INVITATION TO BID
NO. 24-040

WASTEWATER TREATMENT PLANT SCREENING EQUIPMENT

CITY OF FAIRHOPE
SHERRY SULLIVAN, MAYOR

March 22, 2024

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CITY OF FAIRHOPE

INVITATION TO BID

SEALED BIDS will be received by the City of Fairhope of Baldwin County, Alabama, in the City of Fairhope offices, 555 South Section St. Fairhope, Alabama, until 10:00 A.M. Tuesday, April 23, 2024, and then publicly opened thereafter, for furnishing all labor and materials, and performing all work required by the City of Fairhope and described as follows:

Bid Number 24-040
Fairhope Wastewater Treatment Plant Screening Equipment

The City of Fairhope is requesting responses from qualified suppliers for the acquisition of screening equipment for the City's Wastewater Treatment Plant. The screening equipment quoted in the Invitation to Bid will be installed under a separate contract.

Bid documents will be posted on the City of Fairhope Website: www.FairhopeAL.gov or a copy may be obtained by e-mailing: Purchasing@FairhopeAL.gov. Specifications are on file and may be seen in the Purchasing Department of the City of Fairhope, Alabama, 555 S. Section Street. Prior to opening, Bid packages may be picked up at that location during normal operation, between 7:00 am and 4:00 pm local time.

Questions or comments pertaining to this bid must be presented in writing, sent as e-mail to the attention of the Purchasing Manager, Erin Wolfe, 555 South Section St., Fairhope, AL 36532, e-mail: Purchasing@FairhopeAL.gov, by Tuesday, April 16, 2024, at 11:00 A.M. or will be forever waived.

The City of Fairhope is an Equal Opportunity Employer and requires that all **BIDDERS** comply with the Equal Employment Opportunity laws and the provisions of the CONTRACT Documents in this regard. The **CITY** also encourages and supports the utilization of Minority Business Enterprises on this and all public bids.

All bids must be on blank bid forms provided in the Bid Documents. All bids, with their guarantee (when required), must be enclosed in a sealed, opaque envelope, clearly identified on the outside as a "**Sealed Bid" with Item Name, Bid Number, City of Fairhope's Name and Address and CONTRACTOR's Name and Address**. Each bid must be in a separate envelope. Bids made out in pencil will not be accepted. Failure to observe the instructions contained herein will constitute grounds for rejection of your bid. The **City** reserves the right to accept or reject all bids or any portion thereof, and to waive informalities and to furnish any item of material or work to change the amount of the CONTRACT, whichever is in the best interest of the City of Fairhope.

No bids will be considered unless the **CONTRACTOR,** whether resident or non-resident of Alabama, is properly qualified to submit a proposal for this type of work in accordance with all applicable laws of the State of Alabama. Where applicable, this shall include evidence of holding a current license from the State Licensing board for General BIDDERS, Montgomery, Alabama, as required by Chapter 8 of Title 34, of the Code of Alabama, 1975. In addition, the Awarded Vendor, if non-resident of the State, and if a corporation, shall show evidence of having qualified with the Secretary of State to do business in the State of Alabama. **CONTRACTOR** must have a current business license or purchase a business license with the City of Fairhope prior to work performed. No bids shall be withdrawn for the period of sixty (60) days subsequent to the opening of proposals without the consent of the City of Fairhope, Baldwin County, Alabama. Once completed, a tabulation of the responsive and responsible bids will be available for public viewing by visiting the following web address: www.FairhopeAL.gov.

ITEM I
INVITATION AND INSTRUCTIONS TO BIDDERS

1.00 **BID INVITATION**

Notice is hereby given that the **City of Fairhope ("CITY")** will receive bids on the project described herein. Qualified **BIDDERS** are invited to bid on this CONTRACT.

1.01 **BID NO.:** **24-040**
NAME: **Wastewater Treatment Plant Screening Equipment**

1.02 **SUMMARY**

The City of Fairhope is requesting responses from qualified suppliers for the acquisition of mechanical screens at their Wastewater Treatment Plant. The screening equipment quoted in the Invitation to Bid will be installed under a separate contract.

1.03 **BID DEADLINE**

Bids will be received until **10:00 A.M. local time, Tuesday, April 23, 2024,** at the City Services and Public Utilities Building, 555 South Section St., Fairhope, Alabama, and publicly opened shortly thereafter.

1.04 **AVAILABILITY OF DOCUMENTS**

Bid Documents may be obtained at the City Services and Public Utilities Building, 555 South Section Street., Fairhope, Alabama. One set of Bid Documents can be obtained free of charge.

1.05 **INQUIRIES**

Questions or comments pertaining to this bid must be presented in writing, sent as e-mail to the attention of the Purchasing Manager, Erin Wolfe, 555 South Section St., Fairhope, AL 36532,
e-mail: Purchasing@FairhopeAL.gov, by Tuesday, April 16, 2024, at 11:00 A.M. or will be forever waived.

1.06 **SITE EXAMINATION**

No pre-bid meeting is scheduled.

Suppliers can visit the Wastewater Treatment Plant at 300 N. Church Street Fairhope, AL. Suppliers are to schedule a visit through the City.

The City of Fairhope will not furnish any labor, material, or supplies unless specifically stated in the CONTRACT Documents. **BIDDERS** must be properly licensed to perform the work as outlined in the Scope of Work. Awarded Vendor must have a current business license or purchase a business license with the City of Fairhope prior to bid being awarded.

Except for CONTRACTS funded in whole or in part by funds received from a federal agency, preference shall be given to resident **BIDDERS** on the same basis as the nonresident **BIDDERS** state awards CONTRACT to Alabama **BIDDERS b**idding under similar circumstances. Therefore, non-resident **BIDDERS** shall submit with their bid a written opinion of an attorney at law licensed to practice law in the non-resident **BIDDERS** state of domicile as to preferences granted by that state to entities doing business in that state when letting public contracts.

1.07 **BID SECURITY**

Bids shall be accompanied by a Bid Security equal to 5% (percent) of the bid price, but in no event more

than $10,000.00. Bid Security shall be in the form of a Bid Bond or a cashier's check payable to The City of Fairhope. No Bid Security is required on bids less than $10,000.00.

1.08 **PERFORMANCE ASSURANCE AND INSURANCE**

Not Applicable

1.09 **DURATION OF OFFER**

Bids may be withdrawn in written or telegraphic request received from **BIDDER** prior to the time fixed for opening. No bid shall be withdrawn for a period of sixty (60) days subsequent to the opening of bids without the consent of the City Council of the City of Fairhope.

1.10 **EQUAL OPPORTUNITY**

The City of Fairhope is an Equal Opportunity Employer and requires that all **BIDDERS** comply with the Equal Employment Opportunity laws and the provisions of the CONTRACT Documents in this regard. The City of Fairhope also encourages and supports the utilization of Minority Business Enterprises on this and all public bids.

1.11 **BID SUBMISSION AND PREPARATION**

Sealed Bids, signed, executed, and dated, will be received by the City of Fairhope as noted in section 1.03 above. Submit one copy of the executed offer on the Bid Form provided, signed, and with the required Bid Security. **The bid shall be enclosed in a sealed opaque envelope approximately 9x12 inches or larger, clearly identified on the outside** as a **SEALED BID** with **the BID NAME, BID NUMBER, CITY'S NAME AND ADDRESS, SUPPLIER'S NAME AND ADDRESS.**

Forms furnished, or copies thereof, shall be used, and strict compliance with the requirements of the invitation, these instructions, and the instructions printed on the forms is necessary. Special care should be exercised in the preparation of bids. **BIDDERS** must make their own estimates of the facilities and difficulties attending the performance of the proposed CONTRACT, including local conditions, uncertainty of weather, and all other contingencies. All designations and prices shall be fully and clearly set forth. The proper space in the bid and guaranty forms shall be suitably filled in.

Fill in all blanks on the bid form with non-erasable ink or type. Erasers or other changes must be explained or noted over the signature of the **BIDDER.**

The Bid Form may have a Contingency Allowance listed. Add this amount to the Base Bid to derive the Total Bid. The Contingency Allowance covers unforeseen conditions and shall not be used by the **BIDDER** without the written authorization of the **CITY**. At the conclusion of the project, the unused portion of the Contingency Allowance shall revert to the **CITY**.

Each bid must give the full business address of the **BIDDER** and must be signed by him with his usual signature. Bids by partnerships must furnish the full names of all partners and must be signed with the partnership name by one of the members of the partnership, or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the legal name of the corporation followed by the name of the State of Incorporation and by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. The name of each person shall also be typed or printed below the signature. A bid by a person who affixes to this signature the word "president," "secretary," "agent," or other designation without disclosing his principal, may be held to be the bid of the individual signing. When requested by the **CITY** satisfactory evidence of the authority of the officer signing in behalf of the corporation shall be furnished.

Each project will be bid separately unless otherwise expressly requested in the CONTRACT document. Combination bids, that is bids on separate projects lumped together as a single bid or on all or none basis, will not be accepted unless the CONTRACT document expressly requests or permits same.

1.12 **BID INELIGIBILITY**

Bids that contain irregularities of any kind may be declared unacceptable at the discretion of the **CITY**. The **CITY** may waive any irregularities and may reject any or all bids. Bids received after the deadline will be returned to the **BIDDER** unopened.

1.13 **INQUIRIES/ADDENDA**

All Addenda are part of the CONTRACT Documents. Include resultant costs in the Bid. Addenda will be issued by E-MAIL and posted on the City's website: www.FairhopeAL.gov. It is the responsibility of the **BIDDER** to verify that all Addenda have been received.

Questions or comments pertaining to this bid must be presented in writing, sent via email Purchasing@FairhopeAL.gov by Tuesday, April 16, 2024, at 11:00 A.M. or will be forever waived.

1.14 **BID ACCEPTANCE**

The bid will be evaluated per the request for proposal language included herein.

1.15 **BIDDERS INTERESTED IN MORE THAN ONE BID**

If more than one bid is offered by any one party, by or in a name of his clerk, partner, corporation in which he has a substantial interest, or in which he is an officer, or other person, all such bids may be rejected. A party who has quoted prices on materials to a **BIDDER** is not thereby disqualified from quoting prices to other **BIDDERS** or from submitting a bid directly for the materials or work. The **CITY** reserves the right to determine in its discretion whether the provisions of this clause have been violated by any **BIDDER.**

1.16 **ERRORS IN BIDS**

BIDDERS or their authorized agents are expected to examine the maps, drawings, specifications and all other instructions pertaining to the work, which will be open to their inspection. Failure to do so will be at the **BIDDER'S** own risk. In case of error, in the extension of prices, the unit price will govern.

1.17 **CONTRACT AND BOND**

The **BIDDER** to whom award is made must, when requested, enter into written CONTRACT on the standard form as set out herein, with satisfactory security in the amount required, within the period specified, or, if no period be specified, within 15 days after the required forms are presented to him for signature.

1.18 **COLLUSION**

If there is any reason for believing that collusion exists among the **BIDDERS** any or all bids may be rejected, and those participating in such collusion may be barred from submitting bids on the same or other work with the **CITY**.

1.19 **SUBLETTING OR ASSIGNING OF CONTRACT**

N/A

1.20 **PROSECUTION OF WORK**

The **BIDDER** shall prosecute the work continuously and diligently in the order and manner set out in his schedule as approved by the **CITY**. He shall provide sufficient satisfactory materials, labor, and equipment to ensure that the work will be completed in a satisfactory manner within the time specified in the CONTRACT.

Should the **BIDDERS** fail to maintain a satisfactory rate of progress, the **CITY** may require that additional forces and/or equipment be placed on the work to bring the project up to schedule and maintain it at that level.

Should the **BIDDER** fail to furnish sufficient satisfactory equipment and/or labor for maintaining the quality and progress of the work at satisfactory level, the **CITY** may withhold all estimates that may become due

until satisfactory quality and progress are maintained; or the CONTRACT may be annulled.

END OF INVITATION AND INSTRUCTIONS TO BIDDERS

ITEM II
SCOPE OF SUPPLY

Bid No. 24-040
Wastewater Treatment Plant Screening Equipment

The City of Fairhope is requesting responses from qualified suppliers for the acquisition of screening equipment for the City's Wastewater Treatment Plant. The screening equipment quoted in the Invitation to Bid will be installed under a separate contract.

