made of Type 304 or 316 stainless steel or ASTM C95800 Nickel Aluminum Bronze and designed to drop in the column couplings and be retained by the butted ends of the column pipe.
9. Shaft bearings shall be a cutlass neoprene rubber retained in the spider by a shoulder on each end of the bearing, designed for water lubricated operation with the appropriate shaft diameter.
10. The pump manufacturer shall provide a signed letter certifying that the column pipe and line shafting have been supplied by the pump manufacturer. Column and line shafting provided by suppliers or contractors other than the pump manufacturer will not be acceptable.

C. Pump Construction:

1. Bowl assembly shall consist of flanged type bowls constructed of close grained cast iron conforming to ASTM A48 Class 30. The bowls shall be free of blow holes, sand holes, or other faults and accurately machined and fitted to close tolerances, and capable of meeting or exceeding the hydrostatic pressure ratings of the Hydraulic Institute.
2. The intermediate bowls shall have enamel lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability. A discharge bowl shall be sized and threaded to connect the bowl assembly to the discharge column.
3. The discharge bowl and all intermediate bowls shall be fitted with Vesconite HiLube composite sleeve bearings by VescoPlastics.
4. The suction bowl shall be provided with nonsoluble grease packed bronze bearing. A bronze sand collar shall be provided to protect this bearing from abrasives in the pumping fluids. The bearing housing shall have sufficient opening at the bottom for easy removal of the bearing.
5. The bowls shall be assembled using all Type 316 stainless steel bolting.
6. A stainless steel nameplate with the operating conditions and bowl and impeller date stamped into it shall be attached to the bowl with noncorrosive fasteners. An additional stainless steel nameplate shall be furnished loose for use by JEA.

7. Impellers shall be constructed of either Type 304 stainless steel or ASTM C95500 Nickel Aluminum Bronze. No silicone bronze alloy impellers shall be allowed.
8. Impellers shall be free from defects and accurately cast, machined, filed, and polished for premium efficiency and minimum vibration. Impellers shall be balanced to grade G6.3 of ISO 1940 as a minimum.
9. Impellers shall be secured to the bowl shaft with tapered split Type 316 stainless steel bushing (collets).
10. The bowl shaft shall be constructed from Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms.
11. The pump shall be tested by the factory after trimming and assembly and a curve of the operating conditions including flow, head, efficiency, and horsepower shall be plotted and submitted to the Engineer for approval prior to shipping any materials. The test shall be a nonwitnessed test, but JEA reserves the right to reject the test and witness any retesting at its own cost.

D. Suction Bowl Strainer: A suction strainer shall be furnished with the pump assembly. It shall be made of Type 316, or 316L stainless steel and threaded to the suction bowl. The cone strainer shall have a free area of at least four times the flow area of the suction pipe.

E. Pump Motor: Refer to Specification 26 20 00, Low Voltage AC Induction Motors as detailed in the Drawings.

2.03 FACTORY FINISHING

A. Discharge Head (Interior and Exterior), Pump Bowl (Interior and Exterior) and Suction Bell (Interior and Exterior).

1. Surface preparation SP5 White Metal Blast Cleaning.
2. Manufacturer’s standard NSF 61 certified fusion bonded coating.

B. Column Pipe, Interior and Exterior: Do not provide coating on column pipe.

C. Wellhead Flange and Access Port Arrangement Assembly, Interior and Exterior.

1. Surface preparation SP5 White Metal Blast Cleaning.
2. Polyamidoamine Epoxy, Tnemec Series N141 applied at 2 coats at 4.0 to 6.0 MDFT per coat.

D. Motor.

1. Surface preparation SP10 Near-White Metal Blast Cleaning.
2. Polyamide High Build Epoxy. Two coats at 4.0 to 6.0 MDFT per coat.
3. Top Coat: Aliphatic Acrylic Polyurethane, Tnemec Series 1095 applied at 2.5 to 5.0 MDFT.
4. Finish Color: Submit color chart for Owner selection.
5. Provide a sufficient quantity of the top coat paint for field touchup.

