



ITB WS 07-19 ADDENDUM 01

April 16, 2019

ARBENNIE PRITCHETT WRF RECLAIMED WATER EXPANSION PROJECT

****The Bid date and submission time have NOT changed****

The following changes, additions, and or deletions are hereby made a part of the Bidding Documents for the Bid # WS 07-19 as fully and completely as if the same were fully set forth therein:

TECHNICAL SPECIFICATIONS

- I. 09902- Painting
 - 1) Section 09902- All
 - a. **REPLACE** - Entire Section with attached

- II. 11215- Vertical Turbine Pump - Construction
 - 1) Section 11215- All
 - a. **REPLACE** - Entire Section with attached

- III. 11231- Gas Chlorination System
 - 1) Section 11231- Subsection 2.02.A
 - a. **DELETE** - 2.02.A.11 "One (1) Chlorine Residual Analyzer" This item is covered elsewhere in the Specifications and Drawings.
 - b. **DELETE** - 2.02.A.13 "One (1) Control Panel " This item is no longer required for this system.

- IV. 13125- Prefabricated Concrete Building
 - 1) Section 13215- All
 - a. **REPLACE** - Entire Section with attached

- V. 15100 - Valves
 - 1) Section 15100- All
 - a. **REPLACE** - Entire Section with attached

TECHNICAL DRAWINGS

- I. Drawings
 - a. **REPLACE** - Drawing C-3.0 with the attached C-3.0 DEMO & GRADING- rev 01
 - b. **REPLACE** - Drawing C-4.0 with the attached_C-4.0 OVERALL MECHANICAL PLAN-rev 01
 - c. **REPLACE** - Drawing M-2.0 & 2.1 with the attached_M-2.0 & 2.1 Pump Station-rev 01
 - d. **REPLACE** - Drawing M-3.0 with the attached_M-3.0 Chlorine Feed Bldg- rev 01

SECTION 09902
PAINTING

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install all painting complete as shown on the Drawings and as specified herein.
- B. It is the intent of this Section to paint all new, exposed structural and miscellaneous steel and appurtenances, steel doors and frames, steel frames for glazed openings, door closers, pipe, fittings, supports, valves, mechanical and electrical equipment, roof fans, chemical tanks and systems, electrical conduit and appurtenances, sluice gates, operators and posts, interior gypsum work, interior CMU walls (where scheduled), exposed ductwork; all as specified herein, as indicated on the Drawings, and all other work obviously required to be painted unless otherwise specified. Minor items omitted in the schedule of work shall be included in the work of this Section where they come within the general intent of the specifications as stated herein.
- C. Paint items so noted in paragraph 1.01B and in accordance with the Painting Schedule and Color Coding Schedule herein. Provide letters and numbers for markings as specified. Items noted in Painting Schedule and Color Coding Schedule herein as having factory finish and other obviously factory finished items shall not be field painted. The Contractor is responsible for having damaged factory finish painted items repaired or, if so ordered, for replacing items. The various Sections are responsible, as stated in each, for preparation and field touch-up of abrasions, welds, and damaged primed areas of primed or galvanized components after erection.
- D. The following surfaces or items are not required to be painted under this Section:
1. Portions of metal, other than aluminum, embedded in concrete. This does not apply to the back face of items mounted to concrete or masonry surfaces, which shall be painted before erection. Aluminum to be embedded in or in contact with concrete or masonry shall be coated to prevent electrolysis.
 2. Non-ferrous metals (except copper) and stainless steels, unless specified or noted otherwise.
 3. Fencing.
 4. Concealed surfaces of pipe or crawl spaces.
 5. Acoustical ceilings and acoustical metal panels.

6. Tile.
7. Exterior concrete, unless specified or noted otherwise.
8. Door hardware, except door closers that are not finished.
9. Manhole frames and covers.
10. Fiberglass other than piping.
11. Packing glands and other adjustable parts, and nameplates and data plates of mechanical equipment.
12. Epoxy flooring.
13. Plumbing fixtures.
14. Furniture.
15. Maintenance equipment.
16. Factory prefinished architectural components.
17. Membrane roofing.
18. Acoustical metal deck.
19. Mechanical and electrical equipment that has been factory finished as specified in Divisions 11, 13, 15, and 16.

1.2 RELATED WORK

- A. Valve Identification is included in Division 1.
- B. Waterproofing and Dampproofing is included in Division 7.
- C. Surface Preparation and Shop Prime Painting is included in Section 09901.
- D. Building Signage is included in Division 10.
- E. Project signs are included in Division 1.
- F. Concrete is included in Division 3.
- G. Masonry is included in Division 4.
- H. Metals are included in Division 5.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300.
- B. Product Data: For each type of product indicated.
- C. Samples: Submit the following for each type of coating system and in each color and gloss of finish coat indicated.
 - 1. Color cards for initial color selections.
 - 2. Three sets of 8-in by 8-in samples, on 1/4-in hardboard, of all colors required for all types of paint. Resubmit until approved.
- D. Schedule of Painting Operations: Submit to the Engineer, in accordance with Section 01300, a complete Schedule of Painting Operations within 90 days after the Notice to Proceed. This Schedule is imperative so that the various fabricators may be notified of the proper shop prime coat to apply. Properly notify and coordinate the fabricators' surface preparation and painting operations with these specifications. This Schedule shall include for each surface to be painted, the brand name, the percent volume of solids, the coverage, and the number of coats the Contractor proposes to use in order to achieve the specified DFT, and color charts. When the Schedule has been approved, apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film gauges shall be made available to the Engineer to verify the proper application while work is in progress.
- E. Documentation of the compatibility between prime coats and finish coats shall be submitted along with the date and ambient conditions for all prime coat installation with an established recoat window allowed for each prime system. Corrective surface preparation techniques shall be submitted for all systems in the event that the recoat window is missed.
- F. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 REFERENCE STANDARDS

- A. Steel Structures Painting Council (SSPC)
 - 1. SSPC SP-1 - Surface Preparation Specification No. 1 Solvent Cleaning.
 - 2. SSPC SP-2 - Surface Preparation Specification No. 2 Hand Tool Cleaning.
- B. Where reference is made to one of the above standards, the revision in effect at the

time of bid opening shall apply.

1.5 DELIVERY, STORAGE AND HANDLING

- A. All painting materials shall be delivered to the mixing room in unbroken containers, bearing the manufacturer's brand, date of manufacture, and name. They shall be used without adulteration and mixed, thinned, and applied in strict accordance with manufacturer's directions for the applicable materials and surface before using.
- B. Painting materials shall be delivered to the job site in the original unopened containers, bearing the manufacturer's label. A Product Data Sheet and Material Safety Data Sheet for all painting, activators, thinners, accelerators, and other materials shall be obtained from the manufacturer for each shipment of materials to the job site. Painting materials shall be stored in a dry, well-ventilated area, not in direct contact with the ground, where the temperature is maintained between 40 and 120 degrees F. Damaged materials and/or materials exceeding the shelf life shall not be used.
- C. Paints shall be mixed in proper containers of adequate capacity. All paints shall be thoroughly stirred before use and shall be kept stirred while using. No unauthorized thinners or other materials shall be added to any paint. Air shall not be used directly for agitation. Pigmented material shall be strained after mixing. Where application equipment has strainers, they should be sized so as to allow pigment to pass but not foreign material. Multiple (2 or more) component catalyzed materials may not be used beyond the recommended pot life.
- D. Work areas will be designated by the Owner for storage and mixing of all painting materials. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers outside of the buildings shall be provided and used for painting wastes, and no plumbing fixture shall be used for this purpose.
- E. All recommendations of the paint manufacturer in regard to the health and safety of workmen shall be followed.

1.6 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run

(batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

1.8 QUALITY ASSURANCE

A. Manufacturer Representative

1. The Contractor shall require the paint manufacturer to furnish a manufacturer's qualified technical representative to visit the project site for technical support as required and ordered and as may be necessary to resolve field questions or problems attributable to or associated with the manufacturer's products furnished under this Contract or the application thereof.

B. Pre-Painting Conference

1. Well in advance of commencement of painting operations, but after major equipment has been delivered, a pre-painting conference shall be held. All parties with an interest in the painting work shall attend, including the Contractor, the manufacturer, the Owner, the Engineer, and the painting Contractor. The Contractor shall contact each party and arrange the meeting.
2. The conference shall include an inspection of the areas to be painted by all parties and a discussion of the conformance of each area with the specifications. Important issues such as environmental conditions, climate control systems, original primer, DFT, and monitoring the number of coats that have been field applied shall be discussed and problems shall be resolved.
3. A written record of the meeting shall be submitted to the Engineer.

C. Cold Weather Construction

1. All paint shall be at room temperature before applying, and no painting shall be done when the temperature is below 50 degrees F, in dust-laden air, when rain or snow is falling, or until all traces of moisture have completely disappeared from the surface to be painted. Lower temperatures will only be allowed with written instructions from the paint manufacturer.

D. Inspection and Testing

1. All materials and work shall be accessible and subject to inspection by the Engineer.
2. The completed work shall be inspected visually by the Engineer for skips,

holidays, hiding, uniform color and appearance, and other imperfections. All defective work shall be corrected by the Contractor.

3. Coating thickness on steel shall be determined in accordance with SSPC PA 2. The number of readings will be a minimum of that stated in SSPC PA 2.
4. Coating integrity for coatings in immersion areas or subjected to splash and spillage shall be determined in accordance with NACE RP0188-88 using the low voltage wet sponge test method. All holidays will be clearly marked for repair.
5. The Contractor shall furnish to the job site and use for coating inspection and make available to the Engineer, the following test equipment:
 - a. Wet film thickness gauge.
 - b. Dry film thickness gauge (with certified thickness calibrator) equal to Mikrotest III; Elcometer Inspector III; or Positest.
 - c. Surface Temperature Gauge.
 - d. Holiday Detector, low voltage type such as Tinker & Razor Model M-1, Series 9533.
 - e. SSPC VIS-1-89T "Pictorial Surface Preparation Standard."
 - f. Keane-Tator Surface Comparator Number 372, or equal.
 - g. NBS Certified Coating Thickness Standards.
 - h. Sling Psychrometer.
 - i. Surface moisture metering device equal to Delmhors Model DB.

E. Warranty Inspection

1. A warranty inspection shall be conducted during the 11th month following completion of all coating and painting work. The Contractor, painting Contractor, and a representative of the coating material manufacturer shall attend this inspection with the Engineer and representative of the Owner.
2. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the Engineer. The Owner may, by written notice to the Contractor, reschedule the warranty inspection to another date within the 1-year correction period or may cancel the warranty inspection altogether. If a warranty inspection is not held, the Contractor is not relieved of his responsibilities under the Contract Documents.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All painting materials shall be supplied by one manufacturer, unless otherwise approved by the Engineer. The paint schedule has been prepared on the basis of Tnemec Company Inc. products and application recommendations, unless otherwise noted in the schedule. Equals by Ameron (VyGuard), Carboline, or ICI/Devoo. All materials shall meet NSF Standard 61 and be fully equal to the

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Tnemec products listed in the following schedule. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following schedule together with sufficient data substantiated by certified tests, conducted at no expense to the Owner, to demonstrate its equality to the paint(s) named, is submitted in writing to the Engineer for approval within 30 days after the signing of the Notice to Proceed. The type and number of tests performed shall be subject to the Engineer's approval.

- B. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used. Refer to Section 09901 for special primers.
- C. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.

2.2 PAINT TYPES

- A. The following types of paints by Tnemec Co. have been used as a basis for the paint schedule:

<u>Series</u>	<u>Series Name</u>	<u>Generic Description</u>	<u>Finish</u>
6	Tneme-Cryl	100% acrylic latex emulsion	semi-gloss
30	Spra-Saf EN	Hydrophobic Acrylic	
36	Undercoater	Wood Primer	
39-1261	Silicone Aluminum	high heat Silicone Aluminum	
46H-413	Hi-Build Tneme-Tar	Coal-Tar Epoxy	
54-562:	Masonry Filler	Modified Epoxy Block Filler	
61	Tneme-Liner	Amine Epoxy	
66	Hi-Build Epoxoline	Polyamide Epoxy	
N69	Hi-build Epoxoline II	Polyamidoamine Epoxy	
73	Endura-Shield	Semi-Gloss Acrylic Urethane	
90-97	Tneme-Zinc	Organic Zinc-Rich Urethane	
113	H.B. Tneme-Tufcoat	Water Based Epoxy	
115	Uni-Bond DF	Cross Linking Acrylic	
135	Chembuild	Surface Tolerant Epoxy	

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N140	Pota-Pox Plus	Polyamidoamine Epoxy (NSF 61)
156	Enviro-Crete	Elastomeric Acrylate
201	Epoxoprime	Clear 100% Solids Epoxy
211-212/213	Glass Beads	Non-skid Additive for Series 291
218	Mortarclad	Epoxy Modified Concrete
222	Deco-Tread	Colored Quartz Filled Epoxy
275	Stranlok	Fiber Reinforced Novolac Epoxy
280	Tneme-Glaze	100% Epoxy
282	Tneme-Glaze	100% Novolac Epoxy
284	Deco-Clear	100% Solids Clear Epoxy
287	Enviro-Tread	Water Based Epoxy
291	CRU	Aliphatic Polyester Polyurethane Gloss
434	Perma-Shield H2S	Modified Aliphatic Amine Epoxy Mortar
435	Perma-Glaze	Modified Polyamine Epoxy

2.3 PAINT SCHEDULE

- A. The following surfaces shall have the types of paints scheduled below applied at the dry film thickness (DFT) in mils per coat noted:
- B. Ferrous Metals
- Submerged or subject to splashing

Surface Preparation:	SSPC-SP5
Stripe Coat:	Series 435-5021 (10 mils DFT) applied by brush over weld seams
1 st Coat:	Series 435-5022 (15-20 mils DFT)
2 nd Coat:	Series 435-5021 (15-20 mils DFT) Min total DFT for 2 coats: 30 mils

- Nonsubmerged (exterior)

Surface Preparation:	SSPC-SP6
Stripe Coat:	Series 90-97 (2.5 - 3.5 mils DFT) applied by brush over weld seams
Primer:	Series 90-97 (2.5 - 3.5 mils DFT)

Int. Coat: Series N69 (3.0 - 5.0 mils DFT)
 Topcoat: Series 73 (2.0 - 3.0 mils DFT) Min total DFT for 3
 Coats: 9.5 mils

C. Non-Ferrous Metals and Galvanized Steel

1. Submerged or subject splashing
 - Surface Preparation: SSPC-SP1 and SSPC-SP7
 - 1st Coat: Series N69 (4.0 - 6.0 mils DFT)
 - 2nd Coat: Series N69 (4.0 - 6.0 mils DFT) Min total DFT for 2
Coats: 10.0 mils

2. Nonsubmerged (exterior)
 - Surface Preparation: SSPC-SP1 and scarify
 - Primer: Series N69 (3.0 - 5.0 mils DFT)
 - Topcoat: Series 73 (2.0 - 3.0 mils DFT)
Min total DFT for 2 Coats: 6.5 mils

3. Nonsubmerged (interior)
 - Surface Preparation: SSPC-SP1 and scarify
 - 1st Coat: Series N69 (2.0 - 4.0 mils DFT)
 - 2nd Coat: Series N69 (2.0 - 4.0 mils DFT)
Min total DFT for 2 Coats: 6.0 mils

4. Aluminum in contact with dissimilar metals (nonsubmerged)
 - Surface Preparation: SSPC-SP1 and scarify
 - 1st Coat: Series N69 (2.0 - 4.0 mils DFT)
 - 2nd Coat: Series N69 (2.0 - 4.0 mils DFT)
Min total DFT for 2 Coats: 6.0 mils

D. Concrete Masonry Units (Block)

1. Interior (conditioned office space)
 - Surface Preparation: Clean and dry
 - Block Filler: Series 54-562 @ 60 - 80 SF/gal
 - 1st Coat: Series 6 (2.0 - 3.0 mils DFT)
 - 2nd Coat: Series 6 (2.0 - 3.0 mils DFT)
Min total DFT for 2 coats (excluding block filler):
5.0 mils

2. Interior (unconditioned process/pump rooms)
 - Surface Preparation: Clean and dry
 - Block Filler (2 coats): Series 54-562 @ 60 - 80 SF/gal (8.0 - 10.0 mils DFT
per coat)
 - 1st Coat: Series 113 (4.0 - 6.0 mils DFT)
 - 2nd Coat: Series 113 (4.0 - 6.0 mils DFT) Min total DFT for 2
Coats: 8.0 mils

E. Concrete (precast and cast in place)

1. Submerged or subject to splashing

Surface Preparation: SSPC-SP13
 Surfacers: Series 218 applied at 1/16" ±
 1st Coat: Series N69 (4.0 - 6.0 mils DFT)
 2nd Coat: Series N69 (4.0 - 6.0 mils DFT)
 Min total DFT for 2 coats (excluding surfacer): 10.0 mils

2. Nonsubmerged (interior conditioned space)

Surface Preparation: Clean and dry
 1st Coat: Series 6 (2.0 - 3.0 mils DFT)
 2nd Coat: Series 6 (2.0 - 3.0 mils DFT) Min total DFT for 2 Coats: 5.0 mils

3. Nonsubmerged (exterior)

Surface Preparation: Clean and dry
 1st Coat: Series 156 (4.0 - 6.0 mils DFT)
 2nd Coat: Series 156 (4.0 - 6.0 mils DFT) Min total DFT for 2 coats: 10.0 mils

F. Surfaces exposed to severe H₂S / H₂SO₄

Surface Preparation: SSPC-SP13
 Surfacers: Series 218 (1/16" DFT)
 Mortar Coat: Series 434 (1/8" DFT)
 Glaze Coat: Series 435 (15-20 mils DFT)

G. Plastic piping nonsubmerged

1. Interior

Surface Preparation: SSPC-SP1 and scarify
 1st Coat: Series N69 (2.0 - 3.0 mils DFT)
 2nd Coat: Series N69 (2.0 - 3.0 mils DFT) Min total DFT for 2 coats: 5.0 mils

2. Exterior

Surface Preparation: SSPC-SP1 and scarify
 1st Coat: Series N69 (2.0 - 3.0 mils DFT)
 2nd Coat: Series 73 (2.0 - 3.0 mils DFT) Min total DFT for 2 coats: 5.0 mils

H. Ductile iron pipe

1. Immersion

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Surface Preparation: SSPC-SP6
 1st Coat: Series N69 (6.0 – 8.0 mils DFT)
 2nd Coat: Series N69 (6.0 – 8.0 mils DFT)
 Min total DFT for 2 coats: 14.0 mils

2. Exterior

Surface Preparation: SSPC-SP6
 1st Coat: Series N69 (6.0 – 8.0 mils DFT)
 2nd Coat: Series 66 (2.0 – 4.0 mils DFT)
 3rd Coat: Series 73 (2.0 – 3.0 mils DFT)
 Min total DFT for 3 coats: 12.0 mils

I. Previously painted steel surfaces with solvent based coatings

1. Immersion

Surface Preparation: Pressure clean (3500 PSI) spot SSPC-SP10 (near white metal and SSPC-SP7 (brush blast)
 Spot Primer: Series N69 (3.0 – 5.0 mils DFT)
 1st Coat: Series N69 (4.0 – 6.0 mils DFT)
 2nd Coat: Series N69 (4.0 – 6.0 mils DFT)
2. Interior non-immersion

Surface Preparation: Pressure clean (3500 PSI) or solvent clean (SSPC-SP1) and spot power tool clean (SSPC-SP3)
 Spot Primer: Series 135 (3.0 – 5.0 mils DFT)
 Barrier Coat: Series 135 (3.0 – 5.0 mils DFT)
 Top Coat: Series N69 (4.0 – 6.0 mils DFT)
3. Exterior:

Surface Preparation: Pressure clean (3500 PSI) or solvent clean (SSPC-SP1) and spot power tool clean (SSPC-SP3)
 Spot Primer: Series 135 (3.0 – 5.0 mils DFT)
 Barrier Coat: Series 135 (3.0 – 5.0 mils DFT)
 Top Coat: Series 73 (2.0 – 3.0 mils DFT)

J. Overhead ceilings including (metal decking, rafters, ductwork, conduit, etc.)

1. Interior dry environments

Surface Preparation: Pressure clean (3500 PSI)
 Coating: Series 115 (2.0 – 4.0 mils DFT)
2. Interior wet environments

Surface Preparation: Pressure clean (3500 PSI) and brush blast

	(SSPC-SP7)
Spot Primer:	Series 135 (3.0 - 5.0 mils DFT)
1 st Coat:	Series 135 (3.0 - 5.0 mils DFT)
2 nd Coat:	Series 66 (3.0 - 5.0 mils DFT)

3. Exterior

Surface Preparation:	Pressure clean (3500 PSI) and spot power tool clean (SSPC-SP3)
Spot Primer:	Series 135 (3.0 - 5.0 mils DFT)
1 st Coat:	Series 30 (2.0 - 4.0 mils DFT)
2 nd Coat:	Series 30 (2.0 - 4.0 mils DFT)

K. Wood (interior and exterior)

1. Surface Preparation: Clean and dry
- Primer: Series 36 (2.0 - 3.0 mils DFT)
- 1st Topcoat: Series 6 (2.0 - 3.0 mils DFT)
- 2nd Topcoat: Series 6 (2.0 - 3.0 mils DFT)
- Min total DFT for 3 Coats:
7.5 mils

- L. Any surfaces not specifically named in the Schedule and not specifically excepted shall be prepared, primed, and painted in the manner and with materials consistent with these specifications. The Engineer shall select which of the manufacturer's products, whether the type is indicated herein or not, shall be used for such unnamed surfaces. No extra payment shall be made for this painting.