SCOPE OF SUPPLY FOR SCREENING EQUIPMENT
The screening equipment furnished by the screen manufacturer (Supplier) shall include the following components at a minimum:

- Perforated plate self-cleaning mechanical screen(s)
- Screenings washer/compactor and conveyance system
- Control panel
- Delivery Schedule

Additional information is provided in the following attachments, which are included in the Appendix to this document:

- Appendix A:
  - Drawings (Site Plan and Headworks Plan and Sections)
  - Specification Section 444226 – Self Cleaning Screen
  - Specification Section 262900 - Manufactured Control Panels
  - Specification Section 264400 – Electrical Heat Tracing Systems

PROPOSALS
The Supplier shall submit a proposal for screening equipment based on the information included herein. Proposals must include the following information at a minimum:

1. **Proposal Form** - Lump-sum cost to furnish new self-cleaning mechanical screen equipment, controls, and appurtenances. The cost shall include delivery to the jobsite. Fairhope is tax exempt, so taxes should not be included.
2. **Scope of Supply** – Description shall include all alternates, exclusions, and items to be furnished by others. Alternates, exclusions, and exceptions shall be considered, provided they neither alter the design and operating parameters nor impact the performance of the system. All alternates, exclusions, and exceptions shall be clearly stated in an itemized format with the relevant specification(s) section noted.
3. **Details for Perimeter Seals** – Provide a detailed description of the seal(s) used between the screen and channel wall. The screen(s) will be shifted to one side of the channel, so the perimeter seal on one side will be larger than the other side.
4. **Schedule** – Include the time required to develop and submit shop drawings/equipment submittals and the time required for fabrication/delivery of equipment to the job site. The Schedule shall be based on the schedule included herein. **The Supplier shall assume a 3-week submittal review process by the City and Engineer when developing the schedule.**
5. **Equipment Drawings** - Dimensional drawings of the equipment.
6. **Cost of Routine Maintenance Schedule** – Provide a list of items that require routine/periodic maintenance, including a list of parts, consumables, and other wear items, and a cost for each.
7. **Cost of Reconditioning/Re-Build** – Provide scope and description of the parts and labor required to recondition/re-build the screen(s), and provide a lump sum cost (in 2024$) for the reconditioning/re-build, all as required for the manufacturer to provide a 1-year warranty. Desribe any items that are not included in the scope/cost (e.g. removal and reinstallation by Owner, etc.).
8. **Spare Parts** – Provide a list of recommended spare parts, including cost and lead times for each. Spare parts should include motors and gear boxes for each drive (screen, brush, compactor, etc.).
9. **Waranty and Performance Data:** Provide description of warranty and provdie performance data to include capture rate and power usage.
10. **Extended Warranty** – Provide a description and cost to add/include a 5 year extended warranty (total of 5 years).
11. **Proximity of Spare Parts** - Location of spare parts and authorized service technicians.

12. **References** - List of Owner references for installations of similar size and application in the United States. References will include the following:

a. Installation location, and date installed.
b. Owner name, phone number, and email address.
c. Design engineer name, phone number, and email address.

TENTATIVE SCHEDULE:

- Advertisement of RFP – Friday, March 22, 2024
- Sealed Proposals Due – 10:00 a.m. (Central Time) Tuesday, April 23, 2024
- Evaluate Proposals and Provide Recommendation to Fairhope – Monday, May 13, 2024
- Issuance of Purchase Order – Friday, May 17, 2024
- Construction Contract Award – September 2024

EVALUATION OF PROPOSALS

Proposals will be evaluated based on each of the items listed above and/or other factors Fairhope considers to be relevant. The evaluation will include a fifteen (15) year net present worth analysis of capital costs and operations/maintenance costs, and other factors deemed to be important to Fairhope.

SELECTION AND AWARD

Fairhope recognizes individual systems/proposals may differ in equipment supplied and/or configuration; consequently, Fairhope reserves the right to reject all Proposals or any Proposal that, in it's sole judgment, does not conform to the intent and requirements of the Request for Proposals and system requirements; and the right to delay, cancel, or postpone the proposal selection. Fairhope also reserves the right to accept the proposal that, in its sole judgment, is best suited to its needs and to waive any informality or technicality it deems in its best interest.

Krebs and Fairhope will review each proposal, and Krebs will issue a recommendation to Fairhope based on the criteria outlined in this RFP. Fairhope will issue a Purchase Order Agreement to the selected Supplier upon approval of the recommendation. Fairhope and the Supplier shall sign the Purchase Order Agreement, which shall serve as a binding document that guarantees the equipment will be furnished and paid for per the pricing submitted and the Agreement of terms and conditions of the submitted proposal. The executed Agreement will be transferred to the successful bidder for the construction of the WWTP improvements and included in the construction contract. Fairhope will make no direct payment to the Supplier. The successful construction bidder/supplier will make all payments for the screening equipment.

ITEM III
BID RESPONSE FORM

Date: ____ / _____ / _____

Bid No: 24-040 Wastewater Treatment Plant Screening Equipment

Bids Due: Tuesday, April 23, 2024, 10:00 A.M.

OPTION 1

ITEM NO.	APPROXIMATE QUANTITIES	DESCRIPTION OF ITEM	UNIT PRICE	TOTAL PRICE FOR ITEM
1.	Complete	One (1) self-cleaning, perforated plate screen, one (1) screenings washer/compactor to service one (1) screen, and one (1) system control panel.	Lump Sum	$
2.	Complete	Five-Year Warranty.	Lump Sum	$
3.	Complete	Spare motors - one for the screen, one for the cleaning brush (if required), and one for the washer/compactor.	Lump Sum	$
		Total Bid for Option 1		$
		Equipment Delivery Date to Jobsite		

OPTION 2

ITEM NO.	APPROXIMATE QUANTITIES	DESCRIPTION OF ITEM	UNIT PRICE	TOTAL PRICE FOR ITEM
1.	Complete	Two (2) self-cleaning, perforated plate screens, one (1) screenings washer/compactor to service two (2) screens, and one (1) system control panel.	Lump Sum	$
2.	Complete	Five-Year Warranty.	Lump Sum	$
3.	Complete	Spare motors - one for the screen, one for the cleaning brush (if required), and one for the washer/compactor.	Lump Sum	$
		Total Bid for Option 2		$
		Equipment Delivery Date to Jobsite		

The award of the Contract for Option 1 will be based on the evaluation process described in the Request for Proposals document. A determination will be made to accept or reject Option 2 once the construction contract bids have been received and it is determined by the Owner that the Option 2 pricing is within the project budget.

The Bidder understands that the Owner reserves the right, in the Owner's discretion, to reject any or all bids, to waive any informality in any bid, and to accept any bid considered to be advantageous to the Owner.

The undersigned, as Bidder, hereby declares that the name (or names) of the only person (or persons) interested in this Proposal, as principal (or principals), is (or are) as herein below set out and that no person other than that (or those) herein below stated has any interest in this Proposal, or in the Contract to be entered into; that this Proposal is made without connection with any other person, firm or corporation proposing; and that it is in all respect fair and in good faith, without collusion or fraud.

The undersigned, as Bidder, hereby declares that the name (or names) of the only person (or persons) interested in this Proposal, as principal (or principals), is (or are) as herein below set out and that no person other than that (or those) herein below stated has any interest in this Proposal, or in the Contract to be entered into; that this Proposal is made without connection with any other person, firm or corporation making a proposal; and that it is in all respect fair and in good faith , without collusion or fraud.

Receipt of the following Addenda to these documents is hereby acknowledged by the undersigned (SUPPLIER to complete below):

ADDENDUM NO.	DATE ISSUED	ADDENDUM NO.	DATE ISSUED
_____	_____	_____	_____
_____	_____	_____	_____

Each bid must give the full business address of the SUPPLIER and must be signed by him with his usual signature. Bids by partnerships must furnish the full names of all partners and must be signed with the partnership name by one of the members of the partnership, or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the legal name of the corporation followed by the name of the State of Incorporation and by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. The name of each person shall also be typed or printed below the signature. A bid by a person who affixes to this signature the word "president," "secretary," "agent," or other designation without disclosing his principal, may be held to be the bid of the individual signing. When requested by the City of Fairhope, Baldwin County, Alabama, satisfactory evidence of the authority of the officer signing in behalf of the corporation shall be furnished.

The undersigned agrees to furnish the goods/services as requested by you for the City of Fairhope, Baldwin County, Alabama in your invitation to bid, and certifies that they will meet or exceed the specifications called for. The undersigned has read all information pertaining to this bid and has resolved all questions. It is also understood and agreed that all prices quoted are F.O.B. described in the bid documents and specifications. The undersigned also affirms he/she has not been in any CONTRACT or collusion among BIDDERS or prospective BIDDERS in restraint of freedom of competition, by CONTRACT to bid at a fixed price or to refrain from bidding or otherwise.

Witness our hands and seals this _____ day of _____, 2024.

_____

_____

_____
(Type or Print Name and Address of Firm)

_____
(Type or Print Name and Title of Officer/Legal Representative of Firm Submitting Bid)

_____
(Signature of Officer/Legal Representative of Firm Submitting Bid)

_____
(Type or Print Date)

If Individual or Partnership

_____ _____

(Name of Individual or Partnership) (Name of Partner Print)

_____ _____

(Name of Representative Authorized to sign Bids and CONTRACTs for the firm Print) (Name of Partner Print)

Address_____

_____

_____

Phone Number ( )_____Fax Number ( )_____

E-mail address _____Alabama Contractor's License No. ___N/A_____

Foreign Entity ID (if outside of Alabama)_____

If Corporation or LLC

Company_____

State of Incorporation _____

Company Representative_____
(Representative Authorized to sign Bids and CONTRACTs for the firm Print)

Company Representative_____
(Representative Authorized to sign Bids and CONTRACTs for the firm Signature)

Address_____

_____

_____

Phone Number ( )_____ Fax Number(___)_____

E-mail address _____AL CONTRACTOR's License No. ___N/A_____

Foreign Vendor Id_____

BID PROPOSAL NOTARIZATION:

STATE OF _____}

COUNTY OF _____}

I, the undersigned authority in and for said State and County, hereby certify that_____, as respectively, of _____, whose name is signed to the foregoing document and who is known to me, acknowledged before me on this day, that, being informed of the contents of the document they executed the same voluntarily on the day the same bears date.

Given under my hand and Notary Seal on this _____ day of _____, 2024.

NOTARY PUBLIC _____

MY COMMISSION EXPIRES____/___/_____

ITEM IV
SUPPLIER INFORMATION

This Section must be printed, completed, and turned in with your bid response to

Business Organization

Name of SUPPLIER (exactly as it appears on W-9):

_____
Doing-Business-As Name of SUPPLIER:

_____
Principal Office Address:

_____

_____

_____

LOCAL Telephone Number: _____ Toll- Free_____

LOCAL Fax Number: _____

Email address: _____
Website: _____

Form of Business Entity [check one ("X"]
Corporation ____
Partnership ____
Individual ____
Joint Venture ____
Other (describe): _____

Corporation Statement
If a corporation, answer the following:
Date of incorporation: _____
Location of incorporation: _____
The corporation is held: Publicly ___
Privately ___

Partnership Statement
If a partnership, answer the following:
Date of organization: _____
Location of organization: _____
The partnership is: General ___
Limited ___

Joint Venture Statement
If a Joint Venture, answer the following:
Date of organization: _____
Location of organization: _____
JV CONTRACT recorded? Yes ___ No ___

Contact: _____Email_____

Phone_____Fax_____

END OF SUPPLIER INFORMATION

ITEM VIII

ALABAMA IMMIGRATION ACT CONTRACT REQUIREMENTS

1.0 Background

The **Beason-Hammon Alabama Taxpayer and Citizen Protection Act, Act No 2011-535**, **as amended by Act No 2012-491, *Code of Alabama* (1975) Section 31-13-1** through **Section 31-13-30** (also known as and hereinafter referred to as "the Alabama Immigration Act") is applicable to CONTRACTs with the City of Fairhope, Alabama. All business entities entering into CONTRACTs with the City of Fairhope, Alabama will comply with the Alabama Immigration Act.

2.0 Definitions

ALIEN. Any person who is not a citizen or national of the United States, as described in 8 U.S.C. § 1101, et seq., and any amendments thereto.

BUSINESS ENTITY. Any person or group of persons employing one or more persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood, whether for profit or not for profit. Business entity shall include but not be limited to the following:

a. Self-employed individuals, business entities filling articles of incorporation, partnerships, limited partnerships, limited liability companies, foreign corporations, foreign limited partnerships, foreign liability companies authorized to transact business in this state, business trusts, and any business entity that registers with the Secretary of State.
b. Any business entity that possesses a business license, permit, certificate, approval, registration, charter, or similar form of authorization issued by the state, any business entity that is exempt by law from obtaining such a business license, an any business entity that is operating unlawfully without a business license.

CONTRACTOR. A person, employer, or business entity that enters into a CONTRACT to perform any service or work or to provide a certain product in exchange for valuable consideration. This definition shall include, but not be limited to, a general CONTRACTOR, SUB-CONTRACTOR, independent CONTRACTOR, CONTRACT employee, project manager, or a recruiting or staffing entity.

EMPLOYEE. Any person directed, allowed, or permitted to perform labor or service of any kind by an employer. The employees of an independent CONTRACTOR working for a business entity shall not be regarded as the employees of the business entity, for the purposes of this chapter. This term does not include any inmate in the legal custody of the state, a county, or a municipality.

EMPLOYER. Any person, firm, corporation, partnership, joint stock association, agent, manager, representative, foreman, or other person having control or custody of any employment, place of employment, or of any employee, including any person or entity employing any person for hire within the State of Alabama, including a public employer. This term shall not include the occupant of a household contracting with another person to perform casual domestic labor within the household.

E-VERIFY. The electronic verification of federal employment authorization program of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, P.L. 104-208, Division c, Section 403 (a); 8 U.S.C. §1324(a) and operated by the United States Department of Homeland Security, or its successor program.

STATE-FUNDED ENTITY. Any governmental entity of the state or a political subdivision thereof or any other entity that receives any monies from the state or a political subdivision thereof; provided, however, an entity that merely provides a service or a product to any governmental entity of the state or a political subdivision thereof, and receives compensation for the same, shall not be considered a state-funded entity.

SUB-CONTRACTOR. A person, business entity, or employer who is awarded a portion of an existing CONTRACT by a CONTRACTOR, regardless of its tier.

UNAUTHORIZED ALIEN. An alien who is not authorized to work in the United States as defined in 8 U.S.C. § 1324a (h) (3) .

3.0 Mandatory Clause

All CONTRACTS or CONTRACTS to which the state, a political subdivision, or state-funded entity are a party shall include the following clause:

> ***"By signing this CONTRACT, the CONTRACTING parties affirm, for the duration of the CONTRACT, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the state of Alabama. Furthermore, a CONTRACTING party found to be in violation of this provision shall be deemed in breach of the CONTRACT and shall be responsible for all damages resulting therefrom."***

For purposes of this section, "CONTRACT" shall mean a CONTRACT awarded by the state, any political subdivision thereof, or any state-funded entity that was competitively bid or would, if entered into by the state or an agency thereof, be required to be submitted to the CONTRACT Review Permanent Legislative Oversight Committee.