2.04 SOURCE QUALITY CONTROL

A. Factory Testing: Certified factory tests of pumping unit will be required. The factory test of the pumping unit shall produce at a minimum the following information:

1. HQ curve.
2. Impeller trim diameter.
3. Shaft brake horsepower curve.
4. Water to water efficiency (pump efficiency).

B. Factory Test Report: Include test data sheets, curve test results, performance test logs, certified correct by a registered professional engineer or factory test facility manager.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's field services technicians instructions.

B. Connect suction and discharge piping without imposing strain to pump flanges.

C. Orient discharge head to accurately mate with discharge piping

D. Anchor Bolts: Accurately place using equipment templates. Use new neoprene flange gasket.

3.02 FIELD QUALITY CONTROL

A. Confirm Well Casing Flange with Pump Manufacturer: The Contractor shall conduct field tests to confirm the well casing flange is level and plumb and meets the requirements of the pump manufacturer. The precision of the field measurements to determine the well casing flange level shall be as recommended by the pump manufacturer.

1. If the well casing flange does not meet the pump manufacturer's requirements, perform the following:
   a. Notify the Engineer and Owner immediately.
   b. Submit modifications to the Wellhead Flange and Access Port Arrangement Assembly to adjust for the well casing flange level to provide a sufficiently level base for the pump discharge head.
2. If the well casing flange meets the pump manufacturer's requirements, submit a confirming statement with the pump Shop Drawing.

B. Field Testing: After installation of the pump is completed, except for final connection to the water transmission line, the entire assembly will be subject to field testing. Field testing will be performed to verify mechanical performance and stated guaranteed efficiencies of the pump.

C. The installation contractor shall install the pump in accordance with the manufacturer's field services technician's instructions. The manufacturer's field service technician shall be present during the entire time the pump is installation and subsequent performance testing.

D. The Contractor shall submit for review and approval, the means by which it is proposed to conduct the tests, obtain measurements and the qualifications of the personnel that will be performing the tests.

E. The field functional and performance tests shall be witnessed by the Engineer and Owner.

F. The initial test will be performed at the expense of the Contractor. Test results shall be submitted to the Engineer for review.

G. Test results shall be submitted to the Engineer for review. Should field test results reveal inefficiencies less than the Guaranteed Efficiency the Contractor shall be assessed damages or the equipment will be rejected and replaced at the Contractor's expense. All costs for manufacturer's services shall be borne by the Contractor.

H. Functional Test: Conduct on each pump.

1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
2. Vibration Test:
   a. Test with unit installed and in normal operation, and discharging to the connected piping systems at rates between low discharge head and high discharge head conditions specified.
   b. Shall not develop vibration exceeding the limits specified in Hydraulic Institute Standards 9.6.4. The vibration measurement locations and directions shall be as shown on Figure 9.6.4.2.3.1 for a VS3 configuration.
   c. If unit exhibits vibration in excess of limits specified, adjust or modify as necessary. Unit that cannot be adjusted or modified to conform as specified shall be replaced.

I. Performance Test: Conduct on each pump.

1. A step test shall be conducted in the presence of the Owner and Engineer.
2. The step test shall include a minimum of four steps.
3. The duration of each step shall be as required to obtain steady and reliable test data. The following data shall be measured and recorded during each step of the test:
   a. Flow Measurement: Measured by flow instrumentation.
   b. Pressure: Owner's pressure gauge, or as approved by the Engineer.
   c. Operating Temperature: Monitor bearing areas on pump and motor for abnormally high temperatures
   d. Water level shall be measured by level instrumentation or Engineer approved instrumentation.
   e. Measure phase to phase volts and amp draw at the motor control center using an ammeter provided by the Contractor.

3.03 FIELD FINISHING

C. Discharge Head Assembly, Exterior.

1. As described on the Process Mechanical General Notes in the drawings, PAINTING AND PROTECTIVE COATINGS, System No 5.
2. Finish Color: Submit color chart for Owner selection.

D. Wellhead Flange and Access Port Arrangement Assembly, Exterior.

1. As described on the Process Mechanical General Notes, PAINTING AND PROTECTIVE COATINGS, in the drawings, System No 6.
2. Finish Color: Submit color chart for Owner selection.