2.4 LETTERING OF TITLES

- A. Each pipe system shall be labeled with the name of the materials in each pipeline and alongside this an arrow indicating the direction of flow of liquids. Titles shall be as so described in attached schedule. Titles shall not be located more than 5-li-ft apart, and shall also appear directly adjacent to each side of any wall the pipeline breaches, adjacent to each side of the valve regulator, flowcheck, strainer cleanout, and all pieces of equipment.
- B. Titles shall identify the contents by complete name. Identification title locations shall be determined by the Engineer but in general they shall be placed where the view is unobstructed and on the two lower quarters of pipe or covering where they are overhead. Title should be clearly visible from operating positions especially those adjacent to control valves.
- C. Titles on equipment shall be applied at eye level on machines where possible or at the upper most broad vertical surface of low equipment. Where more than one piece of the equipment item to be titled exists, the items shall be numbered

consecutively as indicated on the mechanical drawings or as directed by the Engineer; for example Pump No. 1, Pump No. 2, etc. Titles shall be composed and justified on the left hand side as follows:

1. Pump No. 1A
2. Pump No. 2A
3. Pump No. 1B
4. Pump No. 2B

D. Application of titles

1. The color of the titles shall be black or white, as approved, to best contrast with the color of the pipes and equipment and shall be stencil applied.
2. Text is to be in ALL CAPS worded exactly as shown in the Schedule. Titles are to be printed in a single line.

3. Letter sizes

Outside Diameter of Pipe or Covering (in)	Size of Legend Letters (in)
$\frac{3}{4}$ to 1- $\frac{1}{4}$	$\frac{1}{2}$
1- $\frac{1}{2}$ to 2	$\frac{3}{4}$
2- $\frac{1}{2}$ to 6	1- $\frac{1}{4}$
8 to 10	2- $\frac{1}{2}$
More than 10	3- $\frac{1}{2}$

Equipment titles are to be 2-in high.

4. Arrow sizes. Where "a" is equal to $\frac{3}{4}$ of outside diameter of pipe or covering, the arrow shaft shall be 2 "a" long by $\frac{3}{8}$ "a" wide. The arrow head shall be an equilateral triangle with sides equal to "a." Maximum "a" dimension shall be 6-in.
5. When using direction arrows, point arrowhead away from pipe markers and in direction of flow. If flow can be in both directions, use a double-headed directional flow.

2.5 TITLES FOR EQUIPMENT

- A. Titles shall be provided in vinyl film on all equipment using 2-in high Optima Bold upper case, Grid 2 spacing, white or black in color as approved depending on substrate. Titles shall be mounted at eye level on machines where possible or at the upper most broad vertical surface of low equipment. Where more than one piece of the equipment item to be titled exists, the items shall be numbered consecutively as indicated on the mechanical drawings or as directed by the Engineer; for example Pump No. 1, Pump No. 2, etc. Titles shall be composed in more than one line if required and justified on the left-hand side as approved.

2.6 METAL TAGS

- A. For pipelines smaller than 3/4-in in diameter, securely fasten metal tags, 2-1/2-in by 1/2-in, of Birmingham or Stubs aluminum with lettering etched and filled with enamel. Tags shall be approved by the Engineer.

2.7 VALVE MARKERS

- A. Furnish and install aluminum tags with engraved lettering as approved by Engineer on all above ground chemical system and process piping valves.

2.8 FABRICATED EQUIPMENT

- A. Unless otherwise indicated, all fabricated equipment shall be shop primed and shop or field finished.
- B. All items to be shop primed shall be thoroughly cleaned of all loose material prior to priming. If, in the opinion of the Engineer, any prime coating shall have been improperly applied or if material contrary to these specifications shall have been used, that coating shall be removed by sandblasting to white metal and reprimed in accordance with these specifications.
- C. All shop prime coats shall be of the correct materials and applied in accordance with these specifications. Remove any prime coats not in accordance with these specifications by sandblasting and apply the specified prime coat at no additional cost to the Owner.
- D. Shop primed surfaces shall be cleaned thoroughly and damaged or bare spots retouched with the specified primer before the application of successive paint coats in the field.
- E. The Contractor shall be responsible for and take whatever steps are necessary to properly protect the shop prime and finish coats against damage from weather or any other cause.
- F. A shop finish coat shall be equal in appearance and protection quality to a field applied finish coat. If, in the opinion of the Engineer, a shop finish coat does not give the appearance and protection quality of other work of similar nature, prepare the surfaces and apply the coat or coats of paint as directed by the Engineer to accomplish the desired appearance and protection quality. Submit to the Engineer substantial evidence that the standard finish is compatible with the specified finish coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent.
 - d. Gypsum Board: 12 percent.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. All surfaces to be painted shall be prepared as specified herein and shall be dry and clean before painting. Special care shall be given to thoroughly clean interior concrete and CMU surfaces to receive polyamide cured epoxy paint of all marks before application of finish.
- B. All metal welds, blisters, etc, shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting. All rust, loose scale, oil, tar and asphalt bearing coatings, grease and dirt shall be removed by use of approved solvents, wire brushing, grinding or sanding.
- C. Concrete surfaces shall have been finished as specified in Section 03350. Report unsatisfactory surfaces to the Engineer. Concrete shall be left for one month minimum before painting and shall be free of dust, oil, curing compounds and other foreign matter.
- D. Concrete masonry unit surfaces shall be smooth and cleaned of all dust, loose mortar and other foreign matter.
- E. All PVC pipe and other plastic matrix surfaces to be painted shall be sanded to an approved profile and cleaned of residue before painting.
- F. All PVC pipe and other plastic matrix surfaces to be painted shall be lightly sanded and cleaned of residue before painting.

- G. Galvanized, aluminum, and copper surfaces shall have all oxidation and foreign material removed before painting by SSPC SP-1, using an approved V.O.C. compliant method. Galvanized and, when ordered, the other metal surfaces specified above shall be hand tool cleaned to SSPC SP-2 standards to provide a uniform 1 mil surface profile.
- H. Existing Surfaces to be Repainted
1. Existing masonry, steel and other previously field painted surfaces indicated on drawings, or so noted, shall be repainted.
 2. Preparation shall be in general as specified above for new surfaces except that all loose paint shall be removed and all edges of existing paint shall be feathered to ensure a smooth surface.
 3. Paint removal, capture of its residue, and its disposal shall be handled in accordance with all laws and regulations concerning disposal of hazardous materials.
 4. Primer (spot) and paint used for a particular surface shall, in general, be as scheduled for that type of new surface. Provide an approved organic zinc-rich (min. 83% zinc in dried film) primer as specified. Confirm with the paint manufacturer that the paint proposed for a particular repaint condition will be compatible with the existing painted surface. Perform adhesion and compatibility tests on existing substrates as ordered and required. Repainted areas shall be covered by the same guaranty specified for remainder of Project.

3.3 WORKMANSHIP

A. General

1. At the request of the Engineer, sample areas of the finished work prepared in strict accordance with this Section shall be furnished and all painting shall be equal in quality to the approved sample areas. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with factory or paint manufacturer's warehouse mixed colors shall be furnished to the satisfaction of the Engineer where standard chart colors are not satisfactory.
2. Protection of furniture and other movable objects, equipment, fittings and accessories shall be provided throughout the painting operation. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, etc, before painting, protect and replace when completed. Mask all machinery name plates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and

other work from all damage during the operation and until the finished job is accepted.

3. On metal surfaces apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s). On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

B. Field Priming

1. Steel members, metal castings, mechanical and electrical equipment and other metals which are shop primed before delivery at the site will not require a prime coat on the job. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be the first coat as specified in the painting schedule. Surface preparation of bare metal shall be the responsibility of the Contractor.
2. Equipment which is specified to receive a baked-on enamel finish or other factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop painted and have been damaged, or where the shop coat or coats of paint have deteriorated, shall be properly cleaned and retouched before any successive painting is done on them in the field. All such field painting shall match as nearly as possible the original finish. Preparation and painting shall be provided by the Contractor.
3. Equipment shipped with a protective shop painting coat or coats shall be touched up to the satisfaction of the Engineer with primers as recommended by the manufacturer of the finish paint. Preparation and painting shall be provided by the Contractor.

C. Field Painting

1. All painting at the site shall be under the strict inspection of the Engineer. Only skilled painters and, where dictated by special conditions or systems and so ordered, specialist painters shall be used on the work.
2. All paint shall be at room temperature before applying, and no painting shall be done when the temperature is below 60 degrees F, in dust-laden air, when

rain or snow is falling, or until all traces of moisture have completely disappeared from the surface to be painted.

3. Successive coats of paint shall be different shades (from paint manufacturer's stock or shop mixed paint) of the required colors so as to make each coat easily distinguishable from each other with the final undercoat the approximate shade of the finished coat to ensure no show-through as approved.
4. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with the type paper appropriate for the undercoats to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted.
5. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weather shall be primed coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.
6. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as approved by the Engineer.
7. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be scraped off and repainted in accordance with the Engineer's directions.
8. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the Engineer.
9. Only the aluminum work noted on the Drawings or in the Painting Schedule shall be field painted.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:
 1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with specified requirements.

3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 COLOR CODING FOR PIPES AND EQUIPMENT

- A. Color coding shall consist of color code painting and identification of all exposed conduits, trough items, and pipelines for the transport of gases, liquid, and semi-liquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors, and all operating accessories which are integral to the whole functional mechanical pipe and electrical conduit system. Colors shall be as noted in the Color Coding Schedules at the end of this Section.
- B. All hangers and pipe support floor stands shall be painted the same color and with the same paint as the pipe it supports. The system shall be painted up to but not including the flanges attached to the mechanical equipment nor the flexible conduit connected to electrical motors. When more than one pipe system is supported on the same bracket, the bracket shall be painted the same color as the adjacent wall or ceiling. Colors shall be as noted in the Color Coding Schedule as selected and approved by Engineer.
- C. All systems that are an integral part of the equipment, that is originating from the equipment and returning to the same piece of equipment, shall be painted between and up to but not including, the fixed flanges or connections on the equipment.
- D. The color code establishes, defines, and assigns a definite color for each category of pipe. Pipelines, equipment, or other items that are not listed in the Color

Coding Schedule shall be assigned a color by the Engineer and shall be treated as an integral part of the Contract.

- E. Banding for pipes shall be as specified in the Color Coding Schedule. Bands shall be 2-in wide and spaced 5-ft on center, located on each end of the pipe title, at 2-ft from the title bands, and at wall penetrations.
- F. All moving parts, drive assemblies, and covers for moving parts which are potential hazards shall be Safety Orange #CA26.
- G. All safety equipment shall be painted in accordance with OSHA standards.
- H. All inline equipment and appurtenances not assigned another color shall be painted the same base color as the piping. The pipe system shall be painted with the pipe color up to but not including the flanges attached to pumps and mechanical equipment assigned another color. Tanks shall be painted the color of the piping system that they serve, unless the tank is fiberglass and levels are monitored through the tank.
- I. All conduit shall be painted to match its background surface.
- J. Control panels shall be factory finished.
- K. All colors will be confirmed by the Engineer from color charts submitted by the Contractor, based on the color coding schedule herein.

3.7 COLOR IDENTIFICATION

- A. All color numbers and names herein refer to master color card. Colors of specified equal manufacturers may be substituted with approval of the Engineer.
- B. Building surface colors shall be painted as scheduled in the Color Coding Schedule or as selected by the Engineer.
- C. The following Tnemec colors shall be used as a basis for the Color Coding Schedule:

<u>Colors</u>	<u>Tnemec Name</u>	<u>Tnemec #</u>
White	White	11WH
International Orange	International	05SF
Safety Yellow	Lemon Yellow	02SF
Safety Green	Hunter Green	08SF
Brown		24YB
Dark Brown		23YB
Safety Red	Chilean Red	07SF
Gray	Slate Gray	32GR
Safety Blue	True Blue	11SF

Black Black 35GR

3.8 COLOR CODING SCHEDULE

- A. Color selection for the following items are to be reviewed by the Engineer and approved by the Owner at the time of shop drawing review. The Contractor shall submit color charts for color selections.

<u>Piping and Legend</u>	<u>Color</u>	<u>Bands</u>
Basin Drain	Brown	White
Drain	Gray	Safety Blue
Dewatering Filtrate	Gray	Safety
Digester Sludge	Brown	International
Grit Basin Influent		

<u>Piping and Legend</u>	<u>Color</u>	<u>Bands</u>
High Pressure Air	Green	
Instrument Air	Green	
Irrigation Water	Blue	Black
Low Pressure Air	Green	
Natural Gas	Orange	Black
Non Potable Water	Blue	Black
Polymer Solution	White	Safety Green/Black/Red
Potable Water	Safety Green	
Return Activated Sludge	Brown	Gray/Red
Raw Sewage	Gray	Black
Scum	Dark Brown	Gray
Secondary Effluent	Gray	International
Sludge	Brown	Safety Blue/Black
Sanitary Force Main		
Sample	Safety Green	Safety Yellow
Storm Water		
Thickened Sludge	Brown	Red/Black
Vacuum	Safety Yellow	Safety Blue
Water Activated Sludge	Brown	Gray/Black

Building and Architectural Components

Interior Wall Color Sherwin Williams SW 6105 Divine

White Interior Metal Doors and Frames to match wall

color

PAINING

Other Colors, if not identified in appropriate Specification Sections, shall be selected by the Engineer and approved by the Owner.

END OF SECTION

SECTION 11215 VERTICAL TURBINE EFFLUENT PUMPS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section covers the work necessary to install the Owner Purchased vertical turbine pumps, complete with accessories, for reuse pumping. The Contractor shall furnish all labor, materials, equipment and incidentals required and install, complete and ready for operation and field test, the pre-purchased Effluent Vertical Turbine Pumps including their respective drives and controls as shown on the Drawings and as specified herein. Refer to Exhibit A of these specification for submittal data on Vertical Turbine Pumps
- B. Installation shall be performed by the Installing Contractor in accordance with Drawings and Specifications to provide a working system.
- C. Related work:
1. Documents affecting Work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 2. Painting as included in Section 09900
 3. Electrical as included in Division 16

1.02 SPARE PARTS

- A. All spare parts shall be properly protected for long periods of storage and packed in containers that are clearly identified markings as to contents.

1.03 QUALITY ASSURANCE

- A. The SUPPLIER shall submit completed pump data sheets similar to that included at the end of this section.
- B. Technical Services: The SUUPLLIER shall provide service of manufacturer's service engineer, complying with the following:
- Erection and installation: Two days, one trip.
 - Start-up and training: Two days, one trip
- C. To assure unity of responsibility, the motors, and supporting sole plates shall be furnished and coordinated by the pump manufacturer. The manufacturer shall

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assume responsibility for the satisfactory operation of the entire pumping system including pumps, motors, and sole plates, as specified.

- D. The equipment furnished shall be designed and constructed to operate satisfactorily when installed as shown on the Drawings.

1.04 REFERENCE STANDARDS

- A. Design, manufacturing and assembly of elements of the equipment specified herein shall be in accordance with, the following:

1. American Gear Manufacturers Association (AGMA)
2. American Institute of Steel Construction (AISC)
3. American Iron and Steel Institute (AISI)
4. American Society of Mechanical Engineers(ASME)
5. American National Standards Institute (ANSI)
6. American Water Work Association (AWWA)
7. American Welding Society (AWS)
8. American Bearing Manufacturers Association (ABMA)
9. Hydraulic Institute Standards - 2.6
10. Institute of Electrical and Electronics Engineers (IEEE)
11. National Electrical Code (NEC)
12. National Electrical Manufacturers Association (NEMA)
13. Occupational Safety and Health Administration (OSHA)

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 DELIVERY STORAGE AND HANDLING

- A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.
- B. All equipment and parts must be properly protected against any damage during shipment. Store the equipment in accordance with manufacturer's recommendations.
- C. Factory assembled parts and components shall not be dismantled for shipment unless transportation restrictions require a partial dis-assembling of the unit, and the CMAR is notified and acknowledges in writing.
- D. The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank flanges, strongly built and securely bolted thereto.
- E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

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- F. For protection of bearings during shipment and installation, the bearing shall be properly processed. Anti-friction bearings, if pre-lubricated, shall be protected in accordance with the bearing manufacturer's recommendations against formation of rust during a long period of storage while awaiting completion of installation and start-up of the machine in which they are used. Anti-friction bearings which are not pre-lubricated shall be properly treated in accordance with the bearing manufacturer's recommendation against formation of rust during a long period of storage while waiting completion of installation and start-up by the application of Exxon, Rust-Ban No. 392 or equal treatment.

PART 2 - PRODUCTS

- A. Base plates:
1. Provide with separate cast iron sub-base to be permanently grouted and anchored to concrete foundation.
 2. Plates to be drilled and tapped to accept pump base flange and anchor bolts.
 3. Use stainless steel anchor bolts for anchoring base plate to the concrete base.
- B. Nameplate: Provide each pumping unit with a stainless-steel nameplate with the following information:
1. Manufacturers name, address and telephone number.
 2. Model number.
 3. Serial number.
 4. Head, capacity and RPM at rated condition.
 5. Motor horsepower, RPM and frame size.
- C. Control Panel and Electrical Connections: The CONTRACTOR shall provide and install the following:
1. Thermal protection system consisting of thermistors and a monitoring relay:
 - a. Three (3) thermistors embedded in the coils, one in each phase, protecting the stator windings from damaging temperatures resulting from motor overload, too-frequent starting, blocked air passages, and locked-rotor current.

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2. Monitor and alarm panel enclosure shall be NEMA 4X 316 Stainless Steel with hinged cover.
 - a. Provide power from panel from the motor controller.
 - b. Panel shall contain adjustable RTD monitors and relays that will latch when a high temperature setting is reached.
 - c. Panel door shall include two LED type indicating lights, one for winding high temperature and one for bearing high temperature, and one alarm reset pushbutton.

2. Provide silicone rubber strip type space heaters rated 120 volts.

- D. Manufacturer shall coat inside and outside of column piping, outside of bowls and inside of discharge head. Tnemec system of 3 mils Series Omnithane, 4 mils of Series N149-1255 Pota-Pox and 4 mils Series N140-15BL White Pota-Pox.

- E. The following instruments shall be provided by the SUPPLIER and installed by the CONTRACTOR.
 1. Float switches. The total number of floats supplied shall be as dictated by the project plans. The floats shall match the Owner's standard.
 2. Submersible pressure transducer (level). The submersible pressure transducer shall match the Owner's standard. The transducer shall be provided with cable clamp installation/mounting hardware.
 3. Pressure transducer (system pressure): The pressure transducer shall match the Owner's standard throughout the distribution system.
 4. Automatic air release valves (ARV) to suite the pumping conditions. The ARV shall match the Owner's standard throughout the distribution system.
 5. Pressure gauges: Install where indicated on the drawings and not otherwise specified in separate sections of these Specifications.
 - a. Provide solid front rounded type, 4 or 4-1/2" phenolic or stainless steel case with blow-out back, Type 316 stainless steel bourdon tube, glycerin fill, 1/2" NPT bottom male threaded connection, Teflon coated 400 series, stainless steel rotary movement, black micro-adjusted corners and black figures with white plastic dials, and a threaded ring.
 4. Select gauge at the nearest standard range which provides a top limit above the pump shutoff head at the operating conditions but no greater than 10% above the shut off head.
 5. Each gauge connection to consist of a shutoff valve and 1/2" stainless steel

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pipng connections.