4.0 CONTRACTs Involving Business Entity, or Employer

As a condition for the award of any CONTRACT, grant, or incentive by the state, any political subdivision thereof, or any state-funded entity to a business entity or employer that employs one or more employees, the business entity or employer shall not knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama.

As a condition for the award of any CONTRACT, grant, or incentive by the state, any political subdivision thereof, or any state-funded entity to a business entity or employer that employs one or more employees within the state of Alabama, **the business entity or employer shall provide documentation establishing that the business entity or employer is enrolled in the E-Verify program.** During the performance of the CONTRACT, the business entity or employer shall participate in the E-Verify program and shall verify every employee that is required to be verified according to the applicable federal rules and regulations.

5.0 CONTRACTS Involving Subcontracting

Any SUB-CONTRACTOR on a project paid for by CONTRACT, grant, or incentive by the state, any political subdivision thereof, or any state-funded entity shall not knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama and shall also enroll in the E-Verify program prior to performing any work on the project. Furthermore, during the performance of the CONTRACT, the SUB-CONTRACTOR shall participate in the E-Verify program and shall verify every employee that is required to be verified according to the applicable federal rules and regulations. This subsection shall only apply to SUB-BIDDERS performing work on a project subject to the provisions of this section and not to collateral persons or business entities hired by the SUB -CONTRACTOR.

6.0 Proof of E-Verify documentation will be in the form of a copy of the signed Memorandum Of Understanding (MOU) generated upon completion of the E-Verify program.

END OF ALABAMA IMMIGRATION ACT CONTRACT REQUIREMENTS

ITEM IX

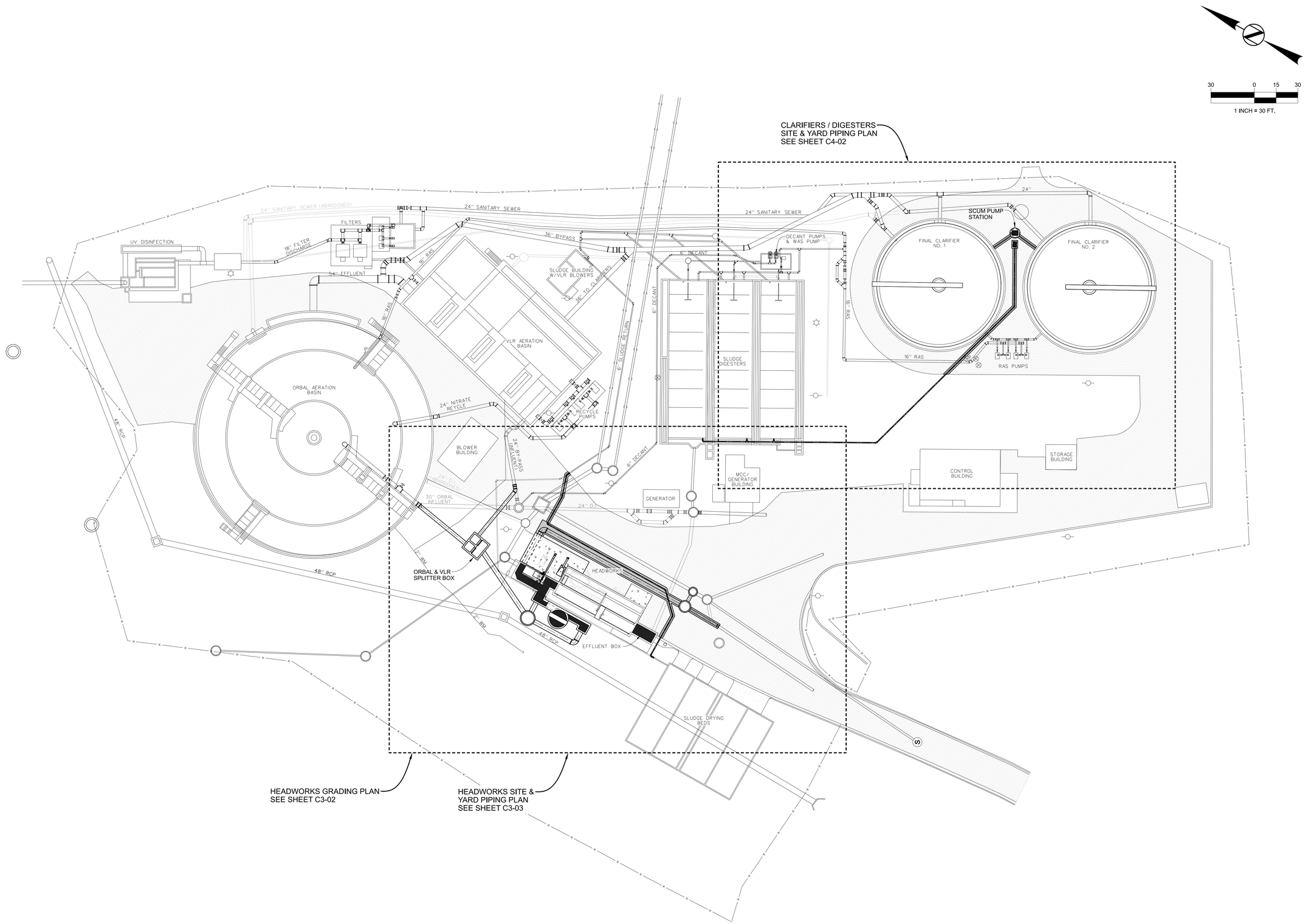
INVITATION SUMMARY

Bid Number 24-040
Wastewater Treatment Plant Screening Equipment

Bid Name:	Bid 24-040 Wastewater Treatment Plant Screening Equipment
Issue Date:	March 22, 2024
Certificate of Insurance Requirements:	See Standard Terms and Conditions and Insurance and Instructions to Vendors
Deadline for Questions Date:	Tuesday, April 16, 2024, 11:00 A.M.
Bid Due Date:	Tuesday, April 23, 2024, 10:00 A.M.
City Internet Site:	www.FairhopeAL.gov
SEALED Bid Response Copies to submit:	One (1) Paper Original
Purchasing Department Contact for questions:	Purchasing@FairhopeAL.gov (251) 928-8003

END OF INVITATION SUMMARY

Appendix A



KREBS ENGINEERING

30% REVIEW SET

CITY OF FAIRHOPE

FAIRHOPE WWTP HEADWORKS IMPROVEMENTS

FAIRHOPE, ALABAMA

CITY OF FAIRHOPE ALABAMA

Designed: DRV	Project No.: 23045
Drawn: JAR / CLM	
Checked: CLL	

Revisions

No.	Date	Description

Sheet Title: OVERALL SITE & YARD PIPING PLAN

Issue Date	Sheet No.
FEB., 2024	C2-01
Sequence: -- of --	

A1 | PLAN | 1" = 30'

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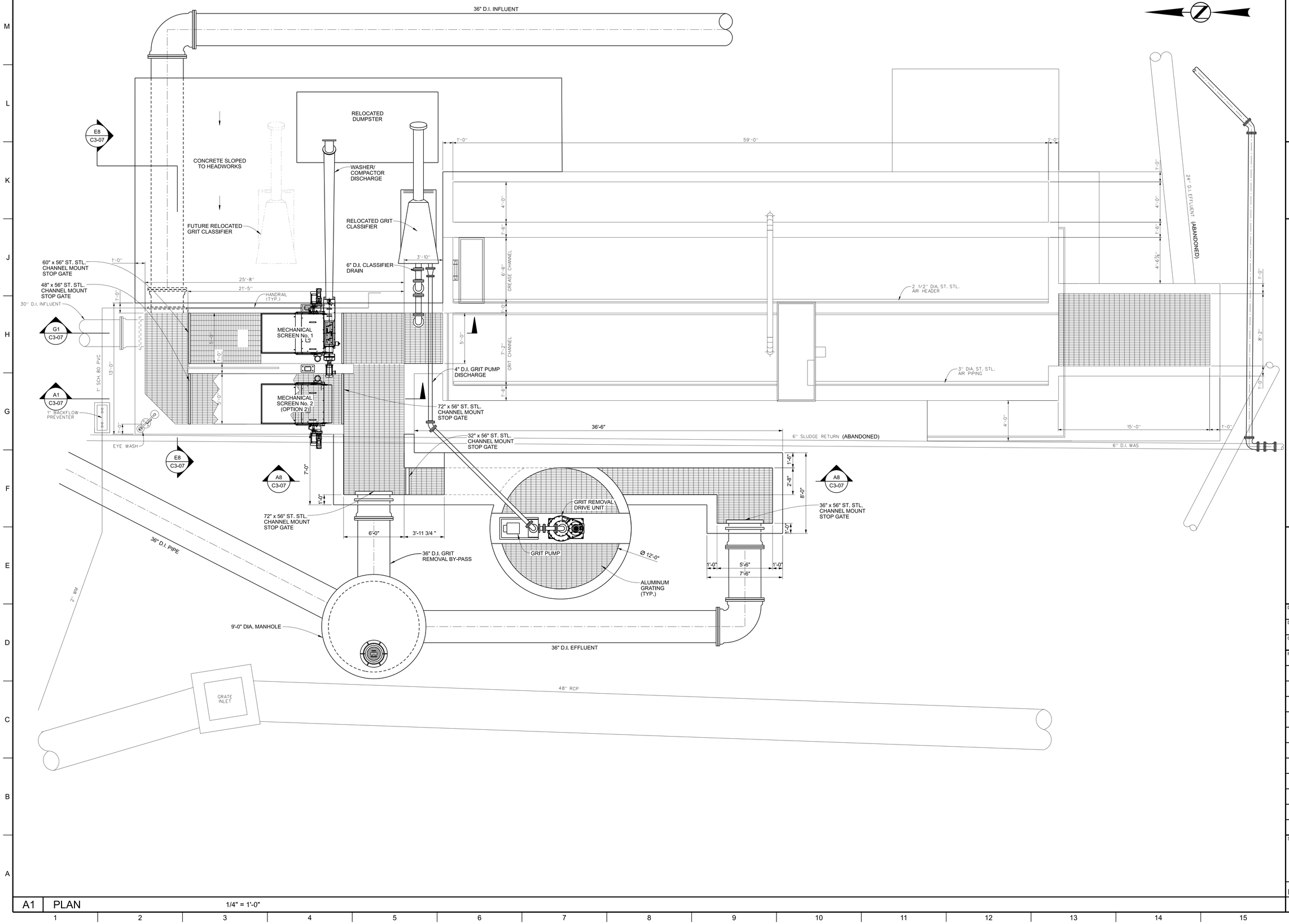

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Designed: DRV	Project No.: 23045
Drawn: JAR / CLM	
Checked: CLL	

Revisions

No.	Date	Description

Sheet Title: HEADWORKS IMPROVEMENTS PLAN

Issue Date: FEB., 2024

Sheet No.: C3-06

Sequence: -- of --

A1 | PLAN | 1/4" = 1'-0"

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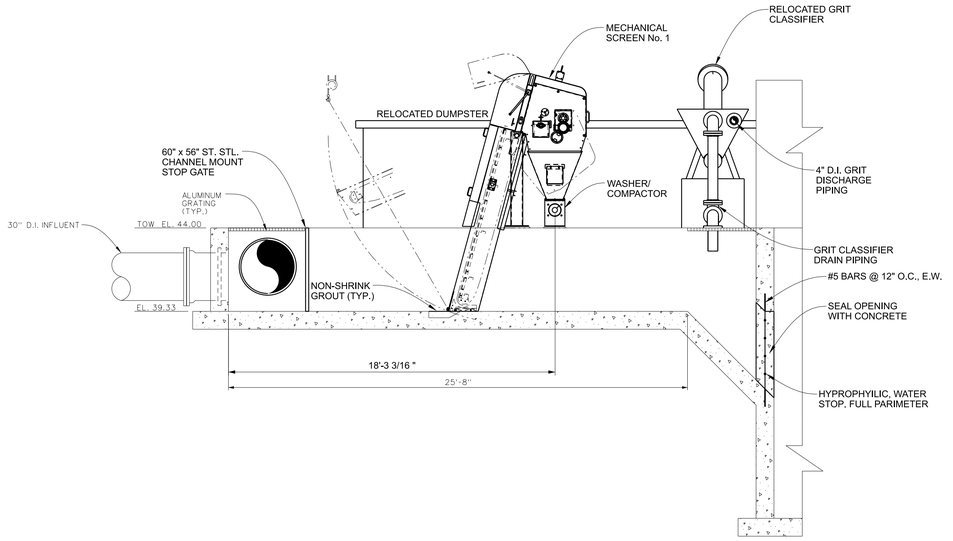
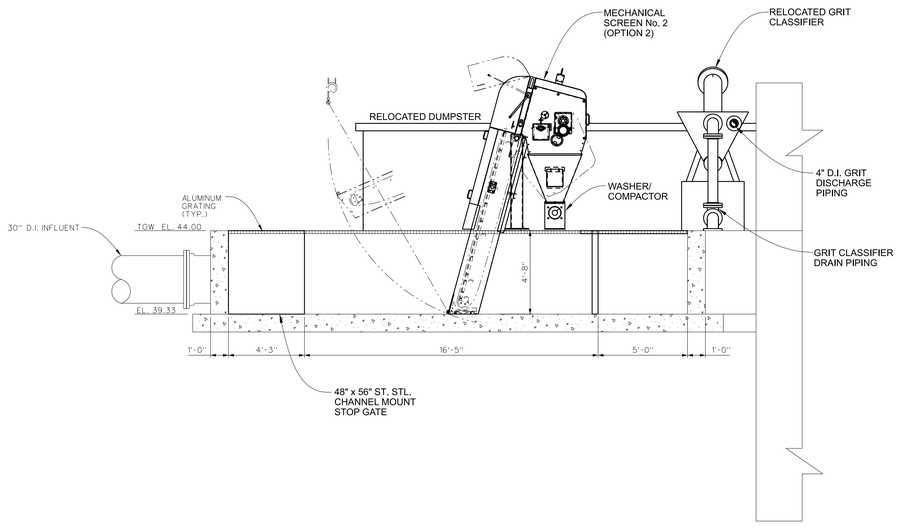


