



Florida Municipal Power Agency

REQUEST FOR PROPOSALS

FOR

**GENERAL WORK FOR HOT REHEAT PIPE
REPLACEMENT PROJECT AT CANE ISLAND
POWER PLANT**

Florida Municipal Power Agency
8553 Commodity Circle
Orlando, Florida 32819-9002
(407) 355-7767 Fax (407) 355-5796

REQUEST FOR PROPOSALS

(This is not an order)

R
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R
N
TO: 8553 Commodity Circle
Orlando, Florida 32819
Attn: Sharon Samuels

RFP FMPA 2021-243

Date Issued: March 29, 2021

Telephone: (407) 355-7767

SEALED PROPOSALS MUST PHYSICALLY BE IN THE FLORIDA MUNICIPAL POWER AGENCY OFFICE PRIOR TO PROPOSAL OPENING AT **10:00 A.M. ON APRIL 29, 2021**, WHICH WILL BE IN THE FMPA FIRST FLOOR CONFERENCE ROOM LOCATED IN THE FMPA BUILDING AT 8553 COMMODITY CIRCLE, ORLANDO, FLORIDA 32819.

- Proposals shall be submitted on the forms provided and must be manually signed.
- Proposals shall be sealed in an envelope with the proposal number, opening date, and time clearly indicated.
- Proposals received after the opening date and time may be rejected and returned unopened.
- The attached Request for Proposals shall become part of any purchase order resulting from this Request for Proposal.

DESCRIPTION

March 2021

**Florida Municipal Power Agency
Request for Proposals
for
General Work for Hot Reheat Pipe Replacement Project
at Cane Island Power Plant**

See attached Request for Proposals, General Conditions, Specifications, and Proposal Forms for detailed description.

It is the intent and purpose of the Florida Municipal Power Agency that this Request for Proposal promotes competitive bidding. It shall be the proposer's responsibility to advise if any language, requirements, etc. or any combination thereof, inadvertently restricts or limits the requirements stated in this Request for Proposal to a single source. Such notification must be submitted in writing and must be received by not later than ten (10) days prior to the proposal opening date.

ADVERTISEMENT

Proposal For

March 2021

**FLORIDA MUNICIPAL POWER AGENCY
REQUEST FOR PROPOSALS
FOR
General Work for Hot Reheat Pipe Replacement Project
at Cane Island Power Plant**

**REQUEST FOR PROPOSALS
FMPA 2021-243**

Sealed proposals will be received by the Florida Municipal Power Agency (FMPA), 8553 Commodity Circle, Orlando, Florida 32819 until 10:00 A.M. ON **APRIL 29, 2021**, when at that time Proposals will be opened publicly by a FMPA representative.

The proposal is for the General Work for Hot Reheat Pipe Replacement at Cane Island Power Plant as more fully described in the Request for Proposals package.

RFP packages for this project may be obtained from FMPA at the above address, by telephone (407) 355-7767, via e-mail request to bidinfo@fmpa.com, or via Internet download at www.fmpa.com.

No proposal may be altered, withdrawn, or resubmitted after the scheduled closing time for receipt of proposals. Proposals received after the day and time stated above will not be considered.

Proposals will be accepted for General Work for Hot Reheat Pipe Replacement at Cane Island Power Plant from companies who have established, through demonstrated expertise and experience, that they are qualified to provide the services as specified.

The Florida Municipal Power Agency reserves the right to reject any and all proposals in total or in part and to waive defects in proposals.

Jacob Williams
General Manager and CEO
Florida Municipal Power Agency

FLORIDA MUNICIPAL POWER AGENCY

Request for Proposals for

General Work for Hot Reheat Pipe Replacement at Cane Island Power Plant

1. FMPA Description

Formed by Florida's municipal electric utilities in February 1978, the Florida Municipal Power Agency (FMPA or the Agency) is a non-profit, governmental, wholesale electric utilities company created to serve the needs of municipal electric utilities in Florida. Of the 34 municipal systems in the State, 31 are FMPA members who participate at varying levels in Agency activities.

2. Introduction - General Description of Services Sought

Florida Municipal Power Agency, (FMPA/Owner) invites proposals for the demolition, Installation, construction, material supply, and testing at Cane Island Power Park as noted herein. Based on the relevant previous experience, your firm has been selected to receive this RFP and is invited to submit a proposal to supply the work described herein.

The scope of work includes, construction at Cane Island Power Park, 6075 Old Tampa Hwy, Intercession City, FL 33848.

MATERIALS

All work and materials shall comply with engineering plans provided herein.

3. Overview

Upon selection of the awarded Contractor(s), FMPA will enter into a Master Agreement specifying terms and conditions. FMPA will issue a Purchase Order with project-specific technical specifications.

The submission of a proposal implies a general acceptance on the part of the bidder of the terms of this RFP, form of contract, and especially of those parts establishing warranties and guarantees.

4. Purchasing Services

Subsequent to the award, FMPA shall issue Purchase Orders to the Contractor(s) awarded the agreement pursuant to this Request for Proposal.

5. Indemnity

After notification of award, the successful bidder shall indemnify and save harmless FMPA from and against all claims, suits, actions, damages, or causes of action arising during the terms of the resulting agreement for any personal injury, loss of life, or damage to property sustained by reason of a result of the performance of the services or delivery of goods for which the resulting agreement was entered into, or its agents, employees, invitees, and all other persons, and for and against any orders, judgments, or decrees, which may be entered thereto, and from and against all costs, attorney's fees, expenses and liabilities incurred in or by reason the defense of any such claim, suit or action, and the investigation therefore.

Nothing in the award, resulting agreement, contract or Purchase Order shall be deemed to affect the rights, privileges and immunities of FMPA as set forth in Florida Statute 768.28.

The successful bidder(s) covenants and agrees to indemnify and save harmless FMPA and to defend from all cost, expenses, damages, attorney's fees, injury or loss to which FMPA may be subjected by any person, firm, corporation, or organization by reason of any wrongdoing, misconduct, want, or need of care or skill, negligence or default or breach of contract, guaranty, or warranty, by the successful bidder(s), his employees, his agents or assigns.

6. Notice to Proposers

Sealed proposal packages will be received until **10:00 A.M. ON APRIL 29, 2021** ("Proposal Due Date") at the offices of Florida Municipal Power Agency. Each proposer is required to submit a Proposer Information Form (included in this RFP package), other forms included in this package as appropriate, and all other information necessary to allow a complete evaluation of the proposal. Registered proposers will be notified through the issue of RFP addenda of any change in the Proposal Due Date or other necessary revision to information contained in this RFP. FMPA reserves the right to reject all proposals received after the Proposal Due Date.

One (1) original hard copy (including original signatures) and one electronic version of the proposal response package should be sealed and delivered to the following address:

Ms. Sharon Samuels
Florida Municipal Power Agency
8553 Commodity Circle
Orlando, Florida 32819

Clearly legible on the outside of the sealed envelope shall be "**General Work for Hot Reheat Pipe Replacement at Cane Island Power Plant**, FMPA RFP 2021-243".

7. Duration of Offer

Proposals submitted in response to this RFP are irrevocable 180 days. This period may be extended at FMPA's request only by written agreement of the proposer. The content of this RFP and the proposal of the successful proposer will be included by reference in any resulting contract.

8. Right of Rejection

This RFP is not an offer establishing any contractual rights. This solicitation is solely an invitation to submit proposals.

FMPA reserves the right to:

- Reject any and all proposals received in response to this RFP;
- Waive any requirement in this RFP;
- Waive any irregularities, regardless of the severity

- Not disclose the reason for rejecting a proposal;
- Not select the proposal with the lowest price; and
- Seek and reflect clarifications to proposals.
- Negotiate with the selected bidder in the event that the price exceeds available funds.
- Select the proposal that is in the best interest of FMFA

9. **Proposal Contents**

The submission of a proposal implies a general acceptance on the part of the bidder of the terms of this form of contract, and especially of those parts establishing warranties and guarantees

The proposal should include a description of the firm's capabilities and experience with providing the requested services, including a description of any special qualifications which are indicative of working familiarity with similar projects.

The following information must be included:

1. Demonstration of first-hand experience in providing similar services to those requested in this RFP;
2. Description of the resources available, including staffing levels, qualifications of key personnel who will be performing the work, equipment and capabilities; and locations of offices;
3. Proof of Insurance coverage;
4. Proof of licenses and certifications as applicable;
5. Safety protocols;
6. A schedule for the work, including the range of start dates to which your firm is prepared to commit to and anticipated completion dates.
7. General description of how projects will be staffed, managed, and completed, including project management and invoicing;
8. Identification of any work or services that may be provided by a subcontractor. Bidder shall provide information similar to that above concerning subcontractor's equipment, personnel, and qualifications; including a minimum of two (2) reference projects with similar scope of work. If after award of the RFP, the successful bidder(s) desire to utilize a subcontractor other than listed in the bid, the bidder must obtain approval of the subcontractor from FMFA. Denial of a subcontractor by FMFA will NOT absolve the bidder from getting the work done for the contracted price;

9. List of at least two (2) references for which similar projects were conducted, including name, company, title, phone number and email address, and a brief description of the project including the start and end dates;
10. The name and contact information of the person in Bidder's firm who would be the official contact person for any contractual relationship.
11. Fully executed forms as provided in Appendix C - Bid Forms.

10. RFP Schedule

FMPA's timetable for this RFP process is shown below. Note that the dates shown are only estimates and may be modified at any time by FMPA.

Public Notice/Distribution of RFP	March 29, 2021
Site Visit Prebid Walkdown (<i>Mandatory</i>)	April 5, 2021
Sealed Proposals Due Date	April 29, 2021
Notice of Award (<i>Estimated date</i>)	May 18, 2021

11. Site Visits

Site visits by each bidder are mandatory. The pre-bid site visit will be conducted on April 5th. To arrange a site visit, contact **Tobin LaBorde** at (407) 355-7767 or by email at Tobin.LaBorde@fmpa.com.

12. Evaluation

The proposals will be evaluated based on information provided by each proposer by the Proposal Due Date. No additional data will be considered after the Proposal Due Date, except for clarifications requested by FMPA. FMPA will evaluate the proposals in terms of cost and other quantitative and non-quantitative factors.

Selection and rejection of proposals and notification of proposers at all stages will remain entirely with FMPA's discretion. FMPA intends to notify proposers not selected under this solicitation within a reasonable amount of time.

13. Performance Bond/Surety

Neither a bid nor a performance bond or surety is required pursuant to this RFP.

14. Budgetary Constraints

The Florida Municipal Power Agency reserve the right to reduce or increase the quantity, retract any item from the bid, or upon notification, terminate entire agreement without any obligations or penalty based upon availability of funds.

15. Interpretations and Addenda

All questions regarding interpretation of this RFP, technical or otherwise, must be submitted in writing to the following:

By E Mail: *sharon.samuels@fmpa.com*

By Fax: Ms. Sharon Samuels
(407) 355 - 5796

By Mail or Courier: Ms. Sharon Samuels
Florida Municipal Power Agency
8553 Commodity Circle
Orlando, Florida 32819

Only written responses provided by FMPA to proposers' questions will be considered official. A verbal response by FMPA will not be considered an official response. Written responses to questions and requests for interpretations will be provided to all potential proposers. Copies of all addenda issued in connection with this RFP may be sent to all potential proposers.

16. Errors, Modifications or Withdrawal of Proposal

Each proposer should carefully review the information provided in the RFP prior to submitting a response. The RFP contains instructions which must be followed by all proposers. Modifications to proposals already received by FMPA will only be accepted prior to the Proposal Due Date. Proposals may be withdrawn by giving written notice to FMPA prior to the Proposal Due Date.

17. Proprietary Confidential Business Information

All proposals shall become property of FMPA. FMPA will not disclose to third parties any information that is clearly labeled "Proprietary Confidential Business Information" in a proposal unless, in the opinion of counsel for FMPA, such disclosures are required by law or by order of the court or government agency having appropriate jurisdiction. Each page of Proprietary Confidential Business Information must be clearly labeled "PROPRIETARY CONFIDENTIAL BUSINESS INFORMATION" at the top of the page. FMPA reserves the right to disclose information contained in proposals to its consultant(s) for the sole purpose of assisting in the proposal evaluation process. FMPA will require the consultant(s) to maintain the confidentiality of the document.

18. Default and Damages Provisions

FMPA will negotiate standard terms and conditions for default and damages with the awarded Contractor(s). All proposers are requested to include proposed default and damages provisions in their proposals.

19. Public Entity Crimes Statement

Pursuant to Section 287.133(2)(a), FLORIDA STATUTES, all proposers should be aware of the following:

"A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list."

20. Collusion

By offering a submission pursuant to this RFP, the proposer certifies the proposer has not divulged, discussed, or compared his proposal with other proposers and has not colluded with any other proposer or parties to this proposal whatsoever. Also, the proposer certifies, and in the case of a joint proposal, each party thereto certifies, as to his own organization, that in connection with this proposal:

1. Any prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement for the purpose of restricting competition, as to any matter relating to such prices and or cost data, with any other proposer or with any competitor
2. Any prices and/or cost data quoted for this proposal have not knowingly been disclosed by the proposer and will not knowingly be disclosed by the proposer prior to the scheduled opening directly or indirectly to any other proposer or to any competitor
3. No attempt has been made or will be made by the proposer to induce any other person or firm to submit or not to submit a proposal for the purpose of restricting competition
4. The only person or persons interested in this proposal, principal or principals is/are named therein and that no person other than therein mentioned has any interest in this proposal or in the contract to be entered into and
5. No person or agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee excepting bona fide employees or established commercial agencies maintained by the Proposer for the purpose of doing business.

21. Drug Free Workplace

A Drug-Free Workplace Statement must be completed, signed, and returned prior to award of proposal. This form will be used whenever two or more proposals that are identical with respect to price, quality, delivery, and service are received; a proposal received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process.

22. Subcontracted Services

Proposal should indicate which, if any, of the services to be provided would be subcontracted by the proposer to independent contractors. If work is intended to be subcontracted, BID SUBMITTAL MUST BE ACCOMPANIED BY BACKGROUND MATERIALS AND REFERENCES FOR PROPOSED SUBCONTRACTOR(S) - NO EXCEPTIONS. In addition, Contractor(s) must notify FMPA any time work will include subcontracted services. FMPA maintains the right to reject the proposed subcontractor for specific project work.

23. Definitions

The words and terms defined in this document shall have the following meanings as used throughout.

ACCEPTANCE – Written acknowledgement by the FMPA and authorized representative that the Work has been completed in a manner consistent with the terms, conditions and specifications of a Contract or Purchase Order.

CONTRACTOR – The business entity (and its affiliates and authorized assigns), which has been awarded by FMPA or executed a contract with FMPA shall include any and all subcontractors, affiliates and authorized assigns that provide or perform any or all of the Work. This entity may also be referred to as the Contractor, successful bidder, or successful proposer.

PARTICIPANT CONTRACT – The aggregation of all documents that constitute the binding agreement between the Contractor and FMPA. The Participant Contract may include but shall not be limited to The Award or Agreements that result from this solicitation, Blanket Orders, Purchase Orders, Order Releases, and all attachment agreements.

PURCHASE ORDER (PO) – A Work authorization, issued by FMPA or an FMPA Member, which is issued subject to the terms and conditions of the Award or Agreement. The term “Purchase Order” shall also include “blanket order releases” and any other ordering methodology agreed to in writing by FMPA and Contractor.

WORK – Labor, materials, supplies, equipment, goods, and services including any related documentation, software, reports, testing, transport, administration, management, tools and any and all other requirements to be furnished or performed by Contractor under this Agreement and/or a Participant Contract together with all other additional necessities that are not specifically recited in this Agreement or Participant Contract but which could be reasonably inferred as necessary to complete all obligations and fully satisfy the intent of this Agreement and/or a Participant Contract.

24. Entire Contract

These General Terms and Conditions, the Master Agreement between FMPA and the selected Contractor(s), and the Purchase Order (PO) for which they are being provided (including attachments thereto) constitute the entire agreement between FMPA and the Contractor.

25. Acceptance of Services and Work Product

The Product or Services shall be subject to FMPA and authorized staff's inspection at any time. FMPA may reject Product/Services within a reasonable time after completed, if such Product/Services do not comply with the requirements of the Purchase Order or the specifications for the Product/Service. The making or failure to make any inspection of, or payment for or acceptance of Product/Service shall in no way impair FMPA's right to reject or revoke its acceptance of nonconforming Product/Service, or to avail itself of any other remedies to which FMPA may be entitled, notwithstanding FMPA's knowledge of the nonconformity, its substantiality or ease of discovery.

Final acceptance of the Services and Work Product for purposes of the Purchase Order shall be the date upon which FMPA confirms that all Services and Work Product have been completed in accordance with the terms of the Purchase Order ("Final Acceptance").

26. Site Access Conditions

FMPA and authorized staff shall provide Contractor access to the Facility as necessary to perform the Work or Services. Access shall be subject to Contractor's obligation to comply with the following conditions:

1. Contractor shall confine its activities to only those portions of the Facility necessary for performance of the Services.
2. Contractor shall take all safety measures reasonably necessary to protect FMPA and FMPA property, its permittees and licensees and the property of each, from injury or damage caused by or resulting from the performance of Services. Contractor shall follow any and all safety and security procedures established by FMPA for the Facility. In the event of a security emergency, FMPA and its Members may deny Contractor access to a Facility or request that Contractor leave the Facility.
3. Contractor shall maintain all required insurance coverage's set forth in Section 27 at all times during the term of the Purchase Order.
4. Contractor's performance of Services shall not interfere with the use, occupancy or enjoyment of the Facility by FMPA and its Members.
5. No work or activity performed as part of the Services shall cause FMPA and its Members to be in violation of any requirement of law nor shall Contractor or any agent, employee or representative violate any federal, state or local laws while performing Services.
6. All Services shall be performed in a manner that will not damage the Facility and Contractor shall promptly notify FMPA and shall be responsible for the cost of repairing any such damage should it occur.
7. FMPA rules on maintaining a drug-free workplace shall be strictly followed and enforced by Contractor with respect to all of its employees or subcontractors and none of Contractor's employees, subcontractors, agents or representatives shall be permitted to use non-prescription drugs or alcohol at any FMPA and its Member Facility.

27. Required Insurance

The Contractor shall acquire and maintain at all times during the performance of Services the insurance coverage set forth below. Contractor shall furnish FMPA a copy of the insurance certificate. Additional information on insurance requirements are noted in Appendix B, page 4.

The liability limits shall not be less than:

Workers' Compensation Statutory

Commercial General Liability \$2,000,000

Automobile Liability \$500,000

Product Liability as set forth in the Purchase Order, if any;

Pollution Insurance as set forth in the Purchase Order, if any;

28. Termination for Default

Any failure by Contractor to perform or comply with the terms and conditions of the Purchase Order which continues for ten (10) calendar days after written notice from FMPA to Contractor demanding that such failure to perform be cured, shall be deemed an event of default by Contractor. Upon the occurrence of any such event of default, FMPA may terminate the Purchase Order and pursue any remedies available at law or in equity.

29. Termination for Convenience

FMPA shall have the right in its sole discretion to terminate by written notice, in whole or in part, the Purchase Order for its convenience. FMPA shall pay Contractor for any Services performed under the Specifications of the Bid Package prior to the termination date.

30. Warranties

Reference Warranty section of Appendix B, page 3.

31. Hazardous Materials of Contractor

Any Hazardous Materials used by Contractor in the performance of the Services shall be packaged, shipped, handled, labeled and disposed of by Contractor in a manner that complies with all federal, state and local laws or regulations applicable to Hazardous Materials. No Hazardous Materials shall be stored by Contractor at the FMPA and its Member's Facility before, during or after the performance of Services hereunder. Contractor shall, at its expense, remove, transport and dispose of all Hazardous Materials (i) brought by Contractor to the Facility or (ii) disturbed by Contractor's performance of Services or created by Contractor's use, handling or combination of non-hazardous materials brought by Contractor to the Facility during the performance of Services. For purposes of the Purchase Order, the term "Hazardous Materials" shall mean any substance which by law requires special handling, containment or disposal, including without limitation "hazardous substances" as defined in the Comprehensive

Environmental Response, Compensation and Liability Act of 1980, as amended (42 USC Sections 9601, et seq.), the Hazardous Materials Transportation Act, as amended (49 USC Sections 5101, et seq.), “hazardous wastes” as defined in the Resource Conservation and Recovery Act, as amended (42 USC Sections 9601, et seq.), “toxic substances” as defined in the Toxic Substance Control Act as amended (15 USC Section 2601 et seq.), as amended and in the regulations adopted, published, and promulgated pursuant thereto. Contractor shall be responsible for obtaining and maintaining any licenses, permits, and/or other authorizations of any kind required for the performance of the Services. Contractor shall pay all costs of such licenses, permits and authorizations and all costs and expenses incurred in obtaining and maintaining them. The Contractor shall comply with all federal, state and local laws, and rules and regulations that are applicable to the performance of the services requested by FMPA.

32. Safety and Protection

Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with work under this RFP. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

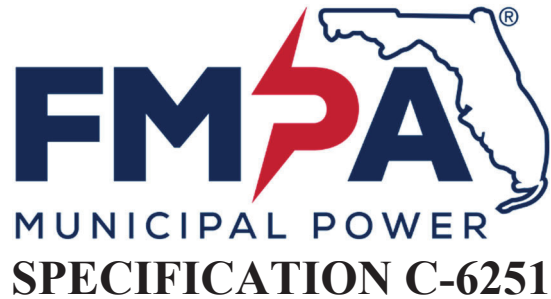
1. All persons on the site who may be affected by the project work;
2. All Work and materials and equipment to be incorporated therein, whether in storage on or off of the project site; and
3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of the project.

33. Control of Work and Subcontractors

Contractor shall be solely responsible for all construction means, methods, techniques, sequences, procedures, and safety programs in connection with the performance of the Work. In addition, Contractor shall be solely responsible for the engagement and management of any subcontractors used to perform any portion of the Work.

APPENDIX A

SCOPE OF WORK
&
ENGINEERING DRAWINGS
&
PRICING SHEET



GENERAL WORK CONTRACT

FOR THE

HOT REHEAT PIPE REPLACEMENT PROJECT

AT THE

CANE ISLAND POWER PARK UNIT 3

FLORIDA MUNICIPAL POWER AUTHORITY

S&L PROJECT NO.: 13840-007

ISSUE PURPOSE: BID – REV. 0

ISSUE DATE: 03-23-2021





Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

HOT REHEAT PIPE REPLACEMENT GENERAL WORK CONTRACT

FOR THE HOT REHEAT PIPE REPLACEMENT PROJECT AT THE CANE ISLAND POWER PARK UNIT 3

<u>Rev.</u>	<u>Purpose of Issue</u>	<u>Date</u>	<u>Sections Affected</u>
0	Bid	03-23-2021	ALL

This is to confirm that this Specification has been prepared, reviewed and approved in accordance with Sargent & Lundy's Standard Operating Procedure SOP-0407, Specifications, which is part of our Quality Management System.

Mechanical Sections

<u>Rev.</u>	<u>Prepared By</u>	<u>Reviewed By</u>	<u>Approved By</u>
0	Ethan Bredemeier 	Jason Wear 	James Kamba  Digitally signed by James Kamba Date: 2021.03.24 14:51:07 -04'00'

Structural Sections

<u>Rev.</u>	<u>Prepared By</u>	<u>Reviewed By</u>	<u>Approved By</u>
0	Noberto Perez Murillo 	Keith Sheridan  Digitally signed by Keith Sheridan Date: 2021.03.24 12:23:26 -05'00'	James Kamba  Digitally signed by James Kamba Date: 2021.03.24 14:51:28 -04'00'

Electrical Sections

<u>Rev.</u>	<u>Prepared By</u>	<u>Reviewed By</u>	<u>Approved By</u>
0	Ryan Palkon 	Russell Kalins 	James Kamba  Digitally signed by James Kamba Date: 2021.03.24 14:51:44 -04'00'

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Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

Instrumentation & Controls Sections

Rev.

Prepared By

Reviewed By

Approved By

0

Svetlana Royzen

Svetlana
Royzen

Digitally signed by Svetlana
Royzen
Date: 2021.03.24 10:54:33
-05'00'

Bogumil Bortnowski

Bogumil
Bortnowski

Digitally signed by Bogumil
Bortnowski
Date: 2021.03.24 11:02:24
-05'00'

James Kamba

James Kamba

Digitally signed by James Kamba
Date: 2021.03.24 14:52:01
-04'00'



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

SECTION 000107

CERTIFICATION OF SPECIFICATION PAGE

GENERAL WORK CONTRACT

**FOR THE
HOT REHEAT PIPE REPLACEMENT PROJECT
AT THE
CANE ISLAND POWER PARK UNIT 3**

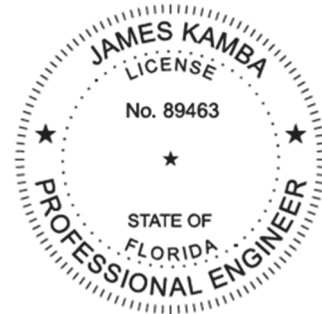
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Florida.

Signature: James Kamba Digitally signed by James Kamba
Date: 2021.03.24 15:44:35 -04'00'

Typed or Printed Name: James Kamba

Date: 02-28-2023

License: 89463





Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

**TECHNICAL SPECIFICATION FOR
GENERAL WORK**

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Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

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Attachment 4	Project Lists
Attachment 5	Pricing Pages

END OF SECTION 000110



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



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Issue: Bid, Rev. 0
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SECTION 011100

SUMMARY OF WORK

PART 1 - GENERAL

101. PROJECT INFORMATION

- 101.1 Owner: Florida Municipal Power Authority
- 101.2 Consulting Engineer: Sargent & Lundy L.L.C. (S&L)
- 101.3 Project Name: Cane Island Unit 3 (CI3) Hot Reheat Pipe Replacement Project
- 101.4 Project Location: Cane Island Power Park
6075 Old Tampa Highway
Intercession City, FL 33848
- 101.5 Contractor: The Contractor to perform the work described herein. This includes the Contractor and all vendors and subcontractors required to provide the material and perform the work.

102. DESCRIPTION OF THE PROJECT AND GENERAL BACKGROUND

- 102.1 The purpose of this project is to replace a section of the existing Unit 3 Hot Reheat System piping, fittings, pipe supports, and flowmeter with in-kind products at the Florida Municipal Power Authority's Cane Island Power Park. This work also includes an additional manual drain line and redesigned pipe supports. Work is to be performed during the outage starting November 1st, 2021.
- 102.2 In general, this Specification and the drawings referenced herein cover the technical requirements for the demolition and removal of a 134 foot section of the existing Unit 3 Hot Reheat (HR) System piping, fitting and pipe supports; and installation, testing, startup and commissioning of the new portion of Hot Reheat System piping, fittings, and pipe supports. The scope includes disconnection and reconnection of existing piping and instrument takeoffs and wiring to facilitate the new flow transmitter location. All instruments are being reused except flow element FE-065 and thermowell TE-030. Both the flow element and thermowell are provided by Owner. All large bore piping is supplied by others and installed by the General Work Contractor (GWC).

103. SCOPE OF WORK

- 103.1 The Work shall include the tasks identified in the following Division of Responsibility (DOR) Matrix complete (i.e., design, procure material, fabricate as necessary, deliver, store and construct or install) as specified herein for the Hot Reheat piping system replacement.

