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& LITTON** EST.  
1956

ENGINEERS ARCHITECTS SURVEYORS

**ADDENDUM NO. 002**

**TO:** All Plan Holders

**RE:** **Wastewater Treatment Plant Rehabilitation  
Pound, Virginia  
for Wise County Public Service Authority  
T&L Project No. 16235**

**DATE:** February 1, 2023

**BIDS RECEIVED DATE:** February 8, 2023

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated January 8, 2023, as noted below. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

This Addendum consists of 53 pages and 5 drawing sheets.

**CLARIFICATIONS AND ANSWERS TO PRE-BID QUESTIONS:**

1. The pre-bid conference attendance record for the mandatory pre-bid meeting is enclosed.
2. The estimated construction cost of this project is approximately \$4 million.
3. The fence does not wrap around the secondary clarifiers. It terminates at the wall of each clarifier and needs to cover the space below the clarifier troughs as noted on drawing C104.
4. All programmable logic controllers for this project shall be Allen Bradley CompactLogix, without exception.
5. The mechanical screen and washer/compactor which will be installed in the preliminary treatment building shall have a control panel installed in the electrical room of the preliminary treatment building. Only a separate local control station(s) shall be installed next to the equipment in the rated area in the treatment room.
6. Mobile cart and cold weather protection are required for the screenings washing and compacting equipment.
7. Sludge disposal required by construction will be performed by pumping sludge to the aerobic digester and then dewatering using the existing belt press. It is anticipated that most sludge can be moved using the existing system at the plant, however, the contractor should be prepared to provide pumping capacity for moving wet sludge to the digester when needed. Dried sludge will be removed and disposed of by the Owner.





8. Drawing C701 implies that the diffusers for the aerobic digester are to be fine bubble, but the intent is that the aerobic digester be provided with coarse bubble diffusers as specified in Section 46 5103 – Coarse Bubble Air Diffuser Systems.
9. The Contractor shall be responsible for moving the Owner's belt press from its existing location on the treatment plant site to its new location in the new pre-engineered metal building, including all disconnections from pipe, electrical, etc. at the existing location and all new connections at the new location.
10. Based on record drawings of the original plant construction from 1972, the underdrains under the existing sludge drying beds shown on Drawing C203 are four inches in diameter and covered by approximately 27 to 32 inches of material; twelve inches of sand, four inches of 1/8 to 1/4 inch diameter gravel, four inches of 1/4 to 3/4 inch diameter gravel, and seven to twelve inches of 3/4 to 2-1/2 inch stone.
11. There is no existing communication cabling between the upper lift station and the treatment plant site. The new communication system will utilize radios and antennas as per project documents.
12. Where galvanized framing channel is used outdoors it shall be hot dipped galvanized and hot dipped galvanized or stainless-steel hardware shall be used. Stainless steel framing channels and hardware is also acceptable. All cuts and cut ends on galvanized channel shall be coated with a zinc rich, cold galvanizing, touch up coating.
13. The detail on Drawing I102 where ventilation openings are provided in an otherwise NEMA 4X panel enclosure is the acceptable method specified. The panel will be de-rated to a NEMA 3R panel. NEMA 4x is specified and derated because standard NEMA 3R panels allow easy insect and vermin access into the panel interior.
14. The bury depth of the existing force main where the new M-5 meter is to be installed as shown on Drawing C301 is approximately 3 feet as per the original record drawings.
15. In lieu of unlicensed spread spectrum radios for use at upper lift station and control building at treatment plant, use NextGen Viper SC+ VHF licensed SCADA radios with frequency range of 136-174 MHz and performance as follows:
  - a. -116dBm@8kpbs,
  - b. -109dBm@16kpbs,
  - c. -102dBm@24kpbs,
  - d. -95dBm@32kpbs.

#### CHANGES TO THE PROJECT MANUAL:

1. The new Wage Rate Decision which was provided at the mandatory pre-bid meeting replaces the one previously in the project manual. A copy of the new Wage Rate Decision is enclosed.
  - a. Note that the minimum federal wage of \$16.20 per hour as indicated on the first page of the Wage Rate Decision **does apply** to this project. Wage rates shown on page two of the Decision also apply. In many cases, the wage rates on page two will be superseded by the \$16.20 minimum per hour rate.
2. Division 23 – Heating, Ventilating, and Air-Conditioning (HVAC) Specification Sections have been added and are enclosed.
3. Section 40 0559 – Hydraulic Gates has been added and is enclosed.



4. Section 40 9513 – Control Panels has had 3.1F revised and G has been added. These paragraphs concern outdoor mounted control panels/enclosures. The revised section is enclosed.
5. Addendum No. 001 made the following addition in Paragraph 2.1 D of Section 40 9816 – Supervisory Control and Data Acquisition System: “As an alternative to a purchased UPS the Integrator may proposed (sic) a standby power supply, charger, and associated battery storage, and the necessary interfaces.” This addition has been removed from the paragraph and is no longer allowed as an alternative to a purchased UPS. The revised section is not enclosed.
6. Section 46 2100 – Mechanically Cleaned Bar Screen has been revised to eliminate the two level controllers listed in 2.3.F.1 b and c. Only the controller in a (two Siemens Sitrans LU Ultrasonic controllers) remains. The revised page is not enclosed.
7. Section 46 4321 – Circular Clarifier Equipment has been modified. Additions and clarifications have been highlighted. Deleted paragraphs are as follows:
  - a. Paragraphs 2.3.B.3.c, 2.3.B.5, and 2.3.D.1.
  - b. Paragraphs 2.4.A.3 and 5 and 2.4.D.8.
  - c. Paragraph 2.5.C.The revised section is enclosed.
8. Section 46 5103 – Coarse Bubble Air Diffuser Systems had a reference to an equalization tank which was removed from the project scope before bid documents were issued. The reference has been deleted from the section as there is no equalization basin in the project. The revised section is not enclosed.

#### **CHANGES TO DRAWINGS:**

1. C401 - Preliminary Treatment Building Renovation Plan has had the sheet reference in the note about door schedules corrected. The revised Drawing is enclosed.
2. M101 - HVAC Details & Lift Station Floor Plan has modifications to the heater and exhaust fan schedules and a new fan control schematic for the pretreatment building wastewater room exhaust fan. The revised Drawing is enclosed.
3. I202 – Piping and Instrumentation Diagram 2 of 3 has been revised to show flow transmitter signals to both the UV System Control Center and to Control Panel CP-SB. The revised drawing is enclosed.
4. I 301 and I302 have been revised to correct several devices. The revised Drawing is enclosed.

#### **Enclosures:**

Pre-bid conference attendance record

Wage Rate Decision

Specification Sections

- 23 0513 – Common Motor Requirements for HVAC Equipment
- 23 0529 – Hangers and Supports for HVAC Piping and Equipment
- 23 0553 – Identification for HVAC Piping and Equipment
- 23 0934 – Variable-Frequency Motor Controllers
- 23 3413 – Axial HVAC Fans



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- 23 3416 – Centrifugal HVAC Fans
- 23 8216 – Electric Resistance Heaters
- 40 0559 – Hydraulic Gates
- 40 9513 – Control Panels
- 46 4321 - Circular Clarifier Equipment

Drawings

- C401 – Preliminary Treatment Building Renovation Plan
- M101 – HVAC Details & Lift Station Floor Plan
- I202 - Piping and Instrumentation Diagram 2 of 3
- I301 – Device and Instrument Schedule 1 of 2
- I302 - Device and Instrument Schedule 2 of 2



**PRE-BID CONFERENCE  
ATTENDANCE RECORD  
WEDNESDAY, JANUARY 25, 2023; 2:30 P.M.**

Wastewater Treatment Plant Rehabilitation  
For  
Wise County Public Service Authority  
T&L Project No. 16235

Initial for Attendance	NAME	COMPANY	WORK NUMBER	MOBILE NUMBER	EMAIL ADDRESS
CM	Cody McElroy	Wise County PSA	276-679-1263		<a href="mailto:cmcelroy@wisecountypsas.org">cmcelroy@wisecountypsas.org</a>
CWC	Cody Culbertson	Wise County PSA	276-679-1263		<a href="mailto:cculbertson@wisecountypsas.org">cculbertson@wisecountypsas.org</a>
	Allen Cornett	DEQ			<a href="mailto:james.cornett@deq.virginia.gov">james.cornett@deq.virginia.gov</a>
	Ron Helton	Thompson and Litton, Inc.	276-328-2161	276-393-6145	<a href="mailto:rhelton@t-l.com">rhelton@t-l.com</a>
DBM	Brian McGough	Thompson and Litton, Inc.	276-328-2161		<a href="mailto:bmcgough@t-l.com">bmcgough@t-l.com</a>
RL	Roger Lee	amb pemco	304-320-6537	304-320-6537	rlee@amr.pemco.com
CWL	Corey Ludwig	AMB Pemco	540-922-5632	same	cladwig@amr.pemco.com
BOE	Bobby Reynolds	WCPST	276-767-0157	276-639-7087	breyvils@wisecountypsas.org
APB	Dee Brown	DCI/SHIRES, INC. PO BOX 1259, BLUEFIELD WV 24701 PH 304-323-1996 FAX 304-323-3037 EMAIL: robertdeeb@dcishires.com			
JM	John McNeill	Custom Controls Unlimited	(919)661-5556		<a href="mailto:john.mcneill@ccvinc.com">john.mcneill@ccvinc.com</a>
ZJ	Ben Jesse	King General Contractors, INC	(276)644-1585	276-285-4896 276-275-3199	vann@kingcompany.45 cindy@kingcompany.45
TD	Tony Delporcio	DCI Shires, Inc.	304-323-1996 <del>87880</del>	540-320-5054	Tony Del@dcishires.com
TS	Tracy Stephens	JS Horen Company	423-745-5000	423-215-6961	bidding@jshoren.com



**PRE-BID CONFERENCE  
ATTENDANCE RECORD  
WEDNESDAY, JANUARY 25, 2023; 2:30 P.M.**

Wastewater Treatment Plant Rehabilitation  
For  
Wise County Public Service Authority  
T&L Project No. 16235

Initial for Attendance	NAME	COMPANY	WORK NUMBER	MOBILE NUMBER	EMAIL ADDRESS
MA	MIKE HERRILL	Hansen Construction Co. Inc	423-263-5561		Costello@hansenconstruction.com
DB	DAVID BLANKENSHIP	English Const	434-845-0301		JLBJ@ENGLISHCONST.COM
	Lane Rlevins	Frizzell	423-968-9967		llevins@frizzellcontractors.com
					Ksmith-10@contractors.net

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"General Decision Number: VA20230025 01/06/2023

Superseded General Decision Number: VA20220025

State: Virginia

Construction Types: Heavy (Heavy and Sewer and Water Line)

Counties: Bland, Carroll, Dickenson, Floyd, Galax\*, Grayson, Henry, Lee, Martinsville\*, Norton\*, Russell, Wise and Wythe Counties in Virginia.

\*INDEPENDENT CITIES

HEAVY CONSTRUCTION PROJECTS (Including Sewer and Water Lines)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> <li>. Executive Order 14026 generally applies to the contract.</li> <li>. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.</li> </ul>
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> <li>. Executive Order 13658 generally applies to the contract.</li> <li>. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.</li> </ul>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number      Publication Date  
0                              01/06/2023

SUVA2010-026 09/01/2010

	Rates	Fringes
CARPENTER.....	\$ 9.00 **	0.84
CEMENT MASON/CONCRETE FINISHER...	\$ 11.00 **	1.02
ELECTRICIAN.....	\$ 15.55 **	2.37
LABORERS		
Common or General.....	\$ 7.64 **	0.51
Flagger.....	\$ 7.25 **	
Pipelayer.....	\$ 7.89 **	
POWER EQUIPMENT OPERATOR:		
Backhoe.....	\$ 10.97 **	0.72
Bulldozer.....	\$ 18.00	
Crane.....	\$ 20.63	7.28
Excavator.....	\$ 11.36 **	1.09
Loader.....	\$ 12.79 **	1.17
TRUCK DRIVER		
Dump Truck.....	\$ 10.61 **	1.03
Off the Road Truck.....	\$ 16.50	

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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\*\* Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).



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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

## **SECTION 23 0513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. General construction and requirements.

#### **1.2 REFERENCE STANDARDS**

- A. NEMA MG 1 - Motors and Generators 2014.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### **1.3 SUBMITTALS**

- A. Submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- D. Operation Data: Include instructions for safe operating procedures.
- E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

#### **1.4 QUALITY ASSURANCE**

- A. Conform to NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

### **PART 2 PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Baldor Electric Company/ABB Group or equal: [www.baldor.com/#sle](http://www.baldor.com/#sle).
- B. Leeson Electric Corporation or equal: [www.leeson.com/#sle](http://www.leeson.com/#sle).