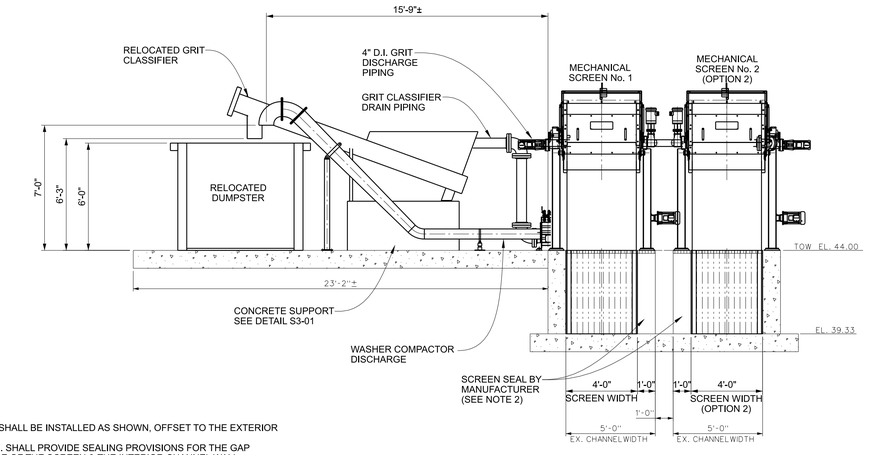
NOTE: HANDRAIL NOTE SHOWN FOR CLARITY.

G1 SECTION AT EXISTING SCREEN CHANNEL 1/4" = 1'-0"



NOTE: HANDRAIL NOTE SHOWN FOR CLARITY.

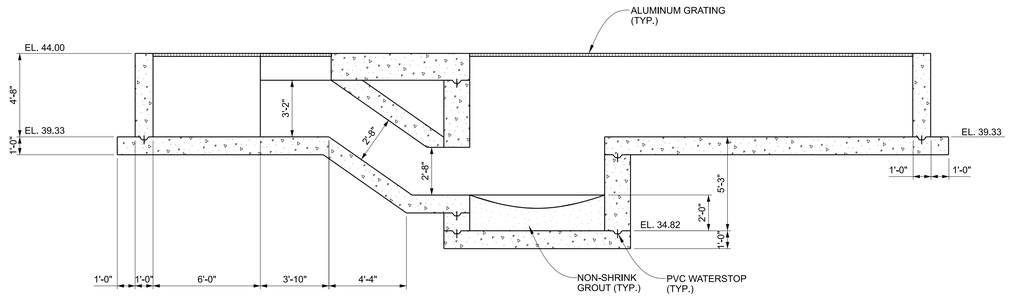
A1 SECTION AT EXISTING SCREEN BYPASS CHANNEL 1/4" = 1'-0"



NOTES:

1. THE NEW SCREEN SHALL BE INSTALLED AS SHOWN, OFFSET TO THE EXTERIOR CHANNEL WALL.
2. THE SCREEN MANF. SHALL PROVIDE SEALING PROVISIONS FOR THE GAP BETWEEN THE EDGE OF THE SCREEN & THE INTERIOR CHANNEL WALL.

E8 SECTION AT EXISTING SCREEN CHANNELS 1/4" = 1'-0"



A8 SECTION AT NEW GRIT SYSTEM 1/4" = 1'-0"

KREBS ENGINEERING

PRELIMINARY

CITY OF FAIRHOPE

FAIRHOPE WWTP HEADWORKS IMPROVEMENTS

FAIRHOPE, ALABAMA

CITY OF FAIRHOPE ALABAMA

Designed: DRV	Project No.: 23045
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Revisions

No.	Date	Description

Sheet Title: HEADWORKS IMPROVEMENTS SECTIONS

Issue Date	Sheet No.
FEB., 2024	C3-07
Sequence: -- of --	

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SECTION 44 42 26 - SELF-CLEANING SCREEN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Under this section of the specification, the contractor shall provide and install the equipment as shown in the contract drawings and as described herein.

B. The equipment shall include, but not be limited to, a mechanical screen unit, consisting of a frame assembly, filter belt/screen assembly, drive assembly, rotating brush assembly, screenings compactor, and system control panel.

C. This equipment shall be provided as an integral package by a single manufacturer who shall take responsibility for the coordination of all components to ensure the proper functioning of the screening equipment as a complete system.

1.3 SUBMITTALS

A. **Certification from Contractor and Manufacturer/Suppliers:** During the bid period and again before submitting/ordering and installing materials, products, and equipment, the Contractor and all manufacturers and suppliers shall thoroughly review the materials, products, and equipment being supplied and shall familiarize themselves with the existing and proposed/new facilities, as well as connections to existing facilities/utilities. This shall include field verification of the location, nature, size/dimensions, current and intended future use, etc. Before ordering and installation, the Contractor shall coordinate with all manufacturers and suppliers to provide all needed information including field dimensions, photographs, information on related materials and equipment, etc.). The Contractor and all manufacturers and suppliers shall include written confirmation (with the submittal) of the following:

1. The materials, products, and equipment being supplied are of the correct size, materials, and type.
2. The materials, products, and equipment being supplied do not conflict with existing or proposed/new facilities.
3. The products/equipment being supplied are intended for use in this application.
4. All manufacturer(s) and supplier(s) shall provide (either with submittals or separately) written concurrence/acknowledgment of their review/coordination and concurrence with the items above.
5. Shop drawings and product data submitted for review by the Engineer shall bear the Contractor's certification that he has reviewed, checked, and approved the submittals, that they comply with the requirements of the project and with the provisions of the Contract Documents, and that he has verified all sizes, dimensions, locations, field measurements, construction criteria, materials, catalog numbers, and similar data. Field dimensions, sizes, and other pertinent information shall be clearly shown on the shop drawings/submittals. The Contractor shall also

certify that the work represented by the shop drawings is recommended by the Contractor and that the Contractor's warranty and guaranty will fully apply.

B. The contractor shall provide product data, drawings, and calculations as follows:

1. Basic design, layout, and detailed equipment drawings.
2. Design calculations including upstream and downstream water elevations at low average and peak flow rates.
3. A statement of the terms of the warranties.
4. List of spare parts which should be purchased and kept on hand.
5. All ancillary equipment to be provided by the manufacturer shall be listed.
6. Complete shop drawings of all equipment furnished including cut sheets describing sub-components with the specific components highlighted.
7. Operation & Maintenance Manuals

C. The Contractor, equipment manufacturer(s) and/or supplier(s), and representative(s) shall be responsible for reviewing the specified equipment during the bid period, and confirming that the specified equipment and appurtenances are suitable for use in this application, and, for notifying the Engineer immediately upon discovery of any issues with the use of the equipment in this application.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be stored and protected per the manufacturer’s recommendations.

B. Plate packs shall be shipped on flatbed trucks to allow access by crane provided by the contractor.

C. If access by crane to the basins is not possible, then the plate settlers shall be shipped as a pack which can be disassembled for individual component installation.

1.5 QUALITY ASSURANCE

A. Manufacturer shall have available skilled installation, supervision and start-up services as specified.

B. Manufacturer shall provide an installation list of a minimum of 10 installations of similar design as specified herein installed within the last five (5) years.

1.6 WARRANTY

A. The manufacturer of the equipment shall guarantee all components provided by said manufacturer including buy-out items not manufactured by said manufacturer for twelve (12) months, commencing from the date the equipment is put into service and the Owner receives beneficial use. The Contractor shall refer to the General Conditions for additional warranty requirements.

1.7 MANUFACTURERS

A. Parkson

B. Huber Technology

C. Hydrodyne Engineering

D. Or pre-approved Manufacturer

PART 2 - PRODUCTS

2.1 MECHANICAL PERFORATED PLATE SCREEN

A. The perforated plate screen will be designed to positively clean and remove debris up to 3 inches in diameter from the influent stream by means of perforated screen panels designed to retain and elevate debris to the discharge point of the unit where the rotating brush assembly cleans the screen panels.

B. The unit shall be suitable for installation and operation in the existing channel(s) measuring approximately 5’-0” wide and 4’-8” deep. A recess (notch) in the channel bottom to accommodate the base of the screen is not possible due to the existing channel. Manufacturers shall account for this condition in their design. The angle of inclination shall be approximately 75 degrees from horizontal. The opening from which the unit discharges screenings shall be dictated height of the existing roll-off dumpster, approximately 6’-0” above the elevation of the top of the existing headworks channel.

C. The plate perforation size shall be 6 mm and the screen shall be capable of passing a maximum peak flow of 12 MGD based on a nominal unit width of 4’-0” - 4’-6”. The maximum downstream water level shall not exceed 2’-6”. The maximum upstream water level shall not exceed 3’-0” when the screen is 30% blinded.

1. Wastewater Influent TSS

a. Maximum Influent TSS = 350 mg/L
b. Average Influent TSS = 150 mg/L

D. The screen shall be capable of presenting a clean filtration surface to the influent stream at all times during continuous operation. It shall be capable of intermittent operation in order to form a mat of material to provide maximum debris removal. the screen shall have adequate contact surface area per square foot of wetted screen frontal surface in order to maximize the capture of paper, rags, and other flexible debris, which tends to drape over and adhere to the filtration surfaces.

E. Washwater Requirements

1. To be provided by the Manufacturers.

2.2 FRAME

A. The frame of the unit, which is stationary, shall be constructed from type 304, stainless

steel with a thickness of 1/4 inch and shall support and locate all of the operating components. The unit shall rest at the bottom of the channel, and be anchored at the operating floor elevation. No mechanical mounting or fastening of the unit frame is required to the sidewalls or bottom of the channel.

B. Guide rails shall be mounted to each side on the inside surface of the frame to direct the filter belt during its ascension out of the channel. The guide rails shall be 1/2 inch thick and will be constructed from type 304 stainless steel

C. Screen mounting brackets will be provided on each side of the frame to allow the frame to be secured to the structure at the operating floor. A common bracket may be required where two screens are installed side by side with a common divider wall. Supports shall be fabricated of a minimum 3/8 inch thick type 304 stainless steel plate.

D. At the top of the screen, circular chain guides shall gently direct the filter belt from its ascending path out of the channel towards the drive sprockets. These circular guides shall be constructed from type 304 stainless steel and shall be welded to a type 304 stainless steel shaft. To reduce the wear on both the chain and chain guides, the shaft shall be secured to bearings on each side of the frame and free to rotate.

E. Chain guides shall also be provided to direct the filter belt from the drive sprockets to the descending path into the channel. These fixed rails shall be constructed of type 304 stainless steel and shall be 5/8 inch thick.

F. Lower return guides shall be provided at the base of the screen to direct the screen belt during its 180-degree turn from the descending to ascending paths. The lower guide rails shall be constructed from 1/2-inch thick type 304 stainless steel and shall be fixed in place as low as possible in the frame to optimize the submerged screen area. No submerged bearing or rotating guides are used that will require routine maintenance or that may become fouled by trash and debris.

G. Neoprene rubber seals with type 304 stainless steel backing plates shall be mounted along the upstream edges of the frame and contact the channel walls to seal the outer edge of the frame against the channel wall.

H. Neoprene rubber seals with type 304 stainless steel brackets shall be mounted parallel to the screen panel side plates and prevent flow by-pass between the screen belt and the screen frame.

I. A bottom seal will consist of a neoprene seal mounted between two stainless steel reinforcing plates and fastened to the bottom plate of the screen frame. The seal shall maintain contact with the traveling screen belt throughout its cycle and prevent flow by-pass under the screen belt.

J. All shaft bearings are mounted externally to the side frame for ease of access and maintenance.

K. The rear portion of the screen shall be equipped with covers to protect operators from contact with moving parts and minimize misting and dripping. All enclosures shall be removable. There shall be a hinged section for access to the screen and rotating brush assembly for periodic maintenance. The covers shall be fabricated from 14

gauge type 304 stainless steel.

2.3 SCREEN BELT ASSEMBLY

A. Each screen panel will be fabricated from 11 ga (.120 inch) L-grade stainless steel perforated sheet, formed to provide a 2-½ inch shelf for lifting solids out of the channel. The perforations will be provided on the face and the shelf of the panels; no perforations will be allowed in the sharp bend areas of the screen panels. Support plates will be welded to the ends and in the middle of the formed perforated sheet. The end support plates will be provided with weld nuts for mounting of the screen panel onto the drive chains.

B. Overlapping side plates will be sandwiched between the end of the screen panel and the chain, to enclose the ends of the screen belt. Side plates shall be 16 gauge stainless steel

C. The screen belt is supported by a drive shaft and sprockets. The shaft ends extend beyond the screen frame and is mounted on take-up bearing assemblies. Drive shafts shall be made of 300-series stainless steel. A take-up bracket and take-up rod shall be mounted on the screen frame and secured to the bearing housings to hold the position of the drive shaft and allow for adjustment of the screen belt tension. Brackets, take-up rods, and associated hardware shall be of stainless steel.