Key to Abbreviations Used in DOR	
Owner (Owner)	OWNER
Sargent & Lundy	S&L
Work to be performed in the field by the Contractor in accordance with this Specification, C-6251.	GWC
HR Pipe & Fitting Fabricator	PIPE
Work by an entity other than the Owner, Sargent & Lundy, Contractor or Pipe/Fitting	OTHERS
Not Applicable.	N/A



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DIVISION OF RESPONSIBILITY (DOR) MATRIX				
	ITEM	Engineer and Design	Material and/or Equipment Supply	Erect and/or Install
1.	GENERAL			
a.	Submittal of Contractor prepared drawings and data per Section 013323.	GWC	N/A	N/A
2.	STRUCTURAL SCOPE OF WORK			
a.	As required, demolition and removal from site of existing HR System auxiliary pipe support steel, including bolts, anchors, etc.	GWC	N/A	GWC
b.	Procurement, erection, and installation of all new HR System auxiliary pipe support steel, including welding equipment, bolts, anchors, etc. Anchors shall be hot dipped galvanized/zinc coated or stainless if specified.	S&L	GWC	GWC
c.	Procurement, erection and installation of new structural steel modifications and reinforcement for new HR System pipe supports.	S&L	GWC	GWC
d.	Procurement and installation of any grout work required for installation of new HR System pipe supports	S&L	GWC	GWC
e.	Procurement and installation of any post installed anchorage required for installation of new HR System pipe supports	S&L	GWC	GWC
f.	Surface preparation of existing structural steel for welding of new structural steel	GWC	GWC	GWC
g.	Touch-up coating of structural steel using 2-Coat system with inorganic zinc primer and polyurethane finish. Finish color to match existing.	GWC	GWC	GWC
h.	Temporary support and bracing of existing components as needed.	GWC	GWC	GWC
3.	MECHANICAL SCOPE OF WORK			
a.	Development of a staging and sequencing plan for the demolition of the existing HR piping system, including pre-outage staging of new HR piping system and outage erection and installation planning of new HR piping system. Plan shall include construction sequence, material moving corridors, and acceptable riggings loads developed to implement construction. Contractor shall develop its own plan and submit plan with its proposal.	GWC	N/A	GWC
b.	Removal and proper disposal of existing HR System insulation.	N/A	N/A	GWC



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DIVISION OF RESPONSIBILITY (DOR) MATRIX				
	ITEM	Engineer and Design	Material and/or Equipment Supply	Erect and/or Install
c.	Temporary supporting, rigging, and accommodation of potential "cold spring" of existing HR System piping. Contractor responsible for design and installation of temporary restraints as necessary to facilitate safe removal of existing HR system piping and supports.	GWC	GWC	GWC
d.	Demolition and removal from site of all existing HR system piping, pipe fittings, and pipe supports as indicated in Attachment 1.	S&L / GWC	N/A	GWC
e.	Temporary storage of existing small-bore drains, vents, instruments, and branch connections. Existing small-bore (2" and smaller) HR System drain, vent and branch connections shall be left in place to the maximum extent practical to minimize the amount of rework for reinstallation of drain, vent and branch connections to new HR System.	S&L/GWC	N/A	GWC
f.	Removal and storage for re-installation of existing small-bore (2" and smaller) pipe supports in order to demolish and removal existing HR piping system and install new HR piping system.	GWC	GWC	GWC
g.	Removal and proper storage of existing HR System 22" valve (BV-189A) for reinstallation by GWC. Contractor shall coordinate with Owner to locate and store the valve in the Cane Island warehouse. Contractor shall take extra precaution when removing the valve from the existing HR system piping to avoid damaging the valve.	GWC / OWNER	N/A	GWC
h.	Installation and erection of new HR system piping and pipe fittings (large bore 2.5" and larger) as provided by Pipe and Fittings Supplier.	PIPE	PIPE	GWC
hi.	New Large Bore (2.5" and larger) Piping Lifting Lugs (if required)	GWC	GWC	GWC
hii.	Removal of Large Bore (2.5" and larger) Piping Lifting Lugs (if required)	GWC	GWC	GWC
i.	Installation of new HR system engineered pipe supports.	S&L	GWC	GWC
j.	Procurement and installation of new small bore (2" and smaller) HR System drain, vent and instrument root valves and connections to existing drain, vent and instruments, respectively.	S&L	GWC	GWC
k.	Procurement and/or replacement of small-bore (2" and smaller) pipe supports as necessary to provide a complete HR system installation, cleaning, and testing.	GWC	GWC	GWC



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DIVISION OF RESPONSIBILITY (DOR) MATRIX				
	ITEM	Engineer and Design	Material and/or Equipment Supply	Erect and/or Install
l.	Re-Installation of existing HR System 22" valve (BV-189A) on new HR System piping.	GWC	N/A	GWC
m.	Inspection and testing of new HR System. Hydrotesting of the new HR system is not envisioned, so all field welds shall be 100% inspected by liquid penetrant testing (PT) and radiograph testing (RT).	GWC	GWC	GWC
n.	Steam blow for the new HR System is not envisioned, so the Contractor shall perform a Hydrolazing (or Aqualazing) cleaning process of new HR System, followed up with a full borescope inspection prior to startup. Hydrolazing (or Aqualazing) shall remove all weld slag, mill scale, debris, etc.) per cleaning criterion WJ-1 (SSPC-SP12/NACE 5 and SSPC-VIS 4/NACE VIS 7). Contractor proposal shall utilize connections provided on new HRH pipe spools for Hydrolazing (or Aqualazing) connections.	GWC	GWC	GWC
o.	Plugging and/or capping and full RT inspection of Hydrolazing (or Aqualazing) connections.	PIPE / GWC	PIPE / GWC	GWC
p.	Procurement and installation of new HR System insulation materials as necessary for new additional HR System piping. Large bore piping shall have calcium silicate insulation. Small bore piping shall have Pyrogel HPS insulation.	GWC	GWC	GWC
q.	Startup, Commissioning and Turnover	GWC / OWNER	GWC / OWNER	GWC / OWNER
r.	Resetting of existing pipe on North-South pipe rack (Drawings TBD)	S&L	GWC	GWC
s.	Installation of new pipe supports on existing HR Pipe on North-South pipe rack (Drawings TBD). Removal of existing pipe supports.	S&L	GWC	GWC
t.	Temporary bracing, insulation removal/reinstallation, pipe support procurement, steel procurement, and other items as needed to install new pipe supports and remove old pipe supports on HR Pipe on North-South pipe rack.	GWC/S&L	GWC	GWC
4.	ELECTRICAL & INSTRUMENTATION AND CONTROL SCOPE OF WORK			
a.	Removal and proper storage of existing HR System instrumentation (pressure, temperature, and flow instrumentation).	GWC	N/A	GWC
b.	Reinstallation of instrumentation other than flow element FE-065 and thermowell TE-030. These items will be replaced.	GWC	N/A	GWC



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DIVISION OF RESPONSIBILITY (DOR) MATRIX				
	ITEM	Engineer and Design	Material and/or Equipment Supply	Erect and/or Install
c.	Contractor shall coordinate with Owner to ensure instrumentation connections are de-terminated appropriately per plant requirements, and electrical power is appropriately isolated per plant Lock Out Tag Out procedures. Coordination with Owner is required for location of appropriate storage.	GWC / OWNER	N/A	GWC / OWNER
d.	De-termination of electrical power and control wiring to HR System instrumentation to be removal and reinstalled. Contractor shall coil back wiring a sufficient distance from the HR System piping to allow for demolition, removal, erection, and installation activities. Instrumentation and wiring associated with flow element FE-065 shall be reused for the new FE-065 location. Contractor shall modify and reinstall tubing and wiring as needed for field fit-up.	S&L	N/A	GWC
e.	Re-installation of existing HR System instrumentation transmitters and gages taps through instrumentation root valve, and thermowells on HR System pipe header. Instrumentation will be located in the same location on the new HR piping system as the existing HR piping system. Instrumentation elements and transmitters shall be recalibrated and tested prior to re-installation by GWC.	S&L	GWC	GWC
f.	Re-termination of electrical power and control wiring to HR System instrumentation, including cable, conduit, wiring, etc.	S&L	GWC	GWC
g.	Installation of new TE-030 and FE-065.	S&L	OWNER	GWC
h.	Installation of new pressure instrumentation piping and tubing for instruments PI-66 and PT-66A per instrument installation detail drawings. Modification to enclosure for pressure instrumentation to accommodate new instrumentation arrangement.	GWC/S&L	GWC	GWC
5.	CONSTRUCTION UTILITIES			
a.	Site safety program.	GWC / OWNER	N/A	ALL
b.	Unloading, storage and protection of delivered materials including pipe spools for the HRH pipe supplied by Owner.	N/A	N/A	GWC
c.	Temporary elevators, scaffolding and rigging for performance of the Work.	GWC	GWC	GWC
d.	Disposal of water and waste from Hydrolazing (or Aqualazing) Cleaning process. GWC to provide estimated volume and pipe preservative that is used.	GWC	OWNER	OWNER



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DIVISION OF RESPONSIBILITY (DOR) MATRIX				
	ITEM	Engineer and Design	Material and/or Equipment Supply	Erect and/or Install
e.	Temporary piping for Hydrolazing (or Aqualazing) water and waste. Piping shall be routed to nearby floor drains.	GWC	GWC	GWC
f.	Containers for construction debris and waste.	N/A	GWC	GWC
g.	Disposal or removal of unused chemicals and waste.	N/A	GWC	GWC
h.	Contractor's construction trailer.	N/A	GWC	GWC
i.	Contractor's construction crane, hoists, tools, etc.	N/A	GWC	GWC
j.	Power for GWC's construction activities - two (2) 480 V 60A drops.	N/A	OWNER	OWNER
k.	Additional power generators for GWC construction activities not met by above power output.	N/A	GWC	GWC
l.	Temporary power hookup installation to owner's power source.	N/A	GWC	GWC
m.	Sanitary facilities for the construction crews.	N/A	GWC	GWC
n.	Source of potable water.	N/A	GWC	GWC
o.	Water supply for hydrolazing.	N/A	OWNER	GWC
p.	Telephone and Internet (incl. WIFI) service(s).	N/A	GWC	GWC
6. CONSTRUCTION TESTING, TURNOVER AND COMMISSIONING				
a.	Outage Coordination. GWC is one of several contractors on-site during the 8-week outage. GWC is required to cooperate with Owner on plans for outage coordination with the other contractors and limited space for crane access. This will be addressed in more detail during the pre-bid site meeting of April 5, 2021.			
b.	Refer to Section 017500 of this Specification for specific items of Work and the Division of Responsibility.			

103.2 In addition, the work shall include but not be limited to the following:

- a. Engineering and construction services required to perform or install the Work.
- b. Surveying to ensure the Work is located as indicated on the design drawings.
- c. Furnishing all special erection and installation equipment and tools including any calibrated instruments required for monitoring and testing.
- d. Maintaining a record of the installation (i.e., as-built drawings) in accordance with the technical requirements of this specification.
- e. Furnishing the services of qualified personnel at the project site to perform field services, such as inspection, welding, and testing.



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- f. Providing a qualified third-party inspection service to monitor the quality of the work as indicated in Section 014500 of this Specification.
 - g. Progress reporting as specified in the commercial terms and conditions.
 - h. Daily site cleanup and disposal of waste and debris.
 - i. Contractor adherence to the Owner's Foreign Material Exclusion requirements.
 - j. Contractor adherence to Owner's Hot Work Program, including applicable fire water requirements.
 - k. All Contractor and Contractor's subcontractors shall participate in the Owner's on-site Plant Safety Training.
 - l. Early in the outage, Contractor shall remove block valve BV-189A and deliver to Owner's on-site maintenance ship for maintenance activities by Owner. Contractor shall provide specific schedule line item that shows when this activity will take place with discretion of Owner. Owner will need 5 days for maintenance of the valve before it can be retrieved from the on-site ship by the GWC.
- 103.3 The Work shall conform to the requirements of these specifications and shall be performed and supervised by personnel who are experienced and knowledgeable in the crafts and trades required by the Scope of Work. The Work shall be performed exclusively by the Contractor's trained and competent personnel or, where permitted, that of its subcontractor(s); and shall comply with all applicable safety laws, regulations, programs and practices to ensure the safety of all people located on the work site, including the Contractor's personnel (or that of its subcontractor(s)) performing the Work.
- 103.4 Performance of the Work shall include all the labor, supervision, administration, management, material procurement, tools, installation and testing equipment, miscellaneous material and consumables to furnish, detail, fabricate, deliver, unload, store, remove from storage, construct, erect and install the type of Work identified herein.
- 103.5 Provide all installation equipment and machinery, welding equipment, welding rods and all incidental items not shown or specified but reasonably implied for successful completion of the Work and in strict accordance with design drawings and Specifications, including inspection, testing and quality standards.
- 103.6 Inspection and tests specified in various Sections of this Specification shall be performed by personnel qualified to perform such inspections and tests.
- 103.7 Provide installation quality assurance and quality control submittals where required.
- 103.8 Prepare red-lined as-built drawings for review upon completion of the Work to document any variances between the construction issue of the design drawings and the actual installation. Finalize as-built drawings after the Owner and the Consulting Engineer review.
- 103.9 All other work, as indicated on the design drawings, as specified herein or as required to properly complete the Work.
- 103.10 Contractor Site Specific Safety and Health Plan
- a. Contractor shall provide a Contractor Site Specific Safety and Health Plan (SSSHP) to be implemented under the Owner's safety management protocols.
 - b. The SSSHP shall be designed to prevent Contractor's employees from working under conditions which are unsanitary or dangerous to safety and health.



- c. Contractor shall designate a qualified Safety Representative for each 50 employees that is working at the project site. The Safety Representative shall have a minimum of five (5) years of experience in construction safety, possess the OSHA 30-Hour Construction Safety Training certification, and hold current certification in First Aid and CPR.
 - d. The SSSHP shall demonstrate adherence to the Owner's safety protocols and compliance with OSHA regulations.
- 103.11 I&C
- a. General Requirements
 - a1. The general requirements for instrument installation are provided in Section 409119.
 - b. Procurement Requirements
 - b1. Hot Reheat System instruments as shown on the Data Sheets and / or identified in this Specification.
 - b2. Contractor shall furnish and install a thermowell with thermocouple 3SGC-TE030 in the hot reheat drain pot piping as identified in the Instrument Data Sheet included in Attachment 1. The installation shall be per Instrument Installation Detail drawing 6018-3SGJ-K2003 included in Attachment 1. Contractor shall re-terminate the existing instrument cable on the new replacement thermocouple.
 - b3. Contractor shall re-calibrate and install the exiting flow transmitter 3SGJ-FT-065 in the new location in the Hot Reheat piping per the Instrument Installation Detail drawing 6018-3SGJ-K2002 included in Attachment 1. Contractor furnish and install new instrument root valves, re-install the existing instrument enclosure, modify and re-install wiring and prefabricated heat trace bundles as required. The new venturi flow meter 3SGJ-FE-065 will be furnished and installed in the piping by Others.
 - b4. Contractor shall reinstall exiting Pressure Transmitters 3SGC-PT066A, 3SGJ-PT066B, and 3SGJ-PI-066 reusing the existing instrument enclosure, valves, prefabricated heat trace bundles, etc. per Instrument Installation Detail drawing 6018-3SGJ-K2001. Contractor shall make necessary modifications to adjust location of the existing instrument enclosure and electrical junction box to suit the new installation with instrument taps relocated from the top of the pipe to the side of the pipe.
 - b5. Contractor shall re-install pressure transmitters 3SGJ-PT-020A and 3SGJ-PT-020B as per the existing installation arrangement reusing the existing components and enclosure.
104. PROJECT MEETINGS
- 104.1 Pre-Construction Meeting
- a. Schedule a pre-construction meeting prior to the start of work.
 - b. Meeting shall be attended by the Owner, the Consulting Engineer, the Contractor, major subcontractors, and the site safety representative. The purpose of this meeting will be to finalize the Project Schedule and discuss any outstanding questions regarding scope of work or construction facility topics.



- c. Submit the proposed detailed work schedule to the Owner and the Consulting Engineer for review, one week prior to the scheduled preconstruction meeting.

104.2 Progress Meetings

- a. Schedule progress meetings and/or hold call meetings as directed by the Owner.
- b. Meetings shall be attended by the Contractor, major subcontractors, the Owner's Representative, the Consulting Engineer, and the site safety representative.

105. MATERIAL AND SERVICES FURNISHED BY OTHERS

105.1 The following work has been, or will be, performed and/or provided by Others:

- a. Procurement and delivery of new large-bore (2.5" and larger) HR System pipe and fittings.
- b. Shop nondestructive examination (NDE) of the pipe spools shall be performed by the pipe and valve suppliers, respectively. Field NDE shall be performed by GWC.
- c. Flow element procurement.

106. ADVANCE OR FIELD ENGINEERING

106.1 The Contractor shall prepare specifications for all subcontracted items immediately after notification of award and shall award subcontracts in such time that shop detail drawings can be submitted to fulfill the requirements of the Project Schedule, and other requirements given in this Specification.

106.2 The Contractor shall complete all construction engineering work in accordance with the procedures and criteria specified herein, and to meet all local government requirements. The Owner and the Consulting Engineer reserve the right to examine the Contractor's engineering data in order to verify compliance with the requirements of this Specification. The Contractor shall submit any documentation requested by the Owner for the purpose of this verification, including, but not limited to, diagrams and documents associated with computer-aided analyses and programs. The Contractor's standard procedures will not be accepted as a substitute for any requirements specified herein.

106.3 Any design calculations and drawings prepared by the Contractor for the Work associated with erection and/or installation shall be performed by a Professional Engineer registered in the State of Florida. The calculations and drawings shall be sealed, signed, and dated by the same Professional Engineer. This shall also include Work associated with the stability of systems, structures, and components, whether existing or new and shall also apply to Contractor's temporary scaffolding, rigging, shoring, and bracing. The Professional Engineer shall visit the site to oversee that the scaffolding and rigging are installed and used in accordance with the intent of its design.

106.4 Temporary elevators and lifting devices used by the Contractor for the performance of the Work shall meet the applicable Federal, State, and local building code requirements. These plans shall be submitted to the Owner for review and acceptance.

106.5 Drawings shall not be scaled. Follow calculated dimensions in all cases.

107. PRODUCTS

107.1 The products used for fabrication or delivered to the project site shall be certified 100% asbestos free.



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- 107.2 Coatings used on this project shall be certified 100% lead free.
- 107.3 Safety Data Sheets (SDSs) shall be submitted to the Owner for approval one month prior to the material being brought on to the project site. This requirement is applicable to all material that the Contractor plans to use on-site and includes concrete, chemicals, other material, etc.
108. INTENT OF DOCUMENTS
- 108.1 The Contract Documents are complementary, and what is called for by any one, shall be as binding as if called for by all. The intention of the documents is to include all design, labor, and material, equipment, and transportation necessary for the proper execution of the Work.
- 108.2 Discrepancies between the design drawings and the Project Specification, or errors or omissions or mis-description in either the design drawings or in the Project Specification, shall be referred to the Consulting Engineer for interpretation and adjustment prior to beginning fabrication. Do not proceed without the Consulting Engineer's written acceptance.
- 108.3 The Specification includes references to codes and standards of various governing organizations. These standards indicate the minimum requirements for the Work. Other national standards that are equal to the specified standards may be used for the Work. The Contractor is solely responsible for the Work and compliance with the specified standards.
109. PERFORMANCE OF THE WORK
- 109.1 This project is not pursuing Leadership in Energy and Environmental Design (LEED) Certified; however, the Contractor shall provide materials and employ construction practices that are sustainable to the greatest extent possible including disposal of waste.
- 109.2 The Contractor shall provide a representative that will input and provide daily force reports and daily production reports.
- 109.3 The performance of the Work, as specified herein and as indicated on the design drawings, shall comply with the current safety and health standards authorized by the U.S. Department of Labor's Occupational Safety and Health Administration, as well as state and local jurisdictional requirements.
- 109.4 The Contractor shall take all appropriate precautions to ensure the safety of all people working on-site or visiting the Contractor's fabrication shops.
- 109.5 The Contractor shall maintain the necessary skilled and qualified labor force for the Work to ensure the on-time delivery of the fabricated material to the project site and the on-time completion of the Work.
- 109.6 The Contractor's personnel shall be competent, capable, qualified, and able to perform the duties required to the satisfaction of the Owner. A supervisor vested with authority to make decisions binding on the Contractor shall be assigned to the task to resolve fabrication problems as they arise so as not to delay fabrication or delivery of the material or to resolve installation problems as they arise so as not to delay completion of the Work.
- 109.7 In the event of variation between the Consulting Engineer's Standards and this Specification or the design drawings, the Specification and design drawings shall govern. In the event of variations between the Specification and the design drawings, the design drawings shall govern.



109.8 The Contractor shall be solely responsible for advising the Consulting Engineer in writing of any conflicts between the Specification and the design drawings and the Contractor's drawings, including performance and levels of quality. The Contractor agrees that its obligations, liabilities, and warranties shall not be diminished or extinguished due to its meeting the requirements of the Specification and the design drawings.

110. REGULATORY REQUIREMENTS

110.1 The Contractor shall at all times be solely responsible for complying with all applicable laws, ordinances, regulations, and codes, including those relating to safety of all persons, in connection with the Work. No obligation of the Consulting Engineer shall impose upon them any duty to review the Contractor's compliance with safety measures.

111. PROTECTION OF PROPERTY AND PERSONNEL SAFETY

111.1 The Contractor shall take adequate precautions to protect existing structures, fences, pavements, above ground utilities and underground utilities and to avoid damage thereto. The Contractor shall, at its own expense, repair any damage caused by its operations.

111.2 The Contractor shall be responsible for determining what temporary support and bracing must be provided to support loads that the Work may be subjected to, including construction equipment and the operation of such equipment. The design of any temporary support determined to be required by the Contractor shall be prepared under the supervision of a Professional Engineer registered in the State of Florida and shall be certified by that engineer.

111.3 The Contractor shall be responsible for the adequacy and safety of such support and bracing.

111.4 Shoring and bracing equipment and practices shall meet all OSHA requirements.

111.5 The Contractor shall conduct safety training of all its personnel (including any subcontractors) in accordance with the Owner's safety requirements (i.e., the Contractor Safety Training Program).

112. CLEAN-UP AND DISPOSAL OF DEBRIS

112.1 The Contractor shall be responsible for cleanup and disposal of all debris resulting from the installation work. All excavated material and other construction related debris shall be properly disposed of (i.e., in an environmentally responsible way) on-site in a location designated by the Owner.

112.2 Clean up, disposal and site restoration, if required, shall be in compliance with the applicable requirements of all access permits. If any additional permits are required for disposal of debris, these shall be the responsibility of the Contractor.

112.3 Work areas shall be kept clean and orderly at all times with as little disturbance as possible to existing conditions. Upon completion of work at each site, all tools, equipment, material, and debris shall be completely removed, and the area left in a clean condition.

113. EXISTING SITE CONDITIONS

113.1 The Contractor shall inspect the site and notify the Owner of any deficiencies that would prohibit proper completion of the Work for resolution.

- 113.2 Prior to performing any Work, in any part of the Project Site, and prior to installing any foundations or below grade utilities in the area of the Work, the Contractor shall make a thorough field check for the purposes of verifying existing conditions that may affect the Work. The Contractor shall include a thorough investigation of the potential interferences and difficulties that it may encounter in the proper and complete execution of the Work. The Contractor shall advise the Owner immediately of the discovery of any conditions that may affect the timely and safe execution of the Work.
- 113.3 The Contractor further acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface material and obstacles, including underground or embedded utilities, to be encountered insofar as this information is reasonably ascertainable from an inspection of the site (including field location and identification of underground utilities) and reference drawings made available by the Owner, as well as from information presented by the drawings and specifications that are a part of the Contract, the character and extent of existing work within or adjacent thereto and any other work being performed thereon at the time of the submission of bids.
- 113.4 Should the Contractor fail to perform any of the obligations set forth above, the Contractor's later plea of ignorance of existing or foreseeable conditions which create difficulties or hindrances in the execution of the Work will not be considered as an excuse for any failure on the part of the Contractor to fulfill in every detail the requirements of the Contract nor will such a plea be acceptable as the basis of a claim for additional compensation.
- 113.5 The Contractor needs to be aware that some installation work may be performed in an area where headroom is limited. Refer to reference drawings to determine equipment headroom clearances.
114. VERIFICATION OF DIMENSIONS ON DRAWINGS AND MEASUREMENTS AT SITE
- 114.1 The Contractor shall make a thorough field check for the purpose of verifying existing conditions that may affect the Work, such as possible errors in work previously done by others, difficulties that might be encountered in the execution of the Work for any reason, and dimensions and other questions relating to interconnection of the Work with the existing construction.
- 114.2 The Contractor shall satisfy itself as to the accuracy of the dimensions of the existing construction as such dimensions relate to the dimensions given on any drawing issued by the Consulting Engineer. It shall be understood that neither the Consulting Engineer nor the Owner guarantee the exactness of such dimensions.
- 114.3 Should the Contractor discover any variation in the dimensions of existing conditions and the dimensions given on any drawings issued by the Consulting Engineers, the Contractor shall give immediate notice thereof to the Owner and the Contractor shall not proceed with the Work until such variation is resolved.
115. CONTROL AND CHARGE OF CONTRACTOR'S WORK
- 115.1 The Consulting Engineer shall have no authority to stop the Work by the Contractor for any reason.
- 115.2 The Contractor shall be responsible for the safety of its employees and subcontractors; and for maintaining the safety of the job site.
- 115.3 The Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures used in the construction of the Work.



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- 115.4 The Owner, however, reserves the right to request, and the Contractor shall supply, detailed information regarding the Work such as procedures or work methods.
- 115.5 Only the Owner (or its authorized representative) has the authority to stop the Work (in accordance with the General Terms and Conditions) if such Work is determined to be not in accordance with this Specification, the design drawings or the Contract documents.
116. DESIGN DRAWINGS
- 116.1 The design drawings prepared by the Consulting Engineer indicate the physical dimensions of the Work to be installed as defined by the Scope of Work and form a part hereof. Refer to the Attachment 1 of this Specification for applicable design documents and drawings.
117. REFERENCE DRAWINGS
- 117.1 The reference drawings assembled by the Consulting Engineer are for information only. Refer to the Attachment 2 of this Specification for applicable Reference Drawings and for existing plant HR System drawings.

END OF SECTION 011100



SECTION 013216
PROJECT SCHEDULE

PART 1 – GENERAL

101. **EXTENT**

101.1 This Section outlines the requirements for Project Controls which are to be set in place for the Owner to accurately evaluate the status of the Project with regards to the Contractor's schedule, cost, and performance of the Work. Contained in this Section are Contractor's requirements for the Preliminary Project Schedule, the Detailed Project Schedule (DPS), the Baseline Schedule, Schedule Updates, Progress Reporting and Owner Required and Owner Controlled Schedule Dates.

102. **GENERAL REQUIREMENTS**

102.1 The Contractor shall provide the required methods and experienced personnel to support the Project Controls requirements. These practices relate to Planning and Scheduling, Progress Measurement and Earned Value, Cost Control and Change Management. The Contractor is responsible for ensuring that the Owner is informed at all times of the status of the Work.

102.2 The Contractor shall provide the name, email address, general contact information and title of its representative who is responsible for accessing and maintaining the Contractor's schedule.

103. **PROPOSAL SCHEDULE REQUIREMENTS**

103.1 The Contractor shall submit with its proposal a comprehensive and detailed Preliminary Project Schedule. The Preliminary Project Schedule shall be of sufficient detail to identify, at a minimum:

- a. General approach and sequence of the work, as outlined in the Installation Plan to be developed by the Contractor in accordance with the Scope of Work given in Section 011100 of this Specification.
- b. Anticipated award date.
- c. The Owner's Key Milestone dates as set forth in Table 013216-1 of this Section.
- d. The Owner Controlled Schedule Dates presented in Table 013216-2 of this Section.
- e. The Contractor's additional anticipated key milestone dates.
- f. Construction related engineering.
- g. Material procurement by the Contractor.
- h. Submittal of shop detail and erection drawings for components supplied by the Contractor.
- i. Significant interface points between the Owner and the Contractor, including material and/or components that will be provided by the Owner.
- j. Planned delivery dates for material and components furnished by the Contractor.
- k. Start and completion of fabrication periods for material furnished by the Contractor.



- l. Start and completion for each key component's fabrication, assembly and/or subassembly on site.
 - m. QA/QC Inspections.
 - n. Submittal of all other pertinent information as defined in Section 013323.
- 103.2 The Preliminary Project Schedule shall be in the form of a bar chart and show the logical flow of the Work and the anticipated critical path(s).
- 103.3 If available to the Contractor, the Proposal Schedule is to be submitted using Primavera's P6 Project Management software. However, other forms of software are acceptable.
104. DETAILED INSTALLATION AND BASELINE SCHEDULE REQUIREMENTS
- 104.1 Contractor shall submit its Detailed Project Schedule (DPS) and detailed Installation Plan addressing all aspects of material procurement, document submittals (refer to Section 013323 for the list of submittals), fabrication, inspections, material receipt, assemblies, subassemblies, erection and turn-over sequences to the Owner that will satisfy the dates per Table 013216-1 of this Section and Section 013323. In the case of start milestones dates presented in Table 013216-2, work shall not be scheduled to start any sooner than shown, unless approved by the Owner. In the case of completion milestones, the work shall be scheduled to complete on or before the dates in Table 013216-1.
- 104.2 The DPS shall contain sufficient detail for the Owner and the Contractor to confirm that the Contractor will be ready to perform the outage work when the plant is shut down.
- 104.3 The DPS shall contain all of the activities necessary to support the outage work.
- 104.4 The DPS and all subsequent updates shall, at a minimum, include the following characteristics:
- a. All scheduling shall be done using the Primavera Enterprise P6 scheduling software unless a different scheduling software is approved by the Owner. Contractor shall be responsible for maintaining and controlling the Primavera Master Project Schedule.
 - b. The DPS shall be in the form of a single schedule network depicting the entire scope of the Contractor's efforts to complete the Work. The schedule network shall be complete with no open ends, other than one activity indicating the project award milestone. All installation activities shall be tied to a project completion milestone. All schedule activities shall be sequenced together in a logical order to form schedule activity float paths. All float paths shall ultimately lead to and be logically tied to a related intermediary completion milestone as defined by Table 013216-1 of this Section or to completion interface milestones defined per Article 104.2f4 of this Section. Intermediate completion milestones and completion interface milestones shall be tied to the project completion milestone.
 - c. Submittal Schedules:
 - c1. As required to meet the dates set forth in Table 013216-1 and Table 013216-2 of this Section shall include a detailed submittal schedule that fully identifies and delineates the time and logical sequences for the development, submittal, review and return of each drawing or drawing package, data, calculations, or other documents as set forth by this specification or contract requirements.



- c2. As appropriate, the submittal schedule activities shall be properly sequenced and logically related to the appropriate manufacturing, inspection and delivery activities so that the status of individual submittal schedule activities reflect on the projected schedule dates of the related or affected downstream elements.
- c3. The submittal schedule portion of the DPS shall include a period of not less than 10 working days, or as otherwise set forth by this Specification, for the Consulting Engineer to review each initial submittal. The Consulting Engineer's review period will commence when the electronic submittal is received by the Consulting Engineer and will end when the submittal is returned or otherwise discharged by the Consulting Engineer.
- c4. The Submittal Schedule shall allow for a minimum of one Contractor re-submittal and one Owner re-submittal review period or additional re-submittal periods based on the Contractor's experience, for each required submittal.
- d. Scheduling of Contractor and Owner Supplied Material:
 - d1. The DPS shall account for both the Contractor's procurement of key materials and those items being supplied by the Owner. All significant or key material deliveries will be signaled with "Delivery Received" milestones in the DPS that will be logically tied to all related on-site schedule installation activities that are dependent upon the associated delivery to proceed. Deliveries controlled or managed by the Owner shall be identified separately from those controlled by or managed by the Contractor.
- e. The schedule activities in the DPS shall meet the following criteria:
 - e1. As reasonably feasible, the DPS shall be divided by separate or distinct areas and features of the work. Field operations involving pre-erection fabrication will be divided from erection work. Non-continuous work will be divided into separate schedule activities. Subcontracted work efforts will be separated from the Contractor's self performed work efforts. Significant QA/QC tasks or hold points will be included in the schedule. Any rehab, replacement, or temporary work shall be broken out separately for each work phase and area. Testing and turnovers will be shown separate from installation work.
 - e2. The project shall be scheduled in units of days accounting for various shift work, as applicable.
- f. Fabrication, Inspection and Delivery Schedules:
 - f1. The Contractor's DPS shall include a detailed fabrication, inspection and delivery schedule for items furnished and installed by the Contractor. The fabrication, inspection and delivery schedule shall address all major or significant procurement and fabricating steps or processes, including the creation of shop detail and erection drawings, for all materials, assemblies and subassemblies and products being provided. In addition, any required or anticipated key hold points and key inspections required by this Specification or by the Contractor's own procedures shall be identified and accounted for in the fabricating, inspection and delivery schedules. Any Owner required releases, inspections or reviews shall be clearly identified in the schedule.
- g. Resource Loading:
 - g1. Each installation work activity in the DPS, other than the Owner's reviews, milestones, time related holds, shall be assigned an estimated amount of man-hours broken down by craft by the Contractor. The purpose of the work hour assignments will be to provide an estimated work effort



weight or weighted value of each task relative to each other and to the overall work effort of the Contractor. This information will be used by the Owner to:

- g1.1 Establish the amount of progress achieved and remaining.
 - g1.2 Establish a basis to compare against planned progress.
 - g1.3 Generate performance indices.
- 104.5 Owner's Review and Approval of Contractor's Detailed Installation Schedule:
- a. The Contractor's initial and subsequent submittal of the DPS will be subject to the Owner's review and approval.
 - b. The Owner's review or approval of the schedule is solely for the purpose of assuring the Owner that the Contractor's schedule meets the intent of this Section. The Owner's review or approval does not constitute a guarantee or agreement by the Owner that the submitted schedule is complete or is otherwise executable by the Contractor.
 - c. Once submitted and approved by the Owner, the approved DPS file shall be presented and designated as the "Baseline Schedule." The Baseline Schedule, or subsequently approved Baseline Schedule revisions, shall be used to measure and evaluate all schedule progress. Any changes to the Baseline Schedule, including re-baselining or resourcing or resource or change order maintenance, will be subject to the Owner's review and approval. All subsequently approved Baseline Schedule revisions shall be assigned a sequential number; shall have the schedule files preserved for future reference; and shall replace the prior Baseline Schedule revision as the baseline from which to measure and evaluate the Contractor's Project progress.
- 104.6 The Contractor's schedule shall be carried out in accordance with Table 013216-1 and Section 013323 of this Specification. It shall be the Contractor's responsibility to maintain the progress of its Work in accordance with the schedule.
- a. Crane access will be limited during outage. Crane access window will be determined later.