1.02 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Supplement 1, Base Bid Pump Data Sheet.
2. Supplement 2, Base Bid Induction Motor Data Sheet.
3. Supplement 3, Alternate Bid Pump Data Sheet.
4. Supplement 4, Alternate Bid Induction Motor Data Sheet.

END OF SECTION

RIVERTOWN BASE BID WELL PUMP DATA SHEET
VERTICAL TURBINE PUMP

Project: Rivertown WTP Wellheads	Pump Mfr.: Goulds, Peerless, National or American Marsh
Owner: JEA	Size & Type:
Service: Raw Water Well Pump	No. Stages:
Pump Name: Rivertown Well #1, #2 and #3 Pump	Serial No.:
Equip. Tag Number(s): RT1-P-1-1-1, RT2-P-1-1-1, RT3-P-1-1-1	Model No.:
No. Pumps Required: 1	
Drive Type: ☒ Constant ☐ Adjustable	

LIQUID	OPERATING CONDITIONS	SERVICE CONDITIONS
Name: Raw Water	Capacity (U.S. gpm):	Temp (°F): Max _____ Min _____
Pumping Temperature (°F):	Normal 1,650 Rated gpm	Rel. Hum (%): Max _____ Min _____
Normal 75 Max 85 Min 65	Total Dynamic Head (ft):145	Altitude (ft):
Specific Gravity @ 70 °F: 1.0	Suction Lift (psig):	☐ Indoor ☐ Heated
Vapor Pressure (psia):	Max _____ Rated _____	☒ Outdoor ☐ Unheated
Viscosity (CP) @ _____ °F:	Submergence (min. ft.):	Will Pump be Submerged?
pH: 7.6	NPSH Available (ft):	☒Yes ☐No
Corrosion/Erosion/Abrasion Caused by:		Area Classification:
H_2S		Other:
Remarks:	Remarks: Pump setting depth is to be determined	Remarks:

PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)		
Proposal Curve No.:_____	Min. Continuous Flow (gpm): _____	NPSH Required (ft water):_____
Pump Speed Range (rpm): 1800	Max. Head (ft): _____	3% Head Drop_____
Efficiency (%): 80 Min_____	Max. Power (BHP): _____	Suction Specific Speed: _____
Rated Power (BHP): _____		Factory Testing:
		☒Required ☐Not Required
Remarks: For Bidding purposes assume a design pumping rate of 1,650 gpm, 10-inch discharge flange, 100-feet of 10-inch diameter column pipe, 100-feet of 1-1/2- inch diameter shaft, and 100-hp motor.		

Equipment Tag Number(s): RT1-P-1-1-1, RT2-P-1-1-1, RT3-P-1-1-1

PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)

Nozzles

	Size	Rating	Facing	Location
Suction	10-inch			
Discharge	10-inch			

Miscellaneous Connections

	Size	Location
Drain		
Vent		
Pres. Gauge		
Warm Up		

Casing Mount:

☐ Vertical

☐ Vertical Barrel

Max. Allowable Pressure (psig):

At 60°F: _____

At Norm. Pump. Temp.: _____

Pump Shaft Dia. (In.): _____

Column Size (In.): 10 in

Lineshaft Type:

☒ Open ☐ Enclosed

Min. Lineshaft Size (In.): 1-1/2

Hydro Test Pressure (psig): _____

Field Testing: ☐ Not required

☒ Required, functional and performance

Impeller Type:

☐ Open ☒ Closed

Impeller Diameter (in.):

Rated _____ Max _____ Min _____

Max Bowl Size (in.) _____

No. of Stages: _____

Packing Mfr: _____

Type _____

Size/No. Rings _____

API Class Code _____

Manufacturer _____

Model _____

Manufacturer Code _____

Bearings (Type/No.):

Bowl _____

Lineshaft _____ Pump Shaft _____

Intermediate _____ Guide _____

Head Shaft: _____

Lubrication Type:

☐ Grease ☐ Oil

☒ Pumped Liquid

Coupling:

Manufacturer _____

Type _____ Model _____

Driver Half-Coupling Mounted by:

☐ Pump Mfr. ☐ Driver Mfr.