D. All chain components shall be corrosion-resistant stainless steel. Sidebars shall be type 304 stainless steel. Pins, bushings and rollers shall be type 400 series stainless steel. 400 series components shall be heat treated to a minimum hardness of 39 on the Rockwell C Scale.

E. The filter shafts shall have a maximum diameter of 3/4 inch and be spaced on 4-inch centers in the direction of travel of the filter belt. The shafts shall be constructed from type 304 stainless steel.

2.4 DRIVE ASSEMBLY

A. The drive assembly consists of a gear reducer, motor, drive shaft, and eccentric bearing. The drive mechanism shall be protected from the trash stream to ensure that the screen runs smoothly without jamming. The driving force is transmitted to clean, trash free components to avoid mistracking or binding, which could render the screen inoperable, requiring manual cleaning and realignment.

B. The gear reducer is of hollow shaft design by Sumitomo, mounted directly to the unit external to the side frame and connected directly to the drive shaft with a keyless tapered bushing. The reducer shall be designed per AGMA recommendations for Class II service based on the required horsepower for operation of the machine.

C. The motor shall be a squirrel cage induction motor, TEFC, 460 volt, 3-phase, 60 Hz, rated for Class I, Division II application.

D. Overload protection shall be provided by an electrical overload device that senses motor current draw (SSAC Current Monitor or equal).

2.5 SCREEN BELT CLEANING ASSEMBLY

A. The filter belt assembly is cleaned by the interaction of the spray header and rotating brush assembly with the screen plates. Screenings removed by the spray and brush assemblies will be directed into a screenings discharge chute.

B. A spray header assembly shall be provided on the inside of the screen belt. The spray header pipe shall be schedule-40 stainless steel and sized for the required flow rate and pressure. The spray header shall be machined with tapped holes to accommodate replaceable spray nozzles. The spray header shall be equipped with a schedule 80 PVC pipe coupling on both ends for connection to the city water supply. Source water will be connected on either end of the header with a PVC pipe plug installed on the opposite end of the source water connection.

C. The rotating brush assembly is supported by bearings on each side of the machine mounted externally to the machine frame. The brush is driven by a 460-volt, 3-phase, 60 Hz motor equipped with a cyclo gear reducer. The brush drive shaft shall be stainless steel.

D. The brush assembly shall consist of a split core brush that is fastened to a drive shaft. The split core design allows the removal of the brush without removing the brush drive shaft and bearings. The core of the brush shall be made of 6063-T6 aluminum and split into two halves. The brush will consist of a total of sixteen (16) rows of nylon brush bristles running the width of the screen panels and equally spaced from each other.

2.6 DISCHARGE CHUTE

A. A discharge chute shall be provided integral to the screen chassis, constructed from 14 gauge type 304 stainless steel and designed to direct the screenings to the collection equipment below.

B. The chute shall have a 1/4-inch thick flange that shall allow it to be connected to ancillary washing, compacting, and collection equipment.

C. A chute seal shall be provided to deflect spray water and screenings into the screenings discharge chute and prevent screenings from falling back into the flow downstream of the screen belt. The chute seal shall be constructed of 3/8” thick reinforced neoprene belting with a stainless steel reinforcing plate for fastening the chute seal to the discharge chute.

2.7 LUBRICATION

A. Lubrication lines shall be extended from each bearing housing to a central point located on the respective side of the machine, accessible from the operating floor for ease of maintenance.

2.8 FASTENERS

A. All fasteners shall be type 18-8 stainless steel.

2.9 SURFACE FINISH

A. Surface treatment of stainless steel components.

1. All frame and structural members will be mechanically cleaned using Dupont Starblast. Sheet metal components such as covers or the discharge chute will be furnished with a 2B finish.
2. All other appurtenances including roller chain, brush sprockets, bearing housings, motor, reducer, etc. shall be supplied with the manufacturer's standard finish.

2.10 SCREENING WASHER/COMPACTOR/CONVEYOR

A. Design Data:

1. Maximum cubic feet of screenings per hour (continuous) – 70
2. Volume reduction, minimum – 60%
3. Minimum motor HP – Per Manufacturer
4. Solids content after compaction, minimum – 40%
5. Operational Environment – Class 1, Division 2
6. Screening wash water supply – City water

2.11 MATERIALS OF CONSTRUCTION

A. The main body will consist of a drainage trough and a washer barrel, enclosed by an outer housing and a support leg at each end. The main body will be constructed of type 304L stainless steel for all welded components; to minimize corrosion in the heat-affected zones, and type 304 stainless steel for all non-welded components.

B. The drainage trough will be the perforated inlet area of the unit, which captures screenings and allows liquid to drain. The drainage trough will be constructed from 12 gauge (0.11") AWP 8 stainless steel with 0.19-inch diameter perforations.

C. The washer barrel will provide a washing zone and a dewatering zone for the incoming screenings. The washer barrel will be constructed of 0.25-inch thick stainless steel, with three distinct perforated drainage zones having 0.19-inch diameter holes chamfered to 0.38-inch diameter on the outside. The inside of the washer barrel will be provided with six (6) 0.25-inch thick by 1.50-inch wide replaceable wear bars with 400 Brinnel hardness.

1. The outer housing will enclose the sides and bottom of the drainage trough and washer barrel. The outer housing will collect drained liquid from the drainage trough and washer barrel and direct the liquid to a 4.0-inch drain tube. Access panels will be provided on the outer housing in the washer barrel area to facilitate servicing of the washer barrel. The outer housing will be constructed from 10 gauge (0.135 inch) thick stainless steel.
2. A support leg will be provided at each end of the main body to support the main body, provide the means to mount the drive assembly (at the drive end) and provide the means to mount discharge piping (at the discharge end). Each support leg will be designed to allow the screw to be removed from either end of the main body. Each support leg will be provided with a footpad and anchor

bolt holes, to secure the unit to the structure

3. The shafted screw will be provided to convey screenings through the various stages of the unit. The screw will be constructed of carbon steel and finished with alkyd enamel paint. The spiral will be a minimum of 8.00 inches OD and have a minimum of 0.63-inch thick flights. A replaceable 0.25-inch wide nylon brush with a stainless steel casing will be attached with bolted clips to the spiral OD throughout the inlet area to scour the perforated sheet. The brush OD will be 8.50 inches.
4. The wash zone will include a spray wash system to wash organic residue from screenings. The wash zone spray will consist of one (1) spray header, water injection points, one (1) ball valve, and one (1) solenoid valve. The solenoid valve body will be of NEMA 7 brass construction with Buna seals. The ball valve will be of brass construction with a stainless steel ball. The system will have an output flow rate and pressure to be specified by the Manufacturer.
   The press will include a single-point spray wash system to flush organic residue trapped in the outer trough. The flushing spray will consist of one (1) spray header, one (1) ball valve, and one (1) solenoid valve. The solenoid valve body will be of NEMA 7 brass construction with Buna seals. The ball valve will be of brass construction with a stainless steel ball. The system will have a flow rate and pressure to be specified by the manufacturer.

2.12 DRIVE SYSTEM

A. The unit drive system will consist of a gearmotor mounted on a sealed drive mounting bracket and a drive shaft that connects the gear reducer output to the shaft of the screw.

B. The gearmotor will be a single-speed, dual voltage SEW Eurodrive motor direct coupled to an SEW Eurodrive helical gear reducer.

1. The electric motor will be for severe duty with a 1.15 service factor, rated for use in a 40° C ambient temperature. The TEFC motor will be NEMA design B with Class F insulation, and a 230/460 volt, 3-phase, 60 Hz power supply. The motor shall be rated for Class I, Division II hazardous areas.

   a. The gear reducer will be AGMA class II (1.6 service factor) with a minimum 94% efficiency, producing an output speed of 14 rpm and an output torque of 13,900 inch-pounds. Heavy duty tapered roller bearings in the gear reducer will provide a maximum thrust capacity of 6,740 pounds.
   b. Gear reducers with service factors of less than 1.4 and efficiencies of less than 94% will not be allowed.

2. A drive mounting bracket will be provided to mount the gearmotor to the drive end support leg of the unit. The bracket will be made of type 304L stainless steel.
3. A compression type packing gland seal will be provided on the mounting bracket to seal the drive shaft. PTFE packing rings will be fitted into the seal housing, and held in place by a two-bolt stainless steel gland follower.
4. The drive shaft will be directly coupled to the spiral and constructed of carbon steel. The shaft will be painted, except in the area of the shaft that extends into the hollow bore of the reducer.

5. Inlet Hopper and Cover

    a. A 12 gauge (0.105 inch) stainless steel inlet hopper will be supplied to direct screenings and liquid into the drainage trough. The chute will be flange bolted to the trough, with each side of the chute being a minimum of 60 degrees from horizontal.
    b. A 12 gauge (0.105 inch) stainless steel cover will be supplied to cover the remaining top of the main body.
    c. A gasket will be provided to seal the feed hopper's inspection door cover.

6. A 14 gauge (.075 inch) stainless steel discharge pipe will be fitted to the discharge end support leg to direct screenings into a customer provided receptacle. All discharge pipe flanges will be 304L stainless steel. Aluminum flanges will not be allowed.
7. Pipe supports, if needed, shall be supplied by the supplier.
8. All fasteners shall be 18-8 stainless steel

2.13 FABRICATION

A. Weld size, type, and procedure will provide the necessary strength and facilitate the manufacturing of the specific component.

2.14 SURFACE FINISH

A. All stainless steel components will have a standard mill finish and will be mechanically cleaned to remove weld discoloration and fabrication markings.

B. The screw and drive shaft will be finished with an enamel coating.

C. The motor and gear reducer will have the standard manufacturer's finish.

2.15 ELECTRICAL DEVICES AND CONTROLS

A. Electrical device interconnecting conduit and wiring will be the responsibility of the installing contractor. In addition to the drive motor, the following electrical devices will be furnished with the unit as required:

1. Two (2) 120-volt, single-phase, 60 Hz solenoid valves for the wash zone and flush spray washes housed in NEMA 7 enclosures will have 18-inch long integral leads and will have 1/2 inch NPT conduit connections.

2. Two (2) control stations shall be provided (complying with all applicable requirements of Specification Section 26 29 00 "Manufactured Control Panels") as follows:

    1) A NEMA 7 emergency stop push button Screen control station shall be mounted in a NEMA 7 aluminum box (to be located by the contractor adjacent to the Screen equipment) and will have a 3/4 inch NPT conduit connection.

        a) E-Stop Pushbutton (maintained-contact mushroom-head)

2) A NEMA 7 Compactor/Conveyor control station shall be mounted in a NEMA 7 aluminum box (to be located by the contractor adjacent to the Compactor equipment) and will have a 3/4 inch NPT conduit connection.

B. Control Panels

1. One (1) combined control panel shall be provided for power/control of the screen and compactor/conveyor systems.
2. Refer to Specification Section 26 29 00 “Manufactured Control Panels” for additional requirements.
3. The equipment manufacturer shall be responsible for the proper sizing and operation of the control equipment to adequately protect and control the screening system equipment.
4. The single control enclosure shall be of:

    1) NEMA 4X stainless steel construction
    2) Sufficient size to contain all motor starters and controls for the associated equipment.

5. Control panels shall be UL-listed.

6. Controls shall include, but not be limited to, a main breaker/disconnect, starters and MCPs for each motor powered from the panel, transformer, fuses, fuse block, repeat cycle timer, liquid level timer, running (green) and alarm (amber) indicator lights for each motor, float switch level sensor (for back up), High Differential Level Alarm indicator light (amber), Backup Float High-Level Alarm indicator light (amber), two radar level indicators (one upstream and one downstream of the screen), radar differential level controller (mounted within the control panel, to be accessible from the front of dead-front panel door), and all appurtenances for a complete operational system.
7. Radar level sensors shall be provided upstream and downstream of the screen for monitoring differential elevations. The level sensors shall be Vega, Vegapulse C21. A controller shall be installed inside of the control panel to feed the radar sensors, process the measured values, and display them on the controller screen. The controller shall be Vega, Vegamet 842 controller. A window shall be provided in the front of the control panel to view the controller screen without opening the front door of the panel.
8. Necessary relays shall be included to annunciate status and alarm conditions.
9. Interconnections with the remote control station devices as required.
10. Dry contacts and other provisions as required to provide I/O to/from the plant SCADA system for all motor running statuses, all motor alarm statuses, loss of power/phase imbalance, high differential level alarm, and backup high upstream level alarm, and other applicable alarms as recommended by the supplier.
11. A NEMA 7 rated, weatherproof, 120 V, SINGLE PHASE, 60 hertz normally closed solenoid valve shall be provided to actuate the cleaning system.
12. The following indicator lights and selector switches shall be provided on the control panel as a minimum.
    1) Control Power Light – On
    2) Screen Status Light – Running
    3) Screen Status Light – Fault

4) Brush Status Light – Running (for each screen brush)
5) Brush Status Light – Fault (for each screen brush)
6) Compactor/Conveyor Status Light – Running
7) Compactor/Conveyor Status Light – Fault
8) Emergency Stop Push Button
9) System Reset Push Button
10) Screen Selector Switches – Hand/Off/Auto and Forward/Reverse (for each screen)
11) Screen Spray System Switches – Hand/Off/Auto (for each solenoid valve required)
12) Brush Selector Switch – Hand/Off/Auto (for each screen brush)
13) Compactor/Conveyor Selector Switches – Hand/Off/Auto and Forward/Reverse (if applicable)
14) Compactor Spray System Switch – Hand/Off/Auto

15) Runtime Meter for each Screen Drive
16) Runtime Meter for each Brush Drive
17) Runtime Meter for Compactor/Conveyor Drive

C. Supplier is responsible for coordinating and including all instrumentation necessary for the operation and control of the screening equipment.