- a. Shutoff valve to be Type 316 stainless steel ball valve with T-handle operator.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the pump in accordance with the pump Manufacturer's directions and these Specifications.
- B. Handle carefully and protect the pump and appurtenances to avoid damaging the equipment. If the pump and column are laid down, support them with blocks to prevent damage. Install pumps with shaft plumb. Level base by means of steel wedges (steel plates and steel shims). Wedge taper shall not be greater than 1/4-inch per foot. Use double wedges to provide a level bearing surface for the pump base. Secure each pair of wedges in their final positions with tack weld on each side after leveling is complete. Accomplish wedging so that there is not change of level or springing on the foundation when the foundation bolts are tightened. Adjust pump assemblies such that the driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings. Flexible couplings shall not be considered to compensate for misalignment. Carefully fit and coat all bolt threads with lubricant to facilitate future removal.
- C. After the pump has been set in position, aligned, and wedged to the proper elevation, grout the space between the bottom of the pump baseplate and the concrete foundation. Use a poured, non-shrinking grout. The arrangement of the column shall be straight and vertical when the installation is complete. Grout shall be water tight to prevent static water from escaping.

3.02 PAINTING

- A. Shop and field painting for the aboveground discharge head, motor, piping and associated exposed metals shall be in accordance with and as specified in Section 09900 Painting.

3.03 TESTING

- A. Prior to acceptance of the installed pump, demonstrate proper operation of the pump at the guarantee point, at which time data shall be taken on the total head, flow, and horsepower requirements of the pump. Pump supplier to provide all instruments required for this procedure.
 1. A test log shall be presented to the ENGINEER upon the completion of **the field test that records the following:**
 - a) Flow, measured by flowmeter. (GPM)
 - b) Discharge pressures as measured by calibrated gauges (PSI)

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- c) Calculated velocity heads at discharge flanges and total head (FT)
 - d) Motor phase-to-phase voltage, phase current and 3-phase kilowatts.
- B. Balance of Vibration: The rotating parts of each pump and its driving motor shall be statically and dynamically balanced before final assembly. The driving motor alone shall operate without vibration in excess of the limited stated in the latest revision of NEMA MG 1. The complete unit, consisting of the motor and pump, connected and in normal operation, shall not develop amplitudes of vibration exceeding limits recommended by the latest revision of Hydraulics Institute Standards for vertical turbine pumps handling clean liquids.
- C. Test Failures: Units failing the field tests shall be realigned and retested.

END OF SPECIFICATION SECTION

SECTION 13125
PRE-FABRICATED CONCRETE BUILDING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section provides specification requirements for a Pre-Fabricated Concrete Building, consisting of reinforced pre-cast walls, roof; interior and exterior lighting, and HVAC system. The building will serve as the main electrical service and control building for the specific project. Building will be supplied without a floor, unless noted otherwise.
- B. The Building shall be delivered to the location identified on the contract drawings as a fully functional unit, including all electrical conduits, HVAC, doors and all necessary components identified on the contract drawings.
- C. Prior to delivery, the Supply Contractors shall be coordinate with the Owner or Authorized Representative to verify final floor template layout and required floor penetration locations. Supply Contractor shall make all adjustments to doors, seals, and fasteners for satisfactory operation.
- D. Any exceptions/deviations to this specification shall be indicated in writing and submitted with the quotation.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Submittals Section. A large scale template shall be submitted indicating exact location and size opening required for all floor / side wall penetration locations required to supply electrical and monitoring components, if bottom floor is provided.

1.03 REGULATORY & QUALITY ASSURANCE REQUIREMENTS

- A. ACI-318-2008, "*Building Code Requirements/or Reinforced Concrete*". Concrete Reinforcing Institute, "*Manual a Standard Practice*"
- B. ASCE-7-05 "*Building Code Requirement for Minimum Design Loads in Buildings and Other Structures*"
- C. Florida Building Code - 2007, with 2009 Supplements
- D. Unified Facilities Guide Specifications. Divisions 00-09; 21-23; 26-28; 33
- E. UL-752 Test Method Level Four (4) for Bullet Resistance certified by an Independent Structural Engineer.
- F. Concrete Reinforcing Institute, "*Manual of Standard Practice*".

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- G. Building fabricator must have a minimum of 5-years experience manufacturing and setting transportable precast concrete buildings.
- H. Steel Construction Manual - AISC-360-05.
- I. PCI Design Handbook - 6th Edition
- J. International Building Code - 2009
- K. National Electrical Code - 2008
- L. Life Safety Code - NFPA 101-03
- M. ANSI A117.1-2003
- N. ADA Standards - 28 CFR Part 36 - 1994

1.04 WARRANTY

- A. A minimum five (5) year warranty shall be provided by the Building Manufacture and Material Contractor warranting the integrity of the Pre-Cast Concrete Building structure against defects in material and workmanship. The warranty shall include the complete non-prorated repair or replacement of the defective material.

PART 2 PRODUCTS

2.01 ACCEPTABLE PREFABRICATED BUILDING MANUFACTURES:

- A. The precast concrete pre-fabricated transportable building shall be EASI- SET brand as manufactured by Concrete Modular Systems, or prior approved equal. Building to be delivered and placed on slab in accordance with manufacturer's recommendations.
- B. Building to be provided by manufacturer with all necessary openings as required for providing service to electrical controls, drives and service enclosures / cabinets in conformance with manufacturer's requirements.
- C. A floor plan template with knock-out opening locations and dimensions shall be included in submittal package for review. Prior to delivery of the Building to the Project site, Contractor shall verify completion of foundation and alignment of final electrical conduit stub-ups.

2.02 DIMENSIONS & DESIGN LOADS

- A. Building exterior dimensions shall be as provided in the contract drawings. As a minimum, the building shall be a minimum of 6' wide x 10' long x 11' tall with a pitched roof. Low side of building shall be 10'6" respectively including roof panel thickness. Wall shall be 4" thick, floor thickness of 5" (if specified), and a roof thickness of

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6" at center tapering to 4" at the sides (2" slope). The roof panel shall extend a minimum of 4" beyond the wall panel on three sides with a 4'-0" cantilever overhang on the tank cylinder storage area (West side).

B. Design Loads:

- a. Seismic load performance category 'C', Exposure Group III
- b. Standard Live Roof Load - 65 PSF
- c. Standard Floor Load - 250 PSF
- d. Standard Wind Loading - 150 MPH

C. Roof, walls and floor (if specified) panels must each be produced as single component monolithic panels. No roof, floor, or vertical wall joints will be allowed, except at corners. Wall panels shall set on top of floor panel.

2.03 CONSTRUCTION

- A. Concrete shall be Steel-reinforced, polypropylene fiber reinforced, 4000 PSI minimum 28 day compressive strength, air-entrained (ASTM C260) and shall be insulated.
- B. Reinforcing Steel shall be ASTM A615, grade 60 unless otherwise indicated.
- C. Reinforcing Fiber shall be Polypropylene fiber, Fibermesh @ 1.5 pounds per cubic yard.
- D. All panels shall be securely welded together with 1/4" thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A253, Grade C. All fasteners to be 1/2" diameter coil thread bolts. Cast-in anchors used for panel connections to be Dayton-Superior #F-63, or approved equal.
- E. All wall joints between panels shall be caulked on the exterior and interior surface of the joints. Caulking shall be Sonneborn Sonolastic 150 elastic sealant or approved equal, color to match adjacent building surface.
- F. All floor to wall joints shall be sealed to create a continuous and permanent water tight seal on both interior and exterior surfaces with a polyurethane sealant. Sealant shall be Sikaflex-2c, as manufactured by Sika Corporation or approved equal, color to match adjacent building surface.

2.04 ACCESSORIES

- A. Doors and Frames: Shall comply with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (SDI-IOO), and as herein specified. The buildings shall be equipped with two one (1) 3'-0" W x 7'-0" H x 1 3/4" single fiberglass reinforced polyester (FRP) door with FRP frames. Dimensions shall be measured for clear interior opening. Doors and frames shall be SDI Grade III, Model \$, seamless with 0.125 in face sheet (door), and 0.1875 (frame). Fiberglass content shall be minimum 30% to maximum 40%, with UV stabilization. Doors shall have flush top closure and minimum 1 3/4" thick.

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Coated with minimum 15 mil gel coat thickness. Color to be selected by Owner. Coordinate with Owner on final exterior colors and exterior finish.

- B. Door Hardware shall be as follows:
- a. Hinges to be Cal Royal #BB-31 - 4.5 x 4.5 x NRP, US32D (316 SS Pin & Plate), Min. 3 per door.
 - b. Lock set to be Schlage Lock L9456-06L, US26D Finish. The Key Schedule will be: **Okaloosa County Water & Sewer Electrical/LS Key: AB1 (5 ea)**
Contact is Warren Hollow Metal Doors and Frames, Inc. 800.850.9821.
 - c. Threshold to be Hager Companies 417SA x 36", CL with neoprene seal
 - d. Door Closer to be Cal Royal CR441 Series, or approved equal.
 - e. Drip Cap to be Hager Companies 81OS, or approved equal.
 - f. Door Bottoms to be Hager Companies 743S, US32D

2.05 FINISHES

- A. Interior of Building
- a. Walls & Ceiling: R-19 Insulation Package with Fiberglass Reinforced Plastic Paneling, White
 - b. Floor (if specified): Smooth steel form finish.
- B. Exterior of Building shall be split face block finish on all exterior wall surfaces, unless otherwise noted. Aggregate must be seeded into top of panel while in form, chemically retarded, and high-pressure water-washed to expose the aggregate to a depth of 1/8".
- C. Roof to have smooth trowel finish sealed with a clear waterproofing. Color to be selected by Owner

2.06 HVAC

- A. The building shall be heated and cooled with two (2) externally mounted HVAC unit, and programmable thermostat controls.
- B. Wall Mounted HVAC Units
- a. Units shall be manufactured by BARD Manufacturing Company, Model # W30A1-C0ZMP5X4X or approved equal.
 - b. Size: minimum 2.5-Ton, 35,400 BTU Cooling capacity, 9.0 EER with coated coils and condenser section and commercial exhaust ventilator.
 - c. Quantity: 1
 - d. Voltage: 460v- 3 phase with motor overload and phase rotation protection.
 - e. Aluminum finned copper coils, twin multi speed blowers.
 - f. R-410A Refrigerant
 - g. Galvanized 20 Gauge Zinc Coated Steel Cabinet, baked on enamel per ASTM B117-03.
 - h. Electric Heat Strips with automatic limit and thermal cut-off safety control.

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- i. Compressor Control Module shall have built-in off-delay timer adjustable from 30 seconds to 5 minutes. 2-minute on-delay if power interrupt. 120-second bypass for low pressure control.
 - j. ASHRAE/IESNA 90.1-2007 , ANSI/ARI Standard 390-2003, Intertek ETL Listed to Standard for Safety Heating and Cooling Equipment ANSI/UL 1995/CSA 22.2
 - k. Controller/Thermostat:
 - i. Bard Manufacturing, Model # MC3000, Advanced Solid State Controller
 - ii. 2 stage cooling control for each connected air conditioner
 - iii. Input power: 18 to 32VAC, 60/50Hz, power is supplied from each unit with isolation circuitry: no line or low voltage phasing allowed
 - iv. Backup power: connection for -24VDC or -48VDC (-20 to -56V)
 - v. Digital display: 4-character LCD
 - vi. Temperature display: F or C
 - vii. Operating temperature range: 0 to 120F (-18 to 49C)
 - viii. Temperature accuracy: +/- 1F from 60-85F (16-30C), +/- 1% outside 60-85F
 - ix. Memory: EEPROM for set point and changeable parameters (maintains settings on power loss)
 - x. Six (6) Push-button controls: On/Off switch-Change lead unit-Increase and Decrease set points-Program/Save-Comfort
 - xi. Enclosure: 20-gauge pre-painted steel, 9.25"W x 13.50"H x 3.00"D, hinged cover, thirteen (13) .875" diameter electrical knockouts
- C. Exterior units shall be painted to match final building color.

2.07 ELECTRICAL

- A. Vapor proof lighting and receptacles shall be provided within the enclosure as specified in the contract drawings.

2.08 SITE PREPARATION

- A. Precast building slab shall bear fully on a 6" thick FDOT crushed stone base compacted to 100% Standard Proctor Density or 4000 psi fiber reinforced concrete. Pad footprint shall be at least one foot larger than the length and width of building.

END OF SECTION 13125

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SECTION 15100
VALVES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation and test all non-buried valves as shown on the Drawings and as specified herein.
- B. The equipment shall include, but not be limited to, the following; however not all items specified herein may be included in this project.
 - 1. General Requirements.
 - 2. Valve Actuators - Manual.
 - 3. Valve Actuators - Powered.
 - 4. Butterfly Valves.
 - 5. Gate Valves.
 - 6. Knife Gate Valves.
 - 7. Plug Valves.
 - 8. Check Valves.
 - 9. Ball Valves.
 - 10. Thermoplastic Valves.
 - 11. Solenoid Valves.
 - 12. Corporation Stops.
 - 13. Air Release and Vacuum Relief Valves.
 - 14. Mud Valves (Plug Drain Valves).

1.2 RELATED WORK

- A. Buried valves and appurtenances are included in Division 2.

- B. Shop and Finish painting is included in Sections 09901 and 09902.
- C. Slide and Weir Gates are included in Section 11282.
- D. Instrumentation, not specified herein, is included in Division 13.
- E. Valves on all HVAC systems are included in their respective sections of Division 15.
- F. Electrical work is included in Division 16.
- G. Certain items similar to those specified in this Section may be specified to be furnished and installed with individual equipment or systems. In case of a conflict, those individual equipment or system requirements shall govern.
- H. Electric valve operators of all types, rate of flow controllers (including modulating valves and operators) and other types of valves which are part of the automated instrumentation (such as some solenoid valves) if not included herein are included in Division 13. Valve operators shall, however, be mounted at factory on valves as specified herein, as part of the work of this Section.

1.3 SUBMITTALS

- A. Submit to Engineer, in accordance with Section 01300, materials required to establish compliance with this Section. First submittal shall be valve schedule described in Paragraph 1.09. Approval of valve schedule submittal is required prior to Contractor submitting any of equipment in this specification. Subsequent Equipment Submittals shall include at least the following:
 - 1. Valve tag number.
 - 2. Manufacturer and supplier.
 - 3. Address at which equipment will be fabricated or assembled.
 - 4. Drawings showing assembly details, materials of construction and dimensions.
 - 5. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 6. Total weight of each item.
 - 7. A complete bill of materials.
 - 8. Additional submittal data, where noted with individual pieces of equipment.
 - 9. Individual electrical control schematics and wiring diagrams for each valve operator with external interfaces, identified exactly as detailed on Electrical

and Instrumentation Drawings. Standard catalogue cut sheets that show typical wiring diagrams only are not acceptable. Valve actuators shall be coordinated with electrical requirements shown on Drawings and valves as specified herein.

B. Test Reports:

1. Provide certified hydrostatic test data, per manufacturer's standard procedure or MSS-SP- 61 for valves.

C. Certificates:

1. For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with appropriate standards, including certified results of required tests and certification of proper installation.

D. Manufacturer's Installation and Application Data.

E. Operating and Maintenance Data.

1. Operating and maintenance instructions shall be furnished as provided in Section 01730. Instructions shall be prepared specifically for this installation and shall include required cuts, drawings, equipment lists, descriptions and other information required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.4 REFERENCE STANDARDS

A. ASTM International:

1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
3. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
5. ASTM A436 - Standard Specification for Austenitic Gray Iron Castings.
6. ASTM A536 - Standard Specification for Ductile Iron Castings.
7. ASTM B30 - Standard Specification for Copper-Base Alloys in Ingot Form.

8. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

B. American Water Works Association (AWWA):

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
2. AWWA C500 - Metal-Seated Gate Valves Supply Service.
3. AWWA C504 - Rubber-Seated Butterfly Valves.
4. AWWA C507 - Ball Valves, 6-in through 48-in (150mm through 1200mm).
5. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-in (50mm through 24-in (600mm) NPS.
6. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
7. AWWA C511 - Reduced-Pressure Principle Backflow-Prevention Assembly.
8. AWWA C540 - Power-Actuating Devices for Valves and Sluice Gates.
9. AWWA C541 - Hydraulic and Pneumatic Cylinder and Vane Type Actuators for Valves and Slide Gates.
10. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
11. AWWA C800 - Underground Service Line Valves and Fittings.

C. American National Standards Institute (ANSI):

1. ANSI B1.20.1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals).
2. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
3. ANSI B16.10 - Face-to-Face and End-to-End Dimensions of Valves.
4. ANSI B16.104 - Butterfly Valves.

D. American Iron and Steel Institute (AISI).

E. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):

1. MSS-SP-61 - Pressure Testing of Steel Valves.
2. MSS-SP-67 - Butterfly Valves.

3. MSS-SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
 4. MSS-SP-71 - Cast Iron Swing Check Valves, Flanges and Threaded Ends.
 5. MSS-SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Services.
 6. MSS-SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
 7. MSS-SP-80 - Bronze Gate, Globe, Angle and Check Valves.
 8. MSS-SP-82 - Valve Pressure Testing Methods.
 9. MSS-SP-98 - Protective Coatings for the Interior of Valves, Hydrants and Fittings.
- F. National Electrical Manufacturers Association (NEMA).
- G. Underwriters Laboratories (UL).
- H. Factory Mutual (FM).
- I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Valves and appurtenances shall be products of well-established firms who are fully experienced, minimum ten years, reputable and qualified in manufacture of particular equipment to be furnished.
2. Equipment shall be designed, constructed and installed in accordance with best practices and methods and shall comply with this Section as applicable.
3. Units of the same type shall be the product of one manufacturer.

B. Certifications:

1. Manufacturers shall furnish an affidavit of compliance with Standards referred to herein as specified in Paragraph 1.03C above. Refer to Part 3 for testing required for certain items in addition to that required by referenced standards.

- C. Inspection of units may also be made by Engineer after delivery. Equipment shall be subject to rejection at any time due to failure to meet any of specified requirements, even though submittal data may have been accepted previously.

Equipment rejected after delivery shall be marked for identification and shall be removed from job site at once.

1.6 SYSTEM DESCRIPTION

- A. Equipment and materials specified herein are intended to be standard for use in controlling flow of water, wastewater, sludge, and air as noted on Drawings.
- B. Valves, appurtenances and miscellaneous items shall be installed as shown on Drawings and as specified, so as to form complete workable systems.
- C. Unless otherwise noted, powered valve operators shall have:
 - 1. Valves larger than 3-in: electric operators 460 Volt, 3 Phase, 60Hz.
 - 2. Valves 3-inch and under: electric operators, 120 Volt, 1 Phase, 60Hz.
 - 3. Solenoid valves: 120 volt, single phase, 60 Hz, NEMA 4 enclosure, continuous duty Class F coils and manual operator. Solenoid valves for seal water systems shall be "fail open" design; others shall be "fail closed" unless otherwise noted on Drawings or in the Instrumentation specifications.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Reference is made to Section 01600 for additional information.
- B. Packing and Shipping:
 - 1. Care shall be taken in loading, transporting and unloading to prevent injury to the valves, appurtenances, or coatings. Equipment shall not be dropped. Valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Damage to the coatings shall be repaired as acceptable to Engineer.
 - 2. Prior to shipping, ends of valves shall be acceptably covered to prevent entry of foreign material. Covers shall remain in place until after installation and connecting piping is completed.
 - a. Valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.
 - b. Valves smaller than 3-in shall be shipped and stored as above except that heavy cardboard covers may be used on the openings.
 - c. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until the valve is installed and put into use.
 - d. Corrosion in evidence at the time of acceptance by the Owner shall be removed, or the valve shall be removed and replaced.

C. Storage and Protection:

1. Special care shall be taken to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, to prevent deformation. See the individual piping sections and manufacturer's information for further requirements.

1.8 MAINTENANCE

- A. Special tools and the manufacturer's standard spare parts, if required for normal operation and maintenance, shall be supplied with the equipment in accordance with Section 01730 and where noted, as specified herein. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.
- B. Provide one operations and maintenance manual for each type of valve and operator supplied under this specification in accordance with Section 01730.
- C. Included within operations and maintenance manuals, provide a list of all spare and replacement parts with individual prices and location where they are available.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT - GENERAL

- A. Use of a manufacturer's name and/or model or catalog number is for purpose of establishing standard of quality and general configuration desired.
- B. Valves and appurtenances shall be of size shown on the Drawings or as noted and as far as possible equipment of same type shall be identical and from one manufacturer.
- C. Valves and appurtenances shall have name of maker, nominal size, flow directional arrows, working pressure for which they are designed and standard referenced, cast in raised letters or via riveted stainless steel nameplate upon some appropriate part of the body.
- D. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of same working pressure as pipe they connect to, whichever is higher and suitable for pressures noted where they are installed.
- E. Joints, size and material - unless otherwise noted or required by Engineer:
 1. Except where noted, joints referred to herein shall be of same type, nominal diameter, material and with a minimum rating equal to pipe or fittings

they are connected to.