#### **2.2 GENERAL CONSTRUCTION AND REQUIREMENTS**

- A. Construction:
  - 1. Design for continuous operation in 104 degrees F environment.
  - 2. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- B. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.
- C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor.
- D. Wiring Terminations:

Common Motor Requirements for HVAC Equipment	16235	23 0513/1
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1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

**END OF SECTION**

Common Motor Requirements for HVAC Equipment	16235	23 0513/2
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## **SECTION 23 0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Support and attachment components.

#### **1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

#### **1.3 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems and post-installed concrete and masonry anchors.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.4 QUALITY ASSURANCE**

- A. Comply with applicable building code.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.1 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
  - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

Hangers and Supports for HVAC Piping and Equipment	16235	23 0529/1
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3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
  5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use hot dipped galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Prefabricated Trapeze-Framed Metal Strut Systems:
1. Manufacturers:
    - a. ABB Installation Products: [electrification.us.abb.com/#sle](http://electrification.us.abb.com/#sle).
    - b. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - c. Elgen Manufacturing Company, Inc; [\_\_\_\_\_]: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
    - d. Gripple, Inc; Fast Track - Standard: [www.gripple.com/#sle](http://www.gripple.com/#sle).
    - e. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).
    - f. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
  3. Strut Channel or Bracket Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use hot dipped galvanized steel.
  4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
  5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
  6. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- C. Strut Channels:
1. Manufacturers:
    - a. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - b. Gripple, Inc; Universal Bracket: [www.gripple.com/#sle](http://www.gripple.com/#sle).
    - c. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).
    - d. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- D. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
  2. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
- E. Steel Cable:
1. Manufacturers:
    - a. Ductmate Industries, Inc, a DMI Company; Clutcher Cable Hanging System: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
    - b. Elgen Manufacturing Company, Inc: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
    - c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
- F. Cable Hanging System Kits:
1. Manufacturers:
    - a. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - b. Ductmate Industries, Inc: [ductmate.com/#sle](http://ductmate.com/#sle).
    - c. Gripple, Inc: [www.gripple.com/#sle](http://www.gripple.com/#sle).
    - d. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
- G. Pipe Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- H. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
  2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
  3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
  4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
  5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
  6. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
  7. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
- I. Riser Clamps:

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1. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  2. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  3. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
  4. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.
- J. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
    - a. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
    - b. ITW Red Head, a division of Illinois Tool Works, Inc: [www.itwredhead.com/#sle](http://www.itwredhead.com/#sle).
    - c. Simpson Strong-Tie Company Inc: [www.strongtie.com/#sle](http://www.strongtie.com/#sle).
    - d. Or equal..
  2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  5. Hollow Masonry: Use toggle bolts.
  6. Hollow Stud Walls: Use toggle bolts.
  7. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
  8. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
  9. Sheet Metal: Use sheet metal screws.
  10. Wood: Use wood screws.
  11. Plastic and lead anchors are not permitted.
  12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.
    - b. Channel Material: Use galvanized steel.
    - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.

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- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
  - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

**END OF SECTION**

Hangers and Supports for HVAC Piping and Equipment	16235	23 0529/5
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## **SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Nameplates.

#### **1.2 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

### **PART 2 PRODUCTS**

#### **2.1 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Control Panels: Nameplates.

#### **2.2 NAMEPLATES**

- A. Letter Color: White.
- B. Letter Height: 1/4 inch.
- C. Background Color: Black.
- D. Plastic: Conform to ASTM D709.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

#### **3.2 INSTALLATION**

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

**END OF SECTION**

Identification for HVAC Piping and Equipment	16235	23 0553/1
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**SECTION 23 0934 - VARIABLE-FREQUENCY MOTOR CONTROLLERS**

**PART 1 GENERAL**

**1.1 REFER TO ELECTRICAL WORK FOR SPECIFICATIONS**

**END OF SECTION**

Variable-Frequency Motor Controllers	16235	23 0934/1
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## **SECTION 23 3413 - AXIAL HVAC FANS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Mixed Flow fans.

#### **1.2 SUBMITTALS**

- A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

#### **1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

#### **1.4 FIELD CONDITIONS**

- A. Permanent fans may not be used for ventilation during construction.

### **PART 2 PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. ACME Engineering and Manufacturing Corporation; [\_\_\_\_\_]: [www.acmefan.com/#sle](http://www.acmefan.com/#sle).
- B. Carnes, a division of Carnes Company Inc: [www.carnes.com/#sle](http://www.carnes.com/#sle).
- C. Loren Cook Company; [\_\_\_\_\_]: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).
- D. Greenheck Company:.

#### **2.2 MIXED FLOW FANS**

- A. Performance Requirements:
  - 1. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
  - 2. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing the AMCA Certified Sound Rating Seal.
- B. Fan Components:
  - 1. Fabricated from spark resistant materials.
  - 2. Provide backdraft damper as specified.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

#### **END OF SECTION**

Axial HVAC Fans	16235	23 3413/1
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## **SECTION 23 3416 - CENTRIFUGAL HVAC FANS**

### **PART 1 GENERAL**

#### **1.1 REFERENCE STANDARDS**

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program 2015.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating 2016.

#### **1.2 SUBMITTALS**

- A. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Include complete installation instructions.
- C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

#### **1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

#### **1.4 FIELD CONDITIONS**

- A. Permanent fans may not be used for ventilation during construction.

### **PART 2 PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. ACME Engineering and Manufacturing Corporation: [www.acmefan.com/#sle](http://www.acmefan.com/#sle).
- B. Carnes, a division of Carnes Company Inc: [www.carnes.com/#sle](http://www.carnes.com/#sle).
- C. Loren Cook Company: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).
- D. Greenheck Fan Company.

#### **2.2 PERFORMANCE REQUIREMENTS**

- A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- B. Fabrication: Conform to AMCA 99.
- C. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

#### **2.3 WHEEL AND INLET**

#### **2.4 BEARINGS AND DRIVES**

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide safety screen where inlet or outlet is exposed.
- C. Provide backdraft dampers on discharge of exhaust fans

**END OF SECTION**

Centrifugal HVAC Fans	16235	23 3416/1
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## SECTION 23 8216 - ELECTRIC RESISTANCE HEATERS

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes electric resistance air coils.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.
  - 2. Include rated capacities, operating characteristics, and pressure drops for each air coil.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

#### 1.4 COORDINATION

- A. Coordinate size, location and installation of coils with air-handling units to suit conditions and to ensure proper operation.

### PART 2 PRODUCTS

#### 2.1 DESCRIPTION

- A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 "Systems and Equipment" and Section 7 - "Construction and Startup."

#### 2.2 ELECTRIC UNIT HEATERS

- A. Manufacturers: Provide products by one of the following or an approved equal.
  - 1. Markel
  - 2. Qmark
  - 3. Marley
  - 4. Chromalox
- B. Description: Provide and install heavy duty wall mounted forced air electric heater of the wattage, voltage, and phase indicated on the plans. The heater shall have an 18-gauge steel housing with powder coated finish and control compartment housing a master terminal board with a hinged and latched access door. The heating element shall consist of a copper clad steel sheath element with continuously brazed steel fins. Heater shall also have an automatic reset type limit controls to de-energize the heater should an over temperature event occur. The fan shall have a totally enclosed 1-speed, 1-phase, permanently lubricated thermally protected motor with sleeve bearings. Motors shall be mounted on rubber insulators. Heaters shall have louvers that are individually adjustable for directional control of air. Heaters shall include an integral thermostat with an adjustable range of 40 to 110 degrees F. All heaters shall be listed by ETL. Heating elements shall have a one-year manufacturer's warranty.
- C. Accessories: Provide accessories indicated on heater schedule.

### PART 3 EXECUTION

Electric Resistance Heaters	16235	23 8216/1
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**3.1 EXAMINATION**

- A. Examine heaters to verify that the heaters are clean and in good condition before installation.
- B. Clean all dirt and debris from heaters before installation.
- C. Notify manufacturer of any defects.

**3.2 INSTALLATION**

- A. Coordinate heater locations with other disciplines before rough-in of heaters.
- B. Install heaters level and plumb.
- C. Install heaters in accordance with the manufacturer's instructions and applicable electrical codes.

**END OF SECTION**

Electric Resistance Heaters	16235	23 8216/2
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## **SECTION 40 0559 - HYDRAULIC GATES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Upward sliding gates, for opening and closing channels.
- B. Weir gates, downward sliding, for liquid level adjustment.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 46 0500 - Common Work Results For Water and Wastewater Equipment: Requirements applicable to all equipment.

#### **1.3 REFERENCE STANDARDS**

- A. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications 2022b.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM A564/A564M - Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes 2019a.
- E. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel 2021, with Editorial Revision.
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015 (Reapproved 2021).
- G. ASTM D395 - Standard Test Methods for Rubber Property—Compression Set 2018.
- H. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016 (Reapproved 2021).
- I. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids 2016a (Reapproved 2021).
- J. ASTM D572 - Standard Test Method for Rubber—Deterioration by Heat and Oxygen 2004 (Reapproved 2019).
- K. AWWA C562 - Fabricated Aluminum Slide Gates 2021.
- L. NEMA MG 1 - Motors and Generators 2021.

#### **1.4 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, and Section 46 0500 - Common Work Results For Water and Wastewater Equipment for submittal procedures.
- B. Product Data: Manufacturer's data on products, showing composition, dimensions, accessories, and anchorage.
- C. Shop Drawings: Detailed fabrication and installation drawings showing materials, fabrication, tolerances, connections, seals, and anchorages.
- D. Operating and Maintenance Data: See Section 46 0106 - Operation and Maintenance Manual.
- E. Field Quality Control Test Reports.

#### **1.5 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

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## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Golden Harvest, Inc: [www.goldenharvestinc.com/#sle](http://www.goldenharvestinc.com/#sle).
- B. Hydro Gate, a brand of Henry Pratt Company: [www.hydrogate.com/#sle](http://www.hydrogate.com/#sle).
- C. Rodney Hunt: [rodneyhunt.com/](http://rodneyhunt.com/)
- D. Waterman Industries, LLC: [watermanusa.com/#sle](http://watermanusa.com/#sle).
- E. Whipps, Inc.: [whipps.com](http://whipps.com).

### **2.2 GATES - GENERAL**

- A. Aluminum Gates: Comply with AWWA C562.
- B. Design and fabricate gates to withstand the design head.
- C. Metals:
  - 1. Structural steel, monel, babbit, steel forgings, steel castings, stainless steel, bronze, aluminum bronze, brass and other metal materials used for fabrication: Comply with requirements as indicated on drawings and as specified herein and in Section 05 5000.
- D. Structural Steel:
  - 1. Structural Steel: Comply with ASTM A36/A36M.
  - 2. Structural Steel Plates: Comply with ASTM A572/A572M Grade 50.
- E. Stainless Steel Bars and Shapes
  - 1. Stainless Steel Bars and Shapes: Comply with ASTM A276/A276M, UNS S 20910, Condition A, hot-finished or cold-finished, Class C; or ASTM A564/A564M, UNS S 17400, Condition A, age-hardened heat treatment, hot-finished or cold-finished, Class C.
- F. Stainless Steel Plate, Sheet, and Strip:
  - 1. Stainless Steel Plate, Sheet, and Strip: Comply with ASTM A240/A240M, UNS S 41008.
  - 2. Plate finish: Hot-rolled, annealed or heat-treated, and blast-cleaned or pickled.
  - 3. Sheet and strip finish: No.1.
- G. Rubber Seals:
  - 1. Rubber seals: EPDM.
- H. Physical Characteristics of Seals:
  - 1. Tensile Strength 2500 psi (min.); based on ASTM D412.
  - 2. Elongation at Break: 450 percent (min.); based on ASTM D412.
  - 3. 300 percent: 900 psi (min.); based on .
  - 4. Durometer Hardness (Shore Type A): 60 to 70; based on .
  - 5. Water Absorption: 5 percent by weight (max.); based on ASTM D471.
  - 6. Compression Set: 30 percent (max.); based on ASTM D395.
  - 7. Tensile Strength (after aging 48 hrs.): 80 percent of tensile strength (min.); based on ASTM D572.
- I. Leakage Rate:
  - 1. Leakage: Not to exceed 0.05 U.S. gallon per minute per foot of seal periphery under the design seating head and 0.1 U.S. gallon per minute per foot of seal periphery for the

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unseating design head.