2.16 TESTING

A. The screen and washer/compactor systems shall be:

1. Factory assembled and tested for a minimum of 1 hour before delivery.
2. Delivered to the job site fully assembled.

2.17 HEAT TRACING

A. Heat tracing shall have a minimum design temperature of 16°F and a maintenance temperature of 40°F.
B. The compactor and discharge chute shall be heat traced and insulated by the screen manufacturer per the requirements listed in this specification.
C. Heat tracing system shall consist of the following components for each compactor and discharge chute:

1. 60 feet of self-regulating cable, nominal 5 watts per foot output, 120 V (see Specification Section 26 44 00).
2. 1 – Control thermostat with adjustable set point to turn power to cable on and off (see Specification Section 26 44 00).
3. 1 – Power connection (see Specification Section 26 44 00).
4. 1 – End splice with lighted end seal kit/indicator light (see Specification Section 26 44 00).
5. All devices/components/installation per NEC requirements for Class I, Division II hazardous areas.
6. 1 – Roll of aluminum installation tape (Raychem AT-180).
7. Stainless steel installation pins (quantity to be determined by the manufacturer).
8. Mineral wool and/or fiberglass insulation, nominal 2-inch thickness, maximum k value of 0.3 (BT in.)/hr. °F ft^2).

9. A removable insulation blanket consisting of a nominal 1-inch thick fiber insulation core enclosed in silicone coated cloth.
10. Non-corrosive wire and clips to hold removable blankets in place.
11. Embossed stainless steel insulating jacketing.
12. Stainless steel hardware and straps as required to hold metal jacketing in place.
13. Silicone caulk to seal jacketing joints as required.

D. Heat tracing system shall be installed as follows:

1. Install heat cable starting from power connection along the drainer shower pipe including the solenoid. Fix cable in place using glass installation tape.
2. Install heat cable along lower 1/3 of RPS trough bottom to drive end, then turn 180 degrees and run cable along the bottom of the trough and continue along the bottom of drain pipe up to compactor section. Use metal tape, a continuous layer to affix cable to the trough and drain pipe.
3. At the compactor end, affix cable to the compactor section shower piping and solenoid using glass installation tape. Loop cable around solenoid body two times. Make sure to also affix cable to small diameter piping loop.
4. Run cable along bottom of RPS trough back towards drive end and then along remaining drainer shower pipe to the end splice.
5. Terminate cable ends per instructions of the end splice manufacturer.
6. Install fixed insulation using weld pins on RPS trough and drain pipe.
7. Insulate the drive end lower half of trough and enclose complete drain pipe.
8. Insulate trough to within 2 inches of top flange to allow removal of covers.
9. Stop insulation a minimum of 2 inches from side covers.
10. Install embossed aluminum or stainless steel jacketing to cover fixed insulation and use stainless steel hardware and straps to secure jacketing in place.
11. All jacketing is to be installed in a workmanlike manner.
12. Jacketing to have drain holes at low points to allow water to drain freely from behind the jacketing. Jacketing is to be installed to deflect rainwater and wash water from insulation.
13. Install removable blankets over compactor and drainer shower piping leaving solenoid coils un-insulated (solenoid valve bodies are insulated). Install single layer of blankets that are 2 inches thick. Install double layers if blanket is only 1 inch thick.
14. Install removable blankets on compactor trough covers overlapping on the sides to match with the jacketing.
15. Install removable blankets over access doors.
16. Removable blankets are to be held in place using non-corrosive wire and clips or other suitable method.

E. Manufacturer shall supply 30 feet of additional heat tracing equipment as described here within for 1-inch pipe. This shall be supplied from the screen control panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with the Installer present, for compliance with requirements for installation tolerances and other conditions affecting the performance of equipment.

3.2 INSTALLATION

A. Comply with the Manufacturer's detailed written instructions for installing the equipment.

B. Installation and operation shall be per instructions and recommendations provided by the Manufacturer.

C. The equipment Manufacturer shall furnish the services of a factory-trained representative at the job site to monitor the installation, the initial operation of the equipment, and the instruction of the plant operating personnel in the proper operation and maintenance of this equipment. The cost of this service shall be included in the Contractor’s price for the performance of the work.

D. Verify that all units are in condition suitable for installation; are properly fitted, assembled, and installed; are accurately leveled and aligned, and are ready for satisfactory operation.

E. The Contractor shall finish coat all non-stainless steel metals per section 09 96 00.

3.3 CLEANING AND PROTECTING

A. Restore marred, abraded surfaces to their original condition or replace them with new ones.

B. Provide final protection and maintain conditions, in a manner acceptable to Manufacturer and Installer, that ensure equipment is without damage or deterioration at the time of Substantial Completion.

3.4 START-UP ASSISTANCE AND TRAINING

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train the Owner's maintenance personnel as specified below:

1. Factory authorized service representatives of the equipment Manufacturer shall perform all necessary on-site assistance for installation supervision.
   a. One (1) day minimum to inspect the completed installation and note any deficiencies.
   b. Complete and provide the Owner with a copy of an installation report.
   c. Should deficiencies be noted, the Contractor shall correct the deficiencies and the service representative shall confirm in writing that the deficiencies have been corrected. If the representative should require additional time on site to review the corrected deficiencies the costs for additional time on site shall be the responsibility of the Contractor.

2. Once the equipment has been installed correctly and is operating as intended, the service representatives shall perform a minimum of sixteen (16) hours on-site for start-up and training services. If additional time is required for start-up and training services, the cost shall be the responsibility of the Contractor.
   a. Train the Owner's personnel on procedures and schedules related to

troubleshooting, servicing, and preventive maintenance.

b. Schedule training with the Owner with at least seven days advance notice.
c. Training sessions shall include, but not be limited to, a classroom session and a hands-on session.
d. The Owner training shall be video-recorded with a high-definition camera and lapell microphone. Cell phone recordings will not be acceptable. Video files shall be submitted for review and approval.

END OF SECTION 44 42 26

SECTION 26 29 00 - MANUFACTURED CONTROL PANELS

PART 1 - GENERAL

1.1. SCOPE

A. This section describes control stations, PLC panels, motor control panels, manufactured control panels, and other similar panels specified herein. Specifications herein are intended as an extension of requirements in other Divisions of these specifications where reference is made to Electrical Specifications.

1.2. DEFINITIONS

A. “Control Stations”: Enclosures (with all required accessories) containing only door-mounted pushbuttons, indicator lights and/or selector switches (no electronic components or starter/controller equipment).

B. “Control Panels”: Enclosures (with all required accessories) containing equipment/devices other than door-mounted pushbuttons, indicator lights and/or selector switches (such as electronic components, starter/controller equipment, etc.).

1.3. SUBMITTALS

A. Provide the following for each control panel:
   1. A job-specific, custom wiring diagram
      a. The wiring diagram shall clearly show all components (whether the components are mounted internal or external to the control panel enclosure).
      b. All wires and terminal blocks shall be clearly labeled.
      c. Diagram shall be in accordance with NEMA/ICS standards.
   2. Size, type and rating of all system components.
   3. Unit frontal elevation and dimension drawings.
   4. Internal component layout diagrams.
   5. Manufacturer’s product data sheets for all components.

B. A Bill of Materials shall be included with catalog information on all components.

C. Information shall be included on any proprietary logic component sufficient to demonstrate its ability to perform the required functions.

D. The following calculations shall be submitted:
   1. Thermal calculations showing amount of air conditioning or ventilation and heating required for each control panel, per ambient requirements listed below and operating temperature limitations of all equipment/devices within each control panel. Where possible, forced air ventilation shall be utilized rather than air conditioning. Panel shall be oversized, interior equipment/devices shall be derated, and solar shielding shall be provided as required to allow the use of forced air ventilation as the cooling method. Air conditioning, ventilation, and/or heating equipment shall each have ratings/capacities at least 20% larger than required by calculations below unless noted otherwise:

a. Thermal calculations used for sizing cooling/ventilation systems for each control panel located in exterior or non-conditioned spaces shall assume:
   1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
   2) Full solar contact where applicable (not applicable where enclosures are fully protected from solar contact using solar shields separated from panel enclosure with standoffs or similar).
   3) No wind.
   4) Heat loss from interior equipment (electronics, etc.) per equipment supplier's information.

b. Thermal calculations used for sizing heating systems for each control panel shall assume:
   1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
   2) No heat loss by interior components of control panel.
   3) No solar gain on exterior of control panel.
   4) Doubling of heating wattage required to account for wind where control panels are located outdoors.
   5) Minimum temperature difference (due to heating) of 10 degrees F to prevent condensation, regardless of equipment temperature limitations.

2. Load calculations showing the sizing of all power supplies provided (with spare capacity as specified). Power supplies shall each have ratings/capacities at least 20% larger than required by load calculations unless noted otherwise.
3. Load calculations showing the sizing and anticipated runtime of all Uninterruptible Power Supply systems provided (with spare capacity as specified).

PART 2 - PRODUCTS

2.1. GENERAL

A. Control panels shall be Underwriters' Laboratories labeled by the panel manufacturer. Control panel manufacturers not capable of applying the U.L. label to their products are unacceptable.

B. All human interface equipment/devices (indicator lights, selector switches, pushbuttons, time switches, displays, keypads, and other similar items used for control, adjustments or monitoring) shall be mounted on the non-energized side of enclosure door(s) in such a way as to be accessible without exposing the user to energized parts.

2.2. RATINGS

A. All Control Panels shall have short circuit current ratings at least equal to the lesser of the following, unless noted otherwise on plans:
   1. The short circuit current rating of the electrical distribution equipment that feeds the Control Panel.
   2. 150% of the available fault current at the Control Panel as determined by a Short Circuit Current study prepared by a licensed professional electrical engineer.

B. All equipment/devices installed within control panels shall be rated to operate in

ambient temperatures of 50 degrees C (122 degrees F) or higher.

2.3. ENCLOSURES

A. All enclosures (with any required accessories or auxiliary items) shall fit within the space shown on the Plans. Any costs associated with furnishing equipment which exceeds the available space shall be borne by the Contractor.

B. Enclosures (with any required accessories or auxiliary items) shall be suitable for the environment where installed.

C. Enclosure materials shall be as follows unless noted otherwise:
   1. Control Stations:
      a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
      b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).
      c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 of die cast zinc/aluminum construction.
   2. Control Panels:
      a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
      b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).
      c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 or 12.

D. Control Panel Enclosure Construction:
   1. Non-metallic control panel enclosure material, where specified, shall be reinforced polyester resin or equivalent, with a minimum thickness of 3/16 inch for all surfaces except those requiring reinforcement. Panels shall be precision molded to form a one piece unit with all corners rounded. Exterior surfaces shall be gel-coated to provide a corrosion-resistant maintenance-free satin finish which shall never need painting. Color pigments shall be molded into the resin. Color shall be grey.
   2. Metallic control panel enclosures, where specified, shall be fabricated using a minimum of 14 gauge steel for wall or frame mounted enclosures and a minimum of 12 gauge for freestanding enclosures. Continuously weld all exterior seams and grind smooth. Reinforce sheet steel with steel angles where necessary support equipment and ensure rigidity and preclude resonant vibrations.
   3. Use pan-type construction for doors.
   4. Door widths shall not exceed 36-inches.
   5. Mount doors with full length, heavy duty piano hinge with hinge pins.
   6. Provide gasket completely around each door opening.
   7. Mount and secure all internal components to removable back plate assembly.
   8. For NEMA 1 or 12 enclosures, provide handle-operated key-lockable three point stainless steel latching system for each door.
   9. For NEMA 4X enclosures, provide provisions for padlocking all doors and provide clamps on three (3) sides of each door.

E. Control panel enclosures (and associated backpanels and other similar accessories) shall be manufactured by Hoffman Engineering Co., or Saginaw Control & Engineering.

2.4. CONTROL PANEL ACCESSORIES:

A. Cooling systems shall be provided if so required by the application to maintain temperatures within the acceptable ranges of the interior equipment. In no case (regardless of temperature ratings of internal equipment) shall maximum temperatures within control panels be allowed to exceed 50 degrees C (122 degrees F). Thermostats shall be provided to control cooling without need of manual operation. Thermostat setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Cooling units shall be as manufactured by Hoffman Engineering Co., Rittal or approved equal and shall be thermostatically controlled.

B. Space heaters shall be provided for condensation and temperature control. Thermostats AND hygrostats (or combination hygrotherm controllers) shall be provided to control heating requirements (based on temperature and relative humidity within enclosure) without need of manual operation. Setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Space heaters and associated control devices shall be as manufactured by Hoffman Engineering Co., Rittal, Stego or approved equal.

C. NEMA 4X control panels shall be provided with vapor-phase corrosion inhibitor(s) (chemical combinations that vaporize and condense on all surfaces in the enclosed area, to protect metal surfaces/devices within the enclosed area from corrosion). Corrosion inhibitor shall be Hoffman #AHCI series (sized as required by the enclosure volume to be protected) or equal.

D. For outdoor panels, stainless steel solar shields for front, top and each side of panel, supported to associated panel face with standoffs as required (to allow free air flow between solar shield and panel enclosure), shall be provided where required to limit solar loading on panel to allow use of a ventilated panel design rather than an air-conditioned panel design.

E. Provide a sun shield over all LCD displays in exterior-mounted panels. Sun shield shall be collapsible to fully protect LCD display from UV light when not in use, shall provide side and top shielding when in use, shall be constructed of stainless steel and shall be installed such as to maintain NEMA 4X ratings of enclosures.

F. Provide a clear polycarbonate gasketted hinged door or window to encompass all indicators, controllers, recorders, etc. mounted on NEMA 4 and 4X enclosures.