2. Valves and appurtenances shall be of same nominal diameter as pipe or fittings they are connected to.
 3. Valves exposed to view, or in vaults:
 - a. Plastic valves in chemical service - solvent cement, or flanged ends.
 - b. 3-in and smaller - threaded ends- unless noted otherwise herein or on Drawings.
 - c. 4-in and larger - flanged ends.
- F. Provide special adaptors as required to ensure compatibility between valves, appurtenances, and adjacent pipe.
- G. No alternative materials will be considered for approval unless complete documentation is provided regarding their satisfactory long-term use in similar conditions; in addition, the consideration of any substitution will be considered only if superiority of proposed materials is the intent of substitution, and only if sufficient evidence is provided to document that superiority.

2.2 VALVE ACTUATORS - GENERAL/ MANUAL

- A. Geared actuators shall be suitable for all weather service, with mechanical shaft seals, shall be permanently greased, or shall have provisions for greasing. Actuators for submerged duty shall be so rated, with certification by manufacturer for submerged service.
- B. Valve manufacturer shall supply, mount, and test all actuators on valves at factory. Valves and their individual actuators shall be shipped as a unit.
- C. Unless otherwise noted on Drawings, valves shall be manually actuated; non-buried valves shall have an operating wheel, handle or lever mounted on operator; those with operating nuts shall have a non-rising stem with an AWWA 2-in nut; At least two tee handles shall be provided for operating nuts. Unless otherwise noted, operation for valves shall be CCW open.
- D. Manually actuated butterfly valves 6 inches and smaller for fluid service shall have a 10 position, spring retained ratcheting handle. Handle shall be fusion bonded epoxy coated steel or cast iron, hardware, spring and ratcheting plate shall be Type 316 stainless steel. Manually actuated butterfly valves for air service 6 inches and smaller shall have a memory stop handle with infinite throttling position capability. Memory stop plate and hardware shall be Type 316 stainless steel.
- E. Except as otherwise shown on Drawings or specified herein, valves 3-in diameter or larger, with valve hand wheel center line located 7-ft or more above operating floor, shall be provided with chain wheel operators complete

with chain guides and hot dipped galvanized steel chain, which loop within 4-ft of operating floor. These requirements shall supersede positioning lever actuator requirements of manual butterfly valves 6 inch and smaller.

- F. Actuators shall be capable of moving valve from full open to full close position and in reverse and holding valve at any position part way between full open or closed.
- G. Each operating device shall have cast on it the word "OPEN" and an arrow indicating direction of operation.
- H. Floor boxes for operating nuts recessed in concrete shall be standard cast iron type, cast-in- place, with fastening top, and Type 316 stainless steel hardware.
- I. Stem guides shall be of the adjustable wall bracket type, bronze bushed, with maximum spacing of 10-ft as manufactured by Clow; Rodney Hunt or equal. Extended operating nuts and/or stems shall have universal joints and pin couplings, if longer than 10-ft and a rating of at least five times the maximum operating torque. Stem adaptors shall be provided.
- J. Where required by installation, or as specified, provide the following: extended stem; floor stand and handwheel; position indicator and etched or cast arrow to show direction of rotation to open the valve; resilient, moisture-resistant seal around stem penetration of slab.
- K. Gear Actuators:
 - 1. Unless otherwise noted, gear actuators shall be provided for the following: plug and ball valves larger than 3-in diameter; butterfly valves larger than 6 inch diameter; where specified and/or indicated on Drawings; where manual operator effort is greater than 40 lbs rim pull.
 - 2. Actuators shall be capable of being removed from valve without dismantling the valve or removing valve from the line.
 - 3. Gear actuators for quarter turn valves shall be of worm or helical worm gear type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on output shaft. Where shown on Drawings, a two inch cast iron operating nut shall be provided. Actuators shall conform to AWWA C504 except where more stringent requirements are provided hereinafter. Gearing shall be machine cut steel designed for smooth operation. Bearings shall be permanently lubricated, with bronze bearing bushings provided to take thrusts and mechanical shaft seals to contain lubricants. Housings shall be sealed to exclude moisture and dirt, allow reduction mechanisms to operate in lubricant and be constructed of cast iron, ASTM A 126, Grade B, or of ductile iron, ASTM A 536. Gear housing bodies for thermoplastic valves may be cast aluminum or fabricated steel to reduce weight. Gear actuators shall indicate valve position and have adjustable stops.

4. Where indicated on Drawings, gear actuators for butterfly valves shall be of travelling nut type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on output shaft. Unless noted they shall conform to AWWA C504. Stem shaft shall be machine cut alloy steel, nut and cross head shall be bronze, lever shall be ductile iron. Nut Actuators for valves 24-in and smaller shall be slotted lever design, actuators for valves greater than 24 inch shall be link and lever design. Mechanism shall be lubricated with water resistant extreme pressure NLGI No. 2 grease. Bevel gear reduction box shall be mounted on the actuator when required to meet specified manual operating effort requirements Gear actuators shall have mechanical, external indication of valve position and have adjustable threaded stops secured to the stem with spring pins. Stop shall be capable of withstanding 450-fts-lb of input torque. Stop adjustment requiring shims are not acceptable.
 5. Manual Input torque to produce required valve operating torque for worm and travelling nut gear operators shall not exceed 80 ft-lbs. In addition, hand wheel rim pull shall not exceed 20 lbs for valve sizes up to 12 inches, 40 lbs for valve size between 14 and 20 inches, 60 lbs for valve size 24 and greater. Minimum hand wheel size shall be 8 inches for up to 12 inch valve size, 12 inches for up to 16 inch valve size, 18 inches for up to 20 inch size.
 6. Gear actuators for multi turn valves shall be of bevel or spiral bevel type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on output shaft. Gearing shall be machine cut steel designed for smooth operation. Bearings shall be permanently grease lubricated, with dual anti-friction ball bearings on output shaft and mechanical shaft seals to contain lubricants. Output flange of primary gear reducer shall be designed to meet an appropriate MSS or ISO standard to allow mounting to secondary gear reducer. Ring gear shall ride on ball bearings. Stem nut shall be bronze alloy, shouldered, and ride on needle bearings. Housing components shall be O-ring sealed to exclude moisture and dirt, constructed of cast iron, ASTM A 126, Grade B, or of ductile iron, ASTM A 536. Gear housing bodies for thermoplastic valves may be cast aluminum or fabricated steel to reduce weight. Manual operator input effort to the hand wheel shall be a maximum of 30 lbs for operating the valve from full open to full close, under any conditions. Maximum hand wheel size shall be 24-in diameter.
- L. Additional valve actuator requirements are included with the individual valve types and as noted in Paragraph 1.02 above.
- M. Position indication and direction of opening arrows shall be embossed, stamped, engraved, etched, or raised castings. Decals or painted indications shall not be allowed.
- N. Unless otherwise noted, valves larger than 3-in nominal diameter shall be

provided with position indicators at the point of operation.

2.3 VALVE ACTUATORS - POWERED

A. General:

1. Electric actuators for 1/4 turn valves three inches and under, which do not have submergence requirements, and which exhibit a maximum torque specified below shall be operated on 120 volt single phase power as specified below. Other actuators shall be operated on 480 volt power.
2. Actuators shall conform to AWWA Standard C540, insofar as applicable and as herein specified. Actuators shall be O-ring sealed, watertight to standard NEMA 4X/6, submersion to 6 feet for 30 minutes. Actuators installed in vaults below grade and elsewhere subject to submergence shall be watertight to standard NEMA 6P/IP68, 15 ft for 72 hours minimum. Actuators installed in hazardous locations as noted on the Electrical Drawings and/or area classification sheets of the Architectural Drawings shall be FM certified explosion proof for Class 1 Division 1 & 2, Groups C & D and also meet the standard NEMA 4X/6 rating.
3. 480 Volt powered actuators shall be Rotork IQ/IQM; Limitorque MX; EIM TEK 2000; AUMA SA/SAR. Actuators shall be configured as required to provide for part turn or multi-turn and be coupled with gearboxes as required to obtain the speed and operating torque as required for the valve or gate it controls.
4. Modulating actuators shall contain proportional control unit and be capable of 1200 starts per hour, open-closed valve actuators shall not require a proportional control unit, and be capable of 60 starts per hour.
5. Where shown on Instrumentation Drawings, actuators shall have a digital control module, to allow valves or gates to be positioned remotely via a 2-wire non-proprietary field bus protocol. Digital control module shall be equipped with serial communication ports to allow actuation to be linked by a two wire local area network utilizing Modbus function code (report by exception) and arranged in a self-healing ring configuration, with multi-drop taps to each actuator.

B. 120 Volt Single Phase Reversing, Non Spring Return Electric Actuators for 1/4 Turn Valves, 100 to 1000 in-lb Torque Range

1. Valve actuators shall be sized by valve supplier meeting requirements of AWWA C540. Actuators shall be mounted on valves in valve supplier's facility, and factory tested.

2. Actuators shall operate on 120 volt, 60 hz single phase, power supply. Enclosure rating shall be NEMA 4X, constructed of cast aluminum or steel alloy, powder coated or fusion bonded epoxy finish.
 3. Power train shall be self-locking planetary epicyclical gear design, consisting of hardened steel and or hardened bronze alloy gears with bronze bearings. Housing penetrations shall be sealed with mechanical seals. Housing shall be equipped with space heaters. Valve mounting system shall be ISO 5211.
 4. Actuator shall be designed for open/close/jog reversing service. Proportional/modulating service shall be provided where required in the equipment specifications or Instrumentation Drawings. Actuators shall have visual mechanical indication of position. Manual override shall be direct worm drive with minimum 5 inch diameter hand wheel. Hand wheel size shall be provided such that a maximum 40 lb rim pull is required.
 5. Motors shall be designed specifically for valve actuation service, with Class F insulation, with split phase capacitor protection. Duty cycle shall not be less than 40% at 100 degrees
F. for open/close duty, and 100% for modulating duty. 90 degree travel time shall vary from 10 to 20 seconds depending on actuator size. Actuators shall have SPDT contacts for remote valve position indication.
 6. Actuators shall be P Series as manufactured by Promotion Engineering, Brooksville, FL, or equal.
- C. 480 Volt Powered Actuators for Part Turn or Multi-Turn Valve Operation:
1. Operation:
 - a. Capabilities shall be provided to position valve (or gate) locally via Local/Off/Remote selector switch and Open/Stop/Close push buttons.
 - b. For on/off service, when in remote, actuator shall accept one remote signal to open valve or gate and a second remote signal to close valve or gate.
 - c. For modulating service, when in remote actuator shall accept a 4-20mADC position control signal, and shall position valve 0-90 degrees or gate 0-100% of travel in proportion to control signal.
 - d. Unless stated otherwise in valve specifications, actuator and gearing size shall be designed to operate valve at a disc speed of one foot travel per minute of operation. For quarter turn valves, valves shall rotate from stop to stop in 30 seconds per foot of throat diameter.
 2. Functional:
 - a. Motor operated valve controller shall include motor, operator unit gearing, limit switch gearing, limit switches, control power transformer, position transmitter (when required), torque switches, bored and key-wayed drive sleeve for non-rising stem valves, declutch lever and auxiliary handwheel as

- a self-contained unit. Valve contacts shall be capable of handling the current equivalent of a NEMA 1 size starter.
- b. Reversing starters shall be integral with actuator, and shall be solid-state starters for modulating service. Electro-mechanical reversing starters shall be acceptable for open-close service and shall be mechanically and electrically interlocked.
 - c. Limit switches and gearing shall be an integral part of valve control. Limit switch gearing shall be made of bronze or stainless steel and shall be fully lubricated, intermittent type and totally enclosed to prevent dirt and foreign matter from entering gear train. Limit switches shall be of adjustable type capable of being adjusted to trip at any point between fully opened valve and fully closed valve. Limit and torque switches shall be provided for stopping valve in both directions. Mid-travel switches shall be provided as required. Set position shall not be lost if over travel occurs in either manual or electric modes of operation.
 - d. Valve position transmitter shall be a gear actuated, two-wire device, producing 4-20 mA DC signal proportional to 0-90 degree valve position or to 0-100% of valve travel. Transmitter shall be provided with easily accessible zero and span adjustment potentiometers. Valve actuator shall be provided with a local digital or mechanical indicator integral with operator with a 0-100 percent scale. DC power supply shall be provided integral with operator and powered from 110 volt AC internal transformer. Positioner board shall provide repeatable accuracy to 0.25% of span. There shall be separate trim pots on positioner board for zero, span and dead band adjustment.
 - e. Speed of actuator shall be responsibility of system supplier with regards to hydraulic requirements and response compatibility with other components within control loop. Each valve controller shall be provided with a minimum of two limit switch functions, one for opening and one for closing. Each limit switch will have two normally open and two normally closed contacts. Gear limit switches shall be geared to driving mechanism and in step at all times whether in motor or manual operation. Provision shall be made for two extra sets of limit switches as described above, each to have two normally open and two normally closed contacts. Each valve controller shall be equipped with a double torque switch. Torque switch shall be adjustable and responsive to load encountered in either direction of travel. Limit and torque switch contacts shall be silver inlay type.
 - f. Each actuator shall include monitor relays to remotely indicate fault signal for indication of power failure, phase failure, thermal switch tripped, torque switch tripped between travel stops and Local-Off-Remote selector switch position.
3. Physical:
- a. Operator shall be equipped with open-stop-close push-buttons, a local-off-remote selector switch and indicating lights mounted on operator. Where operator will not be situated between 2-ft-0-in and 7-ft-0-in above operator platform, and where shown on Drawings provide a separate remote valve

- operating station.
- b. Motor shall operate on 460 volt, 60 hertz, 3 phase power and shall be sized by actuator manufacturer to provide the required output torque for service intended. Motor shall have Class F insulation, with a duty rating of at least 15 minutes at 40 degrees C ambient temperature. Motor shall be specifically designed and built by actuator manufacturer for electric actuator service. Commercially available motors shall not be acceptable. Actuator shall include a device to ensure that motor runs with correct rotation for required direction of valve travel regardless of connection sequence of the power supply.
 - c. Operators utilizing multiple reduction power gearing shall consist of spur, helical, or bevel gearing and worm of hardened alloy steel, and the worm gear shall be alloy bronze. Operators utilizing single-stage reduction shall be single-stage worm gear totally enclosed in a fully lubricated gearcase, with filling and drain plugs. Non-metallic, aluminum, or cast gearing shall not be allowed. Output shaft shall incorporate thrust bearings of the ball or roller type at the base of the actuator.
 - d. An operating wheel shall be provided for manual and/or emergency operation, engaged when motor is declutched by a lever or similar means, the drive being restored to power automatically by starting the motor. Operating wheel drive shall be mechanically independent of motor drive, and any gearing shall be such as to permit emergency manual operation, using a 40 pound force in a reasonable time. Clockwise operation of handwheel shall give closing movement of valve unless otherwise stated.
 - e. Each actuator shall be supplied with a start-up kit including installation instructions, wiring diagrams, and spare cover screws and seals to provide for losses during commissioning.
 - f. Continuous mechanical dial indication of valve and position shall be provided. Mechanical dial position indicator shall be in step with actuator at all times in both hand wheel and motor operation. For modulating applications, mechanical dial position indicator shall include graduations of 0-100 percentscale.
4. Wiring and Terminals:
- a. Internal wiring shall be of tropical grade PVC insulated stranded cable of 5 amp minimum rating for control circuits and of appropriate size for the motor 3 phase power. Each wire shall be clearly identified at each end.
 - b. Terminals shall be of stud type embedded in a terminal block of high tracking-resistance compound. The 3-phase power terminals shall be shrouded from control terminals by means of an insulating cover.
 - c. Terminal compartment shall be separated from inner electrical components of actuator by means of a watertight seal. Terminal compartment of actuator shall be provided with three threaded cable entries.
 - d. Each actuator shall be provided with a commissioning kit consisting of a wiring diagram and installation and operation manual. A separate wiring diagram shall be provided inside the terminal cover. No special tools,

devices or parts shall be required for commissioning.

- e. Actuators shall have separately sealed motor and control compartments. Operators shall have space heaters in their limit switch, motor, and control compartments.
5. Remote Control Stations:
- a. Where shown on Drawings, or where specified in Equipment Specifications, valve actuators shall be furnished with control stations suitable for mounting remotely from, but, in vicinity of actuator. Remote mount control station shall include a Local - Off - Remote selector switch, Open - Stop - Close pushbuttons and Open - Close indicating lights. Control station operators shall be heavy duty devices mounted in a cast iron, cast aluminum, or stainless steel NEMA 4X enclosure suitable for wall mounting. Wire gage and device quality shall meet or exceed the requirements of Division 16. Local - Off - Remote selector switch shall have auxiliary contacts for remote indication of switch position. Local - Off - Remote selector switch shall have provisions for padlocking in the "Off" position. Additional functionality and/or devices to those specified above are detailed on Instrumentation P&IDs and/or Electrical Control Schematic drawings. Refer to Drawings for confirmation of scope of the Remote Control Stations.
6. Performance Test:
- a. Each actuator shall be shop performance tested, and individual test certificates shall be supplied without additional charge to Owner. Test certificates shall be submitted prior to shipment of valve actuators. Test equipment shall simulate a typical valve load, and the following parameters shall be recorded:
 - 1) No load current.
 - 2) Current at maximum torque setting.
 - 3) Stall current.
 - 4) Torque at maximum torque setting.
 - 5) Stall torque.
 - 6) Test voltage and frequency.
 - 7) Flash test voltage.
 - 8) Actuator output speed.

2.4 BUTTERFLY VALVES

A. AWWA Butterfly Valves for Clear Water Service

- 1. Butterfly valves and operators up to 72-in diameter shall conform to AWWA C504, Class B, except as specified herein. Manufacturer shall submit an affidavit of compliance stating that valves have been manufactured and tested in accordance with AWWA C504 and specifically listing all exceptions. Valves shall have a minimum 150 psi pressure rating or higher as noted on Drawings or in this Section and be manufactured by M&H; Dezurik; Val-Matic; Henry

Pratt; or equal.

2. Butterfly valves for above grade service shall be flanged end with face to face dimensions in accordance with Table 2 of AWWA C504 for short-body valve. Valves for dead end shut off service shall be flanged type.
3. Valve seats shall be full resilient seats retained in body or on disc edge in accordance with AWWA C504. Valve discs shall be constructed of cast iron, ASTM A 48, Class 40; Ni- resist, ASTM A 436, Type 1; or ductile iron, ASTM A 536, Grade 65-45-12.
 - a. When resilient seats are attached to body, discs shall have Type 316 stainless steel seating edges. When resilient seat is attached to disc, it shall be fastened with a one piece Type 316 stainless steel retaining ring, Type 316 stainless steel Nylock set screws and a mating Type 316 stainless steel ring shall be installed in valve body. Resilient seats shall be EPDM. Seats shall be fully adjustable and replaceable with valves in place using no special tools.
4. Valve body shall be constructed of close grain cast iron per ASTM A 126, Class B with integrally cast hubs for shaft bearing housings of through boss-type. Permanently self- lubricating body bushings shall be provided and shall be sized to withstand bearing loads. Stuffing box of liberal dimensions shall be provided at operator end of vane shaft.
 - a. Packing shall be of self-compensating V-type. A sealing element utilizing O-rings shall also be acceptable for up to and including 24-in valves. Over 24-in, pull down seals using a square braid of graphite fiber is an acceptable alternate.
 - b. Packing shall be held in place by a bolted corrosion resistant retainer plate or gland; retainer clips are not acceptable. Valves 30-in or larger shall use a stuffing box with follower gland.
 - c. Replacement of seals, for all size butterfly valves, shall not require removal of valve from the line. In addition adjustment or replacement of seals on valves of 30-in or larger shall not require disturbing any part of valve or operator assembly, except any packing follower gland.
5. Valve shaft shall be of Type 316 stainless steel and designed for both torsional and shearing stresses when valve is operated under its greatest dynamic or seating torque. No reductions of shaft diameter will be allowed except at operator connection. Any reduction shall have a full radius fillet.
6. Butterfly valve actuator shall conform to requirements of AWWA C504, insofar as applicable and as specified herein. Gearing for actuators where required shall be totally enclosed in a gear case in accordance with AWWA C504. Actuators shall have permanent indicators with raised or engraved marks to show position of valve disc.

B. Blower Isolation and Pressure Relief (Blow Off) Valves: Tag Type BFV2.

1. Valves shall be high performance type, soft seat, offset disc, wafer style, except for dead end service, where fully lugged valves shall be used. Body class shall be 150 psi max differential pressure. Body shall be carbon steel, cast or ductile iron. Disc shall be ASTM B 148, C958 aluminum bronze or CF8M stainless steel. Stem shall be 17-4 PH stainless steel. Seat shall be reinforced Teflon/silicon. Stem packing shall be Teflon. Retaining ring and gland assembly shall be Series18-8 stainless steel, gland nuts shall be silicon bronze. Bearings shall be Type 316 stainless steel backed Teflon.
2. Valves shall be DeZurik or Pratt HP, Crane Flowseal, Bray Series 40, or equal.