J. Slide Gate Leaf:

1. Single-component structural fabrication, shop fabricated and provided complete with gate stem, stem guides, leaf nut, leaf nut spanner wrench, bar seals, seal collars, lock assembly, and other appurtenant items as required for installation.
2. Surfaces of leaf framing elements for welding to skin plates: Not to vary from a true plane by more than 1/16 inch to provide uniform bearing.
3. The outside surfaces of skin plates welded to framing elements: Not to vary from a true plane by more than 1/16 inch.
4. Splices in skin plates: Locate only where shown on drawings.
5. The overall width and height of the fabricated gate leaf: Not to vary from the respective dimensions as indicated on drawings by more than 1/16 inch.
6. Stress-relieve gate leaf prior to the attachment of bar seals.
7. Accurately machine surfaces where bar seals attach to provide uniform bearing for the full contact dimensions.
8. Firmly butt top and side bar seals together at the corners.
9. Provide flush condition at bottom seating surface of gate leaf with ends of side bar seals.
10. Perform final machining of bar seals after attachment to the gate leaf.
11. Machine bottom seat of gate leaf for tight fit with gate frame sill.

K. Slide Gate Frame and Bonnet:

1. Shop fabricate slide gate frame and bonnet.
2. Machine finish guiding and seal surfaces of slide gate frame and bonnet to true vertical plane.
3. Machine bottom seat of gate leaf for tight fit with gate frame sill.
4. Stress-relieve gate frame and bonnet prior to the attachment of bar seals.
5. Accurately machine surfaces where bar seals attach to provide uniform bearing for the full contact dimensions.
6. Firmly butt top, side and invert bar seals together at the corners.
7. Perform final machining of bar seals after attachment to gate frame and bonnet.

L. Slide Gate Bonnet Cover, Pedestal and Base Plate:

1. Accurately machine flanges of the bonnet cover, pedestal and base plate for the supporting the operating machinery for the slide gate; drill to match mating flanges and provide required true alignment.
2. Base plate dimensions may be altered to fit the operating machinery furnished, provided the basic configuration, plate thickness, and number and sizes of fasteners are equal to that indicated on drawings and the altered dimensions are approved.
3. Operators:
  - a. Size Operators to start moving gate under design maximum head pressure with a pull not to exceed 40 lbs.



- b. Provide manual hand wheel or crank compatible with lift. Indicate direction of operation clearly and permanently on lift: Provide arrow and the word "OPEN" cast in raised letters to indicate the direction of opening.
  - c. Provide two operators connected by a tandem shaft for gates having width equal to or greater than two times their height.
4. Motor-Operated Lift:
- a. Motor operator: 460-V, 3-phase, 60-Hz motor, constant speed, totally enclosed, thermal protected horizontal type, suitable for outdoor service, and complying with NEMA MG 1; protected against overload, low voltage, and unbalanced voltage.
  - b. Integral controls include a control power transformer, reversing controller, torque switches, limit switches, space heater to prevent condensation, open-stop-closed push-buttons and gate position indicator.
  - c. Provide local-off-remote selector switch.
  - d. Motor reduction helical gear and pinion: Heat-treated alloy steel.
  - e. Final reduction worm drive: Alloy steel and worm gear of machined high-tensile strength bronze.
  - f. All gearing proportioned for 100% overload condition.
  - g. Operator designed to raise the gate at a rate of approximately 12 inch/min.
  - h. Operator: Include declutch lever and handwheel for manual operation.
- M. Controls:
- 1. Provide manual controls as indicated.
  - 2. Provide connections for remote indication corresponding to all local indication.
  - 3. Provide control devices of type and characteristics required to connect to process control system.
- N. Instrumentation:
- 1. Control Panel: Mount instrumentation and control devices in enclosure as specified in Section 46 0500, mounted near equipment. Provide the following, at minimum, mounted on or in panel door:
    - a. Motor starter push-button station.
  - 2. Power Components:
    - a. Motor starter.
    - b. Branch circuit breaker for each drive motor and control circuit.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Thoroughly clean bearing surfaces requiring lubrication; lubricate with an manufacturer's approved lubricant before assembly and installation.
- B. Align field welded components to correct positions prior to commencing welding.
- C. Install anchors as indicated on drawings.
- D. Prime coat embedded metals with required paint on all surfaces prior to installation in concrete forms.

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- E. Gate Frame and Guides:
  - 1. Test gate frame and guides for proper alignment and clearances prior to embedding in concrete, by lowering and raising the gate leaf through the full operating range.
- F. Concrete and Concrete Grout Placement:
  - 1. Embed gate frame and other components in concrete in an approved manner to fill all voids, secure anchorage, prevent seepage, and provide uniform finish surfaces.
  - 2. Inspect embedment concrete after curing for at least 7 days; fill any voids around embedded components by pumping concrete grout to full embedment.
  - 3. Inspect pumped grout after curing for at least 7 days, and use hammer blows to the components to detect any remaining voids.
  - 4. Where remaining voids are located, drill 1 inch diameter grout holes in the components and the voids and fill by pressure grouting through the grout holes.
  - 5. Plug grout holes by welding openings in the components and grinding welds flush.
- G. Fabricate, assemble and install gate assembly so the gate leaf forms a watertight barrier in compliance with the specified leakage rate when lowered to the seated position.
- H. Fabricate, assemble and install gate assembly so the gate leaf forms a watertight barrier in compliance with the specified leakage rate when raised to the fully closed position.

**3.2 ACCEPTANCE TRIAL OPERATION AND TEST**

- A. After the gate assembly has been installed, including operating machinery, the Owner and Architect/Engineer will examine the complete system for final acceptance.
- B. Operate the gate throughout its full operating range a sufficient number of times to demonstrate proper operation.
- C. Conduct initial operation of the gate assembly in the dry.
- D. Conduct operation of the gate assembly in actual operating conditions.

**END OF SECTION**

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## **SECTION 40 9513 - CONTROL PANELS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. This Section specifies the requirements for furnishing, installing, connecting, and testing the control panels applied for instrumentation systems to interface process equipment.
- B. The control panels or field panels will contain the PLC, CPU, UPS, media converter, and necessary surge protection, operator field panel interface devices, switches, relays, and wire management systems to protect the control equipment environment.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 40 6343 - Programmable Logic Controllers
- B. Section 40 9816 - Supervisory Control and Data Acquisition System.

#### **1.3 REFERENCES**

- A. ANSI – American National Standards Institute.
- B. IEEE – Institute of Electrical and Electronics Engineers.
- C. NEMA – National Electrical Manufacturers Association.
- D. ISA – The Instrumentation Systems and Automation Society, (formerly the Instrument Society of America).
- E. NIST – National Institute of Standards and Technology.
- F. UL 508A - for Industrial Control Panels.

#### **1.4 SUBMITTALS**

- A. Product Data:
  - 1. Bill of Materials including part number, item description, and manufacturer to identify all project-specific equipment.
  - 2. Spare parts list for spare parts required by this section, identified as per Bill of Materials, but listed separately.
  - 3. A manufacturer's catalog sheet for each item in the bill of materials, with all part numbers and project-specific options clearly identified. Show electrical characteristics and connection requirements.
- B. Shop Drawings:
  - 1. Interior and exterior elevation drawings showing the layout of all components, dimensions, support points, and required clearances.
  - 2. Wiring diagrams, electrical schematics, and/or control diagrams showing all internal components and method of connection and control for all external devices connected to panel. Provide legend for all symbols used in the diagrams.

### **PART 2 PRODUCTS**

#### **2.1 GENERAL**

- A. The control panels shall be NEMA Type 4x, wall mounted enclosures with all instruments, switches and gauges flush mounted on the front of the panel. Suppliers shall size panels to accommodate devices and equipment installed for a fully integrated operational process

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control system, with space for 10 percent future items. Dimensions on the drawings are for general reference only. All control panel assemblies shall be UL listed and labeled.

- B. Control panels installed in exterior locations shall be of the "dead front" type, with all instruments, switches and gauges flush mounted on the internal panel.
- C. Panels in exterior locations shall be provided with internal strip or other type heating to maintain all panels components above their minimum operating temperature range.
- D. Construction shall consist of a steel frame with 11 gage minimum top, end panels, and front panel. The front of the panel shall consist of a 1/8-inch thick minimum sheet steel door having concealed hinges and 3 point latch with locking handle for accessibility to all wiring on the inside of the panel. Surface mounted subpanels shall be mounted on the interior of the panel, behind each access door for mounting auxiliary devices, accessories. These devices shall not be mounted on the interior side panels of the control panel.
- E. Panel finish shall be the manufacturer's standard ANSI 39-grey Color for machine tool panels and electrical enclosures.
- F. The large double door panels shall have a 15 watt (minimum) interior LED light with diffuser and switch. A duplex NEMA 5-20R, 120 volt single phase receptacle shall be provided and wired inside the panel for maintenance use. The panels shall have all instrument and control wiring installed at the manufacturer's plant. The location of the electrical terminals within the panel shall be coordinated with the Electrical Contractor's layout. Wiring shall be numbered at all connections to permit easy identification. The panel manufacturer shall provide an overall coordinated wiring diagram incorporating all external equipment controlled from the panel. All control and instrument items and devices inside the panel shall be identified with brass or engraved tags.
- G. Panel electrical wiring, together with all instrument and control device connections shall be complete, checked out neatly bundles, racked and cleaned. Signal leads shall be grouped separately from A.C. leads. Wireways may be used in lieu of bundling. Wiring for external connections shall be terminated at terminal blocks. Terminal blocks shall be provided for spare wires as indicated on the drawings. Additional spares equal to 10 percent of the total number of terminal blocks shall be provided for future use. Panel wiring shall not be less than #14 standard copper conductor having 600 V insulation MTW type, for continuous operation of copper at 90 Deg. C. Terminal blocks shall be factory assembled with pressure type wire connectors and white marking strips. All exposed terminals of terminal blocks and device shall be covered. External wiring beyond terminal strips shall be THWN stranded copper wiring methods.
- H. Each external device or field instrument deriving 120 VAC power from the control panels shall have separate power distribution circuits from panel fuses or panel individual circuit breakers. All PLC discrete output circuits to field mounted devices shall be fused with a isolating fuse switch terminal block with interposing relays. Circuits for discrete inputs to the PLC I/O shall have flip switch individual switches as isolating switch blocks for testing PLC inputs.
- I. Pushbuttons, switches and indicator lights shall be Eaton E30 Heavy-Duty Oil tight selector switches or approved equal with legend plates. Pilot lights shall have a transformer type light

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element. Switches shall be rated for 600 volts. Relays shall be 300 volt rated industrial type with convertible contacts, four (4) pole minimum, two (2) spare poles per relay and encapsulated coil, coil voltages shall be 120 VAC.

- J. Human Machine Interface (HMI) operator interface panels shall use 9- to 10-inch devices with touch screen provision for process commands. HMI panels shall be provided from the same manufacturer as the PLC process controllers. Panel mounted devices and exterior mounted equipment shall be installed with suitable gaskets and cover plates to maintain the NEMA ratings.
- K. Engraved name plates shall be provided on the front panel for identification of all components mounted thereon.
- L. Arrangement of devices, wiring, piping, tubing, wireways and mounting brackets shall permit future additions to the panel.
- M. PLC - Programmable logic controller. The panel supplier shall furnish and install the programmable control system in accordance with the Programmable Logic Process Controller section 40 9443 and as detailed on the control diagrams for applicable Contract Drawings. Each PLC shall include but not be limited to processor modules (CPU), communications interface module, power supply, software for applications programming, operator interface system diagnostics, communications, and data acquisition. The PLC shall collect data, process control functions, communicate with other PLCs via Supervisory Control and Data Acquisition (SCADA) system and distribute process information along the data highway, and may have their program down loaded from programmer' s terminal, and be locally programmed from a portable programmer.
- N. The PLC system:
  - 1. Manufacturers:
    - a. Allen Bradley.
  - 2. Shall be furnished by a single vendor who has actively been manufacturing programmable logic controllers of the required specified capabilities and whose products have operated successfully for a period of at least eight (8) years. Furnish the I/O for both analog and discrete control points as noted in the contract drawings for the tags and control points as listed in the schedule.
- O. All PLC equipment shall be UL and VDE, and CE listed.
- P. The PLC system manufacturer' s representative, integrator, and service technician network, shall maintain, as part of a national network, engineering service facilities within 200 miles of the Project, to provide start-up service, emergency service calls, repair work, service contracts, maintenance, and training of Department personnel. Emergency service shall be available within 24 hours of notification.
- Q. The PLC software:
  - 1. Rockwell RS Logix micro developer (english version) and associated software packages for both programming and control operation and to integrate the HMI and remote SCADA system interface for the pumping system.