Table 013216-1
Owner-Required Schedule Dates

No.	Item	Date
A.	PROPOSAL SCHEDULE:	
A1	Proposal to Contractors	March 31, 2021
A2	Pre-Bid Walkdown	April 5, 2021
A3	Proposals Due	April 29, 2021
A4	Award	May 18, 2021
B.	COMMON	
B1	Contractor Construction Plan (including pre-outage and outage sequencing, space requirements, rigging loads / scheme, and laydown loads)	June 29, 2021



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No.	Item	Date
B2	Contractor provides Temporary Power Requirements, including locations, types of equipment, electrical loads, etc., to allow Owner to accommodate Contractor needs	August 1, 2021
B3	Contractor Mobilization for Pre-Outage Work	Aug 13, 2021 (or as Negotiated w/ Owner)
B4	Outage Begins	November 1, 2021
B5	Pipe Return to Service	December 31, 2021
B6	Complete Demobilization	January 14, 2022

105. SCHEDULE UPDATES

- 105.1 Once the DPS has been submitted and approved as a Baseline, the Contractor shall continuously show evidence of the orderly progress, consistent with the Table 013216-1 of this Section by updating the DPS and providing written progress reports.
- 105.2 Schedule updates shall occur bi-weekly during the performance of the Work, except as required for recovery plans as noted in the Terms & Conditions. Written progress reports will be provided with the schedule updates. The exact timing and method of each schedule update and report submission will be mutually agreed upon.
- 105.3 The Contractor is required to notify the Owner of any substantial change in the DPS that will affect material deliveries or installation within 48 hours of identifying the issue. An updated schedule detailing the substantial change shall also be submitted concurrently.
- 105.4 The Contractor's schedule updates of the DPS shall continue until the Work has been completed.

106. PROGRESS REPORTING

- 106.1 Monthly Project Status Report:
- a. Each month, the Contractor shall provide a Project Status Report in narrative form that includes:
 - a1. Work accomplished in the previous period.
 - a2. Work planned for the next reporting period.
 - a3. List all changes made to the DPS with the schedule updates (this can be satisfied with P6 Digger Report or equivalent reporting software).
 - a4. Overall Project status including engineering, manufacturing and deliveries.
 - a5. Current critical path of the schedule.
 - a6. Known or suspected problem areas.
 - a7. Recovery plans.
 - a8. Unresolved issues.



- a9. Proposed and approved change orders and their effect on the progress of Contractor's Work.
- a10. An update of Contractor's master document list (see Section 013300 of this Specification).
- a11. A comparison of Baseline Schedule dates to the current schedule dates with all variances identified.
- a12. Detailed reconciliation of the Contractor's invoicing.
- a13. Reports shall be issued monthly.
- b. Relative to the work hour estimates, the Contractor is also to provide the following in the Project Status Report:
 - b1. A comparison of the Baseline Schedule cumulative work hours to date to the current earned cumulative work hours to date, including histograms and S-curves graphs.
 - b2. A comparison of the Baseline Schedule deliveries and delivery quantities to date to the actual delivery quantities to date, including histograms and S-curves graphs.
 - b3. A comparison of the Baseline Schedule planned number submittals to date to the actual submittals to date including histograms and S-curves graphs.
 - b4. The Project Status Report delivery method will be mutually agreed upon. The Contractor shall provide the Owner with the Project Status Report within 1 business day of the close of the reporting period.
- 106.2 Weekly Status Report Requirements: Weekly reporting is required from all Contractors when personnel are present at the Site and shall contain the following:
 - a. The original baseline schedule shall be updated on a weekly basis to accurately reflect completed work, in progress work, and the planned sequence and timing of the remaining work.
 - b. The current status of all detailed activities by calculating actual progress by measurable and verifiable material quantities ("Physical Percent Complete") and remaining duration.
 - c. Any revisions to any logic affecting the critical path, near critical paths, shall be reported and described in detail.
 - d. Quantity installation reports and EVMS calculations via updates to Contractor's schedule in the Owner's system.
 - e. Identify actual man hours vs. planned for manpower and productivity reporting.
 - f. A written narrative describing progress, problems, delays or other significant issues.
 - g. The Weekly Status Report delivery method and format will be mutually agreed upon. The Contractor shall provide the Owner with the Weekly Status Report within 2 business days of the close of the reporting period.

END OF SECTION 013216



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SECTION 013323

SHOP DRAWINGS AND PRODUCT DATA

PART 1 – GENERAL

101. EXTENT

- 101.1 This section covers the requirements for the preparation and the submittal of project specific drawings and data required for the Work. This includes shop detail drawings, field erection drawings, welding procedures, etc., as indicated on the design drawings or in the technical sections of this Specification.
- 101.2 The required engineering and design shall begin immediately after Contract award, regardless of the shipping date and shall proceed in an expeditious and orderly manner until complete.
- 101.3 Design calculations and drawings prepared by the Contractor or its subcontractor for the Work shall be performed by a Professional Engineer registered in the state of Florida. The calculations and drawings submitted for review shall be sealed, signed and dated by the same Professional Engineer in accordance with the State's Engineering Practice Act and Rules.
- 101.4 Only project-specific drawings and data shall be submitted to the Owner and Engineer, as described herein.
- 101.5 Performance of any Work, including raw material procurement, fabrication of material, procurement of commodities on the installation of any item requiring the review of drawings, data, etc., prior to obtaining final review of drawings, data, etc., is at the Contractor's risk as the Owner and the Consulting Engineer do not accept responsibility for such actions.
- 101.6 Review of drawings, data, etc., shall not act to relieve the Contractor from responsibility for deviations from Contract Design Drawings and Specifications, unless it has, in writing, called the Owner's attention to said deviations at the time of submission of relevant drawings, data, etc., and received written authorization for said deviations.
- 101.7 The Contractor shall not change the delivery schedule if significant alterations to drawings are a result of the Contractor's error or noncompliance.
- 101.8 It shall be the Contractor's responsibility to obtain the Owner's acceptance without comment on those drawings covering an item at least two weeks before that item is required. The Contractor shall be responsible for any field changes resulting from failure to adhere to this requirement.

102. PREPARATION OF SHOP DETAIL AND ERECTION DRAWINGS

- 102.1 The Contractor's drawings shall preferably be prepared in Microstation .DGN, AutoCAD .DWG or .DXF file format. All drawing files shall be merged with the appropriate background file before submittal.
- 102.2 Data submittals shall be prepared in Windows-based Access or Excel format and submittal in the overall equipment database.
- 102.3 All drawings, calculations, and data shall be prepared and submitted in U.S. Customary units (feet, inches, etc.) and in the English language.
- 102.4 Identification of changes on all drawings from the previous issue shall be clearly shown on each drawing. Changes should be circled and marked with a revision number.



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- 102.5 Document Numbering: All documents submitted shall be identified using the Owner's document numbering system.
- 102.6 Shop Details Drawings:
- a. Shop drawings shall be checked and signed by authorized personnel prior to submittal.
 - b. Shop drawings shall meet the quality, legibility and documentation requirements specified herein.
 - c. Shop detail drawings shall indicate, in detail, all parts of the Work fully dimensioned, including reinforcing steel sizes and bending dimensions for reinforcing steel; member sizes, material thickness, quantity and length for column anchor bolts.
 - d. Shop detail drawings shall be clearly referenced to related erection drawings and to other related shop detail drawings.
- 102.7 Erection and Installation Drawings:
- a. If the Contractor does not want to make new erection or installation drawings and chooses to use certain design drawings as the basis of its drawings, the Consulting Engineer will, upon request, furnish the Contractor with an Intergraph Microstation CAD file of each of the requested design drawings. This Intergraph Microstation CAD file will be furnished on a one-time basis for each design drawing and only at the first issue of the drawing.
 - b. When the Contractor uses Consulting Engineer's design drawings as erection drawings, it shall eradicate all of the Owner's and the Consulting Engineer's information, including the following items:
 - b1. Engineer's Logo.
 - b2. Engineer's Drawing Number.
 - b3. Engineer's Revision Identifiers and drawing release record revisions, dates, preparation, review and approval signatures, and purposes for release.
 - b4. Registered Engineer's Stamp.
 - b5. Sheet numbers, if any.
 - b6. All revision bubbles and other revision marks.
 - b7. NOTES or GENERAL NOTES and REFERENCE DRAWINGS blocks shall be cleared of all writing. This space shall contain the Consulting Engineer's Review Stamp.
 - c. Failure to eradicate the foregoing information from the Consulting Engineer's drawings may result in the rejection of the erection drawings for review.
 - d. Erection drawings shall be updated by the Contractor to reflect the latest revision and date of the design drawings at each submittal to the Consulting Engineer.
 - e. Erection drawings shall indicate complete details of the welds that are required to be made in the field.
- 102.8 Each issue of a drawing shall include the date of issue and a description of revisions, if any. Identify the changes from previous issues by clearly encircling the change and marking it with a revision letter or number.



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- 102.9 Master Bills of Material: In conjunction with the development of detailed shop fabrication drawings, the Contractor shall develop a Master Bill of Material (MBOM) for the Work. The MBOM shall be developed in accordance with the following requirements:
- a. The MBOM shall be developed in a standard software platform such as Excel by Microsoft.
 - b. The MBOM shall contain a single line for each unique mark.
 - c. Quantity of pieces required.
 - d. Quantity of pieces fabricated.
 - e. Quantity of pieces delivered previously.
 - f. Quantity of pieces delivered this shipment.
 - g. Quantity of pieces not yet delivered.
 - h. The MBOMs shall be provided with each periodic installation schedule update showing their development status.
 - i. That portion of the MBOM pertaining to delivery shall accompany each truck load of material delivered to the project site as a coversheet to the Contractor's normal shipping bill of material.

103. SUBMITTALS

- 103.1 The Contractor's drawings, data, etc., shall apply specifically to the scope of supply or scope of work. If general type drawings, data, etc., are submitted for review, which include devices which the Contractor does not intend to supply on the Contract, the Contractor shall certify on the drawings, data, etc., which devices will not be supplied.
- 103.2 Where alternatives are shown, the alternative being furnished shall be easily identifiable on that document.
- 103.3 The Contractor's drawings, data, etc., which are not complete in all respects, and which have not been thoroughly checked by the Contractor and "signed-off" to indicate that this check has been performed, may not be considered for review. Drawings, data, etc., will not be considered for review, which cover features that are contingent upon review of other features for which the Contractor has not submitted drawings, etc., for review. Such drawings, data, etc. will not be reviewed and the Contractor shall resubmit after proper completion. Drawings that are considered inadequate for review shall not release the Contractor from the responsibility for meeting the scheduled submittal dates.
- 103.4 Drawing Submittal Options:
- a. Electronic copies of drawings and data shall be in PDF or TIF formats.
- 103.5 The Contractor shall contact the Consulting Engineer to verify compatibility of its CAD software with that of the Consulting Engineer. Each time a drawing is submitted electronically, the file submitted shall include the drawing file merged with all the attached reference files.



- 103.6 All transmittals shall include a unique transmittal number and clearly indicate the Owner's name, Engineer's project number, how they are being sent, and the reason for the submittal. The transmittal should include a clear, concise description of all documents enclosed. Documentation by drawing number, revision number, and date should be indicated, if applicable. Separate transmittals shall be provided for each discipline (General, Structural, Mechanical, Electrical, I&C and HVAC). Drawings or documents that are sent only for information shall have its own transmittal separate from drawings sent for review.
- 103.7 A document being transmitted for review for the first time shall so state on the transmittal sheet or letter accompanying the document.
- 103.8 On the transmittal letter, the Contractor shall advise the Engineer of the date comments are required by to maintain the engineering and shipping schedules.
104. DOCUMENT IDENTIFICATION
- 104.1 Identify drawings, data, etc., with the following information:
- a. Owner's name.
 - b. Station/Unit.
 - c. Equipment number.
 - d. Service.
 - e. Contract number/Specification number.
 - f. Contractor's order number.
 - g. Drawing number and title.
 - h. Issue/revision number.
 - i. Issue/revision date.
 - j. Document transmittals shall be numbered and logged as follows:

CI4-V-SL-XXXX-YYY
- Where XXXX is the reference number, which is the last four (4) digits of the Contract/Specification number. For example, Specification B-1402 would have a reference number of "6251". YYY is the three (3) digit sequence, starting with 001.
- 104.2 Document List: Within four weeks after notification of award, the Contractor shall provide the Owner with a complete document list. This list shall be updated and resubmitted on a monthly basis for the duration of the work and/or until all drawings have been completed, and shall contain the following information:
- a. Document numbers and titles.
 - b. Package number, defined by the Owner after award.
 - c. Scheduled dates when completed and checked documents will be first submitted to the Owner for review.



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- d. Actual dates when completed and checked documents were first submitted to the Owner for review.
- e. Scheduled dates when drawings will be released for fabrication.
- f. Actual dates when drawings were released for fabrication.
- g. Percentage of completion of all documents on each update of the document list.

TABLE 1
SAMPLE DOCUMENT LIST

<u>Doc. No.</u>	<u>Document</u>	<u>Package No.</u>	<u>First Review Submittal (Scheduled)</u>	<u>First Review Submittal (Actual)</u>	<u>Release for Fabrication (Scheduled)</u>	<u>Release for Fabrication (Actual)</u>	<u>Percent Complete</u>
1	General Arrangement						
2	P&ID						
3	Wiring Diagrams						

105. REVIEW PROCEDURE

105.1 General:

- a. Review of shop drawings, data, etc., by the Consulting Engineer does not relieve the Contractor of any of the Contractor's obligations.
- b. Should the Contractor take any exception to the Specification or indicate a deviation to the Design Drawings, it shall be requested on a separate letter and such exception or deviation shall be noted on the drawing.
- c. The Consulting Engineer reserves the right to refuse to review drawings, data, etc., which do not meet the requirements specified herein. This refusal shall not in any way relieve the Contractor from the responsibility for meeting the Scheduled submittal dates.
- d. Drawings will be checked for arrangement and construction only, and their review by the Owner and/or the Consulting Engineer will not relieve the Contractor from responsibility for any errors of dimensions, quantities and/or other errors that may develop later.
- e. For shop drawings, one (1) paper print of each submitted shop drawing will be returned to the Contractor marked with the Consulting Engineer's Review Stamp filled-in, and with comments, corrections and/or changes. When the Contractor receives this reviewed print, it shall promptly incorporate the comments, corrections and/or changes on the original drawing tracing and resubmit it as many times as required, until the specific drawing is returned with a Review Status 1 and does not require corrections or changes.
- f. Submit correlating erection drawings with each set of shop detail drawings to indicate correct locations of members submitted. Shop detail drawings submitted without erection drawings will not be reviewed until the appropriate erection drawings are submitted. Additionally, erection drawings showing members for those shop drawings have not been submitted shall be resubmitted when remaining shop details are submitted for review.



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- g. Resubmittal, if required, shall be performed as quickly as possible so as not to cause delay to any part of the Work.
- 105.2 All comments and questions must be resolved before a re-submittal of the drawings will be processed. If the design has not developed enough to resolve some of the comments or questions, Contractor shall place a “hold” on those items or areas of design. Owner reserves the right to return drawings unprocessed to Contractor if there is any evidence that Contractor has not acknowledged all comments and questions.
- 105.3 Documents or portions thereof, submitted for review will be reproduced and distributed to meet the project requirements. This includes documents with proprietary statements, unless Contractor advises in writing that the documents are not to be reproduced.
- 105.4 A minimum of 2 weeks shall be allowed on all comment cycles.
- 105.5 Identification of changes on all documents from previous issue must be clearly shown on each document by scoping/“clouding” all revisions from the previous issue. Submittals without revisions annotated will be rejected and returned to Contractor unprocessed.
- 105.6 Shop test data and performance curves shall be submitted for review before shipment.



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105.7 Engineer will stamp each drawing with one of the following status codes which instruct the Contractor how to proceed with fabrication:

1. ☐ NO EXCEPTION TAKEN. PROCEED WITH FABRICATION OR CONSTRUCTION IN ACCORDANCE WITH SPECIFICATIONS.
2. ☐ REVISE AS NOTED AND RESUBMIT. PROCEED IN ACCORDANCE WITH SPECIFICATIONS AFTER INCORPORATING NOTED REVISIONS.
3. ☐ DOES NOT MEET SPECIFICATION REQUIREMENTS. REVISE AND RESUBMIT. HOLD FABRICATION AND/OR CONSTRUCTION.
4. ☐ FOR INFORMATION ONLY.

ANY ACTION SHOWN ABOVE IS SUBJECT TO THE TERMS OF THE CONTRACT WITHOUT WAIVING ANY CONTRACTUAL OBLIGATIONS INCLUDING DESIGN OR DETAILING.

FOR: DESCRIPTION OR NAME

EQUIPMENT NO.: _____

BY: JOHN DOE DATE: XX/XX/XXXX

SPEC NO.: _____ PROJ. NO.: XXXXXX-XXX

105.8 Contractor is responsible in obtaining the Engineer's "Status 1" on those documents covering an item at least two weeks before that item is to be shipped. Contractor shall be liable for the costs of any field changes resulting from failure to adhere to this requirement.

105.9 Documents shall not be submitted for Owner's record until they are acceptable to the Engineer without comment.

106. DRAWING DESCRIPTIONS AND DATA TO BE SUBMITTED

106.1 General:

- a. Laydown area requirements with component weights and overall dimensions that will be required for disassembly and maintenance of the existing HR System.
- b. Temporary supporting, rigging, and
- c. Miscellaneous:
 - c1. Detailed Project Schedule per Section 013216.
 - c2. Site Specific Contractor Safety and Health Plan per Section 013525.
 - c3. Contractor Demolition, Construction & Installation Plan (including pre-outage and outage sequencing, space requirements, rigging loads / scheme, and laydown loads).
 - c4. Hydrolazing (or Aqualazing) Cleaning Procedure
 - c5. QAQC documentation as required by Sections 014500, 400510.



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- c6. Safety Data Sheets (SDS)
 - c7. Testing and Commissioning documentation per Section 017500.
 - c8. Hot Piping & Supports Walkdown Summary Report
 - c9. Complete bills of material, including all special appurtenances furnished with the equipment.
 - d. Final as-built record drawings of the installation.
- 106.2 Mechanical:
- a. Vendor catalog Data – Valves, Insulation, Pipe Supports, Instruments
- 106.3 Structural:
- a. Shop detail drawings that will be used for the fabrication of reinforcing steel and column anchor bolts that is required for the Work.
 - b. Reinforcing steel placement drawings and bar lists, which includes bent bar schedules.
 - c. Anchor bolt setting plans and shop details for the fabricated components.
 - d. Welding Procedures, if applicable.
 - e. Manufacturer's data for prefabricated components.
 - f. Certification of non-shrink grout per ASTM C1107/C1107M.
 - g. Related documents.
107. DOCUMENT SUBMITTAL SCHEDULE
- 107.1 Documents required shall be submitted to the Engineer for review in accordance with the schedule in Section 013216 and Table 2.

TABLE 2
DOCUMENT SUBMITTAL SCHEDULE

<u>Document</u>	<u>Owner's Required Submittal Schedule – For Approval</u>
Detailed Preliminary Project Schedule	With Proposal
Instrument Data Sheets	With Proposal
Instrument Installation Details	With Proposal
Site Specific Safety and Health Plan	2 weeks after Award
Detailed Schedule (Resource Loaded) Including Pre-Outage and Outage Schedule(s)	4 weeks after Award
Monthly Progress Report	Monthly



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<u>Document</u>	<u>Owner's Required Submittal Schedule – For Approval</u>
Contractor Demolition, Construction & Installation Plan (including pre-outage and outage sequencing, space requirements, rigging loads / scheme, and laydown loads)	4 weeks after Award
Contractor Input on Field Weld Locations	4 weeks after Award
Master Document List (MDL)	4 weeks after Award
QAQC Plan (incl. Quality Documents identified in Section 014500, i.e. Quality Control Manual, Quality Assurance Plan), and Section 400510.	4 weeks After Award
Vendor Catalog Data / Outline Drawings	6 weeks After Award
Insulation and Lagging System Product Data	6 weeks After Award
Bill of Material (BOM)	6 weeks After Award
Welding Procedure Specifications (WPS), Procedure Qualification Records (PQR) and welding certifications	6 weeks After Award
Processes and Procedures (NDE, PWHT, Inspections, etc.)	6 weeks After Award
Inspection Point Program and Test Plan	6 weeks After Award
Cleaning and Painting Procedures	6 weeks After Award
Safety Data Sheets (SDS)	1 month prior to material arrival on site
Inspection and Testing Results	4 weeks After Inspection or Test
Certified Material Test Reports	2 weeks prior to Shipment
Packing and Shipping Instructions	2 weeks prior to Shipment
Final Redlines and As-Built Record Drawings, Documents, Data, including any subcontractor documents	2 weeks prior to Demobilization

108. FINAL RECORD DRAWINGS, DOCUMENTS AND DATA

108.1 Contractor shall submit final as-fabricated record drawings, documents and data, including subcontractor documents, as indicated herein or as directed by Owner.

108.2 At the completion of the project, Contractor shall submit a complete set of all final (as-built) Contractor and Subcontractor drawings, including any changes through performance testing.

108.3 Contractor's final record submittals shall be in Microsoft Word, Microsoft Excel and AutoCAD file formats. Drawing files shall be submitted electronically on compact disk (CD), Digital Versatile Disc (DVD) or USB drive with the project name, station name, station unit number, drawing numbers and revision numbers identified on the disk labels with one full size print of each drawing.

END OF SECTION 013323

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SECTION 014219

REFERENCE DOCUMENTS

PART 1-GENERAL

101. EXTENT

101.1 This Section includes:

- a. Schedule of References.
- b. Quality Assurance Provisions.

101.2 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. References to these documents are to the latest issue date of each document, unless otherwise indicated in this specification or in the Adopted Building Code, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

101.3 Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state or local codes having jurisdiction.

101.4 Acronyms will be used throughout the text of this specification to refer to the applicable organizations.

102. SCHEDULE OF REFERENCES

102.1 ABMA – American Boiler Manufacturers Association

102.2 ACI – American Concrete Institute

102.3 AGA – American Galvanizers Association

102.4 AHDGA/ZI – American Hot Dip Galvanizing Association.

102.5 AISC – American Institute of Steel Construction

102.6 AISE – Association of Iron and Steel Engineers

102.7 AISI – American Iron and Steel Institute

102.8 ANSI – American National Standards Institute

102.9 ASCE – American Society of Civil Engineers

102.10 ASME – American Society of Mechanical Engineers

102.11 ASNT – American Society for Nondestructive Testing

102.12 ASSE – American Society of Safety Engineers

102.13 ASTM – ASTM International

102.14 AWS – American Welding Society

102.15 CFR – Code of Federal Regulations



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102.16	CMAA – Crane Manufacturers Association of America
102.17	CRSI – Concrete Reinforcing Steel Institute
102.18	EPA – Environmental Protection Agency
102.19	EPRI – Electric Power Research Institute
102.20	FCI – Fluid Controls Institute
102.21	HI – Hydraulic Institute
102.22	HMI – Hoist Manufacturers Institute
102.23	IBC – International Building Code
102.24	IEEE – Institute of Electrical and Electronics Engineers
102.25	ISA – International Society of Automation
102.26	ISO – International Organization for Standardization
102.27	MIL – Military Specifications and Standards
102.28	MSS – Manufacturers Standardization Society of the Valves and Fittings Industry
102.29	NACE – NACE International, The Corrosion Society
102.30	NEC – National Electrical Code
102.31	NEMA – National Electrical Manufacturers Association
102.32	NERC – North American Electric Reliability Corporation
102.33	NFPA – National Fire Protection Association
102.34	NIA – National Insulation Association
102.35	NIST – National Institute of Standards and Technology
102.36	NIOSH – National Institute for Occupational Health and Safety
102.37	OSHA – Occupational Safety & Health Administration
102.38	PFI – Pipe Fabrication Institute
102.39	RCSC – Research Council on Structural Connections
102.40	SAE – SAE International
102.41	SAMA – Scientific Apparatus Makers Association
102.42	SSPC – The Society for Protective Coatings
102.43	UL – UL LLC



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103. QUALITY ASSURANCE PROVISIONS

- 103.1 Conform to reference standard by date of issue current on date for receiving bids.
- 103.2 For products or workmanship specified by association, trade or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- 103.3 Obtain copies of standards when required by Contract Documents.
- 103.4 Maintain copy at job site during submittals, planning and progress of the specific work, until substantial completion.
- 103.5 Should a specified reference standards conflict with Contract Documents, request clarification from Consulting Engineers before proceeding.
- 103.6 The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

END OF SECTION 014219



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SECTION 014500

QUALITY CONTROL

PART 1 – GENERAL

101. EXTENT

- 101.1 This Section covers the administrative and procedural requirements for quality assurance and quality control.
- 101.2 Testing and inspecting services are required to verify compliance with design and construction specifications and for production of standard products. These services do not relieve Contractor of responsibility for compliance with the Contract Documents.
- 101.3 The Contractor shall have an inspection, testing and documentation program in effect. The Contractor shall be responsible for assuring that its subcontractor's Quality Control Program meets the specified requirements imposed on the Contractor by the Owner.
- 101.4 All manufacturing, processing, testing and inspection operations affecting the equipment or material may be subject to surveillance by the Owner or the Owner's Representative.
- 101.5 Requirements for Contractor to provide quality-assurance and -control services may be supplemented by provisions of other sections of the specifications.
- 101.6 Other Sections may contain QA activities specific to those work results.
- 101.7 The Contractor is responsible to assure that any activities sub-contracted to lower-tier constructors or agencies are contractually "passed-down" and the Contractor shall assure that their sub-tier entities follow these requirements.

102. SUBMITTALS

- 102.1 Submit the following documents for review in accordance with the submittal requirements of Section 013323, and as follows:
 - a. The Quality Assurance and Quality Control (QA/QC) Plan.
 - b. Within two (2) weeks prior to beginning of fabrication or as defined elsewhere under Drawings/Data submittal requirements, the following applicable procedures shall be submitted for review and acceptance as applicable:
 - b1. Welding Procedure Specifications (WPS), Procedure Qualification Records (PQR), and welder certifications.
 - b2. Inspection and test procedures conducted in accordance with applicable industry standards such as, but not limited to, ASME, ANSI, IEEE, NEMA, ASTM.
 - b3. Cleaning, painting, storage, packaging, and shipping procedures. Contractor shall attach the Safety Data Sheets (SDS) with all painting/coating procedures.
 - b4. Nondestructive examination procedures and personnel qualifications.
 - b5. Other special processes and procedures, such as heat-treating, pipe bending, flushing, etc.



- b6. The Contractor shall develop and submit an installation plan describing the installation sequence and inspections and/or tests to be performed, for use in determining inspection points that the Owner may desire to witness. The Owner will advise the Contractor, prior to the start of fabrication, manufacturing, and/or construction of those steps in the fabrication, manufacturing and/or installation process that the Owner desires to witness and Owner will also identify which of these points that require work to be stopped pending written authorization to proceed from the Owner.
 - c. Quality documents, such as but not limited to the ones listed below, shall be submitted as required by the Owner for review and acceptance:
 - c1. Material certifications, including filler metal certifications.
 - c2. Inspection check sheets and nondestructive examination records.
 - c3. Test records.
 - c4. Manufacturer's data reports, safety data sheets, etc.
 - c5. Copies of all deviation reports/non-conformance reports and dispositioning records.
 - c6. Certificate of conformance.
 - d. Radiographs and reader sheets shall be submitted to Owner for review and acceptance within ten (10) days after completion of radiographic examination. All radiographs not properly identified will be rejected.
 - e. Non-conformances and deviations shall be documented in detail and promptly submitted to the Engineer for review, acceptance, and resolution.
- 102.2 The Contractor shall furnish the following documents for the Owner's records upon completion of the work:
- a. Certificate of Compliance, stating that all equipment and materials furnished comply with this Specification and accepted deviations.
 - b. Documents identifying deviations and their acceptance.
 - c. Others as indicated in individual Specification sections.
103. GENERAL QUALITY CONTROL AND QUALITY ASSURANCE PROVISIONS
- 103.1 Contractor shall ensure that all materials, equipment, products and work are manufactured in accordance with the QA/QC program. Contractor shall resolve any comments to the Owner's satisfaction, post-award.
- 103.2 The Contractor shall be responsible for ensuring that its sub-contractor's QA and QC programs meet the specified requirements imposed on the Contractor by Owner.
- 103.3 Contractor shall develop an inspection point program. The program shall include the manufacturing, inspection and test operations that the Contractor believes may be of interest to Owner in demonstrating product quality, whether performed in its or its sub-contractors' facilities.