2.5 GATE VALVES

A. General Requirements:

1. Unless otherwise specified below, these requirements shall apply to gate valves.
2. Gate valves shall meet requirements of AWWA C500, AWWA C509 and AWWA C515 as applicable to type of valve specified.
3. Submerged valves shall be furnished with mechanical joints and Type 316 stainless steel hardware; non-rising stem design. Flanges shall be provided if so indicated on Drawings.
4. Exposed valves shall be furnished with Class 125 flanged ends; provide valves with bolted bonnet, outside screw and yoke, unless otherwise noted on Drawings. Fasteners shall be Type 304 stainless steel.
5. Rising stem valves shall be sealed with adjustable and replaceable packing; valve design must permit packing replacement under operating system pressures with only moderate leakage.
6. Non-rising stem valves shall utilize a minimum of two O-ring stemseals.
7. Unless otherwise specified, valves shall be rated at or above for the following working water pressures:

Valve Size	Pressure
3-in to 12-in	200
14-in to 30-in	150
36-in and greater	as specified

- a. Valve bodies shall be hydrostatically tested to at least twice the rated working water pressure. In addition, valves shall be seat-tested, bi-directional at rated working pressure, with seat leakage not to exceed one

fluid ounce per inch of valve diameter per hour. Provide certificates of testing.

8. Flanged valves to have face-to-face dimensions per ANSI B16.10 and flanges per ANSI B16.1.
 9. Exposed valves 18-in and larger shall have valve by-pass. By-pass valves shall be of same disc type as main valve and shall meet these specifications.
 10. Bonnet and packing gland bolts shall be Type 316 stainless steel; packing gland bolts shall have bronze nuts.
 11. Exposed valves 16-in and greater indicated for horizontal stem installation shall be furnished with rollers, tracks and scrapers and enclosed bevel gear grease case.
 12. Provide geared operator and chain wheel, chain and chain guides for valves with handwheel centerline more than 7-ft above operating level.
 13. Valves shall be marked per AWWA Standards, including name of manufacturer, valve size, and working pressure and year of manufacture.
 14. Unless otherwise indicated, valves 12-in and smaller shall be capable of installation in vertical or horizontal position, and sealing in both directions at rated pressure.
- B. Valve Applications:
1. Valves for Potable Water Service:
 - a. Double disc design manufactured by Kennedy/ M&H/ Clow Valve.
 - b. Double revolving disc manufactured by American R/D Valve; Anchor Darling.
 - c. Solid wedge-resilient seated design as manufactured by Mueller Co; J & H Valve; M&H/Clow Valve; American Flow Control; American R/D Valve.
 2. Valves for Wastewater Service:
 - a. Solid wedge metal seated design manufactured by M&H Valve; American R/D Valve; Stockham Valve, or Walworth.
 - b. Resilient seated design manufactured by American Flow Control; Kennedy/M&H/Clow Valve; J & S Valve; US Pipe; Mueller or American R/D.
- C. Valve Requirements:
1. Double Disc:
 - a. Conform to AWWA C500.

- b. Wedging surfaces shall be bronze, Monel or stainless steel.
2. Double Revolving Disc:
 - a. Conform to applicable provisions of AWWA C500.
 - b. Wedging surfaces shall be Monel or hardened stainless steel.
 - c. Discs fully free to rotate, guided in travel by cast surfaces.
 - d. Disc rotation shall produce a self-cleaning action during opening or closing.
 - e. Wedging forces applied only when discs are in seating position.
 3. Solid Wedge:
 - a. All-metal valves shall be manufactured of ASTM A 126 Cast Iron, Class B. Wedge seating surfaces and body seat rings shall be cast from B62 bronze, and shall conform to AWWA C500.
 - b. Shall be coated internally and externally with an asphaltic varnish, per AWWA C500.
 - c. Body shall have tongue and grooved guides for wedges.
 4. Resilient Seated:
 - a. Resilient seated valves shall be manufactured of ASTM A 536 ductile iron, vulcanized rubber disc per AWWA C509, manganese bronze or Type 316 stainless steel stem and trim, full port design, Type 304 or Type 316 stainless steel fasteners as required in general requirements. Valves shall conform to AWWA C509 and be UL and FM approved.
 - b. Shall have internal and external fusion bonded epoxy coating of valve body, including bonnet, per AWWA C550.
 - c. Gate shall be encapsulated with EPDM according to ASTM D 2000. It shall be bonded and vulcanized in accordance with ASTM B 429 Method B.
 - d. Shall have no recesses in valve body.
- D. Gate Valves 3 inch and Smaller:
1. Gate valves 2.5-in diameter and smaller shall have screwed ends and shall be bronze body. Gate valves 3-in diameter shall be flanged end, iron or bronze body. Gate shall be brass, bronze, or Type 304 stainless steel solid wedge; union bonnet; silicon bronze rising-stem; equal to Jenkins Figure 47CUJ, division of Crane Valve Group; Lunkenheimer Figure 3127, Cincinnati Valve Co, Fairbanks Figure U-0252, or equal. Model numbers referenced above are for screwed ends, flanged shall be equal construction with appropriate end connections. Iron body valves shall be installed in steel or iron pipelines.
- E. Tapping Valves and Sleeves:
1. Under no circumstances shall a standard gate valve be used for a tapping valve. Tapping valves shall comply with same requirements as solid wedge, resilient seat or double disc gate valves except they shall have flanged end and

port opening modified for tapping service. Tapping valves shall be provided with plugged flush port at bottom of gate guide and plugged tap for pressure/leak testing. Valves shall be capable of passing a full nominal sized cutter without damage to the valve. Tapping sleeve shall be gray cast iron or ductile iron mechanical joint type with outlet flange conforming to MSS-SP-60.

2.6 KNIFE GATE VALVES

A. Open Bonnet Metal Seat Design:

1. Knife gate valves shall be lugged, one-piece cast Type 316 stainless steel body rated for 150 psi working pressure. Valves shall be marked for direction of flow with cast wedges and gate guides in body to force gate against the seat. Gate shall be a beveled knife edge. Valves shall have metal to metal seating, with a raised seat face with a relief groove to allow gate to push solid particles aside to prevent material packing in seat area. Gate shall be Type 316 stainless steel, polished with a surface finish of 32 micro-inch RMS or better. Valve body shall be full port for up to 12-in pipe size and minimum 95% port for 14 through 30-in pipe size. Seats shall be solid stainless steel. Body flanges shall be raised face, ANSI 125/150 drilling according to ANSI B16.5. Flange faces shall be machined and grooved according to MSS SP-6. Flange bolt holes shall be threaded.
2. Valve shall be open bonnet design, stem shall be 1/4-in pitch, 1/4-in lead, constructed of Type 304 stainless steel. Stem nut shall be acid resistant bronze. Valve yoke shall be Type 304 stainless steel, designed to support operator and without any movement or twisting at stall thrust capability of operator. Gate shall be seated with 4 rows of packing, packing gland shall be Type 304 stainless steel, energized by Belleville springs to provide a constant force on the packing. Packing gland bolts shall be Type 304 stainless steel with type 17-7 ph SS self-locking nuts. Sealing packing shall be Chevron type Acrylic/PTFE/silicone. Bottom row of packing shall be comprised of Teflon impregnated Kevlar to act as a gate wiper and protect the sealing packing.
3. For hand wheel operated valves hand wheel shall be sized to seat and unseat knife gate valve at specified operating pressure with a maximum rim pull of 40 lb. If necessary, a bevel gear operator shall be supplied. Bevel gear operators shall be fully enclosed and permanently lubricated, with a sealed housing to prevent contamination. Bevel gear operators shall meet the requirements of Paragraph 2.02 K. Bevel gear operators shall be provided with a stem cover to protect stem when valve is in open position. Stem cover shall be removable for inspection and maintenance. Electric operators shall be installed where shown on the Drawings.
4. V Port knife gate valves (VPKG) shall be as specified above and shall include a 45 degree V-port welded in place of same material as body. V-Port plate shall be fully seal welded.

5. Valves shall be ITT Fabri-Valve Model C37, Hilton Model H 200-SC, SCV, Orbinox or equal.

B. Open Bonnet Perimeter Seat Design:

1. Knife gate valves shall have a one-piece cast Type 304 stainless steel body with a recessed dovetail elastomer seat capable of providing bubble tight shutoff to the full rated pressure. Use of O-Ring seals on face of disc or body will not be acceptable. Body flanges shall be raised face, ANSI 125/150 drilling according to ANSI B16.5. Flange faces shall be machined and grooved according to MSS SP-6. Valve body shall be full port for up to 12- in pipe size and minimum 95% port for 14 through 30-in pipe size.
2. Gate shall be Type 316 stainless steel, polished with a surface finish of 32 RMS or better. Gate edges shall be radiused to mate with seat. Valve seat shall be an elastomeric seal mechanically retained in a trapezoidal groove around perimeter of valve body. Seat groove shall be relieved to minimize compression set of seat material. Seat material shall be EPDM. Valve shall have a positive travel stop to prevent seat damage.
3. Valve shall be open bonnet design, stem shall be 1/4-in pitch, 1/4-in lead, constructed of Type 304 stainless steel. Stem nut shall be acid resistant bronze. Gate shall be seated with 4 rows of packing, packing gland shall be Type 304 stainless steel, energized by Belleville springs to provide a constant force on packing. Sealing packing shall be Chevron type Acrylic/PTFE/silicone. Bottom row of packing shall be comprised of Teflon impregnated Kevlar to act as a gate wiper and protect the sealing packing.
4. For hand wheel operated valves, hand wheel shall be sized to seat and unseat knife gate valve at specified operating pressure with a maximum rim pull of 40 lb. If necessary, a bevel gear operator shall be supplied. Bevel gear operators shall be fully enclosed and permanently lubricated, with a sealed housing to prevent contamination. Bevel gear operators shall meet requirements of Paragraph 2.02 K. Bevel gear operators shall be provided with a stem cover to protect stem when the valve is in open position. Stem cover shall be removable for inspection and maintenance. Electric operators shall be installed where shown on the Drawings.
5. V Port knife gate valves (VPKGV) shall be as specified above and shall include a 45 degree V-port welded in place of same material as body. V-Port plate shall be fully seal welded.
6. Valves shall be ITT Fabri-Valve Model C67, Hilton Model H 202-SC, SCV, Orbinox or equal.

C. Bonneted Metal Seat Design:

1. Knife gate valves shall be lugged body rated for 150 psi working pressure. Valves shall be marked for direction of flow, and bar wedges and gate guides shall be installed in liner body to force gate against the seat. Gate shall be a beveled knife edge. Valves shall have metal to metal integral stainless steel seat, with a raised seat face with a relief groove to allow gate to push solid particles aside to prevent material packing in seat area. Wetted surfaces shall be Type 304 stainless steel with Type 304 stainless steel trim. Packing gland bolts shall be Type 304 stainless steel with naval bronze nuts. Body flanges shall be raised face, ANSI 125/150 drilling according to ANSI B16.5. Flange faces shall be machined and grooved according to MSS SP-6. Flange bolt holes shall be threaded.
2. Valves shall have a pressure-retaining bonnet that fully encloses the gate. Bonnet shall be rated at same pressure as valve body and shall not include any type of internal gate packing or gate wiper. A packing gland shall be located at top of bonnet to provide a tight seal around stem.
3. Wetted parts of body and bonnet shall be Type 304 SS, including fasteners. Exterior flanges and stiffeners shall be cast or fabricated carbon steel. Provide 2 inch flush and drain ports in bonnet, and ports shall be of same material as wetted parts. Provide 3/4 inch flush and drain ports in body and ports shall be of same material as wetted parts. Type 304 SS body cladding and face rings shall be fully welded to carbon steel body - "floating" body liners are not acceptable. Stainless steel welding shall be pickled and passivated. Gate shall be Type 304 SS, suitable for service conditions, and shall be ground and polished to a minimum surface finish of 32 micro-inch/inch R.M.S. to prevent damage to seat. For valves 20 inches and larger, hardened gate support strips shall be provided for valve gates oriented on edge, constructed of Stellite or equal material.
4. Stem shall be constructed of Type 304 SS, with Acme threads. Stem nut shall be of acid- resisting Bronze. Packing shall be Teflon-impregnated synthetic fiber, without included asbestos. Packing shall be replaceable without disassembling valve or removing valve from pipeline.
5. Valve yoke shall be carbon steel, designed to support operator and without any movement or twisting at stall thrust capability of operator.
6. For hand wheel operated valves, hand wheel shall be sized to seat and unseat knife gate valve at specified operating pressure with a maximum rim pull of 40 lb. If necessary, a bevel gear operator shall be supplied. Bevel gear operators shall be fully enclosed and permanently lubricated, with a sealed housing to prevent contamination. Bevel gear operators shall meet requirements of Paragraph 2.02 K. Bevel gear operators shall be provided with a stem cover to protect the stem when valve is in open position. Stem cover shall be removable for inspection and maintenance. Electric operators shall be installed where shown on the Drawings.

7. V Port knife gate valves (VPKGV) shall be as specified above and shall include a 45 degree V-port welded in place of the same material as the body. V-Port plate shall be fully seal welded.
8. Valves shall be Hilton Model H-200-BV-T304, Fabri-Valve CF134R, Orbinox, or equal.

2.7 PLUG VALVES

- A. Plug valves shall be of offset disc type, 1/4 turn, non-lubricated, serviceable (able to be repacked) under full line pressure and capable of sealing in both directions at rated pressure. Disc shall be completely out of flow path when open. Plug valves specified herein shall be manufactured by DeZurik; M&H Valve; or approved equal. Manufacturers named or otherwise, shall comply completely with this Section.
 1. Minimum port area shall be 80 percent when measured by percent cross-sectional area of equivalent size (nominal same diameter) pipe.
 2. Plug valves shall be capable of passing "pigging" cleaning equipment (using a Girard or similar cleaning pig of full nominal pipeline diameter) in either direction and manufacturer shall so certify that this may be done without use of special equipment.
- B. Valves shall be rated at minimum 175 psi WOG (Water, Oil and Gas) working pressure for sizes 4-in to 12-in inclusive and at minimum 150 psi WOG working pressure for sizes 14-in and larger and shall be capable of providing drop tight shut-off to full valve rating with pressure on either side of plug.
 1. Plug valves under this Paragraph shall be performance, leakage and hydrostatically tested in accordance with AWWA C517, except as modified herein.
 2. At above rated minimum working pressures, valves shall be certified by manufacturer as permitting zero leakage for a five-minute duration with full pressure applied in either direction.
 3. At direction of Engineer, valve manufacturer may be requested to perform a valve seat leakage test, witnessed by Engineer to prove compliance with this Section.
- C. Valve bodies shall be of cast iron, 30,000 psi tensile strength, ASTM A 126, Grade B, or of ductile iron, ASTM A 536 and of top entry, bolted bonnet design, cast with integral flanges conforming to connecting piping. Exposed bolts, nuts, and washers shall be zinc or cadmium- plated, except for submerged valves, which shall have Type 316 stainless steel hardware.
 1. Valve bodies shall be glass lined for plug valves installed in glass lined

ductile iron pipelines. Glass lining shall be as specified in piping specification.

D. Valve Plug:

1. Shall be Buna N coated, cast iron ASTM A 126, Grade B, or ductile iron, ASTM A536, Grade 65-45-12.
2. Shall be removable without removing valve from the line.
3. Shall have an integral upper and lower shaft which shall have seals on upper and lower journals to prevent entrance of solids into journals.
4. Shall be one piece for all valves.

E. Shaft bearings shall be permanently lubricated stainless steel or bronze at both upper and lower stem journals. Operator shaft shall have easily replaceable seals, which shall be externally adjustable and repackable without removing bonnet from valve, or shall have self-adjusting packing.

F. Valve seating surface shall provide full 360 degree seating by contact of a resilient seating material on plug mating with welded-in high nickel content overlay seating surface in body.

1. Seating design shall be resilient and of continuous interface type having consistent opening and closing torques and shall be non-jamming in closed position. Screw-in seats shall not be acceptable.
2. Plugs shall have a full resilient facing of neoprene or Buna-N.

G. Valves 6 inch and larger shall be actuated via gearbox and hand wheel, unless mechanized, which shall require gearbox and actuator. A suitably sized steel actuator mounting bracket shall be provided to provide an air gap between actuator and valve stem seal. Under no circumstance shall gear box be mounted directly to top body flange such that leakage could directly enter gear box.

H. Unless otherwise required due to location or mechanized operation, each valve 4-in and smaller shall be provided with its own securely attached lever. Provide adjustable limit stops for both opening and closing and a clearly marked position indicator.

I. Plug valves shall be installed so that direction of flow through valve and shaft orientation is in accordance with manufacturer's recommendations. Unless otherwise noted, shaft shall be horizontal, with plug opening up.

2.8 CHECK VALVES

A. Iron Swing Check Valves for Metallic Lines of 4-in to 30-in Diameter:

1. Check valves shall be swing type and shall meet the requirements of AWWA C508. Valves shall be iron body, bronze mounted, single disc, minimum 175 psi working pressure for 4 to 12 inch, 150 psi working pressure for 14 to 30 inch, non-shock and hydrostatically tested at 300 psi. When there is no flow through line, disc shall hang lightly against its seat in practically a vertical position. When open, disc shall swing clear of waterway. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing valve from line.
2. Check valves shall have corrosion resistant seat and body rings. Bronze or ductile clapper arm and bronze or 316 stainless steel bolts on the bolted cover. Shaft assembly and key shall be ASTM A 582 Type 316 stainless steel or higher grade and supported at both ends by non-corrosive, lead free bushings. The shaft shall be sealed where it passes through the body by compression packing retained by a packing gland, gland studs and nuts.
3. Slow closing operation valves 6 inch and larger shall be fitted with an extended hinge arm, outside lever, weight or spring. Position of weight shall be adjustable. Various weights shall be provided and installation approved by Engineer. Lever shall be installed to horizontal in closed position, for both horizontal and vertical pipeline installations.
4. For free opening and fast closing operation valves 6 inch and larger shall be fitted with an air/oil filled cushioned check valve utilizes a totally enclosed cushion cylinder externally mounted to the side of the main valve body. A heavy outside lever, positively clamped to an extra-large diameter pivot shaft with weight level. The position of weight shall be adjustable. The position and the setting of the air/oil filled cushion shall be provided and installation approved by Engineer. Lever shall be installed to horizontal in closed position, for both horizontal and vertical pipeline installations.
5. Where check valve position switches are required as shown on Instrumentation Drawings, check valves shall be furnished complete with position switch mounting bracket and actuation lever mounted to stem shaft. Where outside lever and weights are required, stem shaft shall extend both sides of valve body and position switch assembly shall be mounted on opposite side of lever and weight assembly.
6. Where position switches are to be supplied for existing check valves with external shaft and lever, supply mounting brackets and hardware required to mount position switches to existing valves. Contractor shall use existing bolting where possible to mount brackets. If bolting is not available in required area, Contractor shall drill and tap valve body if required to mount position switches. Drill location and depth shall be reviewed with, and approved by Engineer.

7. Position switches shall be lever type, NEMA 7 enclosure, SPST, 120VAC, 6A, Square D Type 9007CR or equal. Hardware shall be Type 316 stainless steel.
8. Check valves shall be manufactured by DeZurick; GA; Mueller/Pratt; or equal.

B. Dual Disc Check Valves:

1. Blower Discharge Service: Tag Type DDCV1.
 - a. Check valve shall be wafer style dual shaft design with torsion spring induced closure. Valve body shall be pressure class 125, Class 35 cast iron or steel; shafts shall be Type 316 stainless steel, Discs shall be Type 316 stainless steel or aluminum bronze; spring shall be INCONEL. Seat shall be resilient, vulcanized, Viton A. Double disc check valve shall be Titan CV41, Cameron Valve, Techno Check, Style 5051 or equal.

C. Rubber Flapper Check Valves:

1. Body shall be cast iron, ASTM A 126, Class B, or ASTM A 536 Gr 65 Ductile iron, 150 lb flanged. Body shall be fusion bonded epoxy coated. Disc shall be Nylon reinforced EPDM encapsulated steel. Valve body and open disc shall provide full flow at least equal to nominal pipe diameter. Seating surface shall be on a 45-degree angle. Top access port shall be full size, allowing disc removal without removing valve body from pipeline. Disc shall be one piece construction, precision molded with and integral O-ring sealing surface and contain steel and nylon reinforcements in both the flex and central disc areas.
2. Rubber flapper check valves shall be as manufactured by Crispin Multiplex Series 500, equal by Val-Matic or equal.