## 2.2 WIRING

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- A. Wiring for 120-volt circuits shall be 12 AWG minimum, and shall be rated for 600-volt service. Power wiring, communication wiring, and low voltage wiring shall be routed in separate wireways and raceways. Separate field and panel wiring in separate wireways and wire troughs also. Paralleled line voltage systems shall be barriered for separation and isolation unless a 2 inch separation can be maintained.
- B. Instrumentation cable shall be 16 AWG, stranded copper, single or multiple-twisted, minimum 2 inch lay of twist, 100 percent shielded pairs, and shall have a 300-volt insulation. Each pair shall have a 20-AWG tinned-copper drain wire and individual overall.
- C. Refer to Drawings for detailed I/O schedules referenced to instrumentation tags and process loop numbers.

### 2.3 LIGHTNING/SURGE PROTECTION

- A. General:
  - 1. Lightning/surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring. Instruments shall be housed in a suitable metallic case, properly grounded. Ground wires for all surge protectors shall be connected to the electric ground and where practical each ground wire run individually and insulated from each other. The protectors shall be mounted within the instrument enclosure or a separate NEMA 3R junction box coupled to the enclosure. Provide surge protectors on each incoming power supply line at each control panel.
- B. Signal Line:
  - 1. All signal lines when they enter or leave a building shall be protected through the use of gas tube surge arresters, and secondary Zener diode protectors. These shall be provided at both ends of the signal lines and as close to the instruments as possible. The protectors shall be MCG type DEP, Joslyn, or approved equal.
  - 2. Surge protection for signal work shall be rated a minimum of 10KA peak impulse current.
  - 3. Protect all copper signal lines from control and/or field panels to field mounted devices and including between field mounted panels and SCADA PLC panels and devices.

### 2.4 INDICATOR BAR GRAPHS

- A. Electronic type bar graph, 4-inch nominal vertical scale. Calibrated in engineering units, with digital indicator. Provide with 4/20 mA DC input. Suitable for panel mounting.

### 2.5 PILOT LIGHT INDICATORS

- A. Provide LED pilot lights, provide heavy duty oil tight type, suitable for voltage supplied. Provide red lens cover for stopped-off or closed valve, provide green lens cover for run, open valve, on, indications, provide white power-on, and amber for alarm status.

### 2.6 SELECTOR SWITCHES AND PUSH BUTTONS

- A. Heavy duty oil tight selectors and push buttons, provide with stackable contacts, 10 amp rated. Push buttons shall be flush type with semi recessed trim ring.

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## 2.7 GENERAL PURPOSE RELAYS

- A. Plug-in type, 3-pole, normally open, normally closed contacts, 10 amp rated at 120 VAC, 5 amp rated at 28 VDC. Provide dust and moisture resistant covers. Relays shall be rated for continuous duty. Provide with din mounting rails and fasteners.

## 2.8 SIGNAL ISOLATORS

- A. Provide opto-isolation devices for inputs and outputs of instruments with field devices and power supplies. Provide span and zero adjustments as needed. Din rail mount similar to relay mounting. Provide RFI protection.

## 2.9 INTRINSIC RELAYS FOR BARRIER OF HAZARDOUS LOCATIONS

- A. Provide solid state electronic relay and barriers to control energy levels of actuating and sensing circuit for safe operation in hazardous locations. Devices shall be UL listed and labeled for area classification in which applied.

## 2.10 ALARM LIGHTS AND HORNS

- A. Provide a strobe type flashing light with red lens. Furnish with mounting gaskets to ensure panel's NEMA rating is maintained when applied in wet or exterior location. Audible horns shall be vibrating type 120 volt AC with adjustable volume compensation.

## 2.11 POWER SUPPLIES

- A. Provide 24 volt DC regulated instrument power supply with fused input and fused output with local on-off switch and fused output. Size the power supply for required capacity +25 percent space capacity. Provide overvoltage/overcurrent protection to protect instruments from damage and surges. Provide digital LED electronic displays, 4-20 mA DC input, suitable for flush mounting in panels. Power supply input shall be 120 VAC.

## 2.12 WIRE MANAGEMENT DEVICES

- A. Provide plastic 2-inch x 2-inch and 3-inch x 3-inch snap cover wiring troughs, Panduit type, for conductor routing for signals and power distribution in panels.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Check and verify location of PLCs, UPS, switches, HMI and control devices with plans and room details before installation. Ensure access and clearance around the equipment for routing of wiring systems into and out of the panels.
- B. Install instrumentation and panels so that connecting and disconnecting or wiring, piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangement may be made, as approved.
- C. Provide pipe racks or pipe stands for mounting of transmitters.
- D. All wiring in connection with the control panel shall be furnished and installed under this Section of the specifications, except as noted on the Drawings or specified under Division 26, in rigid conduit in accordance with the requirements, and under the direct supervision of the instrument manufacturer.

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- E. Wire and conduit shall be as specified under Division 26 Electrical. Unless otherwise indicated on the drawings, electrical power for instruments can be taken from electrical panels as indicated on the Drawings and wiring in accordance to Division 26. AC power leads shall be grouped separately and kept segregated from DC power leads and in separate conduit. Wire markers shall be installed at each end of all wired. Electrical connections to analytical sensing elements shall be made from flexible cable to permit removal of the element from the system for cleaning and maintenance work.
- F. All control panels located out of doors shall be installed in NEMA 4x enclosures and shall include thermostatically controlled strip heater to prevent freezing, accumulation of moisture and/or condensation of moisture.
- G. For all control panels located out of doors, all exposed control components shall be sunlight resistant without fading or discoloring. If control components are not UV sunlight resistant, provide an additional weatherproof protective cover or enclosure.

**3.2 COMMISSIONING OF INSTRUMENT AND CONTROL SYSTEMS**

- A. The instrument manufacturer shall furnish all labor, tools, material, equipment and services required to completely commission instruments, including loop checkout of control valves electrical interlocks and circuits, analyzers, instruments installed on local panels, and instruments installed on the main control panel after installation an prior to plant startup.
- B. All control loops should be observed for operability and conformance to specifications by impressing a simulated input signal at the primary element, and checking the response of final control element.
- C. Instrument manufacturer shall determine the process dynamics in actual operation and adjust the gain, derivative and integral setting of all instruments. Fine tuning shall be made under all operational status and dynamic conditions including start-up. Set points shall be changed to simulate all operation conditions. No tuning shall be attempted until the process or mechanical system is made operable in accordance with these Specifications.

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**3.4 CLEANING PANELS AND EQUIPMENT CONNECTION COMPLETION**

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- A. After installation vacuum all panels to remove conductor insulation, wire and dust and dirt accumulated in control panels and devices. Clean front controls and touch up any panel holes and penetrations to new conditions.
- B. Provide key locks and install control panel drawings in enclosure pockets for future reference of pertinent wiring identifications and instrument tag data.

**END OF SECTION**

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## SECTION 46 4321 - CIRCULAR CLARIFIER EQUIPMENT

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Inflow and outflow components attached to concrete tank.
- B. Sludge removal equipment.
- C. Scum removal equipment.
- D. Supporting structure.
- E. Controls, instrumentation, and power components.
- F. Piping.

#### 1.2 RELATED REQUIREMENTS

- A. Section 46 0500 - Common Work Results For Water and Wastewater Equipment: Requirements applicable to all equipment.
- B. Section 33 3110 - Process Piping and Fittings.

#### 1.3 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).
- B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings 2014 (Reaffirmed 2020).
- C. AGMA 908 - Geometry Factors for Determining the Pitting Resistance and Bending Strength of Spur, Helical and Herringbone Gear Teeth 1989b (Reaffirmed 2020).
- D. AGMA 2011 - Cylindrical Wormgearing Tolerance and Inspection Methods 2014b (Reaffirmed 2019).
- E. AGMA 2015/915-1 - Accuracy Classification System - Tangential Measurement Tolerance Tables for Cylindrical Gears 2006.
- F. AGMA 6001 - Design and Selection of Components for Enclosed Gear Drives 2019f.
- G. AGMA 6013 - Standard for Industrial Enclosed Gear Drives 2016b (Reaffirmed 2021).
- H. AGMA 6034 - Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors 2021c.
- I. AGMA 6113 - Standard for Industrial Enclosed Gear Drives (Metric Edition) 2016b (Reaffirmed 2021).
- J. AGMA 9000 - Flexible Couplings - Potential Unbalance Classification 2011d (Reaffirmed 2022).
- K. AGMA 9002 - Bores and Keyways for Flexible Couplings (Inch Series) 2014c (Reaffirmed 2020).
- L. AGMA ISO 10064-6 - Code of Inspection Practice - Part 6: Bevel Gear Measurement Methods 2010a.
- M. AGMA ISO 17485 - Bevel Gears - ISO System of Accuracy - Tolerance Tables 2008a (Reaffirmed 2014).
- N. AISC 360 - Specification for Structural Steel Buildings 2016 (Revised 2021).
- O. ASME B17.1 - Keys and Keyseats 1967 (Reaffirmed 2013).
- P. ASME B17.2 - Woodruff Keys and Keyseats 1967 (Reaffirmed 2013).
- Q. ASME B29.100 - Double-Pitch Roller Chains, Attachments, and Sprockets 2011 (Reaffirmed 2021).

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- R. ASTM A48/A48M - Standard Specification for Gray Iron Castings 2022.
- S. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds 2020.
- T. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2020.
- U. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.
- V. NEMA MG 1 - Motors and Generators 2021.

#### **1.4 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, and Section 46 0500 for submittal procedures.
- B. Product Data: Manufacturer's data sheets for standard components, including equipment, grout materials, and electrical controls, and installation instructions.
- C. Shop Drawings: Show complete assembly with all components, mechanisms, and parts.
  - 1. Identify each component with number corresponding to equipment manufacturer's parts list.
  - 2. Show details of each component.
  - 3. Show piping, anchorage, wiring, and tank floor surfacing.
- D. Field Quality Control Reports.
- E. Maintenance Materials:
  - 1. Furnish spare parts recommended by manufacturer to be kept on hand.
  - 2. One set of any special tools necessary for the proper operation and maintenance.

#### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Minimum of ten years experience manufacturing products of the type specified.
  - 2. Minimum of ten similar systems installed, with documented evidence of satisfactory operation for each installation.

#### **1.6 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Circular Clarifier Equipment: Provide all moving components by one manufacturer.
  - 1. Amwell: <http://www.amwell-inc.com/>
  - 2. Envirodyne: <https://www.envirodynesystems.com/>
  - 3. Evoqua: <https://www.evoqua.com/>
  - 4. Ovivo: <https://www.ovivowater.com/en/>
  - 5. Walker Process: [www.walker-process.com](http://www.walker-process.com)

#### **2.2 CLARIFIER CONFIGURATIONS**

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- A. Secondary and Final Clarifiers: Circular, center inflow into influent well, peripheral outflow weir and raceway; central sludge hopper.
  - 1. Scraper Mechanism: Two or one with counterweight submerged arms rotating around center influent column.
  - 2. Scraper Drive: Mounted in center; existing bridge to remain.
  - 3. Sludge Return: Return activated sludge to reactor via suction elements.
  - 4. Suction Mechanism: One or two arms carrying return activated sludge suction collector.
  - 5. Scum Removal: Sloping beach and box type.

### 2.3 SLUDGE AND SCUM REMOVAL EQUIPMENT

- A. Sludge Removal Equipment: Rotating sludge scraper designed to move settled sludge to sludge hopper and drain, scum removal equipment, motor and drive, supporting structures, electrical control, overload protection, and alarms; capable of continuous operation without overheating and without excessive vibration or noise.
  - 1. Operating Mechanisms: Designed so there are no chains, sprockets, bearings (except sleeve bearings when used), or operating mechanism below the liquid surface or in contact with the liquid.
  - 2. Factory Assembly: Fully assembled in factory, match-marked for erection, and disassembled for shipment.
  - 3. Design Criteria:
    - a. Continuous Output Torque Rating: 1,575 foot-pounds, minimum, with scraper arms rotating.
    - b. Peripheral Speed: 6-8 feet per minute.
    - c. Design for continuous 24-hour service under design loads, including continuous output rated torque load, without excessive wear, damage, or failure.
    - d. Design Stresses: Not to exceed stresses allowed under AISC 360.
    - e. Safety Factor: 2.5.
- B. Sludge Scraper Mechanism: Scraper arms, scraper blades, and supporting structure.
  - 1. Scraper Arms: Structural steel, using welded truss construction of triangular or box section; or structural steel shapes or closed end pipe supported either by steel guy-rods or steel tie-rods or both.
  - 2. Scraper Blades: Steel plate 1/4 inch thick, with attached squeegees, welded or bolted to underside of scraper arms.
  - 3. Squeegees: One of the following:
    - a. Bronze, 1/8 inch thick.
    - b. Stainless steel, 1/8 inch thick.
    - c. Attachment to Arms: Bronze or stainless steel bolts and nuts with provision for vertical adjustment of not less than 2 inches.
  - 4. Attachment to Supporting Structure: Bolted or welded connections.
- C. Torque Tube: The torque tube shall be a minimum 6-inch diameter SCH 40 steel connected to the worm gear drive shaft by a rigid cast iron coupling.