☐ Purchaser

Gland Type/Material: _____

Gland Plate Taps Required:

☐ Quench ☐ Flush
☐ Drain ☐ Vent

MATERIALS (manufacturer to supply missing data)		
Bowl: _____	Impeller: _____	Shaft: _____
Bowl Wear Rings: _____	Impeller Wear Rings: _____	Shaft Sleeve: _____
Column: _____	Bowl Bearing: _____	Discharge Head:
Remarks: _____	Head Shaft Bearing: _____	Type _____
_____	Lineshaft Bearing: _____	Material _____
ADDITIONAL REQUIREMENTS		
Sole Plate Suction Strainer _____ _____		

BASE BID INDUCTION MOTOR DATA SHEET

Project: Rivertown WTP Wellheads

Owner: JEA

Equipment Name: Rivertown Well #1, #2 and #3 Pump

Equipment Tag Number(s): RT1-P-1-1-1, RT2-P-1-1-1, RT3-P-1-1-1

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 100 hp

Voltage: 460VAC

Phase: 3

Frequency: 60Hz

Synchronous Speed: 1,800 rpm

☒ Thermal Protection: T-Stat

☒ Space Heater: 120 volts, single-phase

Guaranteed Minimum Efficiency at Full Load: MG-1, Table 12-12 percent

Guaranteed Minimum Power Factor at Full Load: 84 percent

Service Factor (@ rated max. amb. temp.): ☒ 1.0 ☒ 1.15

Enclosure Type: Open weather protected - Type 1

☐ Multispeed, Two-Speed: _____ / _____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☒ Vertical

☒ Vertical Shaft: ☐ Solid ☒ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down _____

☒ Adjustable Speed Drive: Part 31; NEMA MG 1

Operating Speed Range: 50 to 100% of Rated Speed

☒ Variable Torque

☐ Constant Torque

Special Features:

Motor shall be inverter Duty rated for use with an Adjustable Frequency Drive.

Motor housing/enclosure to be painted both inside and out with oxide primer and chemical duty paint such as used on U.S. Motors' brand CORRO-DUTY.

Service Factor shall be 1.15 full voltage / 1.00 Inverter Drive

Motor nameplate must state Inverter Duty Rated.

RIVERTOWN ALTERNATE BID WELL PUMP DATA SHEET
VERTICAL TURBINE PUMP

Project: Rivertown WTP Wellheads	Pump Mfr.: Goulds, Peerless, National or American Marsh
Owner: JEA	Size & Type:
Service: Raw Water Well Pump	No. Stages:
Pump Name: Rivertown Well #1, #2 and #3 Pump	Serial No.:
Equip. Tag Number(s): RT1-P-1-1-1, RT2-P-1-1-1, RT3-P-1-1-1	Model No.:
No. Pumps Required: 1	
Drive Type: ☒ Constant ☐ Adjustable	

LIQUID	OPERATING CONDITIONS	SERVICE CONDITIONS
Name: Raw Water	Capacity (U.S. gpm):	Temp (°F): Max _____ Min _____
Pumping Temperature (°F):	Normal 1,650 Rated gpm	Rel. Hum (%): Max _____ Min _____
Normal 75 Max 85 Min 65	Total Dynamic Head (ft):130	Altitude (ft):
Specific Gravity @ 70 °F: 1.0	Suction Lift (psig):	☐ Indoor ☐ Heated
Vapor Pressure (psia):	Max _____ Rated _____	☒ Outdoor ☐ Unheated
Viscosity (CP) @ _____ °F:	Submergence (min. ft.):	Will Pump be Submerged?
pH: 7.6	NPSH Available (ft):	☒Yes ☐No
Corrosion/Erosion/Abrasion Caused by:		Area Classification:
H_2S		Other:
Remarks:	Remarks: Pump setting depth is to be determined	Remarks:

PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)

Proposal Curve No.:_____ Min. Continuous Flow (gpm): _____ NPSH Required (ft water):_____

Pump Speed Range (rpm): 1800 Max. Head (ft): _____ 3% Head Drop_____

Efficiency (%): 80 Min _____ Max. Power (BHP): _____ Suction Specific Speed: _____

Rated Power (BHP): _____ Factory Testing:

☒Required ☐Not Required

Remarks: For Bidding purposes assume a design pumping rate of 1,650 gpm, 10-inch discharge flange, 100-feet of 10-inch diameter column pipe, 100-feet of 1-3/16 inch diameter shaft, and 75-hp motor.