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- 103.4 Owner and/or its designated representative shall have full access to Contractor's and its sub-contractor's facilities for reviewing conformance to the approved QC program and records, and for witnessing of inspections and tests. Owner and Engineer shall be notified ten (10) working days prior to the start of the witness and hold points as specified by Owner.
- 103.5 The Work shall be designed, fabricated, manufactured and/or performed to meet the service, performance, and minimum level of quality requirements specified herein. The Contractor shall be solely responsible for advising the Owner, in writing, of any conflicts between the Project Specification and the Contractor's installation plans, including performance and levels of quality.
- 103.6 Material, fabrication and placing procedures may be subject to inspections and tests conducted by the Owner or its designated representative. Such inspections and tests will not relieve the Contractor of responsibility for providing material and placing procedures in compliance with specified requirements. The Owner reserves the right, at any time before final acceptance, to reject material, equipment, and workmanship not complying with the specified requirements.
- 103.7 Non-conformances and deviations shall be documented in detail and promptly submitted to the Owner for review, acceptance and resolution.
- 103.8 Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship and conditions to produce work in accordance with the Contract Documents.
- 103.9 Examine the areas and conditions under which work is to be installed and notify the Owner in writing of conditions detrimental to the proper and timely completion of the work.
- 103.10 Errors or flaws in the work discerned during construction which prevent the proper installation shall be corrected promptly. The Contractor shall make immediate substitution of the non-complying material or shall make field changes to make the non-complying material acceptable.
- 103.11 For installation steps and tests that the Owner desires to witness, the Contractor shall notify the Owner ten (10) working days prior to witness points and ten (10) working days prior to hold points as a first notice. A second notice shall be given 72 hours prior to both witness and hold points. Notification of hold or witness points shall not be considered to have been given until the Owner has acknowledged receipt of such notification.
- 103.12 All deviations from this Specification shall be documented and referred to the Owner for written disposition.
104. WORKMANSHIP
- 104.1 Comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- 104.2 Provide suitably qualified personnel to produce work of specified quality.
105. MANUFACTURER'S INSTRUCTIONS
- 105.1 Comply with equipment supplier's and fabrication contractor's instructions in full detail, including each step in sequence.
- 105.2 Should instructions conflict with the Contract Documents, request clarification from the Owner before proceeding.



106. COMPLIANCE WITH REFERENCE DOCUMENTS

- 106.1 For products and workmanship governed by association, trade or federal standards, comply with requirements of this referenced document. General reference documents are listed in Section 014219 of this Specification.
- 106.2 Have copies of referenced standards on hand during performance of the Work.

107. QUALITY PLAN

107.1 Quality Assurance Program:

- a. The Contractor shall have a QA Program in effect at all times to verify that all items and services, including subcontracted items and services, comply with the requirements of the Purchase Order and its attachments.
- b. This Program shall clearly establish the authority and responsibility of those responsible for the QA Program. Persons performing quality functions shall have sufficient and well-defined responsibility and authority to enforce quality requirements; to identify, initiate, recommend, and provide solutions to quality problems; and to verify the effectiveness of the solutions.
- c. When requested, the Contractor shall submit a controlled copy of its QA or Quality Systems Manual for review and acceptance by the Owner. In addition, when requested by the Owner, the Contractor shall submit copies of any associated implementing procedures and/or instructions.
- d. If subsequent to its acceptance, the QA Program is found to be ineffective or inadequate in providing acceptable quality control, the Owner reserves the right to require the necessary revisions.
- e. The Quality Program shall describe as a minimum, the following activities as applicable to the Contractor's scope of supply:
 - e1. Document Control System.
 - e2. Procurement Control System.
 - e3. Special Process Control (welding, NDT, etc.).
 - e4. Identification of Materials and Parts.
 - e5. Calibration of Measuring and Test Equipment.
 - e6. Control of Nonconforming Material.
 - e7. Quality Records.
- f. Exceptions to the above Quality program requirements can be made on a case-by-case basis with the Owner concurrence.
- g. As applicable to the Contractor's scope of supply, the following information shall be submitted to the Owner for review and concurrence, prior to the start of manufacturing:
 - g1. Welding procedures, procedure qualification records, welder's qualification requirements, shop and field heat treatment procedures.
 - g2. Nondestructive test procedures, acceptance criteria, and personnel qualifications.



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- g3. Description/Criteria of acceptance inspections and tests to be performed.
 - g4. Performance test procedures with acceptance criteria.
 - g5. Types of records and reports to be submitted with the finished product.
 - h. Once accepted, the Contractor will be monitored during construction for adherence to its Quality Assurance Program.
- 107.2 Following are examples of the supplier quality monitoring process, and may be used in whole or in part, as determined necessary, to assure that the supplied product meets specification requirements:
- a. Quality Audits.
 - b. Review of vendors' "Quality Management Program" (QA/QC Manuals, Fabricator's Inspection Point Program, Shop Inspection/Test Procedures, Special Process/Fabrication Procedures, etc.).
 - c. Source surveillance performed during manufacture/fabrication.
- 107.3 Project "Quality Plan" shown below shall be used as a guide to ensure supplier compliance to deliver the respective equipment.

	Verify ¹	Witness ²
Equipment		
Equipment Subsystem		
Quality Management Program	X	
Welding Procedures & Procedure Qualification Records	X	
PWHT and other Heat Treatments, as applicable	X	
Welder and Welding Inspector Certifications	X	
Inspections/Test Records	X	
Hydrolasing Cleaning Test Reports	X	X
NDE Procedures	X	
NDE Inspector Certifications	X	
NDE (Visual, RT, UT, MPT, PT) Records, as applicable	X	
In Process Inspections		X
Manufacturer's Code Data Report/Forms	X	
CMTR's or additional mechanical test as deemed required	X	
Notes: 1. Verify – The Owner's Engineer will verify inclusion or submittal of all items listed. 2. Witness – The Owner, or designated representative, will have the option to attend the activity indicated. 3. Quality Management Program – Quality management documents, such as QA/QC Procedures Manuals, Fabricator's Inspection Point Program, Shop Inspection/Test Procedures, Special Process/Fabrication Procedures, etc.		



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108. INSPECTIONS AND TESTS

108.1 General:

- a. The Inspection and Test Plan, provided by the Contractor shall indicate all inspections and tests to be performed with the specified equipment. The Inspection and Test Plan shall refer to the applicable inspection and test instruction, whether for source, incoming, intermediary, final or site inspections and tests. The Contractor's Inspection and Test requirements shall fulfill the minimum inspection and test requirements. The Owner, the licensing authorities, as well as their agents shall have the right to witness all tests and inspections carried out in compliance with the Contractor's Inspection and Test Plan. They shall be permitted access the Contractor's shop, where and while all tests or inspections are being performed.
- b. Shop Tests and Inspections: The shop tests and inspections of the specified equipment shall be carried out according to the Contractor's Inspection and Test Plan, which has been approved by the Owner.
- c. Site Tests and Inspections: The site tests and inspections of the specified equipment shall be carried out according to the Contractor's Site Inspection and Test Plan, which has been approved by the Owner.

108.2 Material or equipment shall not be shipped before the Contractor presents a Certificate of Compliance, signed and dated by the Contractor's Quality Assurance/Quality Control department. A copy of this document shall be securely attached to the equipment to be shipped. It is important that the equipment arrives at the site with a copy of the Certificate of Compliance attached.

108.3 The Contractor's Responsibilities for Subcontractors:

- a. The Contractor shall identify in purchase documents to its Suppliers, all applicable quality and QA requirements imposed by this specification on the Contractor and shall ensure compliance thereto. The Contractor has the prime responsibility for subcontractor surveillance and evaluating and monitoring the implementation of the Quality Assurance Programs of its subcontractor.
- b. The Contractor shall submit a copy of its subcontractor Surveillance plans to the Owner for review prior to implementation. Upon request, the Contractor shall submit to the Owner copies of the reports of the subcontractor surveillance activities that it performs on its Suppliers.

108.4 Witness and Hold Points:

- a. The Owner shall have the right to establish witness and hold points. In addition, the Owner may establish witness points to ensure resolution of quality problems.

END OF SECTION 014500



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SECTION 016500

PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

101. EXTENT

- 101.1 This Section covers the basic requirements for the delivery of material, products and equipment to the project site and addresses the following topics:
- a. Location of Project.
 - b. Transportation facilities.
 - c. Pre-assembly of equipment.
 - d. Packaging and shipping.
 - e. Identification of shipped items
 - f. Delivery of equipment.
 - g. Protective coatings and preservatives.
 - h. Inspection and verification of delivered equipment and fabricated material.
- 101.2 The Contractor is responsible to assure that any activities sub-contracted to lower tier constructors or agencies are contractually passed down and Contractor shall assure that their sub-tier entities follow these requirements.
- 101.3 A detailed transportation plan for shipping and delivery of the equipment and/or fabricated material assembled to the greatest extent shippable.

102. LOCATION OF PROJECT

- 102.1 The Cane Island Power Park is located at 6075 Old Tampa Highway, Intercession City, FL 33848. (Receiving hours 7 am to 2:30 pm daily)

103. TRANSPORTATION FACILITIES

- 103.1 Highway Access: I-4 to US 17.

104. PRE-ASSEMBLY OF EQUIPMENT AND FABRICATED MATERIAL

- 104.1 Within the shipping limitations to the project site and to the maximum extent practical, the Equipment Supplier or the Fabrication Contractor shall pre-assemble all components off site.

105. PACKAGING AND SHIPPING

- 105.1 The Equipment Supplier or the Fabrication Contractor shall adequately prepare the equipment or fabricated material for shipment. Where required to preserve/protect the equipment or fabricated material, the Equipment Supplier or the Fabrication Contractor shall furnish and install covers to protect the equipment from rain, hail, wind, dust, road salt, and environmental conditions detrimental to the equipment or material. Equipment shall be adequately sealed and protected during shipment to prevent corrosion, entrance of foreign matter and possible damage from rough handling during transit. Any articles or materials that might otherwise be lost in shipping shall be boxed or wired in bundles and plainly identified as described hereinafter.



- 105.2 The shipping weight and dimensions of each article shall be given, as well as any information related to the unloading and handling of the equipment or materials, such as pickup points, spreader bar requirements, weight distribution, center of gravity, sensitivity, or hazards.
- 105.3 Items that are either too heavy or too bulky to be handled by one person shall preferably be fastened to a pallet or be packaged in a manner that is suitable for handling with a forklift truck. Where it is not feasible to handle an item with a forklift truck, parts shall be prepared so that slings for handling may be attached readily while the parts are on the transporting vehicle. Where it is unsafe to attach slings to the box, the boxed parts shall be packed with slings attached directly to the part and the sling shall project through the box or crate so that attachment can be readily made.
- 105.4 For items shipped by truck, which weigh in excess of 2,000 lb per item or package, the truck shall be open top or have a removable roof to allow unloading by crane.
- 105.5 When a shipment is to be made, the Equipment Supplier or the Fabrication Contractor shall notify the Owner giving a description of the articles shipped, the packing list and any other information necessary for identification. The packing list or shipping documents shall minimally include the following information:
- a. Owner/Client Purchase Order Number.
 - b. Equipment Supplier/Fabrication Contractor part, piece or identification numbers as appropriate.
 - c. Shipment tracking number.
 - d. Specific identity of shipped items by equipment number, part number, name, tag number, and/or other identifiers as appropriate.
 - e. Quantity of each shipped item.
 - f. Dimensions of boxes greater than 27 ft³.
 - g. Gross weight of boxes or equipment.
 - h. Identification of special handling requirements.
 - i. Identification of material, parts or pieces shipped as spares.
 - j. RFID, barcode, or other material control information, as applicable.
- 105.6 The Equipment Supplier or the Fabrication Contractor shall also provide instructions for assembly and storage of equipment, instruments or fabricated material that should be stored inside or that requires special attention or maintenance prior to installation and for the period of time between completion of installation and the time that the equipment is placed in service.
- 105.7 Protective Coatings and Preservatives:
- a. Preservative coatings used on components shall be suitable for the conditions normally expected during shipping, storage and throughout the erection period.
 - b. Each type of preservative used shall be identified as to quality, life expectancy and type. Toxic and hazardous type preservatives shall not be used. Safety Data Sheets (SDSs) shall be provided for all preservatives brought on to the project site. The SDSs shall be submitted to the Owner and shall cover step-by-step procedures, including federal, state and local governing controls for handling and removal of each type of preservative. This information shall be submitted six months prior to delivery. The material represented on these SDSs requires approval by the Owner prior to the bringing the material on the project site.



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105.8 The Equipment Supplier or the Fabrication Contractor shall provide notification to the Owner at least 15 days in advance of the expected shipping date. At that time, the Owner will advise the Equipment Supplier or the Fabrication Contractor of acceptable delivery hours.

105.9 All equipment and separately shipped items shall be clearly identified with a securely fastened, weatherproof tag. All shipping containers, packing lists, bills of material, correspondence, etc., shall also be identified with identical information. Boxes, shipping containers, crates, etc., shall have a packing list firmly attached to the exterior and a duplicate packing slip packed internally.

105.10 Identification requirements are as follows:

Owner	Florida Municipal Power Authority
Station / Unit	Cane Island Unit 3 (CI3)
Equipment/Instrument Tag No.	
Service	Hot Reheat System
Contract / Specification No.	C-6251
Contractor's Order No.	
Date shipped	

105.11 The Equipment Supplier or the Fabrication Contractor shall be responsible for its sub-contractor(s) adhering to the above shipping preparations on all equipment and items shipped directly to the site by the sub-contractor.

105.12 No early shipment of equipment covered by this Specification shall be made unless a release has been obtained from the Owner.

105.13 All weld preparation, flanged faces, other machined surfaces and protruding parts shall be adequately protected against accidental damage and corrosion during transit or storage. Protective covers and braces shall be securely fastened to prevent displacement during transit.

106. DELIVERY OF EQUIPMENT

106.1 The Owner and the Equipment Supplier or Fabrication Contractor shall agree on the date and time of delivery for the purchased products, equipment or material.

106.2 At least eight (8) weeks prior to the start of delivery of equipment, the Equipment Supplier or the Fabrication Contractor shall submit complete bills of material to the Owner. Notice of shipment shall be sent in advance directly to the project site. The bills of material shall correspond to the description of the Equipment Supplier's or the Fabrication Contractor's bill of lading included with each shipment of materials to the project site. Equipment serial numbers, the Equipment Supplier's or the Fabrication Contractor's tag numbers, the Owner's equipment and instrument numbers (see paragraph 105.5 above), and service description shall be shown on the bills of material, and on the equipment and all external appurtenances via a nameplate or metal tag securely wired to the device. In particular, the bills of material shall identify:

- a. Date of shipments.
- b. Number of shipments.
- c. Complete contents of each shipment.
- d. Origin of each shipment.
- e. Identification of items that must be field-assembled.
- f. Contract and/or bill of material number.



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- 106.3 Owner's site project manager shall be notified of the delivery date at least one week before the equipment is to be delivered. Further, Owner's site project manager shall be notified of the delivery time (within one hour) at least 24 hours before the equipment is to be delivered.
- 106.4 The Equipment Supplier or the Fabrication Contractor shall identify the means by which equipment will be transported to the site.
- 106.5 The Equipment Supplier or the Fabrication Contractor shall coordinate all deliveries and cooperate fully with Owner's site representative. Details on delivery schedule, unloading and handling requirements, storage prior to and during installation and any onsite requirements of the equipment shall be coordinated with the Owner.
- 106.6 The Equipment Supplier or the Fabrication Contractor shall furnish the Owner with copies of the necessary storage instructions required to maintain the original condition of equipment, before installation and until the equipment is placed in service.

END OF SECTION 016500



SECTION 016600

PRODUCT RECEIVING, STORAGE, AND HANDLING REQUIREMENTS

PART 1 - GENERAL

101. EXTENT

- 101.1 This Section covers the basic requirements for the receipt, handling, and storage of material, products, and equipment received at the Project site. It addresses the following topics:
- a. Receiving, unloading, storage, and protection.
 - b. Inspection, verification, and reporting.
 - c. Special handling of alloy.
- 101.2 The Contractor is responsible to assure that any activities sub-contracted to lower tier contractors or agencies are contractually passed down and Contractor shall assure that their sub-tier entities follow these requirements.

102. RECEIVING, UNLOADING, STORAGE AND PROTECTION

- 102.1 Owner will designate warehouse, storage or laydown areas for material, product, and equipment deliveries.
- 102.2 The Contractor shall receive, unload, store, manage, and protect all material, products and equipment delivered based on the Equipment Supplier's or the Fabrication Contractor's requirements and the requirements of the Owner. The Contractor shall:
- a. Authorize the delivery vehicle onto the site and escort the delivery while on site.
 - b. Direct the safe and proper unloading and handling of the material, products and equipment.
 - c. Receive (count, verify, and inspect) the material, products and equipment.
 - d. Label, mark and identify the material, product and equipment with visible signage, labels, bar-coding or radio frequency tracking devices.
 - e. Properly place the material, products and equipment into approved storage.
 - f. Provide and implement proper procedures and controls to protect and maintain the material, products and equipment while in storage in accordance with the Equipment Supplier's or the Fabrication Contractor's requirements and the requirements of the Owner.
 - g. Document the receipt, inspection, and storage maintenance of the material, products, and equipment.
- 102.3 The Contractor shall provide the heaters and equipment as necessary to control and maintain the temperature and environment as required by the Equipment Supplier or Fabrication Contractor for material or equipment that is sensitive or vulnerable to environmental damage or requires heated storage.
- 102.4 Equipment required by the Equipment Supplier or Fabrication Contractor to be covered or wrapped during storage shall be maintained by the Contractor including the responsibility to frequently inspect and replace deficient or missing protective coverings.



- 102.5 Protective Coatings and Preservatives:
- a. Preservative coatings used on components shall be suitable for the conditions normally expected during shipping, storage and throughout the erection period. Contractor shall monitor and reestablish as necessary any preservatives or coatings that have deteriorated and become ineffective in accordance with the requirements of the Equipment Supplier or the Fabrication Contractor.
 - b. Each type of preservative used shall be identified as to quality, life expectancy and type. Toxic and hazardous type preservatives shall not be used. Safety Data Sheets (SDSs) shall be provided for all preservatives brought on to the project site. The SDSs shall be submitted to the Owner and shall cover step-by-step procedures, including federal, state and local governing controls for handling and removal of each type of preservative. The material represented on these SDSs requires approval by the Owner prior to the bringing the material on the project site.
- 102.6 Material, products and equipment shall stored and tracked by a material log or database system with input capabilities from bar-coding or radio frequency devices so that material location and status is known from the time the material is received, during the time that it is removed from storage, installed in its final location, and until it is turned over to the project start-up group or the Owner.
103. INSPECTION, VERIFICATION, AND REPORTING
- 103.1 The Contractor shall inspect and verify that products, equipment and fabricated material delivered to the project site are free from obvious damage or defects, correctly identified, and acceptable for their intended use. The Contractor shall adhere to Owner's procedures or develop their own procedures for Owner approval, as required, to perform the receipt inspection and verification.
- 103.2 Products, equipment and material shall be inspected visually prior to off loading from the delivery truck or vehicle. Visual defects shall be handled in the following manner.
- a. Any defects in shipping crates or boxes will be noted on the bill of lading and acknowledged (with driver's signature) by the delivery driver.
 - b. Once this damage is noted and before the driver and delivery vehicle are released, the crate or box will be opened and the contents inspected for damage.
 - c. The Equipment Supplier or the Fabrication Contractor will be contacted immediately, before the driver leaves the project site, for direction as to whether or not the damage item should be returned.
 - d. If the item is accepted with damage, pictures will be taken of the damage and a report (Nonconformance Report or NCR), including the pictures, shall be sent to the Equipment Supplier or the Fabrication Contractor for disposition of the damage or deficiency.
- 103.3 Once the delivery is accepted and offloaded, the material, product or equipment will be verified (receipt inspection) against the requirements of the shop detail drawings, data sheets, project specification or any other documentation available to assure that the equipment or fabricated material has been correctly supplied, properly identified, and suitable for its intended use. This receipt inspection shall be documented using a material control log or database system.
- 103.4 A nonconformance report (NCR) will be filed with the Equipment Supplier or the Fabrication Contractor, with a copy to the Owner, for any equipment or fabricated material that does not meet the shop detail drawings, data sheets or project specification.



- 103.5 The Contractor shall track the NCR to closure. No equipment or fabricated material shall be installed with an outstanding unresolved NCR.
- 103.6 It shall be the Contractor's responsibility to work with the Equipment Supplier or the Fabrication Contractor to correct any discrepancy in the equipment or fabricated material delivered to the project site.
- 103.7 The receipt inspection shall include the following attributes as a minimum:
- a. A review of the packing list for correctness and traceability of the items received.
 - b. A visual examination to determine if there is any physical damage caused by:
 - b1. Rough handling during shipping.
 - b2. Failure of packaging, dunnage, protective covers or seals.
 - b3. Loss of inert gas blanketing or missing desiccant.
 - c. A spot check or random measurement of critical dimensions to verify that dimensions of base plates, mounting holes, weld end preps, flanged connections, configuration and orientation conform to the requirements of the design documents.
 - d. A visual examination to verify that the workmanship, materials, welding, machining, and painting conform to the requirements of the design documents.
 - e. Confirmation that marking and identification conforms to specified requirements as follows:
 - e1. Material marking, heat numbers, piece and part marking.
 - e2. Nameplates, ASME code stamping, manufacture's name, serial number, tag number, as required.
 - e3. Equipment tags, equipment number, serial number, item number, P.O No., Vendor ID, as required.
 - f. Verify acceptable documentation including:
 - f1. Traceability.
 - f2. Legibility.
 - f3. Completeness to the requirements of the product, material, or equipment code or specification.

END OF SECTION 016600



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SECTION 017213

FIELD ENGINEERING

PART 1 - GENERAL

101. EXTENT

- 101.1 The Contractor shall prepare specifications for all subcontracted items immediately after notification of award and shall award subcontracts in such time that shop detail drawings can be submitted to fulfill the requirements of the Project Schedule, and other requirements given in this Specification.
- 101.2 The Contractor shall complete all construction engineering work in accordance with the procedures and criteria specified herein, and to meet all local government requirements. The Owner and the Consulting Engineer reserve the right to examine the Contractor's engineering data in order to verify compliance with the requirements of this Specification. The Contractor shall submit any documentation requested by the Owner for the purpose of this verification, including, but not limited to, diagrams and documents associated with computer-aided analyses and programs. The Contractor's standard procedures will not be accepted as a substitute for any requirements specified herein.
- 101.3 Any design calculations and drawings prepared by the Contractor for the Work associated with erection and/or installation shall be performed by a Professional Engineer registered in the State where the Work is to be installed. The calculations and drawings shall be sealed, signed and dated by the same Professional Engineer. This shall also include Work associated with the stability of systems, structures and components, whether existing or new and shall also apply to Contractor's temporary rigging, shoring and bracing.

- 101.4 Drawings shall not be scaled. Follow calculated dimensions in all cases.

102. SITE CONDITIONS

- 102.1 Provide temporary supports to ensure structural integrity of the work. Provide devices and methods to protect other portions of project from damage.
- 102.2 Provide protection from elements for areas which may be exposed by uncovering work.
- 102.3 The Contractor shall be responsible for protecting structures and facilities in the vicinity of the Work from damage from its operations.
- 102.4 The Owner reserves the right to request the Contractor to alter any procedure and/or work method which adversely affects the facility or its operation.
- 102.5 Additional care shall be exercised while working around energized equipment and power lines, and the Contractor shall monitor construction equipment that could accidentally come in contact with such equipment and lines.

103. LINES AND GRADES

- 103.1 The Contractor shall field verify locations and elevations of existing property bench marks. Locations and elevations of existing bench marks as shown on the Design Drawings and Reference Drawings are furnished for Contractor's convenience; in using them the Contractor assumes the risk, as neither the Owner nor the Consulting Engineer assumes responsibility for the accuracy of this information.
- 103.2 Lay out lines and grades from the existing bench marks on the Project Site. The Contractor is fully



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responsible for the correctness of such lines and grades and for proper execution of work to such lines and grades.

103.3 Where the proper fabrication or erection of any part of the work of this Contract depends on other work, verify all necessary dimensions by field measurement to ensure proper fitting together of all work of this Contract.

103.4 The Owner reserves the right to verify correctness of lines and grades during progress of the Work. Such verification by the Owner will not relieve the Contractor of responsibility as herein specified.

103.5 The Contractor shall preserve and maintain bench marks and reference points established by the Owner. Should the Contractor, during execution of the Work, destroy or remove any bench mark or reference point established by the Owner, the cost to the Owner of reestablishing the bench mark or reference point will be charged to the Contractor.

104. TEMPORARY SUPPORT AND BRACING

104.1 The Contractor shall be responsible for determining what temporary support and bracing must be provided to support loads to which work may be subjected, including construction equipment and the operation of such equipment. The design of any temporary support determined to be required by the Contractor shall be prepared under the supervision of a Professional Engineer registered in the State where the Work is performed and shall be certified by that Engineer.

104.2 The Contractor shall be responsible for the adequacy and safety of such support and bracing.

104.3 Shoring and bracing equipment and practices shall meet all OSHA requirements.

END OF SECTION 017213



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SECTION 017500

EQUIPMENT TESTING & COMMISSIONING

PART 1 – GENERAL

101. EXTENT

- 101.1 This section provides general requirements for the testing, start-up and commissioning of the piping and equipment installed under this contract.
- 101.2 Contractor shall be solely responsible for advising the Owner in writing of any conflicts between this specification and Contractor's design, including performance and levels of quality. Contractor agrees that its obligations, liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of this specification.
- 101.3 Original Equipment Manufacturer's (OEM's) requirements and/or instructions shall be given precedence over the requirements listed herein. Contractor shall be solely responsible for advising Owner in writing of any conflicts between this Section and Contractor's or OEM's design, including performance and levels of quality. Contractor agrees that its obligations, liabilities, and warranties shall not be diminished or extinguished due to its meeting the requirements of this Section.
- 101.4 Contractor shall include the testing, starting up and commissioning of all equipment installed under this contract, but not limited to:
- a. Provide labor as required to assist Owner and Engineer in checking, testing, and correcting/adjusting equipment during initial operation.
 - b. Leak test all piping and installed components per the requirements of drawings, manuals, other written instructions, specification and contract requirements installed by the Contractor.
 - c. Check alignment of all equipment (including but not limited to checking for pipe strain) per the requirements of drawings, manuals, other written instructions, specification and contract requirements installed by the Contractor.
 - d. Check all installed equipment and associated components for proper operation.
 - e. Provide and maintain properly qualified personnel during the Work who shall be responsible for planning, coordinating, and supervising the checking and preliminary testing of all Work to ensure proper operation of equipment.
 - f. Contractor shall assure that all test equipment used is properly calibrated at time of use. Contractor shall maintain calibration records as required and make those available to the Owner as required for turn-over documentation.

PART 2 – PRODUCTS

Not Applicable



PART 3 – EXECUTION

301. EXTENT

301.1 The construction, erection and commissioning services shall consist of necessary management, materials, technical advisory services, supervision, labor and construction aids to install and make ready for turnover to the Owner all the equipment and materials being provided in this Project.

Where the Work of the Contractor involves the preceding work of others, Contractor shall make a thorough examination of the work of others prior to starting its Work and to advise the Engineer of any issues that will affect its Work.

302. CHECKOUT AND INITIAL OPERATION

302.1 The Contractor shall provide all temporary instrumentation and other devices required during checkout and initial operation of equipment and systems which Contractor has installed.

302.2 Equipment subject to pressures shall be carefully examined for leakage. All controls and interlocks shall be field-tested.

302.3 Final adjustment of the equipment shall be made while in operation.

302.4 All necessary connections required for testing the equipment, such as pressure taps and temperature measurement connections, shall be included as a part of the work under these specifications.

303. PROJECT COMMISSIONING PROGRAM

303.1 The Owner's Commissioning Group (OCG) shall be responsible to:

- a. Prepare and execute the Project Commissioning Program.
- b. Provide Commissioning Program information to Contractor for incorporation into the Contractor's Master Project Schedule.
- c. Determine the system boundaries to develop Construction Turnover Packages (CTO's).
- d. Provide the Contractor with the format to be used in the development of the CTO's for transfer of control from Construction to Commissioning.
- e. Direct the commissioning work activities of the Contractor's Commissioning Specialists as members of the OCG in commissioning of all components, equipment, sub-systems and systems furnished under Contractor's scope of work.
- f. Provide fuel and start-up electricity for operations during the testing for Mechanical Completion, Substantial Completion and Final Completion test phases.
- g. Coordinate transmission grid operations to provide required connection service and load for all such tests conducted, including any period for pre-testing or establishing steady state conditions prior to such tests.

303.2 The Contractor shall be responsible to provide to the OCG:

- a. A Commissioning Specialist to perform the commissioning work activities on all components, equipment, sub-systems and systems within the Contractor's scope of work in accordance with the Master Project Schedule.



- b. Documentation identifying the qualification of the proposed Commissioning Specialists no later than one (1) month prior to the start of CTO package preparation.
- c. Sufficient number of qualified craft labor support to the OCG to assist the commissioning work activities for components, equipment, sub-systems and systems within the Contractor's scope of work.
- d. Manufacturer/vendor field technical advisor services to assist the commissioning work activities for components, equipment, sub-systems and systems within the Contractor's scope of work.
- e. A Commissioning Schedule detailing the expected startup and commissioning activities, the sequence of those activities, required test instrumentation, activity durations and required tests for components, equipment, sub-systems and systems in their scope of work by the due date specified in the Contract documents.
- f. Test procedures for all Commissioning Program test activities a minimum of sixty (60) days prior to the schedule date for the activity.
- g. All installation and test documentation in the format provided by the OCG for the CTO's. At the OCG's discretion, the Contractor shall submit CTO's on either a component, equipment, sub-system or system basis.
- h. A listing of activities where third party testing services are required or shall be utilized to perform the commissioning activities associated with the Contractor's scope of work.