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- D. Suction Sludge Removal:
1. Design: Horizontal suction header arm with intake orifices positioned at sludge level.
  2. Sludge Recirculation: 0.1 million gallons per day (MGD) minimum, 0.25 MGD average, and 0.5 MGD maximum.
  3. Materials: Hot-dipped galvanized steel for suction header.
  4. Sludge Discharge: Manufacturer's recommended design.
- E. Scum Removal: Skimming blade(s) arranged to skim as much of the water surface as possible, automatically moving scum into discharge with minimum of water; skimming blade mounted on support leg(s) attached to scraper arm.
1. Skimming blades and discharge equipment vertically adjustable in the field.
  2. Provide corrosion-resistant materials for moving parts within skimming assembly to ensure that corrosion will not freeze joints, springs, and other moving or adjustable parts into position.
  3. Discharge Design: Scum box mounted with top above liquid level; sloping beach type approach ramp shaped to contain scum as it is pushed plow blade mounted on outer end of skimming blade; scum box piped to scum well outside clarifier tank; plow blade and skimmer arm passing smoothly over scum box to continue rotation.
    - a. Scum Box: Welded structural steel, minimum thickness 1/4 inch; flanged connection for the scum discharge pipe.
    - b. Construction: Structural steel, unless otherwise indicated.
  4. Provide a stationary anti-rotation baffle supported from the bridge and consisting of a neoprene blade suspended at the water level surface to prevent the scum from rotating. The baffle shall act in conjunction with the rotating scum deflector blade to wedge the surface scum outward toward the skimmer pocket.

## 2.4 DRIVE ASSEMBLIES

- A. Drive Assemblies: Turntable, turntable bearing assembly, turntable base, motor and drive assembly, with appropriate gearing and bearings.
1. Design for all radial and axial loads imposed by drive assembly and components supported, to permit sustained operation at continuous output torque rating without excessive wear, and to develop twice continuous output torque rating without damage to or failure of drive assembly components.
  2. Arrange component parts to permit replacement of motor, drive, bearings, bearing raceways, and complete bearing units.
  3. Turntable and Turntable Base: Cast iron, nodular cast iron, or steel; of sufficient thickness to provide rigidity necessary to maintain alignment of sludge collector assembly.
  4. Fully enclose gearing in cast iron or fabricated steel housings provided with dust and oil seals.
  5. Machine-mate surfaces of turntable and intermediate gear reducer housing in such manner and to such tolerances that accurate alignment is ensured.

- B. Bearings: Ball or roller bearings, either oil lubricated or grease lubricated.
  - 1. Life Expectancy: Load rating and fatigue life based on ABMA STD 9 and ABMA STD 11, as applicable, when clarifier mechanism is operating continuously at specified torque rating.
    - a. Worm and Primary Helical Gearbox: L10 of 100,000 hours.
    - b. Gearmotor, Direct Drive: L10 of 100,000 hours.
    - c. Spur and Intermediate Helical Gearbox: L10 of 17,000 hours.
    - d. Gearmotor, Indirect Drive: L10 of 17,000 hours.
- C. Motor: Constant speed, totally-enclosed, fan-cooled, horizontal vertical type, suitable for outdoor service; complying with NEMA MG 1; protected against overload, low voltage, and unbalanced voltage.
  - 1. Drive Configuration: Close-coupled to or on input shaft of primary speed reducer, or driving speed reducer by a belt/chain drive.
  - 2. Torque: Sufficient to move sludge collector assembly from dead stop in dewatered tank and to move it from dead stop under specified continuous output loading, without overloading.
  - 3. Capacity: Adequate to drive sludge collector assembly continuously at maximum load encountered under any operating condition without overloading or exceeding nameplate rating of motor.
  - 4. Close-Coupled Motors: Provide flexible coupling between motor shaft and speed reducer.
  - 5. Flexible Couplings: AGMA 9002 and AGMA 9000.
  - 6. Belt/Chain Drive: Motor position adjustable to increase or decrease belt/chain tension.
- D. Speed Reduction and Turntable Gearing: All component parts designed to permit sustained operation at continuous output torque rating for life expectancy specified without excessive wear and to develop twice continuous output torque without damage to or failure of any component part.
  - 1. All Gears: Certified as meeting specified quality.
  - 2. Service Factor: As recommended in AGMA 6013, AGMA 6113, or AGMA 6034, when drive is operating at full load motor rating capacity, 24 hours a day continuous running.
  - 3. Loadings: Design to withstand any loadings produced by thrust, out-of-balance, and vibration resulting from operating conditions and to operate from zero rpm to speed consistent with the specified maximum peripheral speed.
  - 4. Turntable Gearing: **Worm gear reduction unit.**
    - a. Quality: Not less than AGMA Quality 6, AGMA ISO 10064-6, AGMA ISO 17485, AGMA 2011.
  - 5. Speed Reduction Gearing: Worm or helical or a combination thereof.
    - a. Quality: Comply with applicable requirements of AGMA 908, AGMA ISO 10064-6, AGMA ISO 17485, AGMA 2011, AGMA 6034, and AGMA 2015/915-1; not less than AGMA Quality 10, AGMA 2015/915-1, AGMA ISO 10064-6, AGMA ISO 17485, AGMA 2011, and AGMA 6113 or AGMA 6013.

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6. Worm Gears: Cast bronze; or cast steel or nodular cast iron with bronze rim; worms of hardened ground alloy steel or high-test heat-treated nodular cast iron.
  7. Helical Gears: Cast or forged alloy steel, with helical angle not exceeding 18 degrees.
  8. Shafts, Bolting, and Keys for Gears: AGMA 6001; structural steel shafts.
  9. Speed Reduction Gearing Lubrication: Provide oil or grease lubrication system.
    - a. When using bath lubrication using oil seals for containment or lubrication systems which rely upon an oil circulating pump, provide means to stop drive motor in event of insufficient lubrication.
    - b. Pressure indicating devices influenced by oil sludge or changes in oil viscosity are not acceptable.
- E. Motor Drives: Chain or belt type, with key mounted motive power transmitting connections.
1. Exception: Use only chain drives directly on center shaft or center drive cage/drum.
  2. Safety Factor: Minimum of 4 as applied to ultimate breaking or transmission strength with respect to loads transmitted at twice continuous output torque rating of clarifier mechanism.
  3. Belt Drives: V-belt-and-pulley; rayon corded belts with heat- and -oil-resistant rubber covering.
  4. Chain Drives: Chain and sprocket.
    - a. Chain: Roller type complying with ASME B29.100, with steel links.
    - b. Sprockets: ASME B29.100, of heat-treated ground alloy steel or of high-test cast iron complying with ASTM A48/A48M, Class 40 minimum, cast in a chill mold; teeth bearing surfaces of Brinell hardness of not less than 360 and minimum hardened zone depth of 3/16 inch; stress relieved before machining.
    - c. Sprocket teeth: Accurately ground to fit the chain.
  5. Shear-Pin Hub: Connect drive pulley/sprocket on output shaft of primary speed reducer to shaft by a shear-pin hub arrangement designed to protect motor against overload, designed so that it will not bind or freeze into position; bronze bushing with grease lubrication.
  6. Machinery Guards: Steel; weatherproof.
- F. Gearmotor: Where practicable, gearmotor may be used in lieu of separate motor and primary speed reducer.
1. Motor Component: As specified in paragraph entitled "Motor."
  2. Speed Reducing Component: Complying with applicable requirements specified in paragraph entitled "Speed Reduction and Turntable Gearing," and in AGMA 6113, AGMA 6013, and AGMA 6034.
- G. Lubrication Fittings: Provide adequate means for lubrication of bearings and other moving parts, by grease or oil as suitable.
1. Greased Bearings: Provide fittings suitable for grease gun service, of type that prevents over lubrication and build-up of pressure injurious to the bearings; where grease fittings would not be easily accessible, provide grease tubing to a convenient location.

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2. Oil Lubrication: Oil reservoir liberal in size, with opening for filling, overflow opening at proper location to prevent overfilling, oil-level sight glass, and drain at lowest point.
- H. Key Mounted Connections: Where connections between shafts and sprockets, gears, pulleys, and other component parts are specified to be key mounted, provide keys and keyways complying with ASME B17.1 or ASME B17.2.

## 2.5 NON-MOVING COMPONENTS

- A. Influent Well: Designed to radially diffuse and dampen influent liquid without inhibiting clarifier process, projecting below and 4 inches above water level.
  1. Construction: Structural steel, 1/4 inch minimum thickness, reinforced and stiffened with structural sections. Influent well shall be a minimum of 7' diameter x 5'-3" SWD.
  2. Provide a slot with a baffle at water level to permit escape of floating material.
  3. Where required by manufacturer's design, provide a standard bolted flange for connection of influent pipe.
  4. Provide new influent well supports.
- B. Baffles: Weir baffles and their splice plates, washers and supports all of the same material.
  1. Material: One of the following:
    - a. Steel, finished as specified under Factory Finishing.
    - b. Fiberglass reinforced plastic as specified.
  2. Scum Baffles: Size and section as indicated, with no projecting bolts, nuts, or splice plates on inboard side (side that skimmer will contact).
  3. Sealant for Mounting Weir Plates: Two-component polysulfide-rubber-base sealant.

## 2.6 CONTROLS

- A. Controls:
  1. Provide manual controls as indicated.
  2. Provide control devices of type and characteristics required to connect to process control system as indicated on the drawings and in 40 9200 - Process Control Descriptions.
- B. Manual Controls:
  1. Two-button, Start-Stop control.
  2. Reset pushbutton.

## 2.7 INSTRUMENTATION

- A. Control Panel: Mount instrumentation and control devices in enclosure as specified in Section 46 0500, mounted on access bridge at or near drive assembly. Provide the following, at minimum, mounted on or in panel door:
  1. Motor starter push-button station.
  2. Motor starter overload reset pushbutton button.
  3. Main circuit breaker handle.
- B. Power Components:
  1. Motor starter.
  2. Main circuit breaker.

3. Branch circuit breaker for each drive motor, control circuit, heating device, and receptacle.
4. Spaces for two additional circuit breakers.

## 2.8 PIPING

- A. Include as part of clarifier work all influent, sludge removal, scum removal, effluent, and tank drain piping.
- B. Pipe and Fittings: Unless otherwise indicated, provide cement-mortar-lined ductile iron pipe, of sizes as indicated; see Section 46 0506 for additional requirements.
- C. Pipe Within Clarifier Tank: Flanged joints.
  1. Pipe Above Ground: Flanged joints.
  2. Buried Pipe: Push-on or mechanical joints.

## 2.9 FACTORY FINISH

- A. Factory finish all parts using protective finish specified for submerged zone in Section 46 0500.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's recommendations and as indicated.
- B. Take special care to correctly align equipment components.
- C. For structural components mounted on concrete, provide full bearing under base plate using non-shrink grout.
- D. For equipment utilizing V-belt drives, adjust sheave alignment and belt tension in accordance with equipment manufacturer's recommendations.
- E. Mount weir plates using double bead of sealant, filling all voids between concrete tank and weir plates.
- F. Inspect painted surfaces for holidays, scratches, chipping, and other damage; remove imperfections, burrs, and loose paint, sand smooth, prime, and refinish using original materials.

### 3.2 SURFACING OF TANK FLOOR

- A. Following installation of scraper mechanism, bring tank floor to finish grade by means of grout surfacing swept into place by use of scraper arms, following equipment manufacturer's recommendations unless otherwise specified.
- B. Grout: If grout proportions for the surfacing are not given in manufacturer's recommendations, use cement-mortar grout composed of one part cement and three parts fine aggregate, with sufficient water as needed for conditions of placement, and one teaspoon of powdered aluminum per bag of cement.
- C. Preparation:
  1. Do not begin surfacing operation until after installed equipment has been inspected by manufacturer's engineer representative.
  2. Adjust scraper arms and blades to give correct clearance above final floor elevation.
  3. If manufacturer's recommended procedure calls for use of straightedges attached to scraper arms, fasten metal clad wooden straightedges to each scraper arm

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approximately 1/4 inch below scraper blade to form a screed.