2.9 BALL VALVES:

A. General Service Ball Valves:

1. Valves shall be bronze, resilient seated, full port, threaded two piece bolted body type valves. Manual valves shall have locking levers. Body and cap shall be of brass, ASTM B 30, ball and stem of Type 316 stainless steel and seats and seals of glass filled TFE. Balls shall be full floating, non-lubricated. Valve seats shall be easily accessible and replaceable.
2. Valves shall be Jamesbury Series 2000 Style 21 as manufactured by Metso Automation; or equal.

2.10 GLOBE VALVES:

- A. Globe valves 3-in diameter and smaller shall have flanged, or screwed ends as

required and shall be bronze body, union or bolted bonnet, renewable full plug stainless steel disc, renewable hardened stainless steel seat ring, rising silicon bronze stem, pressure class 200. Globe valves shall be Figure 3245P as manufactured by Walworth Co.; Valley Forge, PA; Jenkins Figure 592J, division of Crane Valve Group; Stockham Figure B-62; Lunkenheimer Figure 73-PS, Cincinnati Valve Co, Fairbanks Figure 0505, or equal. Model numbers referenced above are for screwed ends, flanged ends shall be provided where shown on Drawings and shall be equal construction with appropriate end connections. Iron body valves shall be installed in steel or iron pipelines.

2.11 THERMOPLASTIC VALVES TAG TYPE NOTED BELOW

A. General:

1. Valves shall be certified as completely compatible with intended and specified service; compatibility shall apply to material of valve and internal components, including seals, gaskets, O-rings and washers; solvents and primers used in valve joint make-up shall be specifically in conformance with written instructions of valve supplier. Service chemicals and service conditions are shown in the piping sections in Division 15.
2. Except as otherwise specified, valve ends shall be socket-type designed for solvent welding. Solvent and primer shall be as specified in piping specifications, except that valves installed in systems carrying strong oxidizing, high alkalinity, and strong acid solutions shall contain NO fumed silica, and shall be Weld-On 724 for CPVC pipe as manufactured by IPS Corp., Compton, CA and Oatey Industrial Grade Low VOC Heavy Duty Gray for PVC pipe as manufactured by Oatey Corp., Cleveland OH.
3. Valve body material shall be same as piping system in which valve will be installed, unless explicitly stated otherwise on Drawings or in valve specification.
 - a. PVC shall have a cell classification 12454 according to ASTM D 1784, made from unplasticized polymer, and generally suitable for service to 120 degrees F.
 - b. CPVC shall have a cell classification 23447 according to ASTM D 1784, generally suitable for service to 180 degrees F.
 - c. Polypropylene (PP) shall conform to material requirements of ASTM D 4101 for copolymer polypropylene.
 - d. PVDF (polyvinylidene fluoride) shall be manufactured from high molecular weight polymers of vinylidene fluoride.
 - e. Manufacturer of valves shall retain material source quality documentation and shall furnish it to Engineer upon request.
4. Unless otherwise specified:
 - a. Valve seats shall be Teflon, or Teflon encapsulated elastomer. Alternative materials shall not be substituted without complete documentation

- provided to Engineer of service suitability.
- b. Flange Gaskets shall be low torque, full face ANSI B16.5 with two concentric convex rings between ID and bolt hole diameter, constructed of EPDM, PTFE-bonded EPDM or PVDF-bonded EPDM as manufactured by Asahi of America or equal. Documentation shall be provided to show compatibility of bonded surface material for fluid service intended.
 - c. Valve external hardware shall be Type 316 stainless steel. No internal metallic components shall be exposed to service fluid.
 - d. No factory or field coatings shall be applied to valves.
5. Valves, except butterfly valves, shall have a non-shock service pressure rating of not less than 120 psig at 70 degrees F.
 6. Valves from 1/2-in to 2-in shall have a snap-on fit handle attaching to valve stem to prevent handle from falling off. Valves from 2-1/2-in to 6-in shall have a handle mechanically attached to valve stem to prevent handle from falling off. Valves shall have limit stops at full open and full close to limit handle rotation.
 7. Valves shall be given hydrostatic and pressure and leakage tests at factory. Provide certified copy of test results.
 8. Valves shall be the standard, catalogued products of the following manufacturers:
 - a. Chemtrol.
 - b. Asahi/America.
 - c. Plast-O-Matic.
 - d. George-Fischer.
 - e. IPEX.
 9. Valves specified as furnished with equipment or equipment systems shall comply with these requirements.
- B. Ball Valves:
1. Ball valves shall be double-union type, unless otherwise specified, full-port, adjustable seats.
 2. Provide quarter-turn manual valve operator unless mechanized actuators are specified on Drawings.
 3. Shall be PVC body, furnished with socket ends, EPDM O-rings and stem seals, PTFE seats with EPDM O-ring backup.
- C. Ball Check Valves:
1. Ball check valves shall be double-union style with socket ends, solid and

completely spherical ball, EPDM seals, PTFE seat, capable of either horizontal or vertical mounting. Ball check valves shall be SXE Series as manufactured by IPEX or equal.

D. Diaphragm Check Valves:

1. Diaphragm check valves shall be union PVC, CPVC or PVDF body, thread or socket weld ends, EPDM or FKM diaphragms. Acid service valves shall be PVDF body with FKM diaphragm, and shall be furnished with PVDF flanges to connect to flanged piping. Valves shall be mountable in any position, and shall be Plast-O-Matic model CKM or equal.

2.12 NEEDLE VALVES:

- A. Needle valves shall have a cast bronze or 18-8 stainless steel body, minimum pressure class 200. Ends shall be ANSI B2.1 threaded. Valves shall have a rising bronze stem and non-slip resilient rubber-coated malleable iron hand wheel.
- B. Needle valves shall be Figure 1976 as manufactured by the William Powell Company, Cincinnati, OH, or Figure 88 as manufactured by Crane Company, Valve Division, Chicago, IL; Lunkenheimer Figure 906-BS or equal.

2.13 PRESSURE REGULATING VALVES:

- A. Pressure regulating valves shall be factory tested. Outlet pressure shall be easily field-adjustable over pressure ranges and criteria noted on Drawings.
- B. Threaded pressure regulating valves shall have unions mounted in pipe on each side of valve.
- C. Strainers shall be provided up stream of pilot valves and hydraulic components associated with main valve. Pressure regulating valve manufacturer shall specify screen mesh or size of perforations that are required to protect regulating valve or hydraulic component. Strainers shall be constructed of Type 316 stainless steel.
- D. Pressure Regulating Valves - 3-in and larger:
 1. Valves 3-in and larger and for pressure regulating shall be flanged with globe body, fully bronze mounted, external pilot operated, spring-loaded diaphragm type single seat with seat base equal to size of valve and shall be equal to Figure x-4500D (with an industrial chrome finish) Pressure Reducing Valve as manufactured by GA Industries Inc., Pittsburgh, PA; Clayton Model 90 by Cla-Val Company, Newport Beach, CA; Bailey, Fresno, CA; similar models by Ross; OCV; Watts/Muesecos or equal.
 2. Valve shall be packed with leather material acceptable to Engineer to ensure

tight closure and prevent metal to metal friction and sticking. Valve shall be furnished with indicator rod, to show position of opening of the piston, and pet cocks for attachment to valve body for receiving gauges for testing purposes.

3. Pilot valve, controlling operation of main valve, shall be easily accessible and so arranged to allow for its removal from main valve, while main valve is under pressure. Pilot valve shall be easily adjustable without removal of springs, weights or use of special tools. Control piping on valves shall have strainers to prevent plugging of control mechanisms.
 4. Design shall be such that repairs and dismantling internally of main valve may be made without its removal from line.
 5. Unit shall be flanged. Valve body shall be constructed of cast iron.
 6. Valve shall maintain pre-adjusted downstream pressure for varying rates of flow through positioning of diaphragm by pilot without causing: water hammer or waste of water and without cavitation.
- E. Pressure Regulating Valves - 2-in and Smaller:
1. Pressure regulating valves 2-in and smaller shall be rated 150 psig working pressure, with bronze and brass body; renewable stainless steel seat and flexible diaphragm of suitable material. Outlet pressure shall be easily field-adjustable over pressure ranges tabulated.
 2. Pressure regulating valves 2-in and smaller shall be Figure No. 43D as manufactured by GA Industries, Inc.; Watts Muesco Regulator Co. Series 115 for 1-1/4-in and larger and Model 223-S for units smaller than 1-1/4-in or equal with strainer and of size noted on Drawing. Shall be diaphragm type, pressure reducing globe valves designed for an inlet pressure of approximately 110 psig, and outlet pressures in range of 20 to 60 psig.

2.14 SOLENOID VALVES:

- A. Solenoid valves shall be packless piston type direct acting for sizes less than 1-in and internal pilot operated for sizes 1-in and larger, 2-way or 3-way, valves and shall be ASCO Valve; Red Hat by Automatic Switch Co., similar by Circle Seal Controls-Atkomatic Valve Co. or equal for air and water service.
- B. Valves shall be energized to open, except for valves on water seal lines to pumps which shall be energize to close.
- C. Valves shall have forged brass bodies, NPT end connections of connected piping Type 304 stainless steel internal parts, and Buna-N or Ethylene Propylene valve seats. Valves shall have a minimum 150 psig safe working pressure and zero

minimum operating pressure differential. Connections shall be threaded.

- D. Solenoid valves size 2-inch and larger shall be full bore bronze body, Type 430 stainless steel plunger, copper coil class A encapsulated, Type 302 stainless steel spring, wash-down safe, equal to type A as manufactured by Magnatrol Valve Corp., Hawthorne, NJ or equal. Solenoid valves shall have a manual override actuated by a handle levered plunger mounted on bottom of valve body. These valves shall be mounted in a horizontal run of piping, with solenoid up in vertical position.
- E. Note that solenoid valves may be shown on Electrical and/or Mechanical Drawings, or may only be specified, but if so specified or shown, shall be provided. Solenoid valves located in hazardous classified areas shall be provided with electrical enclosures which satisfy electrical classification as specified or shown on Electrical Drawings.

2.15 CORPORATION STOPS:

- A. Corporation Stops 3/4-in through 2-in shall be ball valve type, meeting AWWA Standard C800- 01, Sec. 4.2.3 (High Pressure), withstanding working pressures up to 300 psi. Body, ball, operating stem, T-head, and service line connector shall be manufactured from red brass and conform to ASTM B 62 and/or ASTM B 584, UNS No. C83600. Ball shall be fluorocarbon coated and shall float on two EPDM seats and be watertight in both directions. Operating stem and nut shall be one piece, held in place by a mating machined flange on stem and in body. Operating stem shall have an EPDM O-ring to provide a watertight seal against the body.
- B. Inlet threads shall be AWWA Taper, except where used with service clamps, where threads shall be IPS threads. Thread types and diameters shall conform to AWWA C800. Inlet threads will be integral to body. Waterway diameter shall be approximately equivalent to nominal size of stop, and shall accommodate maximum cutter size established by AWWA C800. Outlet shall be a compression connection meeting AWWA C800 Sec. 4.4.9.
- C. Corporation Stops shall be FB Style Ballcorp, as manufactured by The Ford Meter Box Company, Inc., Wabash, Indiana, or equal. Where corporation stops are used with plastic pipe, a brass companion flange shall be provided on outlet of each corporation stop.

2.16 AIR RELEASE AND VACUUM RELIEF VALVES:

- A. Pipeline air and vacuum valves shall be supplied with shutoff gate or ball valves with operator handle or lever removed. Valves shall be properly vented and piped to drain.
- B. Valve pressure rating shall be at least equal to attached pipe's rating.

- C. Valves for sewage service shall have connections for draining and flushing with isolation ball valves for connection size up to 3 inch, and solid wedge gate valves for size 4 inch and larger.
- D. Air Release Valves:
1. Small orifice assembly air release valves shall automatically release air accumulations from pipe while under positive pressure. When valve body fills with air, float mechanism shall fall to open small orifice and exhaust air to atmosphere. When air has been exhausted, float mechanism shall be buoyed up and shall tightly close small orifice. Small orifice assembly shall be furnished with Type 304 stainless steel body and cover, and shall use Type 316 stainless steel hardware. Float mechanism shall be constructed of polypropylene or Type 316 stainless steel. Wetted components shall be polypropylene, Buna-N or Type 316 stainless steel. A resilient, Buna-N seat shall provide drop-tight closure.
 2. Separate air release valves shall be Vent-O-Mat Model RBXb, equal as manufactured by APCO; Val-Matic; GA; Crispin or equal of the special type for use with non-clean water.
- E. Vacuum Relief Valves:
1. Large orifice assembly vacuum valves shall automatically allow air to enter pipeline when pressure falls below atmospheric pressure. Vacuum relief valves shall not be configured to release air.
 2. Vacuum relief valves shall be constructed as specified in subparagraph F below, except providing vacuum relief only, as manufactured by Vent-O-Mat.
- F. Combination Air and Vacuum Relief Valves:
1. Valves shall be designed to release large amounts of air during pipeline filling, release small amounts of air accumulated during pipeline operation, and allow large volume of air during pipeline drainage or pipe break. Combination double orifice air/vacuum valve for general service in sizes 1 to 6 inches housed in a tubular stainless steel body with epoxy powder coated cast iron or steel ends secured by means of stainless steel tie rods. Valve shall have an intake orifice area equal to nominal size of valve.
 2. Air release/vacuum valves shall be compact single cylindrical chamber design with multiple solid cylindrical HDPE control floats. Discharge of pressurized air shall be controlled by seating and unseating of a small orifice nozzle on a natural rubber seal affixed into control float. Nozzle shall have a flat seating land surrounding orifice so that damage to rubber seal is prevented. Venting of

large quantities of air during pipeline filling shall be accomplished through large orifice at top of valve. Large orifice sealing shall be affected by flat face of control float seating against an "O" ring housed in a dovetail groove circumferentially surrounding orifice. Valve shall feature integral 'Anti-Shock' Orifice mechanism in op float which shall operate automatically to limit transient pressure rise or shock induced by closure to twice valves rated working pressure. Vacuum relief shall be accomplished through large orifice when control floats fall due to negative pressure in pipeline. Valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. Feature shall consist of easily replaceable gaskets.

3. Valves shall be rated for 230 psi service. Materials of construction shall be as follows: barrel- Type 304L stainless steel; top and bottom flanges- fusion bonded epoxy steel; upper/lower floats and anti-shock orifice- UHMW PE; small orifice nozzle seat and O- rings- Buna-N; nozzle, baffle plate, tie rods, studs, nuts, washers- Type 304 stainless steel. End Connections shall be NPT up to 2 inch, 125 lb flange 3 to 6 inch.
4. Valves shall be as manufactured by Vent-O-Mat, Model RBX 2521 or 1631.

2.17 MUD VALVES (PLUG DRAIN VALVES):

- A. Mud valves shall non- rising stem type, with cast iron body. Stem, stem nut, stop collar, disc ring shall be bronze. Seat ring shall be bronze with a tapered, accurately machined seating face. Plug seat shall be a seamless molded ring of Buna-N tapered to accurately mate with seat. Bolts and nuts shall be stainless steel.
- B. Valves shall be equipped with extension stem and floor box with operating nut or floor stand and hand wheel operators. Stop nut and shaft supports (stem guides) shall be provided as recommended by manufacturer to prevent damage to valve or shaft, but at no greater spacing than noted in Paragraph 2.02 above.
 1. Where shown on Drawings, mud valve operators shall consist of vertical extension stems, stem guides, wall mount floor stand bracket, floor stand, 90 degree bevel gear box, horizontal extension stem, extension stem support bearing, and hand wheel. Shafting shall be Type 316 stainless steel; gearboxes shall be ductile or cast iron body, bronze bearing, steel gearing, grease lubricated, with mechanical lip shaft seals; floorstands brackets shall be heavy fabricated steel or cast iron, primed and finish painted per Section 09902. Operator assemblies shall be as manufactured by Roto Hammer Company, Tulsa OK, or equal.
- C. Mud valves shall be flanged, Waterman Figure MV-11; Clow Style F3075, similar by Mueller; M&H or equal.

2.18 SURFACE PREPARATION AND SHOP COATINGS

- A. Notwithstanding any of these specified requirements, coatings and lubricants in contact with potable water shall be certified as acceptable for use with that fluid.
- B. If not specified herein, coatings shall comply with the requirements of Section 09901 and 09902. In case of a conflict, requirements of this Section govern.
- C. If manufacturer's requirement is not to require finished coating on interior surfaces, then manufacturer shall so state and no interior finish coating will be required, if acceptable to Engineer.
- D. Exterior surface of various parts of valves, operators, floor-stands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease or other foreign matter and thereafter one shop coat of an approved rust-inhibitive primer such as Inertol Primer No. 621 shall be applied in accordance with instructions of paint manufacturer or other primer compatible with finish coat provided.
- E. Unless otherwise noted, interior ferrous surfaces of valves shall be given a shop finish of an asphalt varnish conforming to AWWA C509, (except mounting faces/surfaces) or epoxy conforming to AWWA C550 with a minimum thickness of 6 mils.
- F. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating. Mounting surfaces shall be especially coated with a rust preventative.
- G. Special care shall be taken to protect uncoated items and plastic items, especially from environmental damage.

2.19 FACTORY INSPECTION AND TESTING

- A. Factory inspection, testing and correction of deficiencies shall be done in accordance with the referenced standards and as noted herein.
- B. See Division 1 for additional requirements. Also refer to Part 1, especially for required submission of test data to Engineer.
- C. In addition to tests required by referenced standards, the following shall also be factory tested:
 - 1. Pressure regulating valves shall be factory tested at specified pressures and flows.
 - 2. Butterfly valves shall be factory tested to demonstrate drop tight closure at specified conditions.
 - 3. All types of air and vacuum valves.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

- A. Valves and appurtenances shall be installed per manufacturer's instructions in locations shown, true to alignment and rigidly supported. Damage to above items shall be repaired to satisfaction of Engineer before they are installed.
- B. Install brackets, extension rods, guides, various types of operators and appurtenances as shown on Drawings, or otherwise required. Before setting these items, check Drawings and figures which have a direct bearing on their location. Contractor shall be responsible for proper location of valves and appurtenances during construction of the work.
- C. Materials shall be carefully inspected for defects in construction and materials. Debris and foreign material shall be cleaned out of openings, etc. Valve flange covers shall remain in place until connected piping is in place. Operating mechanisms shall be operated to check their proper functioning and nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to Engineer.
- D. Where installation is covered by a referenced standard, installation shall be in accordance with that standard, except as herein modified, and Contractor shall certify such. Also note additional requirements in other parts of this Section.
- E. Unless otherwise noted, joints for valves and appurtenances shall be made up utilizing same procedures as specified under applicable type connecting pipe joint and valves and other items shall be installed in proper position as recommended by manufacturer. Contractor shall be responsible for verifying manufacturers' torquing requirements for all valves.

3.2 INSTALLATION OF MANUAL OPERATIONAL DEVICES

- A. Unless otherwise noted, operational devices shall be installed with units of factory, as shown on Drawings or as acceptable to Engineer to allow accessibility to operate and maintain item and to prevent interference with other piping, valves, and appurtenances.
- B. For manually operated valves 3-in in diameter and smaller, valve operators and indicators shall be rotated to display toward normal operation locations.
- C. Floor boxes, valve boxes, extension stems and low floor stands shall be installed vertically centered over operating nut, with couplings as required and elevation of box top shall be adjusted to conform to elevation of finished floor surface or grade at completion of Contract. Boxes and stem guides shall be adequately

supported during concrete placement to maintain vertical alignment.