303.3 Tests for Mechanical Completion

Contractor shall perform or support the Owner's Commissioning Group (OCG) to successfully complete tests on all mechanical, control and electrical systems. The Mechanical Completion Tests shall include all tests as are reasonably necessary, customary or required by this specification and Industry Standards to determine that all components, equipment, sub-systems and systems comprising the scope of work function properly and within the parameters described in the Contract. The four (4) areas of Mechanical Completion Tests the Contractor shall be required to perform or support the OCG are:

- a. Construction Tests
 - a1. Contractor shall perform and successfully complete a series of Construction Tests, conducted to demonstrate that the installation is in accordance with the applicable codes and standards for construction and are within the parameters described in the Contract. Contractor's Construction Test Program and associated test procedures for components, equipment, sub-systems and systems comprising the scope of work shall be submitted to the OCG for review and approval not less than sixty (60) days prior to the conduct of the first such test.
 - a2. Contractor shall provide notice of intent to perform a Construction Test to the OCG no later than twenty four (24) hours prior to the start of the test to allow witness scheduling.
 - a3. Contractor test documentation, vendor test documentation and third party test documentation shall be assembled by the Contractor in a CTO in the format provided by the OCG. At the OCG's discretion, the Contractor shall submit CTO's on either a component, equipment, sub-system or system basis.
 - a4. Refer to Article 304, "Testing" for a description of typical Construction Testing required for Mechanical Completion.



b. Pre-Commissioning Tests

b1. Pre-Commissioning Testing is the activities and tests executed under the management and guidance of the OCG following the receipt and acceptance of a specific plant components, equipment, sub-systems or systems CTO. Typically, the testing and checkouts performed during this phase of commissioning are “static” in nature, meaning no mechanical equipment shall be operated and are used to verify the completeness of construction work.

b2. Contractor shall support the OCG in completing Pre-Commissioning Testing.

b3. Refer to Article 304, “Testing” for a description of typical Pre-Commissioning Testing required for Mechanical Completion.

c. Commissioning Tests

c1. Commissioning Testing is the activities and tests executed under the management and guidance of the OCG following the satisfactory completion of the pre-commissioning tests and are performed to verify the quality and proper operation of the installed components. This phase of commissioning also demonstrates the integrity and functional operation of the installation and confirms reliable operation on a sub-system-by-sub-system and system-by-system basis under various conditions of the plant systems in their design operating modes.

c2. The Contractor shall support the OCG in completing Commissioning Testing for the scope of work.

c3. Refer to Article 304, “Testing” for a description of typical Commissioning Testing required for Mechanical Completion.

d. Integrated Plant Tests

d1. Integrated Plant Testing is the activities and tests executed under the management and guidance of the OCG following the satisfactory completion of the commissioning tests and are performed to verify the ability of plant components, equipment, sub-systems and systems to operate concurrently in accordance with project design.

d2. The Contractor shall support the OCG in completing Integrated Plant Tests for the scope of work.

d3. Refer to Article 304, “Testing” for a description of typical, Integrated Plant Testing required for Mechanical Completion.

304. TESTING

304.1 General

Refer to Article 303, “Project Commissioning Program,” for the requirements of the Project Commissioning Program, including testing responsibilities within the Construction and Commissioning Phases of the Project for the Contractor and Owner.

a. All testing required for the equipment erected by the Contractor shall be performed directly by or supported by the Contractor in accordance with the following:

a1. Requirements of governing codes and federal, state and local codes or regulations having jurisdiction.

a2. Instructions and recommendations of manufacturers.



- a3. Compliance with all requirements regarding Code stamping and Code certification as specified in the ASME Boiler and Pressure Vessel Code.
- b. The Contractor shall furnish Code data reports of shop and /or field inspection. Such inspection shall be performed by inspectors who have been qualified in accordance with the Code requirements.
- b1. Documentation shall be assembled in Construction Turnover Packages (CTO's), grouped by the scoping of systems and turnover package format provided by the Owner (or Owner's Representative) Commissioning Group (OCG).
- b2. Where field assembled vessels erected by the Contractor require filling with water for testing, the Contractor shall fill such vessels with the type of water designated by the OCG. After testing, the vessels shall be drained to the location designated by the OCG. The Contractor shall furnish all temporary piping and hose required for filling and draining of the vessels.

304.2 Scope of Testing

The Contractor shall directly perform assigned portions of and support the OCG in completing all aspects of scope of work related testing during the three (3) main phases of Project testing, as follows:

- a. Mechanical Completion Test Program
 - a1. The Contractor shall perform and successfully complete tests on all mechanical systems, while the Owner shall perform and successfully complete tests on all control and electrical systems. The Mechanical Completion Tests shall include all tests as are reasonably necessary, customary or required by this specification and Industry Standards to determine that all components, equipment, sub-systems and systems comprising the scope of work function properly and within the parameters described in the Contract.
 - a2. The four (4) test programs for Mechanical Completion Tests that the Contractor shall be required to directly perform or support the OCG are:
 - a2.1 Contractor's Construction Test Program
 - a2.2 Pre-Commissioning Test Program
 - a2.3 Commissioning Test Program
 - a2.4 Integrated Plant Test Program
 - a3. The Contractor's Construction Test Program is performed in its entirety by the Contractor and witnessed by the OCG. Typically, the testing and checkouts performed during this phase of commissioning are conducted to demonstrate that the installation is in accordance with the applicable codes and standards for construction and are within the parameters described in the Contract. The Contractor's Construction Test Program shall include, but not be limited to, the following types of tests and practices:
 - a3.1 Non-destructive examination (NDE) of welds including visual, dye penetrant, magnetic particle, ultrasonic, radiographic, etc.
 - a3.2 Pipeline leak checks
 - a3.3 Hydrolazing cleaning of critical piping systems



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- a3.4 Cleaning and closure of pipes and vessels
- a3.5 Flushing of system piping
- a3.6 Safety valve setting per applicable code (by Owner)
- a3.7 Insulation resistance tests for low voltage power cables following installation (by Owner, as necessary)
- a3.8 Freedom of movement and function testing for equipment having moving parts
- a3.9 Electrical ground and/or insulation tests (by Owner, as necessary)
- a3.10 Electrical loop continuity checkout of power, control and signal circuits (by Owner as necessary)
- a3.11 Furnishing and scheduling of vendor's representatives or third party testing services as required for specific component or equipment construction tests
- a3.12 Other tests that are customary and as typical of industry standards
- a4. The Pre-Commissioning Test Program is executed under the management and guidance of the OCG and supported by the Contractor, for scope or work, following the receipt and acceptance of a Construction Turnover Package. Typically, the testing and checkouts performed during this phase of commissioning are "static" in nature, meaning no mechanical equipment shall be operated and are used to verify the completeness of construction. The Pre-Commissioning Test Program shall include but be not limited to the following types of tests and practices:
 - a4.1 Loop checkout for power, control, signal and logic circuits (by Owner as necessary)
 - a4.2 Provide clearance to Construction for re-entry to components, equipment, sub-systems and systems for remedial work
 - a4.3 Incorporate Commissioning Program related issues into the Master Punch List
 - a4.4 Debug components, equipment, sub-systems and systems of deficiencies (with support from Owner for control and electrical systems)
 - a4.5 Perform termination integrity checks for terminations (by Owner as necessary)
 - a4.6 Perform grounding continuity verifications for equipment (by Owner as necessary)
 - a4.7 Communicate commissioning related design problems to engineering
 - a4.8 Provide as-built systems input to the Engineer for completion of record drawings
 - a4.9 Other tests that are customary and as typical of industry standards
- a5. The Commissioning Test Program is executed under the management and guidance of the OCG and supported by the Contractor for the scope of work following the satisfactory completion of the pre-commissioning tests. Typically, the testing and checkouts during this phase of commissioning verifies the integrity and functional operation of the installation and confirms reliable operation on a sub-system-by-sub-system and system-by-system basis under various conditions of the plant systems in their design operating modes. The Commissioning Test Program shall include but be not limited to the following types of tests and practices:
 - a5.1 Communicate commissioning related design problems to engineering



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- a5.2 Incorporate Commissioning Program related issues into the Master Punch List
- a5.3 Provide support information for OCG clearance for Contractor for re-entry to components, equipment, sub-systems and systems for remedial work
- a5.4 Perform initial component, equipment, sub-system and system checkout, run-in and testing (by Owner as necessary)
- a5.5 Provide as-built systems input to the OCG and the Owner for completion of record drawings
- a5.6 Provide technical support and craft manpower to the OCG in performance of:
- a5.7 Initial plant startup
- a5.8 Verify all supports can move freely from hot to cold position and adjust if required. All spring hot positions shall be recorded, and travel adjustments made if required.
- a5.9 Other tests that are customary and as typical of Industry Standards
- a6. The Integrated Plant Test Program is executed under the management and guidance of the OCG and supported by the Contractor for the scope of work following the satisfactory completion of the commissioning tests. Typically, the testing and checkouts during this phase of commissioning are performed to verify the ability of plant components, equipment, sub-systems and systems to operate concurrently in accordance with the design basis under various conditions of the plant in different design operating modes. Equipment shall be tested, and its capability demonstrated and documented over the full operating range.
- a6.1 Mechanical Completion Tests may be conducted when portions of the Work, such as cleanup of debris, painting and insulation, are not yet complete. However, in no instance shall a Mechanical Completion Test be conducted when the aforementioned exclusions could affect safety, functionality or integrity of the equipment or system being tested.
- a6.2 Mechanical Completion Tests shall be deemed complete for a component, equipment, sub-system or system when such component, equipment, sub-system or system can be operated properly without endangering personnel, causing damage to equipment, damage to support equipment or damage to the transmission system and the Contractor has provided Mechanical Completion Test documentation to the OCG.
- 304.3 Conduct of Testing
 - a. Contractor shall submit its Construction Test Program and associated test procedures for components, equipment, sub-systems and systems comprising the scope of work to the OCG for review and approval not less than sixty (60) days prior to the conduct of the first such test.
- 304.4 Construction Turnover Packages (CTO's)
 - a. At the time of completion of construction and construction testing of components, equipment, sub-systems or systems, a CTO is utilized to assemble all documentation associated with construction and construction testing for a scoped boundary. The CTO is utilized to formally control of components, equipment, sub-systems or systems within a specific scoped boundary between the Contractor and the OCG.
 - b. The OCG shall be responsible to:



- b1. Provide the Contractor with the scoping documents that identify the physical boundaries for a CTO. The scoped documents provide the Contractor with a definitive identification of when and what components, equipment, sub-systems and systems are to be completed and packaged for released to the OCG.
- b2. Provide the Contractor with the format to be used in the development of the CTO for transfer of control from Construction to Commissioning.
- b3. After review and acceptance of a CTO, accept control of the component, equipment, sub-system or system in accordance with the transfer certificate included with the CTO.
- b4. Return CTO's deemed not satisfactory with the discrepant issues/conditions annotated clearly to the Contractor for correction. Upon correction the CTO shall be resubmitted in accordance with the above process.
- b5. Participate in walking down the components, equipment, sub-systems and systems within the scoped boundaries of the CTO with the Contractor and Owner.
- c. Contractor shall be responsible to provide to the OCG:
 - c1. On a continuing basis during the Construction Phase, complete and assemble all installation and test documentation in the format provided by the OCG for the CTOs.
 - c2. At the OCG's discretion, the Contractor shall submit CTOs on a component, equipment, sub-system or system basis.
 - c3. Assist the OCG and Owner in walking down the components, equipment, sub-systems and systems within the scoped boundaries of the CTO.
- d. The CTO shall include as a minimum but not be limited to the all necessary construction phase installation and checkout information associated with the components, equipment, sub-systems or systems included within the scoped boundaries of the particular CTO, summarized as follows:
 - d1. Construction installation documentation
 - d2. Construction tests and inspections (alignments, holiday test, hydro test reports, NDE reports, etc.)
 - d3. Factory test reports
 - d4. Marked up [scoped] drawings that identify the components, equipment, sub-systems and systems within the boundaries of the package, typical but not limited to the following:
 - d4.1 Piping & instrument diagrams (P&ID's)
 - d4.2 Pipeline list
 - d4.3 Manufacturer/vendor drawings
 - d4.4 Current Turnover Exception List for the package (temporary alterations, jumpers, blanks, software problems, discrepant work, incomplete work, etc.) (Master Punchlist Section) with input from Owner for control and electrical systems.
 - d4.5 Electrical test data sheets including insulation resistance test reports (by Owner as necessary)
 - d4.6 Vendor field installation and testing reports



- d4.7 Material storage and maintenance documentation
- d4.8 Mechanical Construction Completion Checklist
- d4.9 Mechanical Construction Test Procedures (original execution copies)
- d4.10 Electrical Construction Completion Checklist (by Owner as necessary)
- d4.11 Electrical Construction Test Procedures (original execution copies) (by Owner as necessary)
- d4.12 Instrument and Control (I&C) Construction Completion Checklist (by Owner as necessary)
- d4.13 Instrument and Control (I&C) Construction Test Procedures (original execution copies) (by Owner as necessary)
- d4.14 Open Engineering Change (ECN) Notices
- d4.15 Closed Engineering Change (ECN) Notices
- d4.16 Construction Test Data Sheets as applicable organized by component, equipment, sub-system and/or system, typically but not limited to the following:
 - Insulation Resistance (by Owner as necessary)
 - Alignment Record
 - Hydrolazing Cleaning Inspection Report
 - Tank/Vessel Closure Record
 - System Flush Record
 - Cable Termination Record (by Owner as necessary)
 - Distribution Test Record (by Owner as necessary)
 - Equipment Maintenance Record
 - Special Test Records
- d5. Specific Lists, typical but not limited to the following, identifying the components, equipment, sub-systems and systems within the boundaries of the CTO:
 - d5.1 Piping Line
 - d5.2 Valve
 - d5.3 Miscellaneous System Documentation
 - d5.4 Turnover – Construction to Commissioning Form
- 304.5 System Turnover Packages
 - a. When the Commissioning Program achieves the position when components, equipment, sub-systems and systems have been tested and demonstrate compliance with the Contract, the OCG shall execute a transfer of care, custody and control of the components, equipment, sub-systems



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and systems within specific scoped boundaries to the Owner. The mechanism for this transfer is the System Turnover Package (STP).

- b. Contractor shall participate in the development of the STP, including creating punchlists, completing punchlist work and participating in walkdowns with the OCG to verify punchlist status. The Contractor shall provide additional documentation the Owner deems necessary for STP acceptance.

305. ADJUSTMENT AND CORRECTION WORK

305.1 Contractor shall make adjustments as may be required by Owner's representative to place each piece of Equipment erected by Contractor in proper operating condition ready for service, without additional cost to Owner.

305.2 Any correctional Work required to be done by Contractor in order to install the Equipment properly, and which is due to the OEM's faulty shop Work or design shall be reported by Contractor to Owner and shall be done by Contractor only upon written order of Owner's representative.

END OF SECTION 017500



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SECTION 024116
SELECTIVE DEMOLITION AND ALTERATIONS

PART 1 – GENERAL

101. EXTENT

- 101.1 The intent of this Specification Section is to define the requirements for selective demolition and alteration work of existing construction installations including, but not limited to, structural steel, electrical, instrumentation, mechanical, etc.
- 101.2 The Work shall include, but not be limited to, the following items:
- a. Demolition or alteration work as identified on the design drawings and/or Contract documents.
 - b. Storage, protection, and reuse of materials, components, equipment, etc. as identified in the design drawings and/or in Contract documents.
 - c. “Cradle to grave” waste management, characterization, and documentation of waste.
 - d. Disposal, cleanup, and closeout.
- 101.3 Definitions:
- a. Alteration: the careful removal, relocation, rework, and/or modification of existing construction installations as required for the Work.
 - b. Demolition: dismantlement, razing, or wrecking and removal of existing construction installations to established termination points and/or as required for the Work.
 - c. Disposal: the characterization, collection, storage, handling, transporting, treatment, testing, verifying, landfilling, destruction, recycling, permitting, and documented disposition of waste in accordance with any applicable federal, state, or local law, regulation, requirement, code, rule, standard, or guideline, to the extent mandatory.
 - d. Hazardous material: any item or agent (chemical and/or physical) which has the potential to cause harm to humans, animals, or the environment either by itself or through interaction with other factors as further defined by applicable regulatory bodies.
 - e. Hazardous waste: any waste containing hazardous material that meets specific criteria as defined by applicable regulatory bodies.

102. SUBMITTALS

The Contractor shall supply Execution Plans for Owner review and approval. Approval must be provided prior to execution of the Work.

103. QUALITY ASSURANCE

- 103.1 Inspection before working: The Contractor shall examine the areas and conditions under which demolition or alterations are to take place and notify Owner in writing of conditions which are detrimental to the proper and timely completion of the Work.



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103.2 Demolition or alteration procedures and Work are subject to inspections conducted by Owner. Such inspections shall not relieve Contractor of responsibility to provide Work in compliance with the contract and specifications. Owner reserves the right, at any time before final acceptance, to reject Work not complying with the specified requirements.

104. DATA ON EXISTING CONDITIONS

104.1 Details of existing construction installations to be removed, altered, reused, etc., are furnished for Contractor's convenience; in using them, Contractor assumes the risk as Owner assumes no responsibility for accuracy of details. Contractor shall confirm the Work at site and provide appropriate assumptions to account for all demolition and alteration work; Contractor will be permitted and expected to make its own investigation and verification of details, etc., during the Project Site visit during the Bid Period.

104.2 The drawings (design and demolition) may not indicate all demolition and alterations required to perform the Work and accept new construction indicated on the design drawings. The Contractor shall be responsible for minor demolition and alteration work as is required to install new construction/equipment.

104.3 Performance of the Work must be completed by a licensed company per Applicable Law.

105. CONDITIONS

105.1 Contactor may keep all proceeds from the sale of salvage material. No sale of salvage material shall be conducted on-site.

105.2 Burning of waste and debris shall not be permitted.

105.3 Care shall be exercised by the Contractor to ensure no disruption of service occurs to adjacent facilities to remain in service and no waste or debris is deposited in areas not specifically approved by Owner. Contractor shall handle waste and debris in a safe manner as required to meet Owner's onsite requirements and per Applicable Law. Contractor shall provide all necessary containers, carts, and dumpsters for handling waste and debris.

105.4 Temporary facilities, structures, and construction aids required or utilized by the Contractor in execution of the Work shall be designed and provided by Contractor. Examples include trash chute(s) from elevated areas to dumpster(s) at grade, temporary pipe supports, structural braces, guy-wires, etc. All temporary facilities, structures, and construction aids provided by Contractor shall be designed and stamped by a professional engineer, registered in the State in which the Work is performed.

105.5 The Contractor shall remove all temporary facilities, structures, and construction aids including temporary bracing, shoring, lifting devices, supports, etc. Removal shall be performed as soon as safely practical and prior to Project completion. None shall remain in place without prior written Owner approval and per Owner's requirements.

PART 2 – PRODUCTS

201. MATERIALS

201.1 As required to complete the work, Contractor shall be responsible to supply all applicable permanent, temporary, or consumable materials required for the Work.

201.2 All temporary steel, bracing, and the like shall be painted safety orange for clear identification.



- 201.3 If determined acceptable by Owner to remain in place, all temporary steel, bracing, supports, lifting eyes and the like shall be coated to match existing plant as approved by Owner or Engineer.

PART 3 – EXECUTION

301. DEMOLITION AND ALTERATION

301.1 General:

- a. The Work shall be performed in full compliance with the requirements of the standards referenced in Section 014219 and per Applicable Law.
- b. The Work shall be performed by skilled workers with experience in the type of Work to be performed.
- c. Contractor is responsible for identification and notification of any hazard present to Owner prior to any mitigation activities. Upon Owner notification and acceptance, Contractor is responsible for mitigation of any hazard present prior to performing demolition and alteration Work to ensure the safe execution of the work.
- d. Contractor shall perform demolition and alteration work as required to install/construct new foundations, etc., to make connections of new construction to in-place/existing construction installations, and any other work to perform the Work.
- e. Existing exterior barrier materials (roofing, siding, etc.) shall not be removed without implementation of adequate, temporary protection of the interior from inclement weather. The method and material used for protection shall be acceptable to Owner. Existing installations or the Work that is damaged by moisture/etc. due to the failure of the Contractor to provide adequate protection shall be removed and replaced by the Contractor at no cost to Owner.
- f. Per 29 CFR Part 1926 Subpart T, Contractor shall perform an engineering survey, by competent person, prior to start of demolition operations.
- g. Contractor shall perform required cutting, removal, and disposal of removed materials and waste, and furnish and maintain necessary temporary shoring, bracing, and protection of new Work and existing installations potentially affected by demolition and alteration Work.
- h. The design drawings, this Specification, or the Contract requirements may indicate certain portions of existing construction to be dismantled for reuse or alteration. Where indicated, repair/alter as required to put in first-class condition satisfactory to Owner in every respect and re-erect/re-install.
- i. Contractor shall perform demolition and alteration work in a neat and skillful manner, carefully terminating at work to remain in place. Special precautions shall be taken not to damage or deface work to remain in place. The Contractor shall be responsible for any such damage and the repair thereof.
- j. Use of drop ball, blasting, or dropping of heavy pieces of material or equipment, it is not permitted unless approved by the Owner prior to execution of the Contract.
- k. Where concrete is being demolished or Contractor is performing any other dust producing activity, the Contractor shall use water sprays to keep dust from spreading into adjacent areas including existing plant, neighboring properties, etc.
- l. If tarpaulins are used during the course of the Work, they shall be of fireproofed material.



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- m. The plant will be in operation during the Work. If the Work interferes with the successful operation of the existing plant, the Work shall be performed during hours as approved or as directed by Owner.
- n. Demolition waste and debris shall be stored in Owner designated or approved areas.
- o. Dismantled material for reuse shall be stored, protected, inspected, verified, and reported per Section 016600 of this Specification and/or Contract requirements.

302. HAZARDOUS MATERIALS AND HAZARDOUS WASTE

- 302.1 The existing materials to be disturbed in execution of the Work may contain asbestos, lead, mercury, or various other hazardous materials. These hazardous materials may be a result of original product manufacturing or subsequent factors such as contamination.
- 302.2 Contractor shall take appropriate precautions to protect its workers, subcontractor employees, Owner employees, third-party employees, the general public, and the environment including, but not limited to, identifying hazardous materials prior to exposure. Contractor shall notify Owner immediately if previously unidentified hazardous materials are identified.
- 302.3 Contractor shall comply with Applicable Law, Contract requirements, and Owner's policy requirements concerning the removal and disposal of all hazardous material/waste and the following sections apply:
 - a. Contractor shall take appropriate precautions in the identification, removal, and disposal of all hazardous material/waste and shall be in strict accordance with Applicable Law.
 - b. Disturbance of and exposure to asbestos, lead, and all other hazardous materials involves certain health, safety, and environmental risks, which require specific control measures by the Contractor.
 - c. Contractor shall abide by all Owner's hazardous materials and waste requirements and policies.
 - d. It is understood and agreed throughout Industry that disturbance of and exposure to asbestos, lead, and all other hazardous materials involves certain health, safety, and environmental risks, which require specific control measures. Owner shall not be responsible for such control measures on the job and as it pertains to the Work, including measures for the protection of employees of the Contractor, subcontractor(s), or Owner, nor for protection of the general public or environment. Such responsibility for control measures is, and shall remain, that of the Contractor. Contractor is solely responsible for the means and methods of the Work including, but not limited to identification, removal, and disposal of any hazardous material. Therefore, except for claims and damages arising from the negligent acts, errors, or omissions of Owner, Contractor agrees to hold harmless, defend, and indemnify Owner from all claims, suits, expenses, or damages, including attorneys' fees, arising from, or alleged to arise from, exposure to hazardous material in conjunction with the Work. The negligence of Owner shall not bar recovery by the other against the Contractor hereunder.
 - e. Nothing in this agreement or contract shall impose liability on Owner for claims, losses, expenses, or damages arising from, or in any manner related to, the exposure to, or the handling of, or disposal of asbestos containing material, lead-containing material, or any other hazardous material/waste in any way of its various forms within Contractor's scope.
 - f. Asbestos and Lead Awareness:



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- f1. The disturbance of any kind of asbestos containing material may cause the release of asbestos fibers, which may lead to exposure in excess of allowable exposure limits defined in the Federal Clean Air Act, the Federal Occupational Safety and Health Act, and other Applicable Law, or exposure by way of carrier, contamination, or uncontrolled release.
- f2. The burning, cutting, flaking, or any other form of disturbance of lead-containing material may cause the release of lead, which may lead to exposure in excess of allowable exposure limits defined in the Federal Clean Air Act, the Federal Occupational Safety and Health Act, and other Applicable Law, or exposure by way of carrier, contamination, or uncontrolled release.
- g. Except as Owner may otherwise direct, Contractor shall be solely responsible for, and shall have control and charge of construction means, methods, techniques, sequences, and procedures, and for safety, health, and environmental precautions and programs in connection with the Work, and shall carry out the Work in accordance with the Contract Documents.
- h. Owner shall not be responsible for, nor have control or charge over the acts or omissions of Contractor, its subcontractors, or any of their agents or employees, or any other persons performing any work relating to the Work.

303. DISPOSAL, CLEANUP, AND CLOSEOUT

- 303.1 Contractor shall restore all surfaces, finishes, treatments, siding, etc. to original condition subject to Owner approval for all existing construction installations altered or otherwise impacted during the execution of the Work. This shall include, but not limited to, painted surfaces, lagging, siding, insulation, roads, foundations, etc.
- 303.2 Contractor shall manage waste from “cradle to grave” including characterization and documentation of all waste resulting from the Work.
- 303.3 Disposal of all waste resulting from the Work and disposal of excess materials not kept for reuse shall be per Applicable Law.
- 303.4 Collection and accumulation of hazardous waste generated on-site shall not exceed durations defined by Applicable Law and at minimum shall not exceed 5 days.
- 303.5 Collection and accumulation of construction and demolition waste (C&D waste) on-site shall not exceed one week.
- 303.6 Contractor shall maintain copies of all waste management and disposal documentation records on-site and per Applicable Law and Owner requirements. Contractor shall provide Owner access to records for verification and auditing purposes at all times for the life of the Contract.

END OF SECTION 024116



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SECTION 036241

GROUT WORK

PART 1 – GENERAL

101. EXTENT

101.1 This section covers the material, procedures and testing of non-shrink grout of the following:

- a. Column base plates.
- b. Conduit, piping, etc.,
- c. Equipment foundation pad dowels.

101.2 Equipment grouting shall be performed in accordance with the materials and procedures specified by the equipment manufacturer. When the equipment manufacturer does not specify the requirements for equipment grouting, equipment grouting shall be in accordance with the provisions of this Section.

101.3 Grouting shall be performed using non-shrink grout.

102. REFERENCE DOCUMENTS

102.1 Standards, Specifications, manuals, codes and other publications of nationally recognized organizations are referenced herein. References to these documents are to the issue date as indicated by the Adopted Building Code. If the document is not referenced in the Adopted Building Code, then the reference is to the latest issue date of the document together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.

102.2 Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state or local codes having jurisdiction.

102.3 Internationally recognized standards equivalent to or more restrictive than those listed may be proposed by the Contractor. Contractor must submit the basis for equivalency for all requested alternative Codes and Standards. Acceptance of alternate Codes and Standards shall be determined by Owner and Owner's Engineer prior to use/purchase by the Contractor.

102.4 Abbreviations listed below refer to the applicable organizations or documents.

102.5 ASTM – ASTM International:

- a. C109/C109M – Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 mm cube specimens)
- b. C309 – Specification for Liquid Membrane – Forming Compounds for Curing Concrete
- c. C827/C827M – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
- d. C939 – Test method for flow of Grout for Preplaced – Aggregate Concrete (Flow Cone Method)
- e. C1107/C1107M – Specification for Packaged Dry, Hydraulic – Cement Grout (Non-shrink)



- 102.6 ACI – American Concrete Institute:
- a. ACI 351.1R – Report on Grouting between Foundations and Bases for Support of Equipment and Machinery
103. RELATED WORK SPECIFIED IN OTHER SECTIONS
- 103.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:
- a. Section 013323 - Shop Drawings and Product Data
104. SUBMITTALS
- Submit the certification from manufacturer of non-shrink grout that product meets the requirements of ASTM C1107/C1107M. All documents shall be submitted in accordance with the requirements of Section 013323.
105. QUALITY ASSURANCE
- Owner will engage an independent Testing Laboratory to inspect the grout work and to perform tests to verify compliance with the requirements specified herein. Such inspections and tests shall not relieve Contractor of responsibility for providing materials and procedures in compliance with the specified requirements.
106. TESTING
- 106.1 Owner Testing Laboratory shall make all cube specimens from fresh samples of grout taken on the Project Site. Locations for taking samples shall be acceptable to Owner. Owner's Testing Laboratory shall maintain a complete and detailed record of the tests. Copies of the test results shall be submitted to Owner as soon as possible, but not later than two (2) days after the tests are completed.
- 106.2 Extent of Testing:
- a. Each day grout is placed, the Testing Laboratory shall take a quantity of the prepared grout and mold six (6), 2 inch cube (50 mm cube) specimens per ASTM C109/C109M, Section 9 except as modified by ASTM C1107/C1107M, Section 11.5.
- b. Additionally, each time a new lot of grout is initiated, mold six (6), 2 inch cube (50 mm cube) specimens as specified in paragraph 106.2a.
107. STORAGE
- Materials shall be stored in such a manner as to avoid contamination, evaporation, or damage. Liquid admixtures shall be protected from freezing and temperature changes that would adversely affect their characteristics.

PART 2 – PRODUCTS

201. MATERIAL
- 201.1 Grout shall conform to ASTM C1107/C1107M. Grout shall not contain metallic aggregate, oxidizing catalysts, gas producing agents nor more than 300 ppm chloride. Grout shall attain a one (1) day minimum compressive strength of 3500 psi (25 MPa) per ASTM C109/C109M and a compressive strength of 5000 psi (35 MPa) at 28 days. Grout shall conform to ASTM C1107/C1107M when mixed to a fluid consistency as prescribed by ASTM C827/C827M at



temperature extremes of 45° (7°C) and 90°F (32°C) with an extended working time of 30 minutes or more at temperatures between 45° (7°C) and 90°F (32°C).