4. Provide adequate barriers to prevent grout from entering sludge hoppers, cones, and wells, and drains.
  5. Immediately before starting surfacing operation, clean floor of dirt, soil, and other substances that would prevent proper bonding of surfacing to concrete subfloor.
- D. By hand, bring grout surfacing as near as possible to finish grade.
  - E. Rotate scraper arms manually to complete surfacing operation; use of drive unit to move arms is prohibited.
  - F. Immediately remove excess grout from floor, equipment, and walls.
  - G. Remove screeds and install squeegees.

### **3.3 FIELD QUALITY CONTROL - PRIOR TO STARTUP**

- A. Demonstrate proper operation, alignment, flow distribution, and controls using temporary water supply.

### **3.4 OWNER PERSONNEL TRAINING**

- A. See Section 46 0500 for additional requirements.
- B. Operating Personnel Training:
  1. Sessions: One.
  2. Trainees: Two.
  3. Training Hours: 2.
- C. Maintenance Personnel Training:
  1. Sessions: One.
  2. Trainees: Two.
  3. Training Hours: 8.

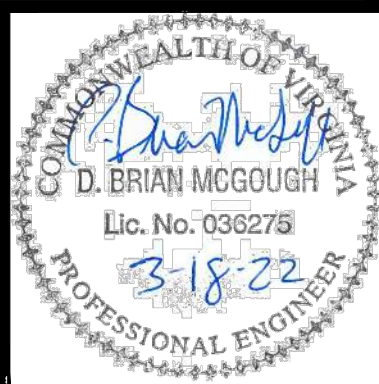
### **3.5 FIELD QUALITY CONTROL - AFTER STARTUP**

- A. Operate for at least two full cycles of operational sequences without failure.
- B. Inspect after 2 weeks of continuous operation for smooth and proper operation.
- C. If demonstrations or inspections are unsatisfactory, adjust, modify, repair, or replace, and retest.
  1. Owner reserves the right to reject the furnished equipment if performance appears to be unachievable with furnished equipment.
  2. Prior to retesting, obtain Owner's approval of retesting schedule.

**END OF SECTION**

Circular Clarifier Equipment	16235	46 4321/9
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**WASTEWATER TREATMENT PLANT REHABILITATION**  
 FOR THE  
**WISE COUNTY PUBLIC SERVICE AUTHORITY**  
**PRELIMINARY TREATMENT BUILDING**  
**RENOVATION PLAN**

No.	1
Date	01-08-23 01-20-23 02-01-23
Purpose of Document Issue	ISSUED FOR BIDS ADDENDUM NO. 001 ADDENDUM NO. 001

Designed	DBM
Drawn	ESB
Checked	DBM
Date	MARCH 2022

Project No. **16235**

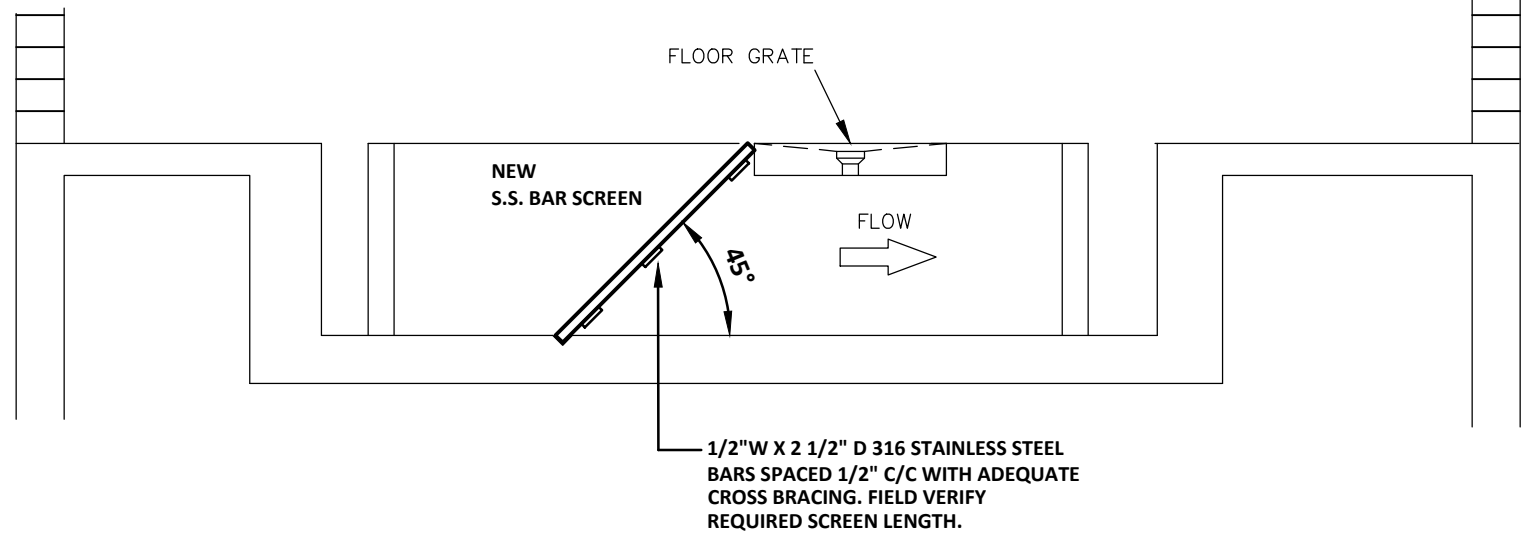
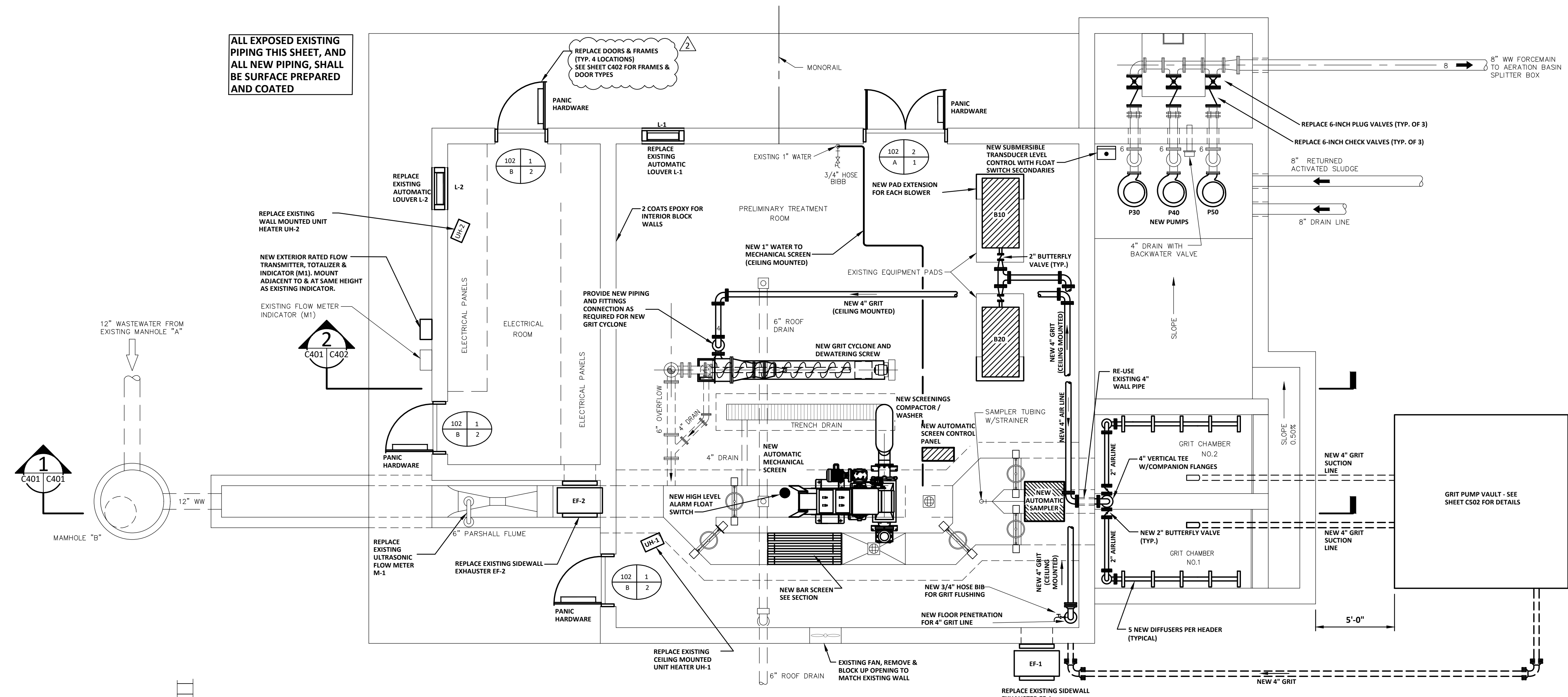


THOMPSON & LITTON

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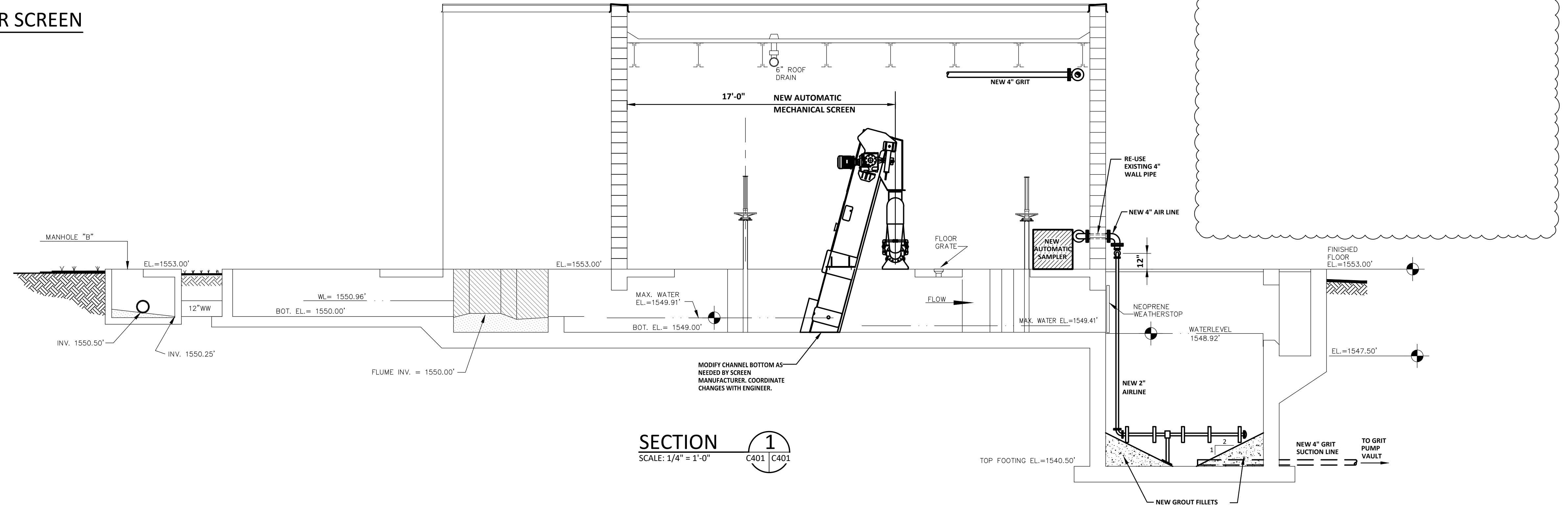
**C401**