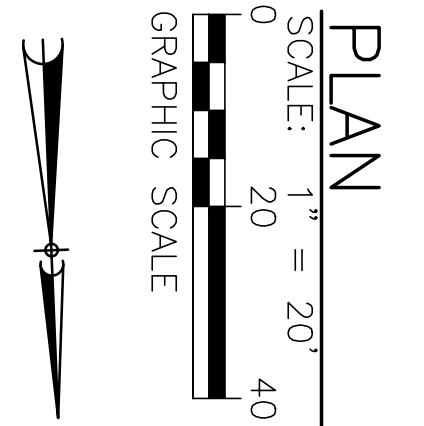
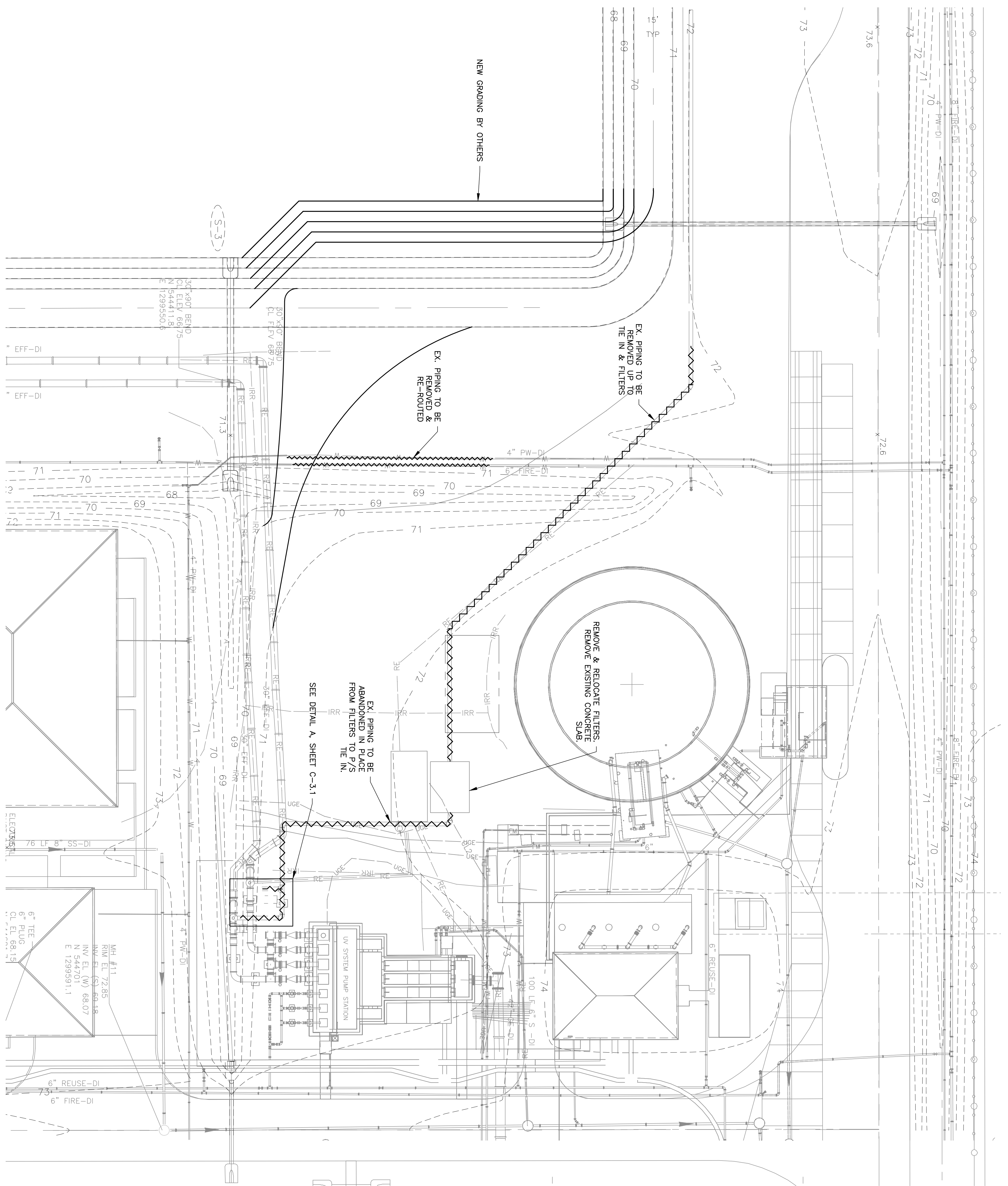
3.3 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

- A. See also Division 1. Take care not to over pressure valves or appurtenances during pipe testing. If unit proves to be defective, it shall be replaced or repaired to satisfaction of Engineer.
- B. Functional Test: Prior to plant startup, items shall be inspected for proper alignment, quiet operation, proper connection and satisfactory performance. After installation, manual valves shall be opened and closed in presence of Engineer to show valve operates smoothly from full open to full close and without leakage. Valves equipped with electric, pneumatic or hydraulic actuators shall be cycled five times from full open to full closed in presence of Engineer without vibration, jamming, leakage, or overheating. Pressure control and pressure relief valves shall be operated in presence of Engineer to show they perform their specified function at some time prior to placing piping system in operation and as agreed during construction coordination meetings
- C. Various pipe lines in which valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed, and replaced, or otherwise made acceptable to Engineer.
- D. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with specified operational capabilities and deficiencies shall be corrected or device replaced or otherwise made acceptable to Engineer.

3.4 CLEANING

- A. Items including valve interiors shall be inspected before line closure, for presence of debris. At option of Engineer, internal inspection of valve and appurtenances may be required any time that likelihood of debris is a possibility. Pipes and valves shall be cleaned prior to installation, testing disinfection and final acceptance.

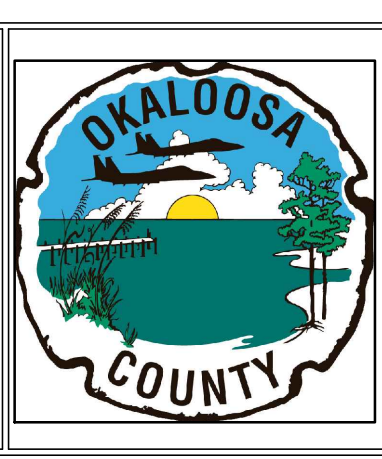
END OF SECTION



PLAN
 SCALE: 1" = 20'
 GRAPHIC SCALE

Constantine Engineering
 1988 LEWIS TURNER BLVD.
 FORT WALTON BEACH, FL 32547
 PH. 850-244-5800
 FL. CERTIFICATE OF AUTHORIZATION # 9816

FILE: SEE LEFT
 VERIFY SCALE
 DATE: OCTOBER 2018
 PROJ.: 100501.00
 DWG.: C-3.0



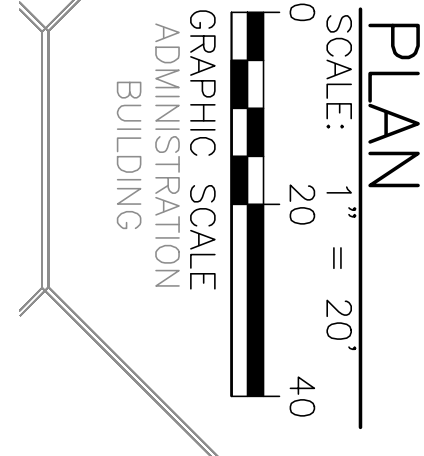
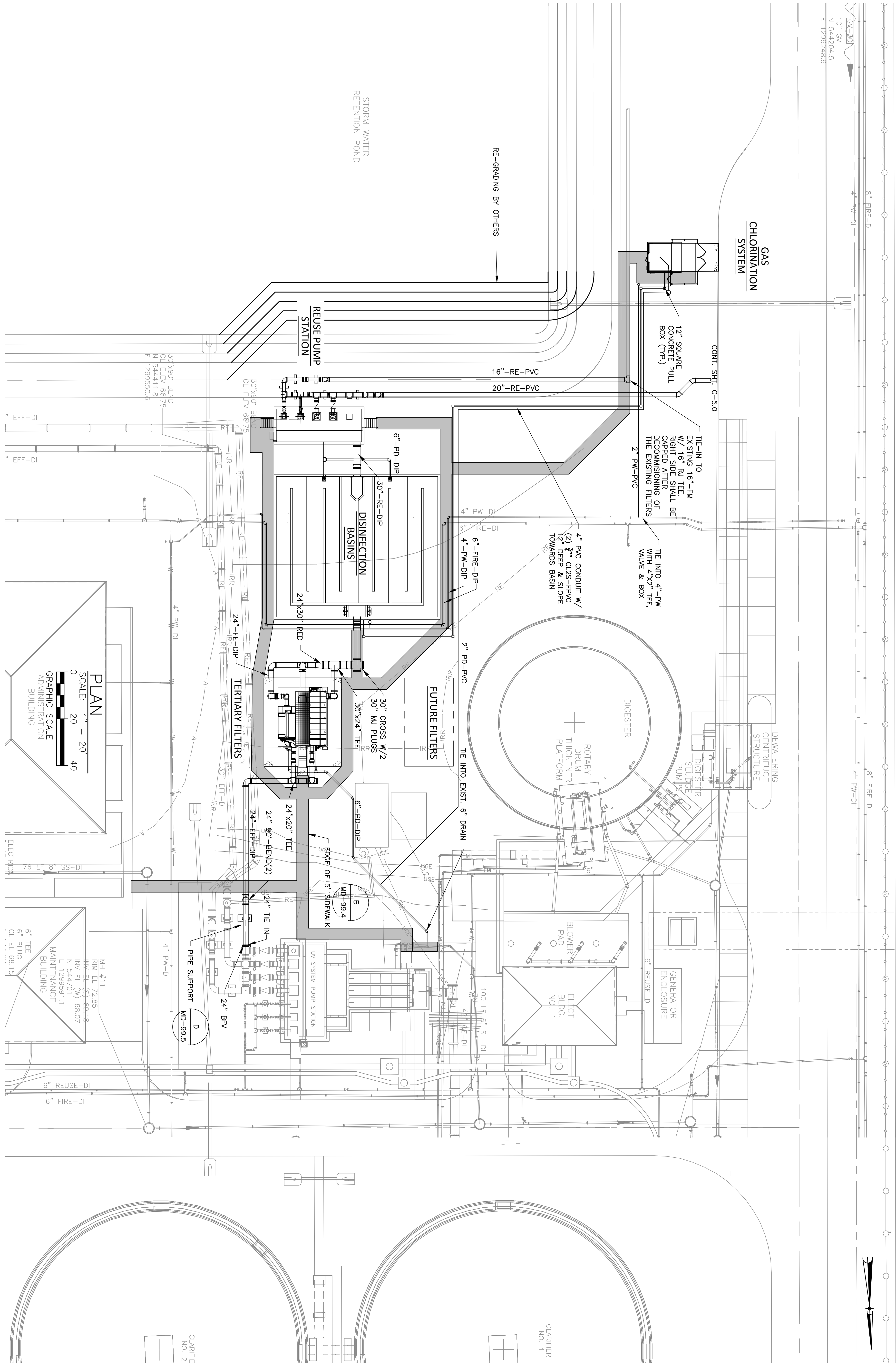
DEMOLITION & GRADING PLAN

OCWS APWRF RECLAIM EXPANSION

NO.	DATE	REVISION	BY	APVD			
DESIGNED BY:	TCG	DRAWN BY:	TCG	CHECKED BY:	JC	APPROVED BY:	JK

ENGINEER SEAL

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JOSEPH P. CHAVIS, 66863

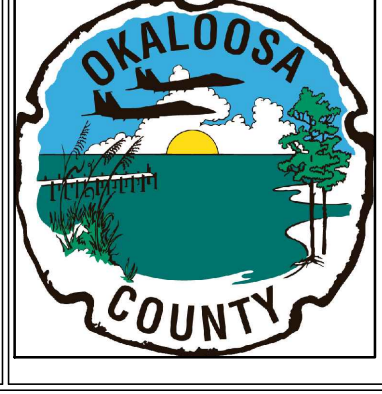


PLAN
 SCALE: 1" = 20'
 0 20 40
 GRAPHIC SCALE
 ADMINISTRATION
 BUILDING

MH #11
 INV. EL. (M) 72.85
 RIM. EL. (M) 69.18
 INV. EL. (M) 69.07
 N 544701
 E 1299591.1
 MAINTENANCE
 BUILDING
 6" TEE
 6" PLUG
 CL. EL. 68.13

CLARIFIER
 NO. 2

Constantine Engineering
 1988 LEWIS TURNER BLVD.
 FORT WALTON BEACH, FL 32547
 PH. 850-244-5800
 FL. CERTIFICATE OF AUTHORIZATION # 9816

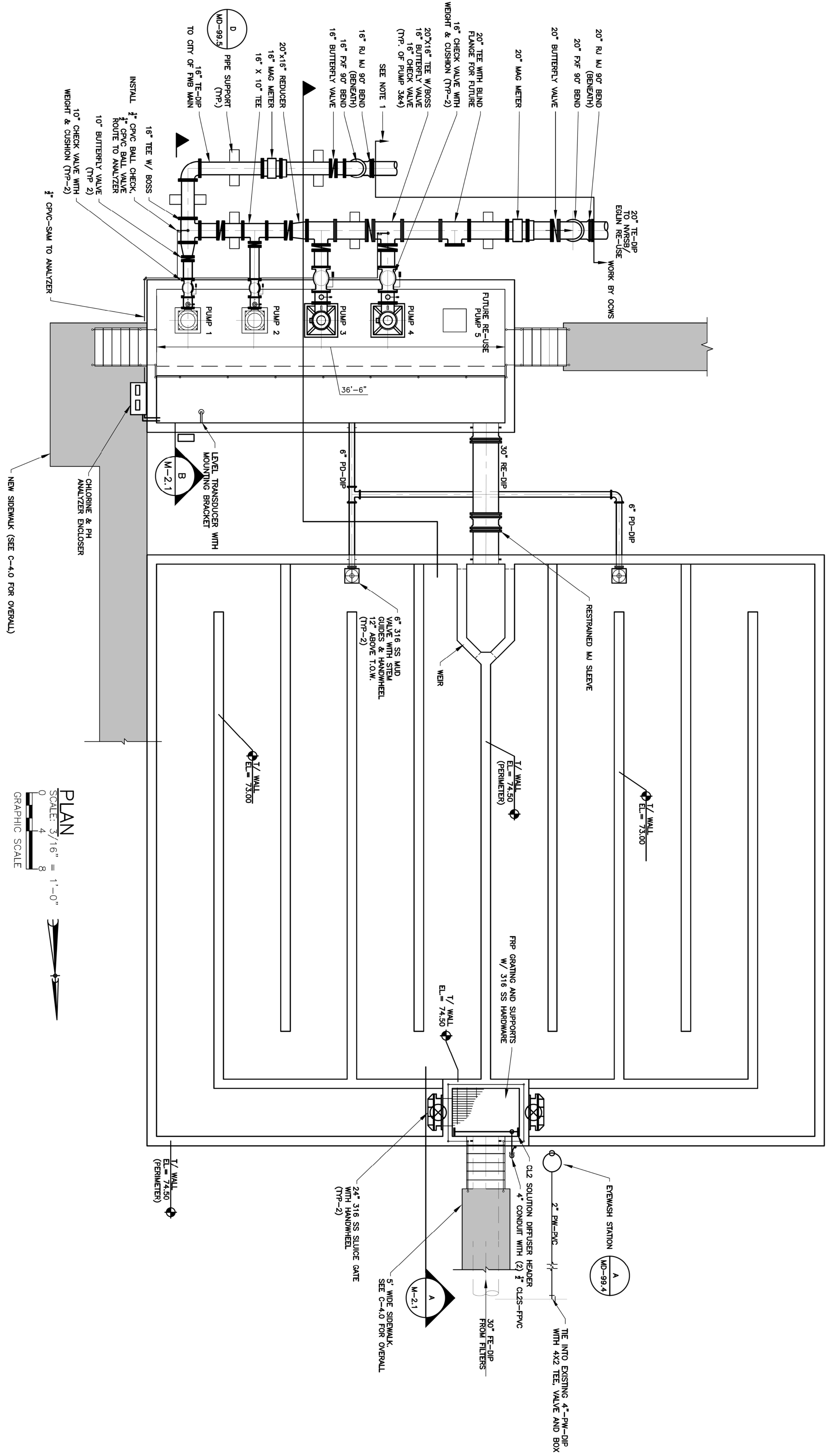


OVERALL MECHANICAL PLAN
OCWS APWRF RECLAIM EXPANSION

NO.	DATE	REVISION	CHECKED BY:	APPROVED BY:
DESIGNED BY:	TCG	DRAWN BY:	TCG	APVD
			JC	JK

ENGINEER SEAL

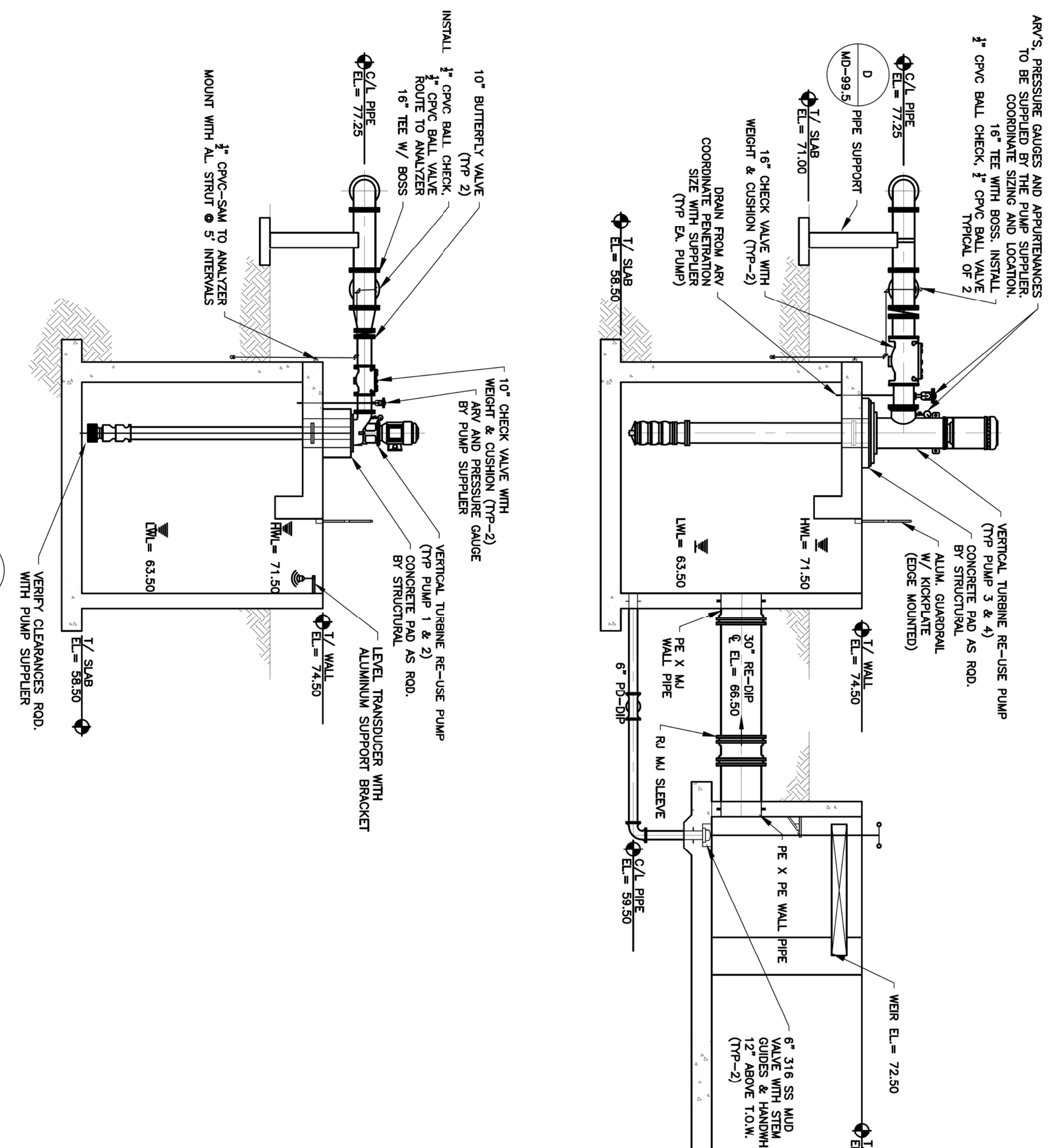
 JOSEPH S. CHEUNG
 LICENSE No. 68863
 STATE OF FLORIDA
 PROFESSIONAL ENGINEER
 THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JOSEPH S. CHEUNG, 68863



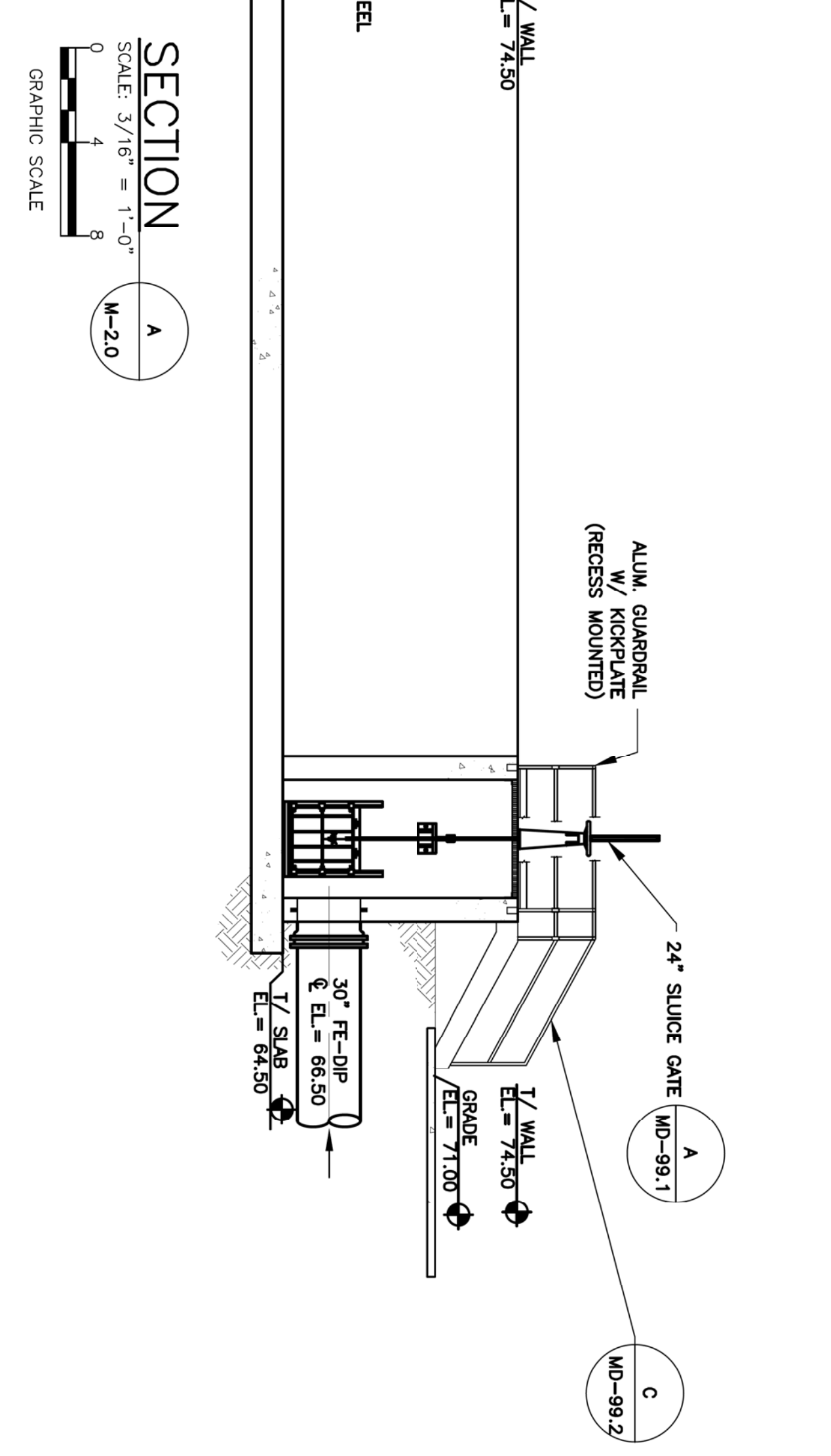
- NOTES:**
1. CONTRACTOR SHALL PROVIDE PIPE & FLANGES UP TO DEMARCATION LINES FOR FUTURE OWNER TE-IN.
 2. CONTRACTOR SHALL PROVIDE TEMPORARY PIPING AS PIPELINE WORK MAY NOT BE COMPLETED BEFORE CONTRACT IS COMPLETE.
 3. ALL BRIDGE SCROUPE FINISHED MATERIAL SHALL BE FINISHED TO THE FINISH SCHEDULE ALL BELOW GRADE DUCTILE IRON SHALL BE RESTRAINED.