- 201.2 For thickness greater than 3 inches (75 mm), pea gravel or other approved filler shall be added to the grout. Such filler shall conform to the grout manufacturer's written requirements or recommendations.
- 201.3 Curing compound shall conform to ASTM C309, Type 1-D with fugitive dye (wax base not permitted). The product shall be compatible with and in accordance with the grout manufacturer's recommendations.
- 201.4 Any shims or wedges that are specified by equipment installation instructions or Design Drawings to be left in place after grouting, shall be made of 304 stainless steel or other stainless steel material approved by the Owner's Engineer.

PART 3 – EXECUTION

301. GENERAL

- 301.1 Grouting shall be performed promptly after the setting and leveling of the equipment or column bearing devices unless otherwise specified by the equipment manufacturer. If pockets, block-outs, or anchor rod sleeves are exposed to weather or other sources of water and will not be grouted promptly during cold weather, when temperatures will be below freezing, they shall be protected from freezing by appropriate means such as heating, filling with propylene glycol antifreeze (i.e., RV or Marine type), closed-cell foam or other effective measures.
- 301.2 All structural baseplates and mechanical/electrical equipment shall be firmly and solidly grouted in place utilizing non-shrink grout. Grouting shall be performed by methods that will ensure complete, uniform, and permanent filling of all space beneath the base without disturbing or displacing the alignment or level of the base in its correct position.
- 301.3 Shimming and Wedging:
 - a. Shimming, wedging and leveling of equipment and column base plates is the responsibility of the Contractor who installs the equipment or column base plates.
 - b. During placement of grout all shims and wedges shall be removed after the grout has hardened, except for those shims and wedges required by the equipment manufacturer or the Owner to be left in place.
 - c. Voids resulting from the removal of shims, wedges, and leveling screws, shall be filled in with the same grout used for grouting the equipment or structural elements.
- 301.4 Surface Preparation:
 - a. Surfaces of hardened concrete upon which the grout is to be placed shall be chipped to remove unsound concrete, laitance, and surface mortar and expose the aggregate.
 - b. Hardened concrete surfaces shall be cleaned of loose materials and saturated with water for not less than two hours immediately before the grout is placed. All excess water shall be removed.
- 301.5 Placing of Grout:
 - a. Grout shall be placed in strict accordance with the requirements specified herein and the grout manufacturer's procedures.

- b. Grouting shall be a continuous operation until the whole plate or base is completely grouted, except that shimmed and wedged areas shall be grouted as specified herein.
- c. Special care shall be taken to ensure that space under the grouted plate or equipment is entirely filled with grout including shear bar pockets and anchor rod sleeves. Grout shall be poured from one side and continuously rodded or strapped with care until it flushes up to the top of the form on all other sides and through grout holes, if any, of the plate. Base plate with shear bars in more than one direction may be grouted through a central hole, only if air-relief holes are provided in the vicinity of the shear bars where air may be trapped.
- d. Unless specified on design drawings, grout shall not extend above the bottom of the grouted plate and shall not extend beyond the edges of the grouted plate except as necessary to allow a 45° shoulder from the bottom edge of the plate to the top of the foundation. Unchamfered shoulders are not permitted unless required by the equipment manufacturer.
- e. Air relief holes and oversized anchor rod holes should be filled with grout to the top of the base plate to avoid being filled with water and/or debris.
- f. For grout thickness exceeding 3 inches (75 mm), see Article 201.2.
- g. Cold Weather Placing of Grout:
 - g1. When the surrounding temperature is below 45°F (7°C), grout temperature during placing shall be not lower than 55°F (13°C), and shall be in accordance with grout manufacturer's written instructions.
 - g2. The addition of calcium chloride or other accelerating admixture to the grout to prevent freezing and/or to develop earlier strength of grout will not be permitted.
- h. Hot Weather Placing of Grout:
 - h1. Grout temperature during placing shall not exceed 75°F (24°C), unless otherwise indicated.
 - h2. Retarding admixture shall not be used unless otherwise indicated.
- 301.6 Non-shrink grout shall be furnished factory premixed so only water is added at the jobsite. Grout shall be mixed in a mechanical mixer for a minimum of 3 minutes or as specified in the manufacturer's written instructions. No more water shall be used than is recommended by the manufacturer.
- 301.7 Grout shall be placed immediately after mixing and before stiffening sets in. Grout shall be placed in strict accordance with the directions of the manufacturer so that all grout space is completely filled without voids. Forms shall be provided where structural components of baseplates will not confine the grout.
- 301.8 Grout shall be finished smooth in all locations where the edge of the grout will be exposed to view after it has reached its initial set.

END OF SECTION 036241



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SECTION 050523

BOLTING

PART 1 – GENERAL

101. EXTENT

- 101.1 This Section specifies acceptable materials and methods of fastening metals to each other and to other substrates with high strength bolts, nuts and washers.
- 101.2 High strength bolts shall conform to the requirements of this Section and to the requirements of the RCSC "Specification for Structural Joints Using High Strength Bolts", unless otherwise indicated on the Design Drawings.
- 101.3 Except as otherwise specified in this Section, the methods, conditions, materials, and products specified herein apply to work whether performed in the shop or in the field.
- 101.4 The Work shall include, but not be limited to, the following for the bolts furnished by the Contractor:
- a. Include an additional 5% overage for bolts, nuts and washers to be installed in the field.
 - b. Provide an erection bolt list by beam number on a point-to-point placement sheet. Indicate the bolt length for each connection.
 - c. Material shall be delivered so as to permit continuous and orderly erection of the Work in the field.

102. RELATED WORK SPECIFIED IN OTHER SUBSECTIONS

- 102.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:
- a. Section 013323 – Shop Drawings and Product Data
 - b. Section 051223 – Structural Steel and Gallery Work Fabrication
 - c. Section 051224 – Structural Steel and Gallery Work Erection

103. REFERENCE DOCUMENTS

- 103.1 Standards, Specifications, manuals, codes and other publications of nationally recognized organizations are referenced herein. References to these documents are to the issue date as indicated by the Adopted Building Code. If the document is not referenced in the Adopted Building Code, then the reference is to the latest issue date of the document together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.
- 103.2 Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state or local codes having jurisdiction.
- 103.3 Internationally recognized standards equivalent to or more restrictive than those listed may be proposed by the Contractor. ASTM's Handbook of Comparative World Steel Standards DS67, latest edition, can be used as reference guide to compare material standards. Contractor must submit the basis for equivalency for all requested alternative Codes and Standards. Acceptance of alternate Codes and Standards shall be determined by Owner and Owner's Engineer prior to use/purchase by the Contractor.
- 103.4 Abbreviations listed below refer to the applicable organizations or documents.



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- 103.5 AISC - American Institute of Steel Construction:
- a. 360 "Specification for Structural Steel Buildings."
 - b. 303 "Code of Standard Practice for Steel Buildings and Bridges."
 - c. 325 "Manual of Steel Construction."
 - d. 341 "Seismic Provisions for Structural Steel Buildings."
- 103.6 ASME - American Society of Mechanical Engineers
- a. B18.2.6(M) "(Metric) Fasteners for Use in Structural Applications."
- 103.7 ASTM - ASTM International:
- a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - c. A563/A563M, Standard Specification for Carbon and Alloy Steel Nuts.
 - d. B695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 - e. F436/F436M, Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
 - f. F959, Standard Specification for Compressible Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
 - g. F1136/F1136M, Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
 - h. F2329/F2329M, Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
 - i. F2833, Standard Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type.
 - j. F3125/F3125M, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- 103.8 RCSC - Research Council on Structural Connections:
- a. Specification for Structural Joints Using High Strength Bolts (Referred to as RCSC Bolt Specification).
104. SUBMITTALS
- 104.1 Submit the following documents to Owner and the Consulting Engineer for review in accordance with the submittal requirements of Section 013323 prior to delivery of bolting assemblies:
- a. Certification of Compliance (COC) for material specified herein.
 - b. Copies of Certified Material Test Reports (CMTRs) and other reports required by applicable codes, for metals and material from which bolting assemblies are fabricated. Include the following information:



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- b1. The steel heat used to fabricate the bolts/nuts.
 - b2. The chemical composition and the mechanical properties of the fabricated item as required by the specified ASTM (F3125/F3125M, A563/A563M and F436/F436M), grade, and/or type.
 - c. If bolts and nuts are specified to be galvanized, either mechanically or hot dipped, or are specified to be coated, advise the results of Rotational Capacity Testing per ASTM F3125/F3125M, Annex A2.
 - c1. For hot dipped galvanized bolts, include the measured thickness of the coating determined per ASTM F2329/F2329M.
 - c2. For mechanically galvanized bolts, include the measured thickness of the coating determined per ASTM B695.
 - c3. For Zinc/Aluminum coated bolts, include the measured thickness of the coating determined per ASTM F1136/F1136M or F2833.
 - d. Submit a COC for each different lot of bolts, nuts and washers, and identify by lot number. Attach a tag listing the corresponding lot number to the container used to deliver the bolts/nuts/washers to the project site.
 - e. Submit the bolt count and size of bolt for each connection (i.e., point-to-point bolt placement sheets).
 - f. Submit written bolt installation procedure that clearly defines the handling and storage of bolts, pre-installation testing, tightening and inspection of high strength bolts.
105. QUALITY ASSURANCE
- 105.1 The Contractor or its bolt supplier shall certify that bolts, nuts and washers furnished comply with all of the appropriate requirements of the applicable specifications as noted in the test report listed above.
 - 105.2 For fasteners to be accepted, lot numbers must appear on the product containers delivered to the project site. The lot numbers on the containers must correspond to the lot identification numbers on the test reports. The bolt manufacturer's symbol and grade markings must appear on all bolts and nuts.
 - 105.3 Inspect finished product to ensure that the bolt holes are not plugged by galvanizing. Take corrective action in the shop so that bolt holes do not have to be reamed in the field.
 - 105.4 Evidence of Conformity: The supplier shall certify that bolts, nuts and washers furnished comply with all of the appropriate requirements of the applicable Specifications, and shall provide complete manufacturer's test reports to document that the chemical and mechanical requirements of the applicable Specifications have been met. Test reports for galvanized fasteners shall include the results of the rotational capacity test. For fasteners to be accepted, lot numbers must appear on the product containers and correspond to lot identification numbers on the test reports. Manufacturer's symbol and grade markings must appear on all bolts and nuts.
 - 105.5 Whenever high-strength bolts are to be installed, the pre-installation verification required by the RCSC Bolt Specification shall be followed.
 - 105.6 Owner shall be notified of any test failures immediately so that corrective action can be initiated. Documentation of all testing (pass or fail) shall be submitted to Owner within 24 hours of completing the test. The cost of replacing rejected bolt assemblies is the responsibility of Contractor furnishing the bolts.



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PART 2 - PRODUCTS

201. MATERIAL REQUIREMENTS

- 201.1 High-strength bolts for Pretensioned Joints as specified in the RCSC Bolt Specification shall be used for all bolted connections unless otherwise indicated. All bolts shall be pretensioned using one of the pretensioning methods as specified in the RCSC Bolt Specification. The following types of high-strength bolts shall be used in accordance with the RCSC Specification, unless otherwise indicated:
- a. ASTM F3125/F3125M, Grade A325/A325M bolts shall subsequently be referred to as A325 bolts.
 - a1. For bolts through 7/8-inch (M22) diameter with coated structural steel: Use A325, Type 1 Bolts with a plain (uncoated) finish (field touch-up is required).
 - a2. For bolts through 7/8-inch (M22) diameter with galvanized structural steel: Use A325, Type 1 Bolts with a galvanized finish.
 - b. ASTM F3125/F3125M, Grade A490/A490M bolts shall subsequently be referred to as A490 bolts.
 - b1. For bolts 1-1/8-inch (M27) diameter with coated structural steel: Use A490, Type 1 Bolts with a plain finish (field touch-up required).
 - b2. For bolts 1-1/8-inch (M27) diameter with galvanized structural steel: Use A490, Type 1 Bolts with a Zinc/Aluminum Inorganic Coating per ASTM F1136/F1136M Grade 3.
 - c. Nut and washer materials and finish shall be in accordance with the RCSC Bolt Specification.
 - d. Squirter® Type direct tension indicators (DTIs), if preferred by the Contractor for installation, shall be manufactured by Applied Bolting Technology shall be used and shall conform to the requirements of ASTM F959/F959M.
 - e. Twist-off Type Tension-Control (TC) bolts shall not be used without the Consulting Engineer's written approval. If approved, TC bolts shall conform to the requirements of ASTM F1852.
- 201.2 Shoulder Bolts, fabricated from ASTM A449 material, shall be used for sliding connections.

PART 3 - EXECUTION

301. GENERAL

- 301.1 Bolt holes shall be 1/16 inch (2 mm) larger than the nominal diameter of the bolt.
- 301.2 Oversized or slotted holes are not permitted unless specifically indicated on the design drawings.
- 301.3 All connections have been designed as Pretensioned (PT) joints. Where specifically indicated on the design drawings, Slip-Critical (SC) joints have been designed for a Class A faying surface.



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302. ASSEMBLY OF JOINTS

- 302.1 Nuts shall be fully engaged with the end of the bolt at least flush with the face of the nut.
- 302.2 The threaded part of the installed bolt shall not be in the shear plane.
- 302.3 For a slotted sliding connection using shoulder bolts, two nuts are required. Each nut shall be installed using an impact wrench. The first nut shall be installed up to the shank of the bolt, followed by the second nut. Both nuts shall be installed to a "snug-tight" condition.
- 302.4 Washers:
- a. Washers shall be used in accordance with the RCSC Bolt Specification.
- 302.5 Direct-Tension-Indicators (DTIs):
- a. Use one hardened flat washer and one Squirter® Type DTI per bolt assembly. The hardened flat washer is always placed directly under the turned element. The DTI shall be located and the squirter side oriented in accordance with Section 8 of the RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts"
- 302.6 Location of Bolt Heads:
- a. Columns: On outside faces of flanges unless noted, on inside faces of flanges for TC bolts.
- b. Beams and Girders: On upper sides of flanges.

303. INSTALLATION OF HIGH-STRENGTH BOLTS

- 303.1 High-strength bolt installation and tightening shall be in accordance with the RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts". Contractor shall have the option of installing bolts using either "turn-of-the-nut", calibrated wrench method, or compressible-washer-type direct tension indicators (DTIs). Twist-off type tension control bolts shall only be used with the Owner's Engineer's written approval.
- a. Contractor shall develop a written bolt installation procedure that clearly defines the handling and storage of bolts, pre-installation testing, tightening and inspection of high strength bolts. This written procedure shall be submitted to the Owner and the Consulting Engineer for review.
- b. Skidmore-Wilhelm Tension Calibrators shall be used and shall be re-calibrated by Skidmore-Wilhelm.
- 303.2 A490 bolts, galvanized or Zinc/Aluminum coated A325 bolts, shall not be reused. Plain (black) A325 bolts may be reused in accordance with the RCSC Bolt Specification.
- 303.3 Fastener components shall be stored in the manufacturer's sealed containers until they are used. Additional storage requirements shall be per the RCSC Bolt Specification.



303.4 Direct Tension Indicator (DTI) Method:

- a. Before starting installation, Squirter® Type DTIs shall be calibrated in a Skidmore Wilhelm tension testing device. Position washers and tighten the bolt assembly to at least 10% to 20% over the minimum bolt pretension as required by the RCSC Bolt Specification with a wrench just as the bolt would be tightened during production installation. For example, a 7/8" (M22) A325 bolt shall be tightened to about 45,000 lb. (200 kN). Once tightened, note the appearance, flow volume and number of squirts emanating from under the DTI at that tension. The number of squirts shall be at least equal to the number of bumps on the DTI less one (i.e., a five bump DTI should squirt out in at least four places). Repeat this test several times to obtain a visual impression of how much squirt is necessary to achieve the required tension.
- b. Pre-installation testing shall be performed for each bolt assembly by measuring the gap as specified by the RCSC Bolt Specification. Once tightened, note the appearance, flow volume and number of squirts emanating from under the DTI at that tension. The amount of correct squirt corresponds to a DTI that has been sufficiently compressed so that a feeler gage of the correct thickness (typically .005 inches (0.13 mm) if the DTI is on the nut end of the bolt or .015 inches (0.38 mm) if the DTI is under the head end of the bolt) will not enter more than half of the available places right into the bolt shank.
- c. High strength bolt installation shall be in accordance with the RCSC Bolt Specification Tightening shall continue until after the orange silicone appears in volume from most of the DTIs squirt locations and until the squirt volume and appearance is just like it was in the calibration procedure. Each DTI has one squirt location for every bump. The number of squirts should be at least equal to the number of bumps on the DTI less one as noted above in the calibration procedure. When turning the nut, prevent the bolt head from spinning with a hand wrench as spinning can cause unnecessary wear on the assembly and vice versa when the bolt head is turned for tightening.

304. INSPECTION AND EXAMINATION

304.1 General Provisions:

- a. Inspection and examination will be performed by Contractor's independent Testing and Inspection Agency. Contractor shall also provide its own quality assurance inspector to ensure all installed high strength bolts meet the project installation procedure prior to the Owner's inspection.
- b. Contractor's Work is subject to inspection and examination by Owner and its Testing and Inspection Agency for full compliance with all the requirements specified herein and indicated on the Design Drawings.
- c. Contractor will retain and pay for the services of the Testing and Inspection Agency to perform this inspection and examination work.
- d. Contractor shall provide, and pay for, access and all rigging required for the examinations performed by Owner or its Testing and Inspection Agency. Contractor shall also provide personnel required to assist Owner or its Testing and Inspection Agency at no additional cost to Owner.
- e. Owner's inspection will not relieve Contractor of its obligation for inspection. Owner's Testing and Inspection Agency will not be available for Contractor's use.

304.2 Inspection of High-Strength Bolting:

- a. Contractor shall furnish and use a Skidmore-Wilhelm tension calibrating device. The device furnished shall bear a certification as to the accuracy of the device. Such certification shall be dated not more than 30 days prior to the first actual use of the device for inspection of the Work.



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- b. Inspection procedures shall be in accordance with the RCSC Bolt Specification, including the provisions for arbitration inspection specified therein. When Squirter® Type DTIs are used, the RCSC Bolt Specification requirements shall be augmented by the test procedures performed to establish the volume and appearance of the orange silicone liquid squirted out from the collapsed bumps on the face of the DTI.
- c. In each connection of a structure, approximately 10 percent of the bolts shall be inspected, but never less than 2 bolts per connection.
- d. The Testing Service shall confirm the following:
 - d1. That bolt assembly material meets the applicable specifications and that the assembly elements are properly handled and cared for until used.
 - d2. That job site testing and calibration of Contractor's equipment to attain the specified tensions were observed and accepted.
 - d3. That the Contractor has submitted the appropriate reports, certifications and evidence of conformity documentation prior to the start of erection for record and evaluation purposes.
 - d4. The Testing Service shall monitor bolting operations to assure that testing procedures are routinely followed on joints specified to be fully tensioned.

END OF SECTION 050523

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SECTION 050525

STRUCTURAL WELDING

PART 1 – GENERAL

101. **EXTENT**
- 101.1 Materials and installation for welding of structural steel shall conform to the requirements of this Section.
- 101.2 Welding shall conform to the requirements of this section, AWS D1.1 Structural Welding Code – Steel, AWS D1.3 Structural Welding Code – Sheet Steel, and AWS D1.6 – Structural Welding Code – Stainless Steel, as applicable.
- 101.3 The Work shall include, but not be limited to, the following:
- a. Preparation and qualification of welding procedure specifications (WPS) and Procedures Qualification Records (PQR). The Contractor shall use AWS pre-qualified weld procedures whenever possible. If for a particular application there is no AWS pre-qualified weld procedure, then the Contractor shall prepare and qualify the new weld procedure in accordance with the requirements of Article 105.
 - b. Certification of Welders.
 - c. Welding of metals to each other and to other substrates.
 - d. Inspection and testing of welds.
- 101.4 The methods, conditions, material, and products specified herein apply to Work whether performed in the shop or in the field and by the Contractor's own forces or its subcontractors.
- 101.5 Welding work covered by ASME, API, AWWA and AWS D9.1 specifications are not covered herein.
102. **RELATED WORK SPECIFIED IN OTHER SUBSECTIONS**
- 102.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:
- a. Section 013323 – Shop Drawings and Product Data
 - b. Section 051223 – Structural Steel and Gallery Work – Fabrication
 - c. Section 051224 – Structural Steel and Gallery Work – Erection
103. **REFERENCE DOCUMENTS**
- 103.1 Related standard specifications are referenced, but are not limited to, the documents indicated in this Section. The Work performed shall comply with the referenced and applicable requirements of these documents, in addition to federal, state, or local codes having jurisdiction.



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- 103.2 References to these documents shall be to the issue date as adopted in the International Building Code (IBC). If the document is not referenced in the latest issue of the IBC, then the reference is to the latest issue date of the document together with the latest additions, addenda, amendments, supplements, etc. in effect on the date of contract award.
- 103.3 For international projects, the internationally accepted Codes & Standards not listed in this specification shall be acceptable if they are equal to or better than the Codes & Standards referenced herein and/or proposed by the Contractor. The acceptance of those international Codes & Standards shall be determined by the Owner and the Owner's Engineer.
- 103.4 AISC – American Institute of Steel Construction:
- a. 360 – Specification for Structural Steel Buildings
 - b. 303 – Code of Standard Practice for Steel Buildings and Bridges
 - c. 325 – Manual of Steel Construction, Edition
- 103.5 AISI – American Iron and Steel Institute: By material type noted.
- 103.6 ANSI – American National Standards Institute:
- ANSI/ASCE Z49.1 – Safety in Welding and Cutting
- 103.7 ASTM – ASTM International, by material noted and the following:
- a. E94 – Guide for Radiographic Testing
 - b. E164 – Practice for Ultrasonic Contact Examination of Weldments
 - c. E165 – Practice for Liquid Penetrant Inspection Method
 - d. E709 – Practice for Magnetic Particle Examination
- 103.8 AWS – American Welding Society:
- a. A2.4 – Standard Symbols for Welding Brazing and Nondestructive Examination
 - b. A3.0 – Welding Terms and Definitions
 - c. A5.1 to A5.30 – Specifications for Welding Electrodes
 - d. D1.1 – Structural Welding Code – Steel
 - e. D1.3 – Structural Welding Code – Sheet Steel (applicable when the thickness of one of the connected parts is less than 0.18 inch)
 - f. D1.6 – Structural Welding Code – Stainless Steel
104. SUBMITTALS
- 104.1 General: In accordance with Section 013323 as applicable.
- 104.2 Submit two copies of qualification certificates (including requalification, if any), test reports and certificates as approved by an independent testing agency for each welder and welding machine operator.



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- 104.3 Submit two copies of the proposed welding procedures in accordance with the requirements of Article 105 of this Section.
- 104.4 Welding shall not be performed for the Work in the shop or the field until the welder qualification certificates and welding procedures are accepted by Owner.
- 104.5 Welding Electrodes:
- a. Welding Material Certificates of Conformance (COC) or Certified Material Test Reports (CMTRs) for the welding electrodes shall be submitted to Owner at the time of delivery of the material to the Project Site.
 - b. Submit procedures for storage and handling of electrodes.
- 104.6 Submit copies of Contractor's welding inspection and examination records prepared in accordance with Article 305 of this Section.
- 104.7 Submit welding inspector's AWS Certification.
- 104.8 Submit non-destructive testing (NDT) procedures.
105. WELDING PROCEDURES
- 105.1 The Contractor shall submit both prequalified and qualified Welding Procedure Specifications (WPS) to Owner for review. Qualified WPS shall include the Procedure Qualification Record (PQR). Welding procedures shall be qualified in accordance with applicable AWS requirements.
- 105.2 The Contractor shall submit qualified WPS for all materials that are not recognized as prequalified base materials by AWS D1.1. Qualified WPS shall include all combinations of non-prequalified base metals: welded to itself, to a dissimilar non-prequalified base metal, and to a qualified base metal. Non-prequalified base metals include, but are not limited to: ASTM A387, Grade 11, Class 2 and ASTM A387, Grade 22, Class 2 and ASTM A335, Grade P11, and Grade P22 and ASTM A240 stainless clad steel on ASTM A36 backing plate conforming to A264.
- 105.3 The WPS shall specify, as a minimum, all of the applicable essential variables as identified by AWS D1.1, AWS D1.3 or AWS D1.6 including procedure for preheating base metals, minimum preheat and interpass temperatures and as specified in this Section.
- 105.4 Where required by the contract drawings or specifications, welded assemblies shall be stress relieved by heat treating. Final machining after stress relieving shall be considered when needed to maintain dimensional tolerances. As a good industry practice, Post Weld Heat Treatment (PWHT) should be considered for Seismic Class 1 structural steel butt, tee, or corner welds with a weld thickness greater than 1-1/2 inches (40 mm). Other considerations for PWHT are as follows:
- a. PWHT shall be performed when required by the applicable WPS.
 - b. PWHT is to be performed in accordance with the requirements of AWS D1.1.
 - c. The requirements for PWHT are based on the nominal thickness of the material being welded. Nominal thickness is the thickness of the weld, or the thinner of the sections being joined, which is least. For fillet welds, the nominal thickness is the throat thickness, not the leg length. For partial penetration and material repair welds, the nominal thickness is the depth of the weld groove or preparation.



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- d. PWHT is not recommended for weldments of A514, A517, A709 Grades 100 and 100W, and A710 steels.
- 105.5 Welding shall not be performed when the ambient temperature is lower than 0°F (-18°C).
- 105.6 When the ambient temperature is at or below 32°F (0°C) and no other minimum preheat or interpass temperatures are specified in the WPS, preheat base metal to at least 70°F (20°C) before tack welding or welding.
- 105.7 For groove-weld joints with plates greater than 2 inch (50 mm) thick, the material shall have a minimum preheat as specified within Table 3-2 of AWS D1.1.
- 105.8 For combinations of base metals with different thickness, the minimum preheat and interpass temperature shall be based on the thickest part of the base metal being welded.
- 105.9 For combinations of base metals to be welded, the minimum preheat and interpass temperature shall be based on the highest minimum preheat.
- 105.10 Joints requiring preheat and subsequent minimum interpass temperature shall be uniformly heated prior to and maintained during the welding operation for a minimum distance of 5 times the thickness of the thickest welded part, but not less than 3 inches (75 mm) in all directions from the point of welding.
- 105.11 The preheat and interpass temperatures shall be checked by the Contractor just prior to welding by the use of contact pyrometers, temperature indicating crayons or other suitable means.
- 105.12 The welding procedures shall include the following:
 - a. Selection of welding processes, equipment and material.
 - b. Personnel control and quality control of workmanship.
 - c. The controls for welding inspections and examinations shall be specified and maintained.
 - d. Weld joint details and tolerances.
 - e. Weld profiles and weld sizes.
 - f. Size, classification and material specification for electrodes proposed.
 - g. The method and types of groove and edge preparation shall be specified.
 - h. The methods and/or sequence of welding to avoid distortion and to minimize residual shrinkage stresses shall be specified, if applicable.
 - i. Number and travel speed of passes or melting rate, where applicable, for each weld.
 - j. Procedures for PWHT, preheating base metals and the minimum preheat and interpass temperatures required by AWS D1.1 or the applicable ASME Construction Code Section.
 - k. Dimensions and spacing of plug and slot welds.
 - l. The gas type and flow rate shall be specified for shielding, trailing or inert purging.
- 105.13 Provide procedures for storage and handling of electrodes in accordance with AWS D1.1.



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105.14 Welders, welding operators and NDT personnel shall be certified by independent testing agencies, of recognized standing, in accordance with SNT-TC-1A-2001, as a minimum Level 2, or equivalent acceptable to the Owner. Such certifications have been validated within the previous 6 months per AWS D1.1 prior to performing the Work.

106. QUALITY ASSURANCE

106.1 Inspections, examinations, and tests that may be performed by Owner do not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Owner reserves the right, at any time before final acceptance to reject material not complying with specified requirements.

106.2 Welding fabrication errors shall be rectified at Contractor's expense. Promptly remove non-complying material and fabricated components and replace with complying material and fabrications.

106.3 Qualify welding procedures in accordance with applicable AWS procedures.

106.4 Qualify welders and welding operators in accordance with applicable AWS procedures.

106.5 Provide certification that welders and welding operators to be employed for the Work have satisfactorily passed applicable AWS qualification tests.

106.6 Contractor shall be responsible for the supervision of welder and welding operator qualification and the certification of the test documents. Welders and welding operators shall be tested by an independent testing agency, within the previous six months, in accordance with AWS D1.1, AWS D1.3 or AWS D1.6, as applicable. Agencies for testing welders and welding operators shall be of recognized standing. Costs in connection with this certification shall be borne by the Contractor. Independent testing agencies are not responsible for certification of welders and welding operators.

106.7 If recertification of welders is required, retesting will be Contractor's responsibility and at its expense.

106.8 Provide procedures for storage and handling of electrodes in accordance with the manufacturer's recommendations.

PART 2 – PRODUCTS

201. WELDING ELECTRODES

201.1 All electrodes shall conform to AWS A5.1 through A5.30 as applicable.

201.2 Electrodes for all structural steel, miscellaneous metal, and gallery work shall require 70 ksi tensile strength electrodes with a minimum Charpy V-Notch toughness of 20 ft-lbs. (27 J) at -20°F (-29°C). The process consumables for weld metal, tack welds, root pass and subsequent passes deposited in a joint shall be compatible to assure notch-tough composite weld metal.



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- 201.3 For steels not covered by Table 3.1 of AWS D1.1 and this Section, the Contractor shall submit proposed electrodes for acceptance. Notification shall be made prior to the start of welding.

PART 3 – EXECUTION

301. GENERAL

- 301.1 Welding shall conform to the Workmanship Section of AWS D1.1, AWS D1.3 or AWS D1.6, as applicable, unless otherwise indicated on the Design Drawings.
- 301.2 Comply with AWS D1.1, AWS D1.3 or AWS D1.6, as applicable, for procedures, appearance, and quality of welds and for methods used in correcting welding Work.
- 301.3 Steel reinforcing bars, nuts and bolts, and carbon or alloy steels containing more than 0.35 percent carbon shall not be welded.