ALL EXPOSED EXISTING PIPING THIS SHEET, AND ALL NEW PIPING, SHALL BE SURFACE PREPARED AND COATED

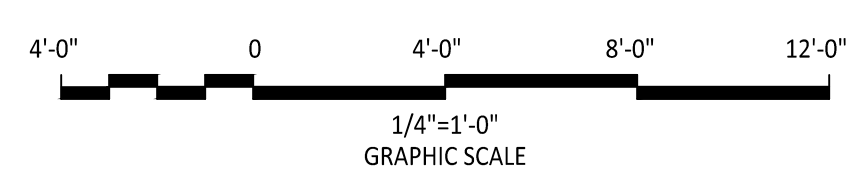


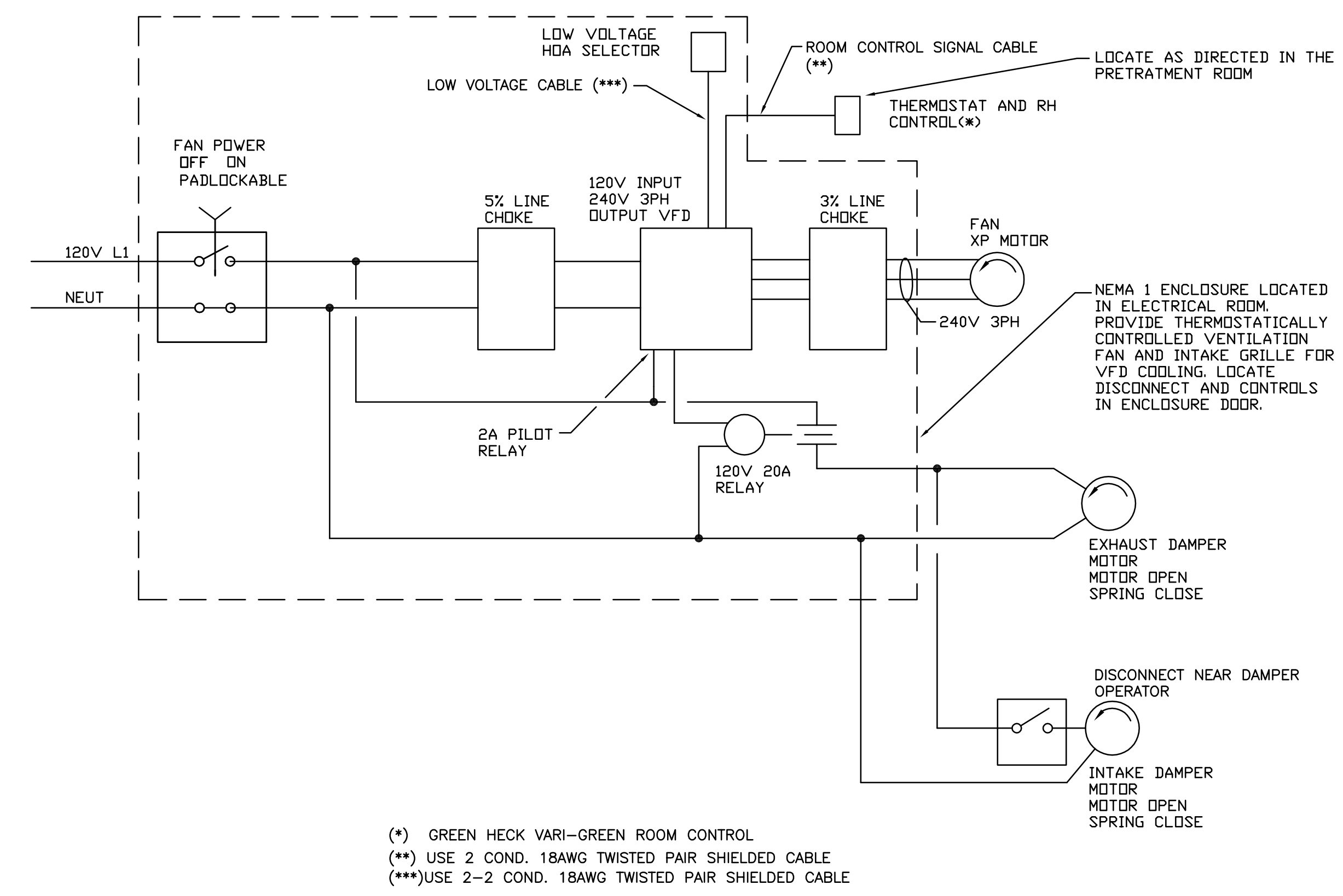
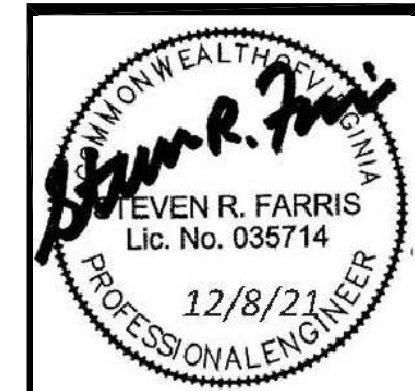
**SECTION AT MANUAL BAR SCREEN**  
SCALE: 1/4"=1'-0"

**MECHANICAL FLOOR PLAN**  
SCALE: 1/4"=1'-0"

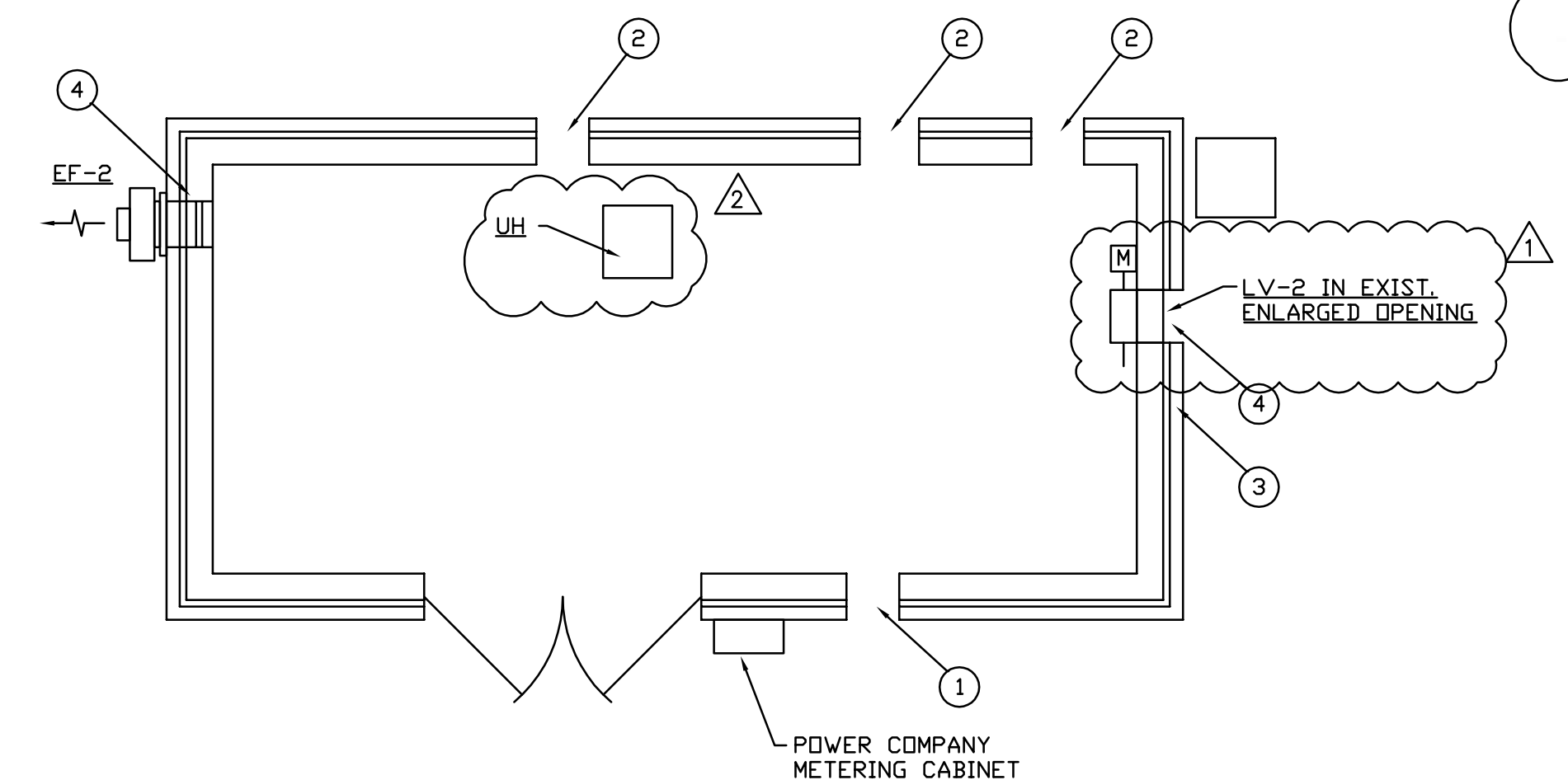


**SECTION 1**  
SCALE: 1/4"=1'-0"  
C401 C401





SCHMATIC WIRING - EXHAUST FAN ER-1 IN PRETREATMENT BUILDING SHEETS C401 AND E100



- KEYED NOTES:**
- 1 REMOVE EXISTING ABANDONED FAN COLLAR AND FAN. BLOCK UP OPENING AS NOTED.
  - 2 BLOCK UP ALL OPENINGS IN BLOCK AND BRICK WALL WITH CUT BRICK AND MORTAR.
  - 3 EXISTING BUILDING WALL IS 8" CMU WITH 4" BRICK VENEER.
  - 4 FOR NEW OPENINGS CUT IN WALL OR ENLARGED EXISTING OPENINGS PROVIDE 4x4x3/16" 304 STAINLESS STEEL ANGLE LINTEL (PAINTED) SET LEG UP ON INSIDE OF WALL AND 3x3x3/16" 304 STAINLESS STEEL ANGLE SET UP LEG ON OUTSIDE OF WALL.
  - 5 MOUNT FAN AS HIGH AS FEASIBLE.

HVAC FLOOR PLAN - UPPER LIFT STATION ELECTRICAL ROOM  
1/4" = 1'-0"  
PLAN NORTH

ELECTRIC UNIT HEATER SCHEDULE UPPER LIFT STATION

MARK	MANUFACTURER AND MODEL NO.	CAP MBH	FAN CFM	TYPE	KW	VOLTS Ø	CONTROL	WT. IN LBS.	NOTES
UH	MARKEL 2600 D1600 MODEL 2605	17	490	VERTICAL	5	240/1	THERMOSTAT	58	1,2,3,4,5 REPLACES EXIST. UH-1

1. REMOVE EXISTING HEATER.
2. PROVIDE LOW VOLTAGE THERMOSTAT.
3. INTERLOCK WITH REMOTE THERMOSTAT.
4. PROVIDE NEW WALL MOUNTED THERMOSTAT.
5. SUSPEND FROM CEILING, MOUNT UP 8".

LOUVER SCHEDULE

MARK	MANUFACTURER AND MODEL NO.	CFM	APD	FA FTZ	MAX VEL	INTAKE	EXHAUST	SIZE			NOTES
								W	H	D	
LV-2	RUSKIN ELM6DW	350	0.02	1	-	X	-	18"	24"	6"	1, 2, 3

LOUVERS ON SHEET C401

L-1	RUSKIN ELM6DW	3175	0.1	3.6	X	-	-	24"	40"	6"	1, 2, 3
L-2	RUSKIN ELM6DW	270	0.01	1.14	X	-	-	24"	18"	6"	1, 2, 3

1. PROVIDE ALUMINUM BIRDSCREEN.
2. PROVIDE 120 VOLT MOTORIZED DAMPER.
3. SELECT FINISH TO MATCH BRICK.

ELECTRIC UNIT HEATER SCHEDULE

MARK	MANUFACTURER AND MODEL NO.	CAP MBH	FAN CFM	TYPE	KW	VOLTS Ø	CONTROL	WT. IN LBS.	NOTES
EUIH ON SHEET C401									
EUIH-3	MARKEL MODEL 5500	17	490	HORIZONTAL	5	240/1	THERMOSTAT	58	1,2,3,4,5 REPLACES EXIST. UH-1
EUIH-4	MARKEL UH SERIES	11.2	400	HORIZONTAL	3.3	240/1	THERMOSTAT	36	1,2,3,6 REPLACES EXIST. UH-2

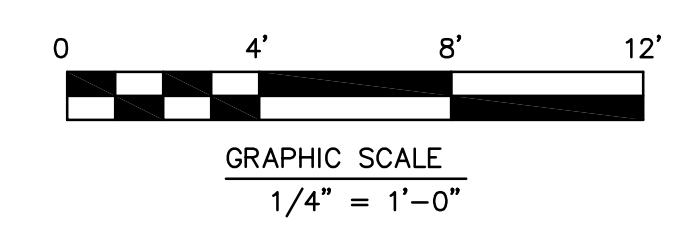
1. REMOVE EXISTING HEATER.
2. PROVIDE LOW VOLTAGE THERMOSTAT.
3. INTERLOCK WITH REMOTE THERMOSTAT.
4. PROVIDE NEW WALL MOUNTED THERMOSTAT.
5. REPLACE EXIST. HEATER AND RELOCATE NEAR WEST WALL.
4. PROVIDE BUILT IN THERMOSTAT AND DISCONNECT.