G. Provide interior mounting panels and shelves constructed of minimum 12 gauge steel with white enamel finish. Provide metal print pocket with white enamel finish on inside of door.

H. Provide interior LED light kit, mounted at top of interior of panel, and switched to turn “ON” when door is opened for the following control panels:
1. Control panels with outer dimensions greater than 20” wide or 30” high.
2. Control panels containing PLCs or other similar programmable devices.

I. Control panels containing VFDs or Reduced Voltage Soft Starters shall include a door mounted digital keypad for adjusting the starter parameters and viewing process values and viewing the motor and starter statuses without opening the enclosure deadfront door.

2.5. CONTROL COMPONENTS

A. General:
1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.
   a. Devices in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.) shall be of non-metallic construction.
   b. Devices in other areas shall be of chrome-plated construction.
2. All components and devices so that connection can be easily made and so there is ample room for servicing each item.
3. Door-mounted indicators, recorders, totalizers and controllers shall be located between 48” and 72” above finished floor level.
4. Door-mounted indicator lights, selector switches and pushbuttons shall be located between 36” and 80” above finished floor level.
5. All devices and components shall be adequately supported to prevent movement. Mounting strips shall be used to mount relays, timers and other devices suitable for this type of mounting.

B. Pilot Lights:
1. All pilot lights to be cluster LED type & push to test.

C. Pushbuttons:
1. All STOP operators within control stations located at equipment shall be provided with lockout provisions and a minimum of two (2) sets of contact blocks.
2. Emergency shutoff pushbutton devices shall be as follows unless noted otherwise:
   a. 2 ¼” diameter, mushroom-style, maintained contact push buttons
   b. With a minimum of one (1) normally open dry contact and three normally closed dry contacts.
   c. Connections made such that pushing “in” the button will shutoff the associated equipment.
   d. Provided with a red engraved nameplate with ½” lettering to read “Emergency Shutoff”.

D. Relays:
1. Control relays shall have the following characteristics, unless noted otherwise:
   a. General purpose, plug-in type.
   b. Minimum mechanical life of 10 million operations.
   c. Coil voltage as indicated or required by application.
   d. Single-break contacts rated 12 amperes, resistive at 240 volts.
   e. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.
   f. Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.

g. LED on/off indicator light and manual operator.
h. Industry standard wiring and pin terminal arrangements.
i. Equal to Square D 8501KP series with matching plug-in socket.

2. Interposing/isolation relays used to isolate discrete output field wiring (and where required for voltage translation for other discrete signals) to/from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:
   a. Minimum mechanical life of 10 million operations.
   b. Single-break contacts rated 6 amperes, resistive at 120 volts.
   c. One (1) N.O. contact per relay.
   d. Furnished with integral transient protection.
   e. LED on/off indicator light.
   f. DIN-rail mounted.
   g. Equal to Square D type Zelio RSL.
3. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:
   a. General purpose, plug-in type.
   b. Minimum mechanical life of 10 million operations.
   c. Single-break contacts rated 10 amperes, resistive at 240 volts.
   d. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.
   e. Rotary-thumbwheel adjustments for time value, timing range and function.
   f. Time value adjustments from .05 seconds to 999 hours
   g. Selectable Timing Functions, including the following:
      1) On Delay
      2) Interval
      3) Off Delay
      4) One Shot
      5) Repeat Cycle-Off
      6) Repeat Cycle-On
      7) On/Off Delay
      8) One Shot Falling Edge
      9) Watchdog
      10) Trigger On Delay
   h. Accuracy shall be $\pm$ 2% and repeatability shall be $\pm$ 0.1%.
   i. Furnished with integral transient protection.
   j. LED indicator light(s) for “timing” and “on/off status”
   k. Held in place with hold-down spring
   l. Equal to Square D type JCK with matching plug-in socket.

2.6. CONFORMAL COATINGS

A. All printed circuit boards within electronic devices (PLCs, RTUs, controllers, I/O modules, power supplies, touchscreens, Ethernet switches, radios, etc.) installed in panels located in non-conditioned or exterior/process areas shall be conformal-coated for harsh environments.

2.7. DC POWER SUPPLIES

A. DC Power supplies shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, AC-to-DC switching, output voltage as required, 120vac input, size as required for the initial application plus 50% spare capacity.

B. Redundant power supplies with diode isolation shall be provided so that the loss of one power supply does not affect system operation. The back-up supply systems shall be designed so that either the primary or the back-up supply can be removed, repaired, and returned to service without disrupting the system operation.

C. Power supply output shall be protected by secondary overcurrent protection device(s).

D. The power distribution from multiloop supplies shall be selectively fused so that a fault in one instrument loop will be isolated from the other loops being fed from the same supply.

E. Each power supply shall meet the following requirements.
1. Regulation, line: 0.4% for input from 105 to 132vac.
2. Regulation, load: 0.8%
3. Ripple/Noise: 15mV RMS / 200 mV peak to peak
4. Operating temperature range: 0 deg C - 60 deg C
5. Overvoltage protection
6. Overload Protection
7. Output shall remain within regulation limits for a least 16ms after loss of AC power at full load.
8. Output status indicator.
9. UL listing

F. Power supplies shall be manufactured by Puls, Sola, Phoenix Contact or equal.

2.8. DISCONNECTS

A. A main disconnect switch or circuit breaker shall be supplied integral to all control panels. The main disconnect or circuit breaker shall be accessible/operable without exposing the operator to energized sections of the control panel(s), and shall be lockable in the open/off position.

B. Individual circuit breakers shall be provided integral to the manufactured control panel for each separate power circuit originating within the control panel.

C. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.

D. Manufacturers:
1. Square 'D' or Cutler Hammer.

2.9. COMBINATION STARTERS

A. All combination starters shall utilize a unit disconnect. Magnetic starters shall be furnished in all combination starter units unless specifically shown otherwise. All starters shall utilize full NEMA/EEMAC rated contactors (size 1 minimum).

B. Starters shall be provided with a three-pole, external (door mounted) manual reset, solid state overload relay. Solid state overload relay shall have switch-selectable trip class and shall provide protection from:
   1. Overload.
   2. Phase Unbalance.
   3. Phase Loss.
   4. Ground Fault (Class II detection).

C. Unless specifically shown otherwise, each combination starter or each group of starters shall be furnished with a control circuit transformer including two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads (including motor space heaters and other similar loads where specified). The transformer rating shall be fully visible from the front when the unit door is opened. Unless otherwise indicated, control voltage shall be 120V AC. Control power shall be provided by individual unit control power transformers.

D. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.

E. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.

F. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

G. Each starter shall be equipped with a minimum of the following control devices:
   1. Door-mounted reset button.
   2. Two (2) field-reversible (N.O./N.C.) auxiliary contacts
   3. For reversing and two-speed starters: Four (4) field-reversible (N.O./N.C.) auxiliary contacts
   4. Additional control devices as indicated on plans.

H. Control Wiring Terminal Blocks
   1. Terminal blocks shall generally be:
      a. Feed-thru, screw-in type
      b. DIN rail mounted
      c. Furnished with the stationary portion of the block secured to the unit bottom plate
      d. Furnished with unit-mounted control terminal blocks for each field wire.
      e. Rated for the voltage and current of the proposed application per UL/NEC standards.
      f. Sized (by supplier) for the associated wire gauges/types/quantities.
      g. Phoenix Contact UT-4 series, Weidmuller WDU-4 series (or equivalent) unless required otherwise by application.

I. Nameplates
1. Each unit shall be properly labeled with an engraved phenolic nameplate with a white background and black letters.
2. Each pilot device shall be properly labeled with a legend plate or an engraved phenolic nameplate.

J. Manufacturers:
1. Square 'D' or Cutler Hammer.

2.10. WIRING

A. Refer to Section 26 05 19 for all wiring types/applications.

B. All wiring shall be identified on each end with hot stamped, shrink tube type, or self-laminating vinyl permanent wire markers to correspond with numbering shown on wiring diagrams.

C. All connections shall be made on terminals with no splices.

D. All wiring runs shall be along horizontal or vertical routes to present a neat appearance. Angled runs will not be acceptable. Group or bundle parallel runs of wire in plastic wire duct where practical.

E. All wiring runs shall be securely fastened to the panel or wire duct by means of plastic wire ties. Adequately support and restrain all wire runs to prevent sagging or movement.

F. AC power wiring and instrumentation/analog wiring shall be run separate.

G. Color code all internal wiring (not field wiring) as follows:
1. Line and load circuits: Black (B)
2. AC control wiring: Red (R)
3. Externally-Powered control wiring: Yellow (Y)
4. Neutral wiring: White (W)
5. Low voltage DC(+)pos: Blue (BL)
6. Low voltage DC(-)neg: Blue/White Tracer (BL/W)
7. Grounding: Green (G)

H. Terminal strips shall be provided for all input and output wiring. No more than two (2) wires shall be connected to one (1) terminal block.

2.11. ELECTRICAL SURGE AND TRANSIENT PROTECTION

A. General
1. Function: Protect the system against damage due to electrical surges.

B. Application: As a minimum, provide surge and transient protection (with proper grounding) at the following locations as described below:
1. Power Input High Frequency Noise Filtering:
a. 120VAC Control panels with integral UPSs, PLCs, or other electronic/microprocessor equipment that is susceptible to failure or improper operation due to high frequency/harmonic input transients shall be

provided with series-connected high-frequency noise filters on the line input (downstream of any panel main disconnects/breakers). Filters shall be as manufactured by Edco/Emerson/Islatrol or equal (exact type(s) as required by application).

2. Power Input Surge Protection:
   a. Provide surge protection device at any connection of 120VAC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:
      1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
      2) Be of two-part (base and SPD), DIN-rail mountable construction.
      3) Have 15kA total nominal discharge current per line (based on 8/20µs waveform).
      4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
      5) Visually indicate operational status.
      6) Be Dehn DEHNguard series or equal by MTL Technologies, or may be combined with the High Freqency Noise Filtering device required above.
   b. Provide surge protection device at any connection of multi-pole AC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:
      1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
      2) Provide protection for all phases.
      3) Have 40kA (per phase) peak surge current rating.
      4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
      5) Visually indicate operational status.
      6) Be Square D SDSA or HWA series or equal.
3. Analog I/O Panel Terminations Surge Protection:
   a. Provide surge protection device at the PLC (or similar) panel connection of each analog I/O signal. Device shall:
      1) Be mounted internal to the associated panel.
      2) Be of two-part (base and SPD), DIN-rail mountable construction.
      3) Have 10kA total nominal discharge current per line (based on 8/20µs waveform).
      4) Have maximum continuous operating voltage (MCOV) rating as required by the associated signal.
      5) Be Dehn Blitzductor XT series or equal by MTL Technologies.
4. Discrete I/O Panel Terminations Surge Protection:
   a. Provide isolation relay at the PLC (or similar) panel connection of each discrete output signal (within the associated panel). See above for isolation relay requirements.
5. Low Voltage Power Supply Load Side Surge Protection:
   a. Provide surge protection device at the PLC (or similar) panel on the load side of each low voltage power supply that has low voltage connections extending external to the panel. Device shall:
      1) Be mounted internal to the associated panel.
      2) Be of two-part (base and SPD), DIN-rail mountable construction.

3) Have 10kA total nominal discharge current per line (based on 8/20µs waveform).
4) Have maximum continuous operating voltage (MCOV) rating as required by the associated utilization voltage.
5) Be as manufactured by Dehn, MTL Technologies, or Phoenix Contact.

C. Installation and grounding of suppressor: As directed by manufacturer. Provide coordination and inspection of grounding.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Provide enclosure mounting supports as required for floor, frame or wall mounting. All supports in exterior, wet or process areas shall be stainless steel unless noted otherwise. All floor-mounted panels or other similar distribution equipment shall be mounted on 6” concrete housekeeping pads unless specifically shown otherwise.

B. All enclosures used outside shall be solid bottom unless otherwise specified. All cable and piping openings shall be sealed watertight. Cable and piping shall enter the enclosure as shown on drawings or specified herein.

C. All equipment and components shall be solidly grounded to the control panel. One grounded terminal unit shall be provided in each control panel for connection to plant ground system. Grounding digital and analog components shall be performed in accordance with the instrument supplier’s installation recommendations. Signal ground shall be solidly connected to the ground system so as to prevent ground loops

3.2. PAINTING

A. For enclosures other than NEMA 4X stainless steel or fiberglass:
1. Completely clean all surfaces so that they are free of corrosive residue. Then, phosphatize all surfaces for corrosion protection.
2. Prime with two (2) coats and finish with one coat of factory finish textured polyurethane. Paint shall be Sherwin-Williams Polane “T’ or approved equal.
3. Color to be selected during shop drawing review phase.

3.3. IDENTIFICATION & DOCUMENTATION

A. Refer to specification section 26 05 53 for additional requirements.

B. Control panel power supply source, type, voltage, number or circuit ratings shall be identified inside control panels and on drawings.

C. All interior devices and components shall be identified with thermal transfer labels with black letters on white background. Labels shall be placed on the subpanel and not the component. Marking system shall be a Brother “PTouch II” or equal. Lettering shall be 1/4" high.

D. All front panel mounted devices such as push buttons shall be identified by the use of engraved bakelite nameplates or legend plates. Nameplates shall be 1/8” thick, white with black core.