302. SPECIFIC WELDING REQUIREMENTS

- 302.1 Fillet welds across flanges of any steel member and any undercutting greater than 0.01 inch (0.25 mm) deep or damage that will reduce the flange area is not permitted.
- 302.2 All groove welds shall be complete penetration welds unless noted otherwise.
- 302.3 Any coating containing zinc or cadmium, on the areas to be welded, shall be removed prior to welding.
- 302.4 Complete joint penetration welds in plate girder flange plates and web plates shall be made before fitting and assembly into the plate girder. These welds shall have smooth transitions between offset surfaces, as specified by AWS D1.1.
- 302.5 The technique employed for welding shall be carefully controlled to minimize shrinkage stresses and distortion.
- 302.6 Tack welds shall be installed by certified welders.
- 302.7 Surfaces and edges to be shop or field welded shall be prepared per AWS D1.1, AWS D1.3 or AWS D1.6, as applicable.
- 302.8 Built-up sections may vary from straightness within the tolerances allowed for wide-flange shapes by ASTM A6, except that the tolerance on deviation from straightness of compression members is 1/1000 of the axial length between points which are to be laterally supported. Completed members should be free from twists, bends, and open joints. Noncompliance with the above criteria as well as sharp kinks or bends are cause for rejection of material.
- 302.9 The use of oversized welds or filling the joints with non-approved material to overcome poor fit-up is not permitted. Joints shall conform to the fit-up requirements of AWS.
- 302.10 Fuel gas, Electroslag, Electrogas, and Braze welding processes are prohibited. Gas Metal-Arc welding (short circuiting transfer) is permitted only on materials under 1/4 inch (6 mm) with prior written approval from Owner.
- 302.11 Inert gas metal-arc welding using consumable base wire electrodes and direct current reverse polarity may be used with prior written approval from Owner. Request for approval shall include type of electrode and type of shield inert gas proposed by Contractor.



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- 302.12 For carbon steel that is galvanized, the Contractor shall take steps to minimize member distortion by avoiding over-welding, use of balancing welds around neutral axis, use of symmetric member sections and proper pickup and laydown of the fabricated component as well as following S&L Specification Section 050515 – Hot-Dip Galvanizing and ASTM A384.
- 302.13 To facilitate galvanizing, the cleanness of welded areas is important. Thus, the weld electrode shall be uncoated wherever possible, or through removal of welding flux residues is required if a coated electrode is used. Submerged arc weld (SAW) shall be used for heavy weldment. Welding rods with high silica levels should not be used.
303. INSPECTION BY OWNER
- 303.1 Owner may, during the course of the Work, inspect the various phases of Work performed by the Contractor, for compliance with the Contract Documents which includes the Design Drawings. Owner reserves the right to approve the facilities to be used for inspections and examinations.
- 303.2 Owner's inspection will not relieve the Contractor of its obligation for inspection of the welding. Owner's testing agency will not be available for Contractor's use.
- 303.3 The Contractor shall provide, and pay for, access and all rigging required for the examinations performed by Owner or its Inspection Agency. Contractor shall also provide personnel to assist Owner or its Inspection Agency at no additional cost to Owner.
- 303.4 Acceptance of Work by Owner or its Inspection Agency shall not relieve the Contractor in any manner from full responsibility for the Work.
304. INSPECTION BY THE CONTRACTOR
- 304.1 Inspection and examination by the Contractor shall be performed by an independent testing and inspection agency in accordance with the Contractor's procedures approved by Owner. As an alternate, the Contractor's in-house Quality Control Inspectors may be used. Inspectors shall meet one of the following:
- a. Current or previous certification as an AWS Certified Welding Inspector (CWI) in accordance with the provisions of AWS QCI, "Standard and Guide for Qualification and Certification of Welding Inspectors".
 - b. Current or previous qualification by the Canadian Welding Bureau (CWB) to the requirements of the Canadian Standard Association (CSA) Standard W178.2, "Certification of Welding Inspectors".
 - c. Inspection may be performed by an engineer or technician, who, by training or experience, or both, in metals fabrication, inspection and testing, is competent to perform inspection of the Work.
- 304.2 Welding shall be inspected and examined in accordance with the applicable inspection sections of AWS D1.1, AWS D1.3, AWS D1.6 and to the requirements specified herein.
- 304.3 The Contractor shall be responsible for, and shall pay the costs for, the specified inspection for these welds made by the Contractor and its Subcontractors.
- 304.4 The Contractor shall maintain a complete and detailed record of the inspections and tests performed by the Contractor's independent testing and inspection agency, including reports for radiographic, ultrasonic, and magnetic particle inspection methods, in a manner approved by



Owner. Copies of the records shall be submitted to Owner upon request. Records shall be certified by the Contractor's independent testing and inspection agency.

305. EXTENT AND METHOD OF EXAMINATION

305.1 Shop and field weld examination shall be performed in accordance with the following requirements:

- a. All welds shall be 100 percent visually examined in accordance with AWS D1.1, AWS D1.3 and AWS D1.6, as applicable.
- b. Complete joint penetration (CJP) welds for members other than plate girders shall be examined 100% by both ultrasonic and magnetic particle methods. The magnetic particle examination shall be performed prior to performing the ultrasonic examination. For CJP welds in plate thinner than 5/16 in. (8 mm) and which are NOT subject to cyclic transverse applied stress into the tensile range, in lieu of 100% ultrasonic and magnetic particle examination, the welds shall be examined with both AC and DC magnetic particle examination techniques. Such alternative examinations shall be approved by the Engineer prior to performance.
- c. Plate girder flange complete joint penetration (CJP) weld splices shall have 100% radiographic inspection.
- d. Plate girder top and bottom web to flange welds shall have 10% of their total length (additive length, both sides) inspected by magnetic particle or liquid penetrant examination.
- e. Plate girder web complete joint penetration (CJP) weld splices shall have 25% of their total length inspected by random radiographic or ultrasonic examination.
- f. Welding to existing structural steel that is ASTM A7 or ASTM A9 shall be examined in accordance with Article 302 of this Section.

305.2 Radiographic inspection shall conform to applicable requirements of the following specifications; where requirements differ between these specifications, the more restrictive requirements, as determined by Owner, shall apply in each case:

- a. ASTM E94
- b. AWS D1.1
- c. X-ray or gamma ray shall be used in radiography and the quality level shall be 2-2T per ASTM E94.

305.3 Ultrasonic Inspection shall conform to the applicable requirements of ASTM E164 and AWS D1.1.

305.4 Magnetic Particle Inspection shall conform to the applicable requirements of ASTM E709 and AWS D1.1.

305.5 Liquid penetrant inspection shall conform to the applicable requirements of ASTM E165 and AWS D1.1.

305.6 Records of Inspection Work: The Contractor shall maintain a complete and detailed record of the inspections and tests performed by the Contractor, including records for radiographic, ultrasonic, magnetic particle and liquid penetrant inspection methods, in a manner approved by Owner. Copies of the records shall be submitted to the Owner upon request. Records shall be certified.



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- 305.7 Replacement of Unacceptable Welds: Portions of welds and/or material shown by any of the specified inspection and/or testing to be unacceptable shall be cut out and/or re-welded and/or replaced and re-inspected by the same original specified inspection and/or testing until the weld is acceptable.
306. ACCEPTANCE
- 306.1 Welds meeting the acceptance standards of AWS D1.1, AWS D1.3 or AWS D1.6, as applicable, and the requirements of this Section shall be accepted.
- 306.2 Portions of welds and/or material shown by any of the specified inspection and/or testing to be unacceptable shall be cut out and/or re-welded and/or replaced and re-inspected by the same original specified inspection and/or testing until the weld is acceptable.

END OF SECTION 050525



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SECTION 050538

POST-INSTALLED CONCRETE ANCHORS

PART 1 – GENERAL

101. EXTENT

101.1 Material and installation for post installed concrete anchors shall conform to the requirements of this Section.

102. REFERENCE DOCUMENTS

102.1 Standards, Specifications, manuals, codes and other publications of nationally recognized organizations are referenced herein. References to these documents are to the issue date as indicated by the Adopted Building Code. If the document is not referenced in the Adopted Building Code, then the reference is to the latest issue date of the document together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.

102.2 Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state or local codes having jurisdiction.

102.3 Internationally recognized standards equivalent to or more restrictive than those listed may be proposed by the Contractor. ASTM's Handbook of Comparative World Steel Standards DS67, latest edition, can be used as reference guide to compare material standards. Contractor must submit the basis for equivalency for all requested alternative Codes and Standards. Acceptance of alternate Codes and Standards shall be determined by Owner and Owner's Engineer prior to use/purchase by the Contractor.

102.4 Abbreviations listed below refer to the applicable organizations or documents.

102.5 ASTM – ASTM International:

- a. A36/A36M – Structural Steel
- b. A193/A193M – High Strength Structural Steel
- c. A307 – Carbon Steel Bolts and Studs
- d. A615/A615M – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- e. B633 – Electrodeposited Coatings of Zinc on Iron and Steel
- f. B695 – Coatings of Zinc Mechanically Deposited on Iron and Steel
- g. C881/C881 – Epoxy-Resin-Based Bonding Systems for Concrete
- h. E488/E488M – Strength of Anchors in Concrete and Masonry Elements
- i. E1512 – Testing Bond Performance of Adhesive-Bonded Anchors
- j. F593 – Stainless Steel Bolts, Hex Cap Screws and Studs

102.6 ACI – American Concrete Institute:

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- a. 318 – Building Code Requirements for Structural Concrete
- b. 355.2 – Standard for Evaluating the Performance of Post-Installed Mechanical Anchors In Concrete
- c. 355.4 – Qualification of Post-Installed Adhesive Anchors In Concrete
- 102.7 ICC – International Code Council:
 - a. ICC-ES AC01 – Acceptance Criteria for Expansion Anchors in Masonry Elements
 - b. ICC-ES AC58 – Acceptance Criteria for Adhesive Anchors in Masonry Elements
 - c. ICC-ES AC60 – Acceptance Criteria for Unreinforced Masonry Anchors
 - d. ICC-ES AC106 – Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry
 - e. ICC-ES AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements
 - f. ICC-ES AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements
- 102.8 U.S. Federal Government Specifications:
 - a. Federal Specifications A-A-1922A, A-A01923A and A-A-55614 for Expansion and Shield-Type Anchors
- 103. QUALITY ASSURANCE
- 103.1 Post-Installed anchors and related materials shall be listed by one or more of the following agencies, as applicable:
 - a. ICC-ES
 - b. UL and/or FM
- 104. RELATED WORK SPECIFIED IN OTHER SECTIONS
- 104.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:
 - a. Section 013323 – Shop Drawings and Product Data
- 105. SUBMITTALS
- 105.1 Submit product data and manufacturer's installation instructions to Owner for record. All documents shall be submitted in accordance with the requirements of Section 013323.
- 105.2 Test Reports: ICC-ES Code approvals and performance data that includes recommended loading for each application.
- 105.3 Only manufacturers with an ICC-ES Report will be considered for substitution requests. Contractor shall submit, for Engineer's review, calculations that are prepared and sealed by a registered Professional Engineer showing substituted product can achieve an equivalent holding capacity using the appropriate design procedure as required by the Building Code. The calculations should indicate diameter and embedment—with consideration of all applicable reduction and modification factors—for substituted product to achieve equivalent performance of



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that illustrated on the design drawings. Any increase in material costs for such submittal shall be the responsibility of the Contractor.

106. DELIVERY, STORAGE AND HANDLING

106.1 Deliver products to job site in manufacturer or distributor's packaging undamaged, complete with installation instructions.

106.2 Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

PART 2 – PRODUCTS

201. MANUFACTURERS

201.1 Drillco National Group, Astoria, NY 11103

201.2 Hilti Corp., Plano, TX 75024

201.3 ITW Ramset/Red Head, Glendale Heights, IL 60137

201.4 Powers Fasteners, Inc., Brewster, NY 10509

201.5 Simpson Strong-Tie Co., Pleasanton, CA 94588

202. EXPANSION ANCHORS

202.1 Wedge Anchors: Anchors used to transmit load between structural elements shall be designed in accordance the applicable building code. The anchors shall be manufactured from carbon steel, and the expansion clip shall be manufactured from 316 stainless steel. Carbon steel anchors shall have an electroplated zinc finish. Anchors shall be tested in accordance with ICC-ES's Acceptance Criteria for Expansion Anchors in Concrete (AC 193) and Masonry (AC 01) Elements for all mandatory and optional tests.

202.2 Manufacturers and Products:

a. Hilti Corp., Plano, TX: Kwik Bolt-TZ or Kwik Bolt 3 Wedge Anchor

b. Simpson Strong-Tie Co., Pleasanton, CA: Strong-Bolt Wedge Anchor

203. ADHESIVE ANCHORS

203.1 An adhesive anchor shall consist of an insert and an adhesive formula. Inserts shall meet the requirements of ASTM A-307, A-36/A36M, A-193/A193M, or F 1554, for threaded rods, and ASTM A-615/A615M or A-706/A706M for reinforcement bars. For exterior exposure, the insert shall be galvanized per ASTM A-153/A153M or be A 300 series stainless steel, and nuts and washers shall be of the same material. The adhesive formula shall meet one of the following adhesive types:



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- 203.2 Two-Part Chemical Adhesives: Adhesives shall be a cartridge-type, two-component, solid epoxy-based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. [ASTM C881/C881M only applies to epoxies, not other adhesives, such as hybrids.] The adhesive shall meet the minimum requirements of ASTM C-881/C881M Types I, II, IV, and V; Grade 3; Classes A (Acrylic Adhesives only), B and C. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation. Epoxy adhesives shall have an evaluation report issued by ICC-ES Evaluation Service, Inc., and be tested in accordance with ICC-ES's Acceptance Criteria for Adhesive Anchors in Concrete (AC 308) and Masonry (AC 58) Elements.
- 203.3 Manufacturers and Products for Two-Part Adhesives for use with solid base concrete:
- a. Hilti Corp., Plano, TX:
 - a1. HIT-HY 200
 - a2. HIT-RE 500 v3
 - b. ITW Ramset/Red Head, Glendale Heights, IL:
 - b1. C6 Epoxy
 - b2. G5 Epoxy
 - b3. A7 Acrylic
 - c. Powers Fasteners, Brewster, NY:
 - c1. Pure110+
 - c2. PE1000+
 - d. Simpson Strong-Tie Co., Pleasanton, CA:
 - d1. AT
 - d2. SET-XP
 - d3. SET
- 203.4 Manufacturers and Products for use with hollow base materials:
- a. Hilti Corp., Plano, TX:
 - a1. HIT-HY 70
 - b. ITW Ramset/Red Head, Glendale Heights, IL:
 - b1. C6 Epoxy

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- b2. A7 Acrylic
- c. Powers Fasteners, Brewster, NY:
- c1. Pure110+
- c2. AC100+Gold
- d. Simpson Strong-Tie Co., Pleasanton, CA:
- d1. AT
- d2. SET-XP
- d3. SET

203.5 Manufacturers and Products for use when temperature is below 40°F (5°C) during installation:

- a. Hilti Corp., Plano, TX
- a1. HIT-HY 200
- a2. HIT-RE 500 v3
- b. ITW Ramset/Red Head, Glendale Heights, IL:
- b1. A7 Acrylic
- c. Simpson Strong-Tie Co., Pleasanton, CA:
- c1. AT

203.6 Manufacturers and Products for use with potable water:

- a. Hilti Corp., Plano, TX:
- a1. HIT-HY 200
- a2. HIT-RE 500 v3
- b. ITW Ramset/Red Head, Glendale Heights, IL:
- b1. C6 Epoxy
- c. Powers Fasteners, Brewster, NY:
- c1. Pure110+
- c2. PE1000+
- d. Simpson Strong-Tie Co., Pleasanton, CA:
- d1. AT
- d2. SET XP

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d3. SET

203.7 Encapsulated Adhesives: Capsule shall be a two-component; vinylester based adhesive capsule-within-a-capsule system supplied in manufacturer's standard packaging. The capsule is placed in the hole and the resin and initiator components are combined when the rod or rebar is driven to the bottom of the hole through the capsule. No spinning or insert end preparation shall be required for proper installation. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation. Capsule adhesives shall be tested in accordance with ICC-ES's Acceptance Criteria for Adhesive Anchors in Concrete (AC 308) and Masonry (AC 58) Elements for the following:

- a. Long-term creep at elevated temperatures
- b. Critical and minimum edge distance and spacing

203.8 Adhesive Limitations:

- a. Installation Temperature: When the base material temperature drops below 40°F (5°C), only Acrylic Adhesives shall be used for adhesive installations. See manufacturer's instructions for additional minimum temperature requirements.
- b. Hollow Substrates: The adhesive manufacturer's screen tubes shall be used for adhesive installations into hollow substrate material. Encapsulated Adhesives shall not be used in hollow substrate applications.
- c. Moisture: Refer to manufacturer's information when moisture is present in or around hole.
- d. Oversized Holes: Refer to manufacturer's information if drilled hole size is larger than what is recommended.
- e. Core-drilled Holes: Refer to manufacturer's information if holes are drilled with a core-drill bit.

204. CONCRETE AND MASONRY SCREW ANCHORS

204.1 Self-Tapping Concrete and Masonry Screw Anchors: Anchors shall have 360 degree contact with the base material and shall not require oversized or undersized holes for installation. Fasteners shall be manufactured from carbon steel material and zinc plated to a minimum thickness of 0.3 mils (8 microns). Anchors shall have an evaluation report issued by ICC-ES Evaluation Service, Inc. and be tested in accordance with ICC-ES's Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Concrete (AC 193) or Masonry (AC 106) for the following:

- a. Static tension and shear loading
- b. Critical and minimum edge distance and spacing
- c. Manufacturers and Products:
 - c1. Hilti Corp., Plano, TX: KWIK HUS-EZ
 - c2. Simpson Strong-Tie Co., Pleasanton, CA: Titen HD

204.2 High strength, heat-treated anchors are recommended for permanent dry, non-corrosive applications or temporary outdoor applications.

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205. UNDERCUT ANCHORS

205.1 Undercut Anchors: Anchors used to transmit load between structural elements shall be designed in accordance with the applicable building code. Carbon steel anchors shall have an electroplated zinc finish. Anchors shall be tested in accordance with ICC-ES's Acceptance Criteria for Expansion Anchors in Concrete and Masonry Elements (AC 193) for all mandatory and optional tests.

205.2 Manufacturers and Products:

- a. Drillco National Group, Astoria, NY: Maxi-Bolt
- b. Hilti Corp., Plano, TX:
 - b1. HDA-T
 - b2. HDA-P
 - b3. HAD Ductile (For nuclear ACI 349 design)
- c. Power Fasteners, Brewster, NY
 - c1. Atomic+ Undercut

206. ANCHOR SIZES

206.1 Anchor size (nominal diameter and embedment as appropriate) shall be as indicated on the Design Drawings. If not indicated on these drawings, sizes shall be provided as required to maintain not less than the appropriate Code safety factors over manufacturer's performance load tables. If the actual concrete compressive strength is not known, the compressive strength shall be determined through testing.

PART 3 - EXECUTION

301. INSTALLATION

301.1 General:

- a. Drilled in concrete anchors shall be installed in accordance with the manufacturer's printed instruction/Specifications and to the requirements specified herein. In case of conflict, the requirements specified herein shall govern. The locations where anchors will be installed, and the sizes and types of anchors, shall be as indicated on the Design Drawings.
- b. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used unless otherwise permitted specifically by the Owner.
- c. The minimum projection of the threaded part of a bolt beyond the nut shall be 1/4 inch (6 mm), after anchor installation is completed. The projection over 1/4 inch (6 mm) shall not be removed without Owner's approval.
- d. The overall anchor length and hole depth that is required shall be determined by the Contractor such that the specified minimum effective embedded length and bolt projection can be obtained.

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- e. Holes for the anchors may be drilled through hardened grout, finished concrete, or surface repaired concrete, but the effective embedded length shall be determined from the surface of the rough concrete. Holes shall not be drilled through grout or concrete that has not completely hardened, nor shall grout or concrete be placed around untightened anchors.
 - f. Reuse of anchors WILL NOT BE PERMITTED.
 - g. One-quarter inch (6 mm) diameter anchors are allowed in all locations as indicated on the Design Drawings provided the required hole depth is less than the depth of the concrete covering the main reinforcement.
 - h. Welding of/to anchors WILL NOT BE PERMITTED.
 - i. Expansion anchors shall not be used for equipment subjected to vibration (i.e. rotating machinery) or to support piping subjected to flow induced vibrations.
 - j. Minimum effective embedded lengths (L_e), spacings (S), edge distance (ED), and distance to embedded steel (ES) shall be adjusted as follows under certain conditions:
 - j1. When two anchors of different diameters are installed adjacent to each other, the dimension “ S ” shall be the average of the two “ S ” dimensions for these diameters, respectively.
 - j2. If dimensions ED , ES and S cannot be maintained between two anchor assemblies, the allowable erection tolerance indicated on the Design Drawings shall be used to resolve the problem. If the problem involves anchors installed by two different Contractors, their erection tolerances shall be used, or Owner shall be notified for a resolution.
 - j3. Distance from the centerline of an anchor to the edge of an embedded steel plate shall equal to or less than S .
 - k. Unless otherwise indicated, no post installed concrete anchor shall be installed at the following locations:
 - k1. The bottom of a concrete beam.
 - k2. The top and sides of the concrete beam, at each end within a clear distance equal to $1/4$ clear span of the beam.
 - k3. The bottom of concrete slabs on metal deck, at the ribs of the deck.
 - l. Anchor relocation tolerances may be provided by the Engineer of Record to avoid cutting of reinforcing steel.
- 301.2 Drilling of Holes:
- a. For all anchors except undercut anchors, holes in concrete shall be drilled with quality carbide tipped solid bits, using a rotary or percussion-type power drill. For undercut anchors use the special undercutting tool supplied by the bolt manufacturer (this tool shall be set to correspond to the anchor sleeve length to make the undercut at the specified embedded depth).
 - b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are



encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

- c. Each hole shall be drilled precisely in order to maintain the anchor's pullout value. The tolerances on the bit shall be as specified by the anchor manufacturer for each anchor size. The anchor shall be no more than 6° out of plumb after installation of undercut anchors or 10° out of plumb after installation of other anchors. Holes shall be cleaned in accordance with the manufacturer's recommendations. Square or rectangular beveled washers shall be used to maintain full bearing of the nut.
- d. The maximum depth of the hole shall not be greater than the thickness of the concrete minus 2½ inches (65 mm).
- e. Holes for the anchors shall not be drilled until the concrete has been cured for a minimum of 28 days.
- f. If drilled holes are not used, they shall be filled with dry-pack grout.
- g. Cutting of reinforcing steel or the use of a diamond tip drill bit is not allowed in elevated slabs or concrete superstructure members (beams and columns) without prior approval by the Owner.

301.3 Tightening of Anchors:

- a. After the anchors are driven into the holes, they shall be brought to a "hand-tight" condition so that all parts of the connection are in good contact with one another.
- b. Anchors shall be tightened to the torque values recommended by the manufacturer. Contractor shall exercise caution not to overtorque the anchor causing damage to the concrete or anchor. Tightening shall proceed systematically from the most rigid or inner part of the connection to its free edges. During this operation, there shall be no rotating of the parts except the nuts and washers.
- c. For Undercut Anchors, tensioning of the bolt with a hydraulic tensioning device is permitted for anchors 3/4 inch (20 mm) diameter and less and is mandatory for larger diameter bolts.
- d. A calibrated torque wrench shall be used for tightening anchors. Calibration and recalibration shall be performed on the following frequency:
 - d1. For a direct reading torque wrench, on a monthly basis.
 - d2. For a snap-type torque wrench, on a monthly basis.
 - d3. For an air-driven impact wrench, on a daily basis.

301.4 Repair of Failures: Failures shall be rectified as follows:

- a. Concrete Failure (this includes all cracking or spalling of the concrete in the vicinity of an installed anchor):
 - a1. Concrete shall be repaired in accordance with the project concrete repairing procedure.
 - a2. After the concrete has been repaired, the anchor hole may be redrilled, in accordance with Article 301.2 of this Section.



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- b. Anchor Failure (this includes anchor breakage, slippage or loosening to the extent that the anchor cannot be tightened to the installation torque):
 - b1. If the unacceptable anchor can be removed without damaging the surrounding concrete, the hole may be redrilled and the anchor replaced with the next larger size anchor. The effective embedded length shall conform to the requirements of the manufacturer.
 - b2. If the unacceptable anchor cannot be removed without damaging the surrounding concrete, the anchor location shall be moved within the tolerance given for the connection by the Engineer of Record. The minimum center-to-center distance from the unacceptable anchor to the replacement hole shall be 2 times the nominal bolt diameter. If this distance exceeds the given tolerance on the placement of the anchors, Owner shall be notified before proceeding.

302. INSPECTION AND TESTING

- 302.1 Special inspection, periodic or continuous, of post-installed anchors shall be provided as required by ICC Reports and/or as specified by the Engineer of Record. This service shall be performed by an independent testing/inspection agency hired by the Contractor.
- 302.2 The Engineer of Record may require pullout or shear tests, in addition to Special Inspection to determine the adequacy of the anchors. A field testing program shall be established by the independent test laboratory and/or the Engineer of Record and performed in accordance with appropriate ASTM test standards. Field tests shall be non-destructive when at all possible.
- 302.3 Owner may, during the course of the Work, inspect the various phases of the Work at the Project Site, for full compliance with the requirements specified herein and to the requirements indicated on the Design Drawings. Any Work failing to meet the specified requirements shall be rectified or replaced by Contractor at its expense.

END OF SECTION 050538

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SECTION 051223

STRUCTURAL STEEL AND GALLERY WORK FABRICATION

PART 1 - GENERAL

101. EXTENT

- 101.1 Furnishing and fabrication of structural steel and gallery work shall conform to the minimum requirements of this Section. The Work shall include but is not limited to the following:
- a. Furnishing, fabricating, and delivering structural steel.
 - b. Preparing shop detail drawings which includes establishing connection configuration for connections designed by Others.
 - c. Preparing field erection drawings.
 - d. Preparing master bills of material and bolt lists.
 - e. Coating of ferrous metal surfaces.
 - f. Installing piece marks on fabricated components and using a bar code marking system to track fabricated material through the procurement, fabrication, and delivery process.
 - g. Furnishing electronic 3D model files of the detailed structure.
 - h. Furnishing, fabricating, and delivering gallery work.
 - i. Furnishing, fabricating, and delivering post installed anchor rods in accordance with Section 050538.
 - j. Unload, store, remove from storage, and erect all structural steel and gallery work furnished by the Contractor.
- 101.2 Work by Others:
- a. Connection design will be by the Consulting Engineers. Geometric detailing of the connection configuration is the Contractor's responsibility.
 - b. Unload, store, remove from storage, and erect all structural steel and gallery work furnished by

102. RELATED WORK SPECIFIED IN OTHER SECTIONS

- 102.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:
- a. Section 013323 - Shop Drawings and Product Data
 - b. Section 050523 - Bolting
 - c. Section 050525 - Structural Welding
 - d. Section 050538 – Post Installed Anchor Rods
 - e. Section 051224 - Structural Steel and Gallery Work Erection
 - f. Section 099113 - Coatings Systems

103. REFERENCE DOCUMENTS

- 103.1 Related standards, Specifications, manuals, codes, and other publications of nationally recognized organizations are referenced herein. Methods, Equipment, and materials shall comply with applicable or specified portions of the referenced documents, in addition to the federal, state, or local codes having jurisdiction. References to these documents shall be to the latest issue date of each document, unless otherwise indicated herein or by the Adopted Building Code, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.
- 103.2 For international projects, the internationally accepted Codes & Standards not listed in this specification shall be acceptable if they are equal to or better than the Codes & Standards referenced herein and/or proposed by the Contractor. The acceptance of those international Codes & Standards shall be determined by the Owner and the Owner's Engineer.
- 103.3 AISC – American Institute of Steel Construction:
- a. AISC 360 – Specification for Structural Steel Buildings.
 - b. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.
 - c. AISC 325 – Steel Construction Manual.
 - d. AISC 341 – Seismic Provisions for Structural Steel Buildings.
 - e. AISC 326 – Detailing for Steel Construction.
- 103.4 ASTM – ASTM International:
- a. By Recommended Practice, Test Method or Specification noted.
- 103.5 ICC – International Code Council:
- a. IBC – International Building Code
- 103.6 RCSC – Research Council on Structural Connections:
- a. Specification for Structural Joints Using High Strength Bolts (Referred to as RCSC Bolt Specification).
- 103.7 Society for Protective Coatings
- a. SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- 103.8 OSHA – Occupational Safety and Health Administration:
- a. Regulation 29CFR, Part 1910 Subpart D, Occupational Safety and Health Standards
- 103.9 Miscellaneous:
- a. ANSI/ASSE A1264.1 – Safety Requirements for Workplace Walking/Working Surfaces & Their Access; Workplace Floor, Wall and Roof Openings; Stairs & Guardrails Systems.
 - b. ASME B18.2.6 – Fasteners for Use in Structural Applications
 - c. ASME B18.2.6M – Metric Fasteners for Use in Structural Applications

- 103.10 AWS – American Welding Society:
- a. D1.1 – Structural Welding Code – Steel
 - b. D1.3 – Structural Welding Code – Sheet Steel
 - c. D1.6 – Structural Welding Code – Stainless Steel
 - d. Z49.1 – Safety in Welding, Cutting and Allied Processes
104. SUBMITTALS
- 104.1 Submit the following documents in accordance with the submittal requirements of Section 013323 prior to the delivery of the fabricated structural steel and gallery work to the Project Site, unless otherwise noted:
- a. Shop detail and erection drawings prepared in accordance with the requirements of Article 203 of this Section. These documents shall be submitted and accepted as Status 1 or 2 prior to the start of fabrication. A minimum of two hard copies of the drawings shall be sent to the Consulting Engineer for review.
- 104.2 Approved Supplier shall submit proof of certification by the AISC Quality Certification Program to the Engineer prior to issuance of purchase order. If evidence of AISC Certification is not available, the contractor shall submit an inspection plan that addresses the quality assurance inspection requirements of AISC 360.
- a. A drawing submittal schedule shall be developed by the Contractor and provided to the Consulting Engineer at least two weeks prior to submitting the first drawing package for review.
105. QUALITY ASSURANCE AND CONTROL
- 105.1 Preference will be given to Contractors who are certified by the AISC Quality Certification Program. Possession of this certification along with an established, written procedural and quality control program is mandatory for the Supplier to be permitted to perform work on Supplier's premises without special inspection as per IBC Code Chapter 17. At completion of fabrication, the fabricator shall submit a certificate of compliance to the Owner and the Owner's Engineer for submittal to the building official stating that the work was performed in accordance with the approved construction documents.
- 105.2 Fabricate structural steel and gallery work members in accordance with AISC 360 and 303.
- 105.3 Promptly notify Owner whenever design drawings for any portion of structure are not clearly indicated.
- 105.4 The Contractor shall maintain certificate of Compliance (COC) for the material specified herein. These COCs shall be submitted if requested.
- 105.5 The Contractor shall maintain certified Material Test Reports (CMTRs) and other reports required by applicable codes for structural steel and gallery work. These CMTRs shall be submitted if requested. Reports and tests which cannot be performed and documented until fabrication has started shall be submitted, if requested, not later than 2 weeks after fabrication is complete. Document shall be traceable to the steel members.
- 105.6 Quality control procedures for shop bolting and welding are specified in Sections 050523 and 050525 respectively.
- 105.7 Quality control procedures for shear stud connectors are specified in Section 050526.