Equipment Tag Number(s): RT1-P-1-1-1, RT2-P-1-1-1, RT3-P-1-1-1

PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)

Nozzles

	Size	Rating	Facing	Location
Suction	10-inch			
Discharge	10-inch			

Miscellaneous Connections

	Size	Location
Drain		
Vent		
Pres. Gauge		
Warm Up		

Casing Mount:
☐ Vertical
☐ Vertical Barrel

Impeller Type:
☐ Open ☒ Closed

Impeller Diameter (in.):

Rated _____ Max _____ Min _____

Max Bowl Size (in.) _____

No. of Stages: _____

Packing Mfr: _____

Type _____

Size/No. Rings _____

API Class Code _____

Manufacturer _____

Model _____

Bearings (Type/No.):

Bowl _____

Lineshaft _____ Pump Shaft _____

Intermediate _____ Guide _____

Head Shaft: _____

Lubrication Type:
☐ Grease ☐ Oil
☒ Pumped Liquid

Coupling:

Manufacturer _____

Type _____ Model _____

Driver Half-Coupling Mounted by:

Max. Allowable Pressure (psig):

At 60°F: _____

At Norm. Pump. Temp.: _____

Pump Shaft Dia. (In.): _____

Column Size (In.): 10 in _____

Lineshaft Type:
☒ Open ☐ Enclosed

Min. Lineshaft Size (In.): 1-3/16

Hydro Test Pressure (psig): _____

Field Testing: ☐ Not required ☒ Required, functional and performance	Manufacturer Code _____	☐ Pump Mfr. ☐ Driver Mfr. ☐ Purchaser Gland Type/Material: _____ Gland Plate Taps Required: ☐ Quench ☐ Flush ☐ Drain ☐ Vent
MATERIALS (manufacturer to supply missing data)		
Bowl: _____ Bowl Wear Rings: _____ Column: _____ Remarks: _____ _____	Impeller: _____ Impeller Wear Rings: _____ Bowl Bearing: _____ Head Shaft Bearing: _____ Lineshaft Bearing: _____	Shaft: _____ Shaft Sleeve: _____ Discharge Head: Type _____ Material _____
ADDITIONAL REQUIREMENTS		
Sole Plate Suction Strainer _____ _____		

ALTERNATE BID INDUCTION MOTOR DATA SHEET

Project: Rivertown WTP Wellheads

Owner: JEA

Equipment Name: Rivertown Well #1, #2 and #3 Pump

Equipment Tag Number(s): RT1-P-1-1-1, RT2-P-1-1-1, RT3-P-1-1-1

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 75 hp

Voltage: 460VAC

Phase: 3

Frequency: 60Hz

Synchronous Speed: 1,800 rpm

☒ Thermal Protection: T-Stat

☒ Space Heater: 120 volts, single-phase

Guaranteed Minimum Efficiency at Full Load: MG-1, Table 12-12 percent

Guaranteed Minimum Power Factor at Full Load: 84 percent

Service Factor (@ rated max. amb. temp.): ☒ 1.0 ☒ 1.15

Enclosure Type: Open weather protected - Type 1

☐ Multispeed, Two-Speed: _____ / _____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☒ Vertical

☒ Vertical Shaft: ☐ Solid ☒ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down _____

☒ Adjustable Speed Drive: Part 31; NEMA MG 1

Operating Speed Range: 50 to 100% of Rated Speed

☒ Variable Torque

☐ Constant Torque

Special Features:

Motor shall be inverter Duty rated for use with an Adjustable Frequency Drive.

Motor housing/enclosure to be painted both inside and out with oxide primer and chemical duty paint such as used on U.S. Motors' brand CORRO-DUTY.

Service Factor shall be 1.15 full voltage / 1.00 Inverter Drive

Motor nameplate must state Inverter Duty Rated.


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