PLAN
SCALE: 3/16" = 1'-0"
GRAPHIC SCALE

<p>1988 LEWIS TURNER BLVD. FORT WALTON BEACH, FL 32547 PH. 850-244-5800 FL. CERTIFICATE OF AUTHORIZATION # 9816</p>	<p>OKALOOSA COUNTY</p>	<p>CHLORINE CONTACT BASIN PLAN</p> <p>OCWS APWRF RECLAIM EXPANSION</p>		<p>Revised Addendum 01</p>		<p>ENGINEER SEAL</p>
		<p>FILE: SEE LEFT</p> <p>VERIFY SCALE</p> <p>DATE: OCTOBER 2018</p> <p>PROJ.: 100501.00</p> <p>DWG: M-2.0</p>	<p>DESIGNED BY: TCG</p> <p>DRAWN BY: TCG</p> <p>CHECKED BY: JC</p> <p>APPROVED BY: JK</p>	<p>NO. DATE REVISION</p>	<p>BY APVD</p>	



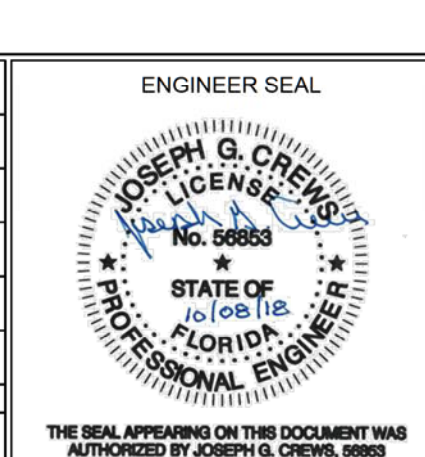
SECTION B
 SCALE: 3/16" = 1'-0"
 GRAPHIC SCALE



SECTION A
 SCALE: 3/16" = 1'-0"
 GRAPHIC SCALE

CHLORINE CONTACT BASIN SECTION
 OCWS APWRF RECLAIM EXPANSION

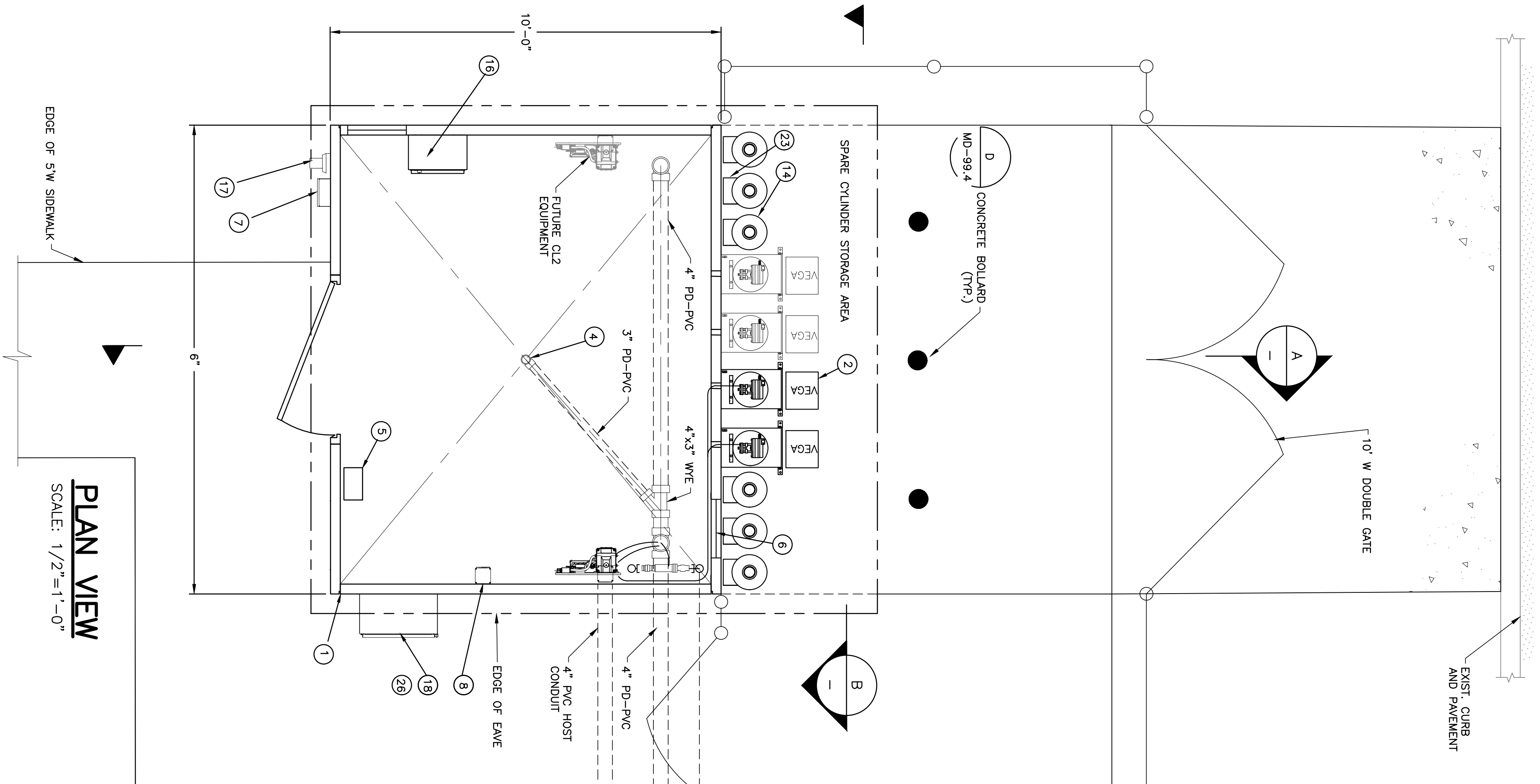
NO.	DATE	REVISION	BY	APVD	
1		Revised Addendum 01			
DESIGNED BY:	TCG	DRAWN BY:	TCG	CHECKED BY:	JC
			APPROVED BY:	JK	



Constantine Engineering

1988 LEWIS TURNER BLVD.
 FORT WALTON BEACH, FL 32547
 PH. 850-244-5800
 FL. CERTIFICATE OF AUTHORIZATION # 9816

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DATE	OCTOBER 2018
PROJ.	100501.00
DWG.	M-2.1

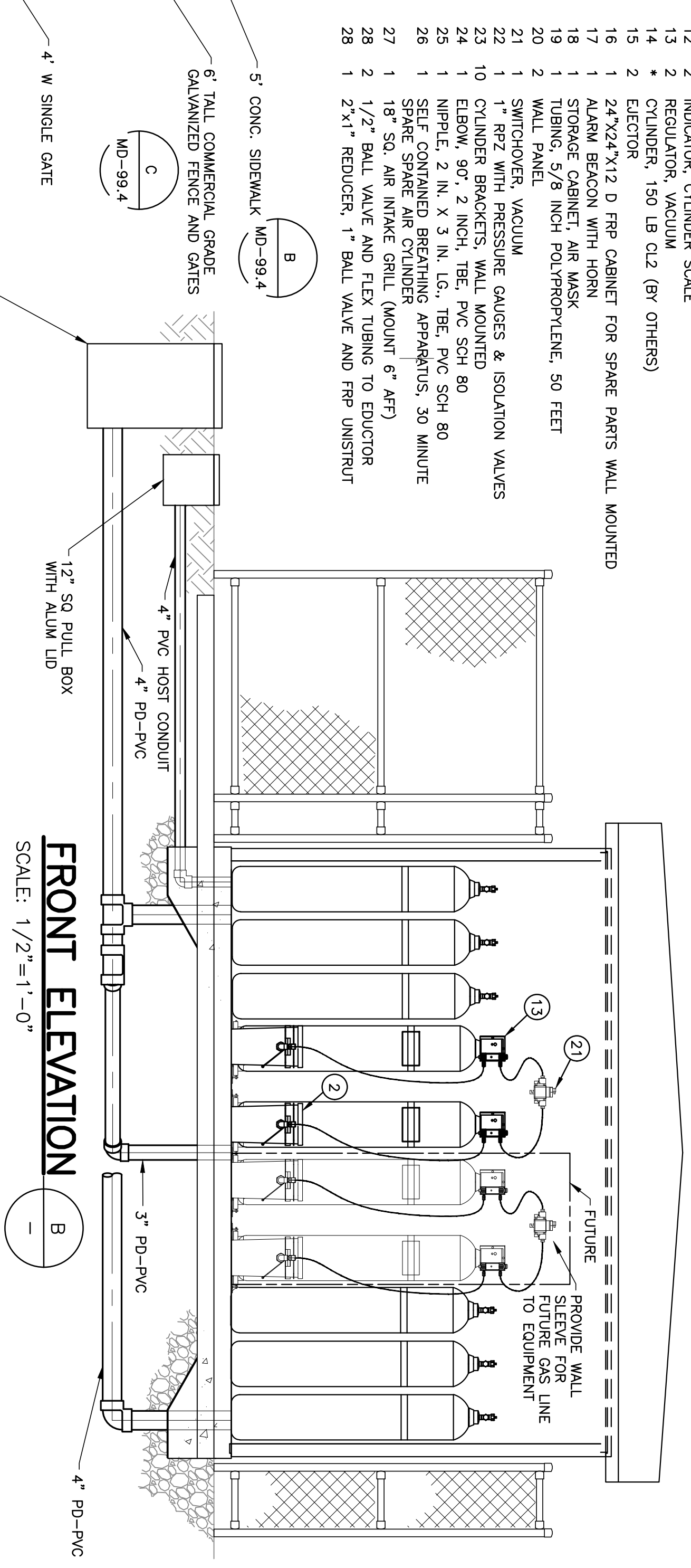


PLAN VIEW
SCALE: 1/2"=1'-0"

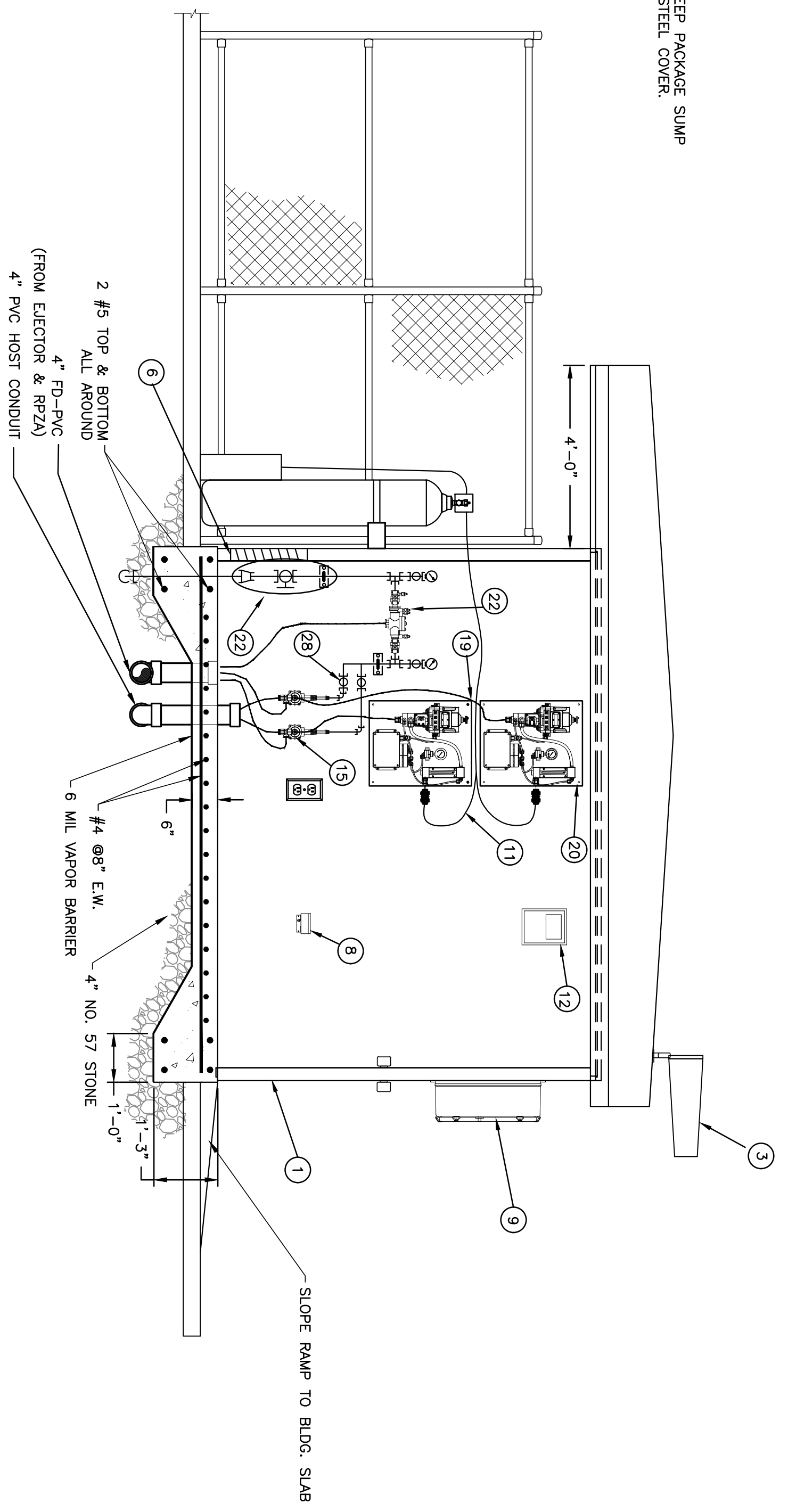
SCOPE OF SUPPLY

ITEM QTY	DESCRIPTION
1	10' x 12' PRECAST ENCLOSURE
2	VENT EXHAUST GAS ARRESTOR (VEGA)
3	WINDSOCK
4	3" FLOOR DRAIN (ZURN FD2210-PV3-CP)
5	HEATER AND WALL MOUNTED THERMOSTAT
6	EXHAUST FAN
7	RECEIVER, CL2 GAS DETECTOR
8	SENSOR, CL2 GAS DETECTOR INCLUDED W/ RECEIVER ASSEMBLY
9	NOT USED
10	FAN INCLUDED W/ STACK ASSEMBLY, SCRUBBER
11	TUBING, 3/8 INCH POLYPROPYLENE, 25 FEET
12	INDICATOR, CYLINDER SCALE
13	REGULATOR, VACUUM
14	* CYLINDER, 150 LB CL2 (BY OTHERS)
15	EJECTOR
16	24"x24"x12 D FRP CABINET FOR SPARE PARTS WALL MOUNTED
17	1 ALARM BEACON WITH HORN
18	1 STORAGE CABINET, AIR MASK
19	1 TUBING, 5/8 INCH POLYPROPYLENE, 50 FEET
20	2 WALL PANEL
21	1 SWITCHOVER, VACUUM
22	1 1" RPZ WITH PRESSURE GAUGES & ISOLATION VALVES
23	10 CYLINDER BRACKETS, WALL MOUNTED
24	1 ELBOW, 90°, 2 IN. X 3 IN. TG., TBE, PVC SCH 80
25	1 NIPPLE, 2 IN. X 3 IN. TG., TBE, PVC SCH 80
26	1 SELF CONTAINED BREATHING APPARATUS, 30 MINUTE
27	1 18" SQ. AIR INTAKE GRILL (MOUNT 6" AFP)
28	2 1/2" BALL VALVE AND FLEX TUBING TO EJECTOR
28	1 2"x1" REDUCER, 1" BALL VALVE AND FRP UNISTRUT

- NOTES:**
- 1) THE CHLORINE SYSTEM AND ALL RELATED SAFETY EQUIPMENT SHALL BE SUPPLIED BY A SINGLE SUPPLIER. SCOPE OF SUPPLY MAY VARY SLIGHTLY BY VENDOR AS THE DRAWING HEREIN IS A REPRESENTATION OF A TYPICAL SYSTEM.
 - 2) THE CHLORINE SYSTEM SUPPLIER, INSTALLING CONTRACTOR SHALL BOTH COORDINATE THE EQUIPMENT LAYOUT INCLUDING WALL PENETRATIONS, POWER SUPPLY, SUPPORTS, AND ANY SUPPLEMENTARY REQUIREMENTS FOR A COMPLETE INSTALLATION WITH THE PRECAST BUILDING.
 - 3) SUPPLYING SHALL BE FITTED WITH ADEQUATE VENTILATION, LIGHTING, ALARMS, DETECTORS, WIND SOCK AND BEACONS AS REQUIRED FOR SAFE WORKING ENVIRONMENT.
 - 4) THE SUMP PUMP STATION SHALL BE OR EQUAL TO LITTLE GANT WOR-SSS PACKAGE SYSTEM. POWER TO THE STATION SHALL BE PROVIDED FROM THE ELECTRICAL SERVICE PANEL AS SUPPLIED WITH THE STATION BUILDING. POUR 8" FLOATATION COLLAR AROUND BASE.
 - 5) THE BUILDING SHALL BE A VERTICAL BROOM FINISH PAINTED TO MATCH THE STANDARD PLANT TAN COLOR.



FRONT ELEVATION
SCALE: 1/2"=1'-0"



SECTION
SCALE: 1/2"=1'-0"

**CHLORINE FEED BUILDING
FUTURE EXPANSION**

OCWS APWRF RECLAIM EXPANSION

NO.	DATE	REVISION	BY	APVD	
1		Revised Addendum 01			
DESIGNED BY:	TCG	DRAWN BY:	TCG	CHECKED BY:	JC
			APPROVED BY:	JK	

ENGINEER SEAL

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JOSEPH G. CREWS, 6883



Constantine Engineering

1988 LEWIS TURNER BLVD.
FORT WALTON BEACH, FL 32547
PH. 850-244-5800
FL. CERTIFICATE OF AUTHORIZATION # 9816

FILE	SEE LEFT
VERIFY SCALE	
DATE	APRIL 2019
PROJ.	100502.04
DWG.	M-3.0