E. Where a panel includes a PLC or other network-connected device that is intended to be connected to another system (such as a plant SCADA system) via a network connection, the panel supplier shall provide an Interface Control Document (ICD) to the other system supplier (such as the SCADA Integrator). This document shall itemize the following for each networked parameter that is capable of being monitored or controlled by the other system:
   1. Parameter Name/Function (ex: Pump No. 1 On/Off Status)
   2. Parameter Type (discrete or analog, input or output)
   3. Parameter register ID/location

F. Where a panel includes a touchscreen or other programmable HMI display and is to be monitored by another system (such as a plant SCADA system), the panel supplier shall provide copies of the HMI display code and screenshots of all proposed HMI screens to the other system supplier (such as the SCADA Integrator) for their use in duplicating the associated HMI.

G. A job-specific, custom wiring diagram for each control panel (not including control stations without relays) shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to the panel (whether the components are mounted internal or external to the enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated panel, and submitted to the owner with the as-built documentation.

3.4. OWNER TRAINING

A. Fully train the owner in the proper operation of all control panels/equipment, describing and demonstrating full operation, including function of each door-mounted device.

3.5. SPARE EQUIPMENT

A. Provide the following spare equipment:
   1. Fuses: 10% (minimum of 3) of each size and type utilized, mounted within a pocket within the associated control panel.
   2. Where control panel contains programmable controller (or similar equipment): Flash drive containing copies of all final programs utilized within the control panel, with provisions/cable assemblies as required to connect the flash drive provided to the controller to download the programs. Flash drive shall be attached to retractable cord (long enough to reach the associated port) attached to the inside of the panel door.

END OF SECTION 26 29 00

SECTION 26 44 00 - ELECTRICAL HEAT TRACING SYSTEMS

PART 1 - GENERAL

1.1. SCOPE

A. This specification covers the requirements of materials and support services for heat-tracing systems. Heat tracing systems (including insulation and all accessories) shall be provided on all piping installed exposed in exterior locations or where otherwise indicated on plans unless noted otherwise.

1.2. CODES, APPROVALS, AND STANDARDS

A. The electric heat-tracing system shall conform to this specification. It shall be designed, manufactured, and tested in accordance with the applicable requirements of the latest edition of the following codes and standards.
   1. ANSI American National Standards Institute
   2. CEC Canadian Electrical Code
   3. CSA CSA International
   4. FM FM Approvals
   5. IEC International Electro-Mechanical Commission
   6. IEEE Institute Of Electrical and Electronics Engineers
   7. ITS Intertek Testing Services (Intertek ETL SEMKO)
   8. NEC U.S. National Electrical Code (NFPA 70)
   9. NEMA National Electrical Manufacturers Association
   10. NESC National Electrical Safety Code
   11. UL Underwriters' Laboratories, Inc.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Heat Tracing:
   1. Raychem/Tyco Thermal Controls.
   2. Thermon.
   3. Nelson Heat Tracing.
   4. Chromalox.

B. Insulation:
   1. Armstrong World Industries, Inc.
   2. Babcock & Wilcox; Insulationg Products Division
   3. CertainTeed Corporation
   4. Knauf Fiber Glass GmbH
   5. Manville Products Corp.
   6. Owens-Corning Fiber Glass Corp.
   7. Pittsburg Corning Corp.
   8. Rubatex Corp.

2.2. SELF-REGULATING HEATING CABLES

A. All heat-tracing applications with continuous exposure (maintain) temperatures from

150°F (65°C) to 250°F (121°C) or intermittent exposure temperatures from 185°F (85°C) to 420°F (215°C) shall use self-regulating cables.

1. Self-regulating heating cable shall vary its power output relative to the temperature of the surface of the pipe or the vessel. The cable shall be designed such that it can be crossed over itself and cut to length in the field.
2. Self-regulating heating cable shall be designed for a useful life of 20 years or more with “power on” continuously, based on the following useful life criteria:
   a. Retention of at least 75 percent of nominal rated power after 20 years of operation at the maximum published continuous exposure (maintain) temperature.
   b. Retention of at least 90 percent of nominal rated power after 1000 hours of operation at the maximum published intermittent exposure temperature. The testing shall conform to UL 746B, IEC 216-1 Part 1.
3. A warranty against manufacturing defects for a period of 10 years shall be available.
4. All cables shall be capable of passing a 2.5 kV dielectric test for one minute (ASTM 2633) after undergoing a 0.5 kg-m impact (BS 6351, Part 1, 8.1.10).

2.3. FREEZE-PROTECTION SYSTEMS

A. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identification number (T-rating) of T6 (185°F or 85°C) without use of thermostats.

B. The heating cable shall have a tinned copper braid with a resistance less than the heating cable bus wire resistance as determined in type test (ASTM, B193, Sec. 5). The braid shall be protected from chemical attack and mechanical abuse by a modified polyolefin or fluoropolymer outer jacket.

C. In order to provide rapid heat-up, to conserve energy, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:

1. Table K.1 Minimum Self-Regulating Indices

Heating cable	S.R. index (W/°F)	S.R. Index (W/°C)
3 W/ft	0.038	0.068
5 W/ft	0.060	0.108
8 W/ft	0.074	0.133
10 W/ft	0.100	0.180

D. The self-regulating index is the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50°F (10°C) and 100°F (38°C) and confirmed by the type test and published data sheets.

1. In order to ensure that the self-regulating heating cable does not increase power output when accidentally exposed to high temperatures, resulting in thermal runaway and self- ignition, the cable shall produce less than 0.5 watts per foot (1.64 watts per meter) when energized and heated to 350°F (177°C) for 30 minutes. After this test, if the cable is reenergized, it must not have an increasing power output leading to thermal runaway.

2. In order to confirm 3.1B, the self-regulating heating cable shall retain at least 90 percent of its original power output after having been cycled 300 times between 50°F (10°C) and 210°F (99°C), allowing at least six minutes of dwell time at each temperature.
3. The heating cable shall be Raychem® BTV-CT or BTV-CR self-regulating heater, with continuous exposure (maintain) capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.

2.4. SYSTEMS FOR DIVISION 1 HAZARDOUS LOCATIONS

A. The following requirements shall apply in addition to the criteria specified above:
1. The self-regulating heating cable shall be specifically FM Approved or CSA Certified for use in Division 1 locations.
2. A ground-fault protection device set at 30 mA, with a nominal 100 ms response time, shall be used to protect each circuit.
3. The temperature identification number (T-rating) of the cable used shall comply with FM and CSA requirements as applicable.
4. Connection methods used with the cable shall be compatible and approved as a part of the system manufactured and supplied by the heating cable vendor for use in the Division 1 location.
5. For plastic pipe and vessel applications, the heating cable shall be Raychem HBTV-CT or Raychem BTV-CT self-regulating heaters, with continuous exposure capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.
6. The heating cable shall be Raychem HQTV-CT or Raychem QTVR-CT self-regulating
heaters, for continuous and intermittent exposure capability up to 225°F (110°C), as manufactured by Tyco Thermal Controls.

B. Terminations for nonhazardous And hazardous class 1, div 2 locations
1. All connection components used to terminate heating cables, including power connectors, splices, tees, and connectors shall be approved for the respective area classification and approved as a system with the particular type of heating cable in use. Under no circumstances shall terminations be used which are manufactured by a vendor other than the cable manufacturer.
2. In order to keep connections dry and corrosion resistant, components shall be constructed of nonmetallic, electrostatic, charge-resistant, glass-filled, engineered polymer enclosure rated NEMA 4X. The component stand shall allow for up to four inches (100 mm) of thermal insulation.
3. Terminals shall be spring clamp wire connection type to provide reliable connection, maintenance-free operation, and ease of reentry.
4. Heating cable terminations shall use cold-applied materials and shall not require the use of a heat gun, torch, or hot work permit for installation.
5. Components shall be rated to a minimum installation temperature of –40°F (–40°C), minimum usage temperature of –75°F (–60°C), and maximum pipe temperature of 500°F (260°C).
6. The component system shall be Raychem JBM-100-L-A connection kit complete with integral LED power indicating light to serve as complete power, splice, or tee connection for up to three Raychem BTV, QTVR, or XTV industrial parallel heating cables as manufactured by Tyco Thermal Controls.

2.5. THERMOSTATS AND CONTACTORS

A. Freeze protection systems shall operate using self-regulating control or with the DigiTrace AMC-1A or DigiTrace AMC-F5 thermostat and the DigiTrace E104-100A or DigiTrace E304-40A contactor in nonhazardous locations, and DigiTrace AMC-1H thermostat with Digitrace E307-40A contactor in hazardous locations, as supplied by Tyco Thermal Controls.

B. Where heat tracing is applied to emergency showers and/or emergency eye wash systems (or other systems where the heated piping system provides water that may be applied to persons in emergency or non-emergency situations), the sensor (that determines whether the heat tracing system is ON or OFF) shall be placed on the associated pipe or tank wall rather than in ambient air (such as to prevent the heat tracing system from overheating the associated liquid).

2.6. END SEAL

A. An above-insulation, lighted end seal kit shall be provided for each heat trace circuit termination as per the manufacturer’s installation details. The kit shall be E-100-LBTV2 as supplied by Tyco Thermal Controls.

2.7. INSULATION

A. All components of the insulation, including covering, mastics and adhesives shall have a flame-spread rating of not over 25, and a smoke development rating of not over 50. Ratings shall be as established by tests in accordance with ASTM E 84 and Federal Specification standards. The integrated insulation assemblies shall also conform to the above specifications. Insulation shall be applied in strict accordance with the manufacturer's instructions.

B. Description:
1. This type of insulation shall be employed for process, cold-and hot water, steam, and condensate piping and equipment with surface temperatures up to 850 degrees F. Pipe insulation and jacketing shall be applied to piping where shown, and shall include fittings, flanges, and valves. Pipe insulation shall be molded-type pipe covering, made of fibrous glass with a minimum k-factor of 0.23 at 75 degrees F mean temperature. Unless otherwise specified the insulation thickness shall be 1” minimum.
2. The insulation shall be oversized for installation over electric heating cable. Insulation shall have a factory-applied white fire-retardant vapor-barrier jacket of kraft paper and aluminum foil laminated together and reinforced with fiberglass yarn. Fittings and valves shall be covered with the same material as the pipe, cut in segments to fit snugly without open spaces, held in place with copper wire or cement, and then covered with the same jacketing material as the pipe. Insulated fittings adjacent to vapor-barrier insulation shall be sealed with an acceptable vapor-barrier cement before installation of the finish jacket. Pipe insulation and vapor-barrier shall be continuous through hangers and supports. Insulation shall be coordinated with the pipe hangers and supports and where insulation protection shields are provided the top half section of pipe insulation at support locations shall be of the same specified density, and the bottom half insulation segments provided between the pipe and the insulation protection shields shall have a density of not less than 6 lb/cu ft. All insulation shall be covered with

smooth aluminum weatherproof metal or plastic preformed jacketing with a factory attached moisture barrier. The jacket for the fittings shall consist of precision-formed smooth-sided sections and shall be sized to cover and protect the insulated fitting. Each section shall be manufactured from aluminum or PVC, and all joints shall be sealed with silicon mastic or solvent welding, to provide a continuous, air and weathertight joint. Strapping shall be 1/2-inch wide, Type 3003 aluminum or stainless steel.

PART 3 - EXECUTION

3.1. GENERAL

A. Heat tracing shall be provided along full length of all exposed piping or vessels located outside of buildings or in other areas designated on plans (such as by insulated piping in areas subject to cold temperature). Insulation shall be provided over all heat traced pipes.

B. The vendor shall provide a detailed design utilizing standard heat-tracing design software, such as Tyco Thermal Controls TraceCalc® Pro design software or equal. At minimum, the design must provide the following:
1. Circuit identification number
2. Maintain temperature
3. Line size and insulation
4. Heat loss for pipe, valves, and supports
5. Amount and type of heating cable required
6. Spiral requirements
7. Heating cable service voltage
8. Heating cable power output at the maintain temperature
9. Minimum and maximum maintain temperature vs. minimum and maximum ambient temperatures
10. Circuit breaker and transformer sizing

C. A ground-fault protection device set at 30 mA, with a nominal 100-ms response time, shall be used to protect each circuit.

D. Install additional heating tape at bolted flanges, valves, pipe supports, and other fittings and fixtures as recommended by supplier, but not less than the following:
1. Bolted flanges (per pair): Two times pipe diameter
2. Valves: Four times valve length
3. Pipe hanger or support penetrating insulation: Three times pipe diameter

E. The entire system shall be installed in compliance with the manufacturer’s recommendations for a fully-functional, code-compliant system.

F. All insulation shall be installed by a qualified insulation contractor in strict accordance with the manufacturer's recommendations and the requirements of these specifications.

G. All piping insulation shall be installed following required testing and approval of piping.

3.2. IDENTIFICATION

A. Heat tracing systems shall be labeled at the field connection of power to the heat tracing equipment per the requirements for Utilization Equipment within Specification Section 26 05 53.

B. Heat traced piping, vessels, etc. shall be identified with appropriate caution signs or markings at intervals not exceeding 20 feet on center per NEC requirements.

3.3. TESTING

A. Factory inspections and tests for self-regulating, power limiting, series constant wattage and constant wattage (MI) heater cables shall include but are not limited to the following:
   1. Testing shall be done per the latest IEEE Std. 515 test section and applicable manufacturer's standards.
   2. In the field, all heater cables shall be meggered. The following separate field megger readings shall be taken on each self-regulating and each M.I. heater cable:
      a. Heater cable shall be meggered when received at jobsite before installation.
      b. Heater cable shall be meggered after installation, but before insulation is applied.
      c. Heater cable shall be meggered after insulation has been installed.
   3. All three of the above field megger readings shall be greater than 20 megohms. Otherwise, the heater cable is not acceptable and shall be replaced.
   4. Field megger tests shall be recorded for each heater cable, and certified reports shall be submitted to the user.

END OF SECTION 26 44 00