EXHAUST FAN SCHEDULE

MARK	MANUFACTURER AND MODEL NO.	CFM	SP. WG	MOTOR		TYPE	FAN RPM	CONTROL	WEIGHT IN LBS.	CONTROL
				HP	VOLTS Ø					
EF-2	GREENHECK MODEL CUE-090-E	350	0.2	1/40	120/1	SIWALL	1050	THERMOSTAT	40	1,2,3,4,9
EXHAUST FANS ON SHEET E100 AND C401										
EF-1	GREENHECK MODEL QE1-18	3175	1	1	120/1	TUBULAR	1108	TEMP & RH	183	5,6,7,9,10,11
EF-2	GREENHECK MODEL CUE-090-G	270	0.375	1/25	120/1	SIWALL	1300	THERMOSTAT	31	1,2,3,5,10

1. PROVIDE BACKDRAFT DAMPER.
2. PROVIDE DISCONNECT.
3. INTERLOCK WITH REMOTE THERMOSTAT AND MANUAL SWITCH. SEE SCHEMATIC THIS SHEET.
4. LOCATE FAN AS HIGH AS FEASIBLE. CUT WALL OPENING. SEE KEYNOTES.
5. REPLACE EXISTING FAN.
6. PROVIDE POLYESTER CORROSION RESISTANT COATING.
7. PROVIDE TEMPERATURE AND HUMIDITY VARIABLE SPEED CONTROL. SEE SCHEMATIC.
8. CHANGE CIRCUIT BREAKER TO 1P-25 AMPS AND THE BRANCH CIRCUIT SIZE TO NO. 10 AWG.
9. INTERLOCK WITH INTAKE LOUVER. SEE SCHEMATIC.
10. INTERLOCK WITH REPLACEMENT FOR EXISTING INTAKE LOUVER. SEE SCHEMATIC.

11. FAN SHALL HAVE CLASS A SPARK PROOF CONSTRUCTION AND TOTALLY ENCLOSED, FAN COOLED MOTOR. INTERLOCK WITH REPLACEMENT FOR EXISTING INTAKE LOUVER AND NEW EXHAUST LOUVER. SEE SCHEMATIC. FAN SHALL HAVE CLASS A SPARK PROOF CONSTRUCTION AND TOTALLY ENCLOSED, FAN COOLED MOTOR. INTERLOCK WITH REPLACEMENT FOR EXISTING INTAKE LOUVER. VERIFY EXISTING WALL OPENING AND PROVIDE NEW ALUMINUM MOTORIZED EXHAUST DAMPER IN EXISTING OPENING. COVER DAMPER WITH ALUMINUM BIRD SCREEN. SUPPORT FAN FROM EXISTING BAR JOIST ROOF CONSTRUCTION USING HOT DIPPED GALVANIZED OR STAINLESS STEEL FRAMING. PROVIDE ALUMINUM AIR PLENUM TO MATCH FAN EXHAUST TO WALL OPENING. LOCATE FAN INSIDE THE BUILDING WALL WITH THE DISCHARGE OVER THE EXISTING WALL OPENING.



WASTEWATER TREATMENT PLANT REHABILITATION  
FOR THE  
WISE COUNTY PUBLIC SERVICE AUTHORITY

**HVAC DETAILS & LIFT STATION FLOOR PLAN**

Purpose of Document Issue	ISSUED FOR BID	ADDENDUM NO. 001	ADDENDUM NO. 002
Date	01-08-23	01-20-23	02-01-23
No.	1	2	

Designed	JRC
Drawn	JRC
Checked	SRF
Date	NOVEMBER 2021

Project No.  
**16235**

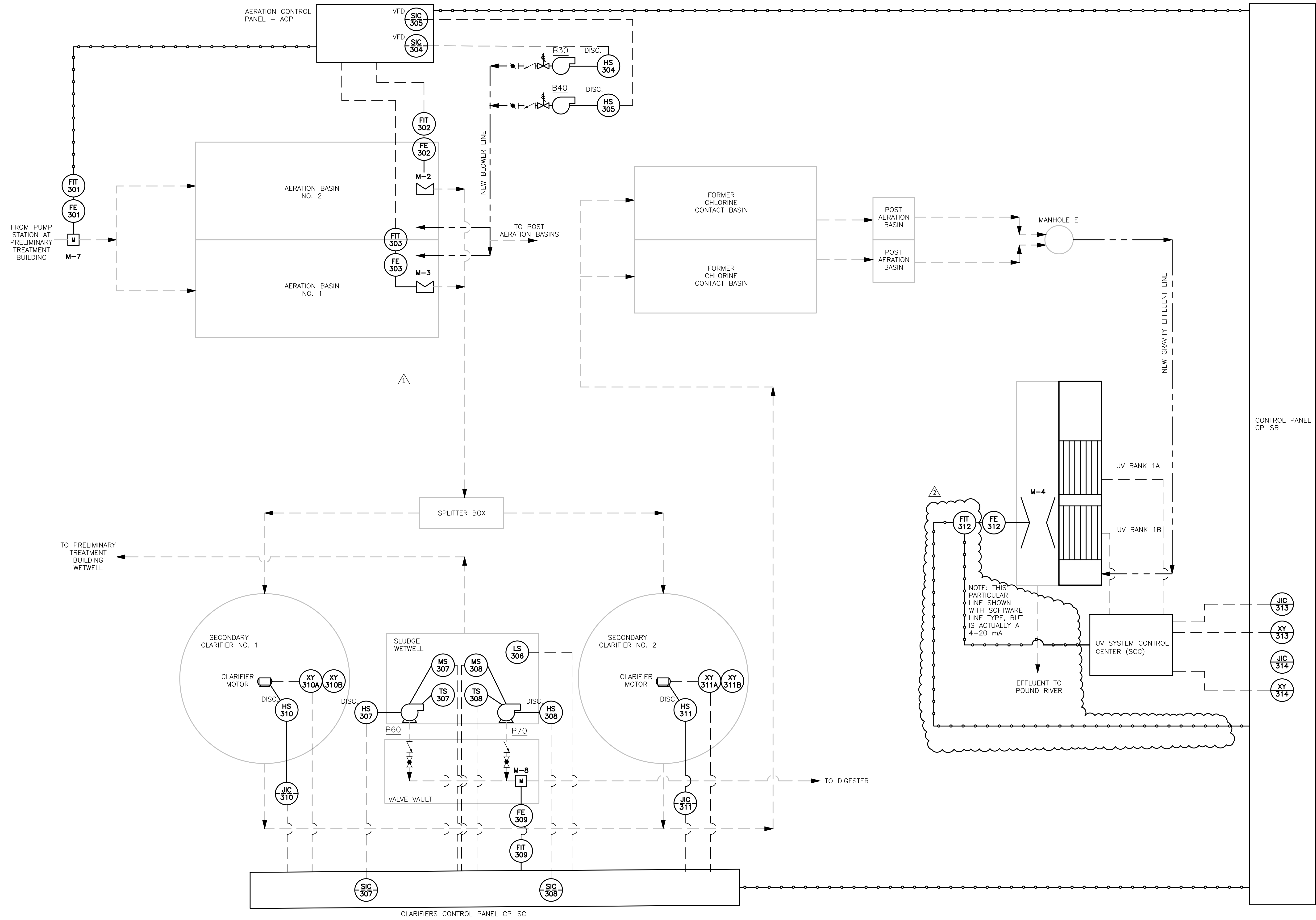


THOMPSON & LITTON

Sheet No.  
**M101**



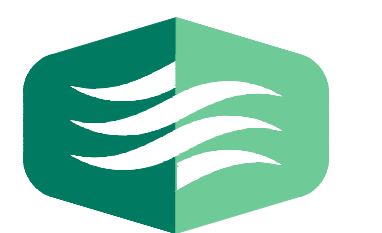
WASTEWATER TREATMENT PLANT REHABILITATION  
FOR THE  
WISE COUNTY PUBLIC SERVICE AUTHORITY  
PIPING AND INSTRUMENTATION DIAGRAM  
2 OF 3



No.	1
Date	01-08-23 02-01-23
Purpose of Document Issue	ISSUED FOR BIDS ADDENDUM NO. 002

Designed	DBM
Drawn	ESB
Checked	DBM
Date	MARCH 2022

Project No.  
16235



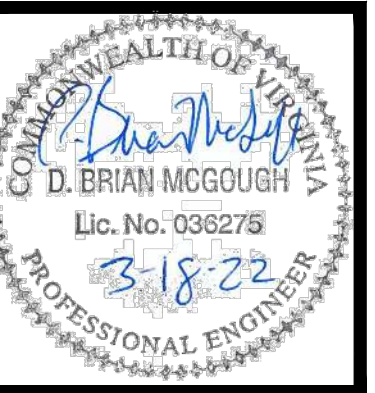
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& LITTON

Sheet No.

1202







WASTEWATER TREATMENT PLANT REHABILITATION  
FOR THE  
WISE COUNTY PUBLIC SERVICE AUTHORITY  
**DEVICE & INSTRUMENT SCHEDULE**  
2 OF 2

P&ID TAG	EQUIPMENT TAG	DEVICE DESCRIPTION	PROCESS	I / O SIGNAL TYPE	CONTROLLER INTERFACE	CONTROL WIRING	NOTES
FIT-312	M4, FE-312	EFFLUENT FLOW TRANSMITTER	EFFLUENT	AI 4-20mA & ETHERNET/IP	UV-SCC	CAT 6A & #18TSP; 3/4" C	PROVIDE REQUIRED WIRING BETWEEN ELEMENT AND TRANSMITTER
JIC-313	UV BANK 1A	UV BANK RUN INDICATION	EFFLUENT	DI 120VAC	CP-SB	2 #14AWG; 3/4" C	
XY-313	UV BANK 1A	UV BANK ALARM	EFFLUENT	DI 120VAC	CP-SB	2 #14AWG; 3/4" C	
JIC-314	UV BANK 1B	UV BANK RUN INDICATION	EFFLUENT	DI 120VAC	CP-SB	2 #14AWG; 3/4" C	
XY-314	UV BANK 1B	UV BANK ALARM	EFFLUENT	DI 120VAC	CP-SB	2 #14AWG; 3/4" C	
S/C-401	B50	VFD	DIGESTER	ETHERNET	CP-DG	CAT 6A	
HS-401	B50	AUXILIARY CONTACT, DISCONNECT SWITCH	DIGESTER	DI 120VAC	VFD	2 #14AWG; 3/4" C	
S/C-402	B60	VFD	DIGESTER	ETHERNET	CP-DG	CAT 6A	
HS-402	B60	AUXILIARY CONTACT, DISCONNECT SWITCH	DIGESTER	DI 120VAC	VFD	2 #14AWG; 3/4" C	
S/C-403	P80	VFD	DIGESTER	ETHERNET	CP-DG	CAT 6A	
TS-403	P80	TEMPERATURE SWITCH	DIGESTER	DI 120VAC	CP-DG	2 #14AWG; 3/4" C	
MS-403	P80	MOISTURE SWITCH	DIGESTER	DI 120VAC	CP-DG	2 #14AWG; 3/4" C	
HS-403	P80	AUXILIARY CONTACT, DISCONNECT SWITCH	DIGESTER	DI 120VAC	VFD	2 #14AWG; 3/4" C	
LIT-404	LE-404	AEROBIC DIGESTER LEVEL TRANSMITTER	DIGESTER	AI 4-20mA	CP - RS	#18TSP; 3/4" C	PROVIDE REQUIRED WIRING BETWEEN ELEMENT AND TRANSMITTER
N/A	N/A	ATS STATUS	PLANT GENERATOR	DI 120VAC	CP - RS	2 #14AWG; 3/4" C	
N/A	N/A	GENERATOR RUNNING	PLANT GENERATOR	DI 120VAC	CP - RS	2 #14AWG; 3/4" C	
N/A	N/A	GENERATOR LOW FUEL	PLANT GENERATOR	DI 120VAC	CP - RS	2 #14AWG; 3/4" C	
N/A	N/A	GENERATOR LOW TEMPERATURE	PLANT GENERATOR	DI 120VAC	CP - RS	2 #14AWG; 3/4" C	
N/A	N/A	GENERATOR HIGH TEMPERATURE	PLANT GENERATOR	DI 120VAC	CP - RS	2 #14AWG; 3/4" C	
N/A	N/A	GENERATOR ERROR	PLANT GENERATOR	DI 120VAC	CP - RS	2 #14AWG; 3/4" C	

No.	1
Date	01-08-23 02-01-23
Purpose of Document Issue	ISSUED FOR BIDS ADDENDUM NO. 002

Designed	DBM
Drawn	ESB
Checked	DBM
Date	MARCH 2022

Project No. **16235**



Sheet No. **1302**