- 105.8 Quality control procedures for the preparation of surfaces and shop application of coating on ferrous metal surfaces are specified in Section 099113.
- 105.9 Contractor's quality control procedures for galvanized steel shall include the following:
- Procedures for examination of potential cracks at re-entrant corners of coped W shapes before and after galvanizing.
 - Procedures for examination of potential undersized holes for bolts and anchor rods after galvanizing.
 - Procedures to verify that the faying surfaces for slip critical connections have been hand wire brushed after galvanizing.
106. INSPECTIONS AND TESTS
- 106.1 Contractor shall enlist the services of an independent testing laboratory to perform in-place and laboratory tests, as applicable, to ensure compliance with these specifications. Testing Agency shall meet and follow the requirements of ASTM E329, "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing", including but not limited to Section 9, Responsibilities and Duties.
- 106.2 Owner will, during the course of fabrication, inspect work underway at the shop(s), and again after delivery at the project site, for full compliance with requirements specified herein. Such examinations do not relieve the Contractor of the responsibility of performing the required inspections and tests nor of the responsibility for providing material and completed fabrications in compliance with the specified requirements.
- 106.3 Even though Owner may inspect structural steel and gallery work at the plant before shipment, Owner reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.
- 106.4 Resolution of Non-Complying Work:
- Contractor is responsible to correct deficiencies in structural steel and gallery work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at no additional cost to Owner as may be necessary to reconfirm any noncompliance of the original work, and as may be necessary to show compliance of corrected work.
 - Fabrication errors shall be rectified as specified in AISC 303. Promptly replace material or fabricated components that do not comply.
 - Errors in shop fabrication that prevent proper field assembly and fit up will be reported, as soon as they are discovered, to Owner and to the Fabrication Contractor by the Steel Erection Contractor. The Fabrication Contractor shall then make immediate substitution of the nonconforming component or arrange for a field correction to be made. Whether the correction is made by substitution or field correction, it shall be performed at no cost to Owner.
 - The allowable limits for reaming the connection bolt holes for fit up in the shop or in the field shall conform to the requirements of Specification Section 050523 (Bolting). If fit up of bolts during erection in the field cannot be obtained by reaming the fabricated bolt holes within these limits, it is considered that there are errors in fabrication, and these errors shall be rectified as noted above. Correction of misaligned bolt holes by the use of flame cutting is not permitted.

107. HANDLING AND STORAGE

- 107.1 All material shall be handled with due care at the Contractor's (or its subcontractors', if any) shop(s) in order to avoid damage to, or deterioration of, the materials before, during and after fabrication, and during delivery. Special care shall be exercised to properly protect shop coated surfaces.
- 107.2 During storage of material at the Contractor's (or its subcontractors', if any) shop(s), due care shall be exercised to store materials off the ground (and temporarily covered, if required) in order to avoid damage to, or deterioration of, the materials from foreign elements and from water, mud, snow, ice or other deleterious materials on the ground.
- 107.3 Comments on the shipping sequence will be provided by the Owner in concert with the erector. The fabricated material shall be delivered to the Project Site in accordance with the agreed upon shipping sequence to permit continuous and orderly erection of the Work in the field by others. Include shipping lists with each shipment of steel.

108. 3D MODEL FILES

- 108.1 The Contractor shall provide 3D model files for use by the Engineer to check interferences with other utilities. Files shall be based on the actual model to create the shop detail drawings.
- 108.2 Required Elements:
- a. Plate elements such as gusset plates, base plates and stiffener plates.
 - b. Primary structural members such as beams, bracing, columns, and girders.
 - c. Secondary structural members such as, but not limited to, girts, purlins, stair stringers, posts and hangers.
- 108.3 Data Format:
- a. 3D model information shall be submitted in one of the following formats (listed in order of preference):
 - a1. MicroStation based (dgn) file.
 - a2. AutoCAD based (dwg) file.
 - a3. Frameworks compatible MDL File exported directly from the shop detailing software.
- 108.4 General Requirements:
- a. Model files shall be divided into building tiers to allow for ease of handling and maintenance.
 - b. Detailing model shall be kept up to date as changes or corrections are made.
 - c. Contractor shall submit model files with shop drawings.

109. MEASUREMENT AND PAYMENT

- 109.1 Calculation of Weights:
- a. Calculation of weights of materials furnished shall be in accordance with the requirements specified in AISC 303 for material sold on a price per pound (price per kilogram) basis.
 - b. Attention is specifically directed to the requirements of AISC 303 that when parts can be economically cut in multiples (or nested) from material of larger dimension, the weights shall be calculated on the basis of the dimensions of the material from which the parts are cut.

PART 2 - PRODUCTS

201. MATERIAL REQUIREMENTS

201.1 Structural Steel Materials:

- a. Materials shall conform to the requirements of this specification and the design drawings. Contractor shall not substitute materials without prior written approval from the Owner. Shop drawings shall accurately identify materials used in fabrication.
- b. Wide flange W and WT shapes: ASTM A992/A992M. Shapes with flange thickness exceeding 2 inches (50 mm) and spliced using complete joint penetration groove welds shall be supplied with Charpy V-Notch testing in accordance with ASTM A6/A6M, Supplementary Requirement S30. The impact test shall be conducted in accordance with ASTM A673/A673M, Frequency H, and shall have a minimum average value of 20 ft-pounds (27 J) absorbed energy at +70°F (+21°C).
- c. Cover plates for reinforcement of columns, beams, or girders: ASTM A572/A572M Grade 50 (Grade 345) or as specified on the design drawings. For plates exceeding 2 inches (50 mm) thick and spliced or connected to other members using complete joint penetration groove welds shall be supplied with Charpy V-Notch testing in accordance with ASTM A6/A6M, Supplementary Requirement S5. The impact test shall be conducted in accordance with ASTM A673/A673M, Frequency P, and shall have a minimum average value of 20 ft-pounds (27 J) absorbed energy at +70°F (+21°C).
- d. Base plates, stiffeners and gusset plates for bracing connections: ASTM A572/A572M Grade 50 (Grade 345).
- e. Angles: ASTM A529/A529M Grade 50 (Grade 345).
- f. Guard plates, ladders, ladder cages, sag rods, channels, S shapes, and miscellaneous steel: ASTM A36/A36M.
- g. HSS square and rectangular sections: ASTM A500/A500M Grade C with minimum yield strength equal to 50 ksi (345 MPa).
- h. HSS round sections: ASTM A500/A500M Grade C with minimum yield strength equal to 46 ksi (315 MPa).
- i. Pipe sections: ASTM A53/A53M Gr. B with minimum yield strength equal to 35 ksi (240 MPa).

202. GENERAL DESIGN AND CONFIGURATION REQUIREMENTS

- 202.1 The design of shop and field connections, which includes connection angles, welds, web reinforcement for coped beams, gusset plates and bolts has been performed by the Consulting Engineers. Connection configuration and detailing shall be by the Contractor and shall be submitted to the Consulting Engineers for review prior to fabrication. Such review shall in no way be interpreted as constituting approval and shall not relieve the Contractor of its responsibility for the preparation of shop detail and erection drawings, the correction of field fit-up problems or from fulfilling all obligations under the Contract.
- 202.2 The connections to be detailed and furnished by the Contractor are indicated on the design drawings.
- 202.3 Contractor shall be responsible for the design of any additional miscellaneous steel required to support grating panels at openings and cutouts through grating panels.
- 202.4 The rework of gallery components to remedy interferences of Contractor-supplied items is the Contractor's responsibility. Rework shall be done at no cost to Owner.

203. SHOP DETAIL AND ERECTION DRAWINGS

- 203.1 Prepare shop detail, erection drawings and master bills of material in accordance with the provisions of AISC 303 and 326 and the requirements of Section 013323. The drawings shall show in detail the sizes of each component, the axes of each component, type and grades of steel, connections and welding details, method of assembly, hardware and anchorages or connections with other work and areas to be painted or galvanized.
- 203.2 Shop drawings shall show the details of the connection configuration.
- 203.3 Erection drawings shall show all necessary details needed for the erector to completely install all elements shown on the design drawings.
- 203.4 Shop drawings for galvanized steel shall clearly identify all faying surfaces of slip critical connections. The Erection and Shop drawings shall include notes that specify that the faying surface shall be roughened by hand wire brushing.
- 203.5 Shop drawings shall include bills of material for fabrication and assembly of structural steel and gallery work components including quantity, material type and weight.
- 203.6 Indicate profiles, sizes, spacing, and locations of structural steel and gallery work members, openings, attachments and fasteners.
- 203.7 Provide bolt lists for all connections, indicating the size, length and quantity for each connection.
- 203.8 Include details of cut outs, connections, camber, holes, and other pertinent data.
- 203.9 Indicate welded connections with standard AWS welding symbols. Show size, length, and type of each weld. Contractor's shop detail and erection drawing shall clearly distinguish between shop and field welding.
- 203.10 Indicate fabrication requirements for plumbing and leveling as specified in Part 3 of this Section and AISC 303.
- 203.11 Indicate where temporary tabs and seat angles are used for double sided connection and holes for safety cable to assure OSHA compliant erection procedure.
- 203.12 Piece mark numbers shall be arranged on the erection drawings at the same end of the member that the piece mark is physically located on the fabricated member. The piece mark location shall also be shown on the shop detail of that member. See marking system requirements presented in Article 207 of this Section.
- 203.13 The shop detail and erection drawings shall be submitted to the Owner and the Consulting Engineers for review and acceptance prior to fabrication. The review will be for general consideration only to see that the intent of the design has been met. Review by the Consulting Engineer shall in no way be interpreted as constituting approval and shall not relieve the Contractor of its responsibility for the preparation of shop detail and erection drawings. Compliance with requirements for material fabrication and erection of structural steel and gallery work is the Contractor's responsibility.
- 203.14 The correction of field fit-up problems that are caused by misfabrication or by the errors on the Contractor's shop detail drawings are the responsibility of the Contractor.
- 203.15 When the web or flange of a plate girder cannot be fabricated from a continuous piece, the Contractor shall submit the proposed splice locations to the Owner prior to detailing.

204. CONNECTIONS

204.1 Connections shall be made with welded joints or high-strength bolted joints, in the shop or field as indicated on the design drawings.

204.2 High-Strength Bolting: High-strength bolts for connections shall conform to the requirements of Section 050523.

204.3 Shop Connections:

- a. The use of combination joints (i.e. welding in combination with the high-strength bolting when bolting is completed prior to welding) is not permitted. Note, this restriction is not to be confused with the shop welding and field bolting connection design.
- b. Shop connection shall be fitted with tabs, seat angles, or other devices to provide for OSHA compliant erection procedures for floor framing. These details shall be reviewed and approved by the Contractor's Registered Professional or Structural Engineer prior to fabrication.

204.4 Field Connections:

- a. Connections of new steel and gallery work to existing steel shall be by welding. Seat angles shall be furnished to temporarily support framing, where applicable, during erection.
- b. Other connections shall be made with high-strength bolts, unless otherwise indicated.

204.5 Welding:

- a. Welding shall conform to the requirements of Section 050525.
- b. Shop welding shall be clearly indicated on the shop drawings.
- c. Field Welding: The Contractor shall provide end and edge preparations for prequalified field welded joints and clearly identify field welds on the erection drawings.

204.6 Beam Connections:

- a. Welded and bolted connections shall be as indicated on the design drawings.

204.7 Connection Angles:

- a. The usual gauge on the outstanding legs of connection angles, as indicated on the design drawings, shall be maintained. For shop bolting, bolt stagger shall be used only where required to maintain the usual gauge unless otherwise indicated.
- b. Connection angles for any deep girder shall be continuous from the top flange to the bottom flange in all cases.
- c. Knife Connection: This connection, consisting of two connection angles shop attached to the supporting member to receive the web of a beam in field erection, shall not be used.

205. MISCELLANEOUS DETAILS

205.1 Bracing connection design has been performed by the Consulting Engineers. The minimum connection design is indicated on the design drawings. The Contractor will be responsible for the geometric configuration and detailing of the bracing connection in accordance with the following requirements:

- a. Long single-angle cross-bracing members shall be fabricated with a draw, or reduction, in the actual center-to-center distance of end connection bolt holes (as compared to the theoretically

correct distance) as indicated in the table below. No draw shall be provided for double-angle, tubular or other shape bracing:

Draw Requirements for Single-Angle Bracing

<u>Length</u>	<u>Draw</u>
0 to 10 ft. (0 to 3 m)	-
Over 10 ft. to 20 ft. (3 m to 6 m)	1/16 in. (1.5 mm)
Over 20 ft. to 35 ft. (6 m to 10 m)	1/8 in. (3 mm)
Over 35 ft. (10 m)	3/16 in. (5 mm)

- b. Double-angle bracing members shall have long legs back-to-back unless otherwise indicated.
 - c. The physical dimensions of gusset plates for horizontal and vertical bracing shall be configured to conform to the dimension indicated on the design drawings whenever practical. If the Contractor cannot meet the dimensions indicated or a particular situation, he shall inform the Owner and Consulting Engineer of the minimum dimensions he can meet. The Owner and Consulting Engineer will review and advise the Contractor as to the acceptance of his proposed alternative detail.
 - d. The minimum thickness of gusset plates for horizontal and vertical bracing shall be 3/8-inch (10 mm). If the design drawings show different gusset plate thicknesses at the end of a brace, the fabricator shall use the larger thickness for both ends and adjust the minimum weld requirements.
- 205.2 Hangers shall have a minimum of two 7/8-inch (22 mm) diameter ASTM A325 bolts at each end as specified in Section 050523, unless otherwise indicated.
- 205.3 Columns shall be fitted with holes or other suitable devices, as applicable, for the installation of safety cables at all working platform levels in accordance with OSHA requirements.
- 205.4 Condition of Steel Prior to Fabrication:
- a. Surfaces of steel prior to fabrication shall correspond only to rust Grade A, B, or C, as indicated in SSPC-VIS 1.
 - b. Rust Grade D, as indicated in SSPC-VIS 1 IS NOT PERMITTED.
206. MARKING SYSTEM
- 206.1 The piece mark shall be identified by one weld-on tag, or other permanent type marking at the proper erection orientation for structural steel members. Miscellaneous items shall be identified with a wire-on tag. All painted material shall have wire on identification tags.

PART 3 - EXECUTION

301. GENERAL

- 301.1 Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications, other referenced publications and standards, as indicated on the shop drawings and as herein specified.
- 301.2 Properly mark and match-mark materials for field assembly. Fabricate for the delivery sequence that will expedite erection and minimize field handling of material.
- 301.3 Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

301.4 Fabricated material shall be delivered to Project Site in accordance with approved schedules so as to permit continuous and orderly erection of the Work in the field.

302. FABRICATION REQUIREMENTS FOR PLUMBING-UP AND LEVELING

302.1 The specification for the erection of structural steel, Section 051224, requires that steel structures shall be plumbed and leveled such that deviations in the completed construction do not exceed the requirements of AISC 303 and as supplemented by the following requirements:

a. Milled Ends of Column Splices and Column Baseplates shall be in accordance with AISC 303 and 360.

302.2 These requirements shall be fully considered in fabrication, and the Contractor's shop erection drawings shall be clearly marked with these restrictions.

303. SURFACE PREPARATION AND COATING

303.1 Surface preparation and coating of ferrous metal surfaces shall conform to the requirements of Section 099113.

303.2 Galvanizing of structural steel and/or grating (when specified):

a. Hot-dip galvanized items shall be in accordance with the applicable requirements of ASTM A123/A123M, A153/A153M, and A385/A385M, Section 050515, Section 099113 and as herein specified. Poorly galvanized work is not permitted. Galvanize after fabrication. Take safeguards against warpage or bending per ASTM A384/A384M.

304. FABRICATION WORK

304.1 General:

- a. Fabrication shall be performed in accordance with AISC 303 and as specified herein.
- b. Fabricate items with joints tightly fitted and secured.
- c. Fit and shop assemble sections in largest practical sizes for handling.
- d. Welding shall conform to the requirements of Section 050525.
- e. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.
- f. Make exposed joints butt tight, flush, and hairline.
- g. Accurately form components required for anchorage of stairs, landings, and railings to each other and to building structure.

305. FIELD ERECTION

305.1 Field erection of structural steel shall conform to the requirements of Section 051224.

END OF SECTION 051223



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SECTION 051224

STRUCTURAL STEEL AND GALLERY WORK ERECTION

PART 1 - GENERAL

101. EXTENT

- 101.1 Erection of structural steel and gallery work shall conform to the requirements of this Section and to the applicable requirements of AISC 303 and 360, unless otherwise indicated on the Design Drawings or as required for the Work.
- 101.2 The Contractor's Work shall include but not be limited to the following:
- a. Unloading, storing, protecting, removing from storage, and erecting the following:
 - a1. Structural steel columns, base plates, bracing, trusses, and framing.
 - a2. Structural steel for the support of gallery Work.
 - a3. Gallery Work which includes stairs, grating, handrails, ladders, guardplates, etc.
 - a4. Steel floor (metal) decking.
 - b. Furnishing and installing grating fasteners (clips).
 - c. Designing, furnishing, and installing supplemental steel and connections to provide adequate grating support at field cutouts.
 - d. Connecting new structural steel and gallery steel to existing steel, including installation of erection seat angles, and connecting materials.
 - e. Performing all bolting Work for field connections.
 - f. Furnishing welding electrodes and performing welding for field welded joints which are included in the Work.
 - g. Furnishing and installing post-installed concrete anchors for gallery steel as indicated on design drawings.
 - h. Furnishing and installing shear stud connectors as indicated on design drawings.
 - i. Laying out and verifying lines and grades.
 - j. Grouting of column baseplates.
 - k. Furnishing and installing miscellaneous incidental materials required for steel erection, such as drift pins, leveling plates, shims, etc.
 - l. Furnishing and installing all rigging and hoisting equipment required for steel erection.
 - m. Designing, furnishing, and installing all temporary shoring and bracing members required to maintain the stability of the structure during erection.
 - n. Field touchup of galvanized and coated surfaces.

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- o. Quality Control and Quality Assurance Documentation.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS

102.1 The Work specified in this Section shall be coordinated with Work specified in the following related Sections:

- a. Section 013323 – Shop Drawings and Product Data
- b. Section 036241 – Grout Work
- c. Section 050523 – Bolting
- d. Section 050525 – Structural Welding
- e. Section 050538 – Post-Installed Concrete Anchors
- f. Section 051223 – Structural Steel and Gallery Work Fabrication
- g. Section 099113 – Coating Systems

103. REFERENCE DOCUMENTS

103.1 Related standards, specifications, manuals, codes and other publications of nationally recognized organizations are referenced herein. Methods, equipment, and materials shall comply with applicable or specified portions of the referenced documents, in addition to federal, state, or local codes having jurisdiction. References to these documents shall be to the latest issue date of each document, unless otherwise indicated herein or by the Adopted Building Code, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.

103.2 For international projects, the internationally accepted Codes & Standards not listed in this specification shall be acceptable if they are equal to or better than the Codes & Standards referenced herein and/or proposed by the Contractor. The acceptance of those international Codes & Standards shall be determined by the Owner and the Owner's Engineer.

103.3 AISC – American Institute of Steel Construction:

- a. AISC 360, "Specification for Structural Steel Buildings"
- b. AISC 303, "Code of Standard Practice for Steel Buildings and Bridges"
- c. AISC 325, "Manual of Steel Construction"
- d. AISC 341, "Seismic Provisions for Structural Steel Buildings"

103.4 ANSI – American National Standards Institute:

- a. A10.13 – Safety Requirements for Steel Erection
- b. A14.3 – Fixed Ladders – Safety Requirements

103.5 ASTM - ASTM International:

- a. By Recommended Practice, Test Method, or Specification noted.



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- 103.6 ICC – International Code Council:
 - a. IBC – International Building Code
- 103.7 AWS – American Welding Society:
 - a. D1.1, Structural Welding Code – Steel.
 - b. D1.3, Structural Welding Code – Sheet Steel
- 103.8 NAAMM – National Association of Architectural Metal Manufacturers:
 - a. MBG 531, Metal Bar Grating Manual.
 - b. MBG 532, Heavy Duty Metal Bar Grating Manual.
- 103.9 ASSE – American Society of Safety Engineers:
 - a. A1264.1, Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems.
- 103.10 OSHA – Occupational Safety and Health Administration:
 - a. Regulation 29CFR, Part 1910, Occupational Safety and Health Standards.
- 103.11 RCSC – Research Council on Structural Connections:
 - a. Specification for Structural Joints Using High Strength Bolts (Referred to as RCSC Bolt Specification).
- 103.12 Society for Protective Coatings:
 - a. SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.
- 103.13 SDI – Steel Deck Institute
 - a. SDI Publication No. 31 – Design Manual for Composite Decks, Form Decks and Roof Decks
- 104. QUALITY ASSURANCE
- 104.1 Inspection requirements are provided in Article 314 of this Section.
- 104.2 Notify Owner of deficiencies in structural steel and gallery work which are not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any noncompliance of the original Work, and as may be necessary to show compliance of corrected Work.
- 104.3 Welding shall be in accordance with Section 050525.
- 104.4 High strength bolting shall be in accordance with Section 050523.
- 104.5 Furnishing and installation of shear stud connectors shall be in accordance with Section 050526.
- 104.6 Resolution of Non-Complying Work:



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- a. Fabrication errors shall be rectified as specified in the AISC 303. Erector shall promptly remove and notify Owner of material or fabricated components that do not comply.
- b. Errors in shop fabrication which prevent proper field assembly and fit up will be reported, as soon as they are discovered, to the Owner and to the Fabricator by the contractor who erects the steel. The Fabricator shall then make immediate substitution of the nonconforming component or arrange for a field correction to be made. Whether the correction is made by substitution or field correction, it shall be performed at no cost to the Owner.

105. UNLOADING, HANDLING, AND STORAGE

- 105.1 Materials shall be unloaded, handled, and stored in a manner to avoid damages to, or deterioration of, the materials. Special care shall be exercised to properly protect galvanized or coated surfaces.
- 105.2 Store materials to permit easy access for inspection and identification.
- 105.3 Store plates and shapes on timber cribbing or equivalent. Store fasteners and other small size materials in barrels, crates or similar containers on cribbing, to allow air circulation and avoid trapping water.
- 105.4 Surfaces of materials contaminated with sand, earth, mud, or other foreign elements shall be cleaned prior to erection.
- 105.5 Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed at the expense of Contractor.
- 105.6 Locate and store steel in a manner to facilitate the sequence and method of erection.

106. FIELD CUT GRATING PENETRATIONS

- 106.1 Price adjustment to Contractor for cutting and banding grating openings in the field and designing, furnishing, and installing supplemental grating support steel will be on a Firm Unit Price basis as agreed upon between Owner and Contractor.
- 106.2 The agreed upon Firm Unit Prices shall also be used for credits to Owner for openings indicated on Design Drawings and not actually cut by Contractor.

PART 2 - PRODUCTS

201. MATERIAL

- 201.1 Material will be as indicated on the shop detail and erection drawings furnished by the Fabricator.
- 201.2 For weld material, see Section 050525 – Structural Welding.
- 201.3 Contractor shall select fasteners for attaching the grating to support steel based on the following:
 - a. Saddle clips shall be stainless steel and attached to support steel with stainless steel self-tapping/drilling fasteners or welded studs.
 - a1. Self-tapping/drilling fastener bolts, 1/4 inch (6 mm) diameter minimum, stainless steel, adequate hardness to penetrate 3/8 inch (10 mm) steel, per ASTM A240/A240M, Type 410.



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- a2. Welded Studs, 1/4 inch (6 mm) diameter, stainless steel conforming to ASTM A276, Type 304. CPL Nelson Studs are approved for use. Use cadmium plated nuts for studs. Welding Material: Per AWS D1.1.
- b. Approved Manufacturers:
 - b1. Carolina Grating Co., Inc., Rock Hill, SC 29731.
 - b2. Nucor Grating, Wexford, PA 15090.
 - b3. Harsco Industrial IKG, Division of Harsco Corp., Channelview, TX 77530.
 - b4. AMICO, A Gibraltar Industries Company, Birmingham, AL 35208.
 - b5. Ohio Gratings, Inc., Canton, OH 44706.
 - b6. Struct-Fast, Inc., Easton, MD 21601.
- 201.4 For post-installed concrete anchor materials see Section 050538 – Post-Installed Concrete Anchors
- 201.5 For grout materials see Section 036241 – Grout Work

PART 3 - EXECUTION

- 301. **PREPARATION PRIOR TO START OF ERECTION**
 - 301.1 Verify that field conditions are acceptable and are ready to receive Work, especially the column anchor rods.
 - 301.2 Check elevations of in-place Work before erection Work proceeds, and report discrepancies to Owner. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel and gallery work have been agreed upon with Owner.
 - 301.3 Contractor shall also check to ensure that the dimensions of the structural steel to be erected conform to the dimensions of the associated completed structures.
 - 301.4 Beginning of installation means Contractor accepts existing conditions.
- 302. **ERECTION – GENERAL**
 - 302.1 The erection of structural and miscellaneous steel shall be in accordance with the engineering drawings, the approved erection drawings, this specification, AISC Code of Standard Practice for Steel Buildings and Bridges, ANSI Safety Requirements for Steel Erection A 10.13, 29 CFR 1910, 29 CFR 1926 and local codes.
- 303. **LINES AND GRADES**
 - 303.1 Lay out lines and grades from existing baselines and bench marks on the property. Contractor is fully responsible for the correctness of these lines and grades and for proper execution of the Work to these lines and grades.
 - 303.2 Owner reserves the right to verify the correctness of these lines and grades during the progress of the Work. This verification by Owner will not relieve Contractor of any responsibility for the Work.



- 303.3 Contractor shall notify Owner of any differences in the location of existing Work from that indicated on the design Drawings, wherever these differences may affect the new Work.
- 303.4 Contractor shall preserve and maintain the bench marks and reference points established by Owner. Should Contractor, during execution of the Work, destroy or remove any bench marks and/or reference points established by Owner, the cost to Owner for reestablishing these bench marks and/or reference points will be charged to Contractor.
304. ERECTION TOLERANCES
- 304.1 Steel Work shall be set accurately to the established lines and grades, and shall be plumbed and leveled such that the deviations in all completed Work are within the tolerance limits and meet the requirements, as specified in AISC 303 and this Specification.
- 304.2 Column baseplates shall be set at the specified elevations within the tolerance of $\pm 1/16$ (± 1.5 mm) of an inch and shall be leveled within the same tolerance.
- 304.3 Additional erection tolerances for girt framing around door, window, and louver openings are provided in Article 310 of this Section.
305. TEMPORARY SUPPORTS AND BRACING
- 305.1 Contractor shall be responsible for determining what temporary supports and bracing must be provided to maintain stability during erection without collapse, failure, or excessive deformation such as to cause any damage, loss of function, or durability problems. Contractor's temporary supports and bracing shall be designed to support all loads to which the Work may be subjected, including construction Equipment and the operation of such Equipment. Contractor shall be responsible for the adequacy and safety of such supports and bracing.
- 305.2 Non-Self-Supporting Steel Frames:
- a. In accordance with AISC 303, if a steel frame structure is considered to be a non-self-supporting steel frame, one that requires interaction with other elements not classified as structural steel (e.g. concrete floor slabs) to provide the required stability or resistance to wind and seismic forces, such frames will be clearly identified on the design Drawings.
- b. For such cases Contractor shall determine the need and furnish and install temporary supports to perform this function until the structural element (e.g. concrete floor slabs) has strength adequate to perform as designed. Contractor shall secure the services of a Registered Design Professional in the State where the erection is being performed to prepare and certify the design of the temporary supports.
306. LEAVE-OUT STEEL
- 306.1 If, during the course of the Work, Contractor determines that erection requires leaving out certain structural steel framing members, Contractor shall secure the services of a Registered Design Professional, in the State where the erection is being performed, to evaluate the effect of the leave-out steel and design temporary supports if required.
- 306.2 Temporary bracing or supports required to compensate for the steel that is left out shall be at Contractor's expense.
- 306.3 Contractor shall erect the left-out steel as soon as the other Work in the area permits.



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307. FIT-UP

- 307.1 Members and details shall be fitted into place by methods that will not damage the materials. Any materials, unduly damaged, shall be replaced by Contractor at Contractor's expense.
- 307.2 Heating of anchor rods in the field for bending or other purpose, and welding of ASTM A193 and ASTM F1554 Grade 55 and 105 anchor rods will not be permitted.
- 307.3 In a column contact joint, the gap between column milled surfaces not exceeding 1/32 inch (0.8 mm) will be accepted. If the gap exceeds 1/32 inch (0.8 mm), but is less than 1/4 inch (6 mm), it shall be packed out with non-tapered steel shims. The shims shall be mild steel regardless of the column material. Gaps of 1/4 inch (6 mm) or more shall be reported to Owner.
- 307.4 Obtain written permission of Owner prior to field cutting or altering of structural members not shown to be cut or altered on the erection drawings.

308. MISFITS

- 308.1 Attention is specifically directed to the requirements of AISC 303, Section 7.14, that corrections of minor misfits and a reasonable amount of cutting and reaming are considered a part of erection. However, any errors in shop Work which prevent proper field assembly and fit-up of parts shall be reported, as soon as they are discovered, to Owner as well as to the structural steel fabricator, so that the fabricator may either correct the errors or make substitution of the misfitting component.
- 308.2 Connection design is based on standard size bolt holes as specified in the RCSC "Specification for Structural Joints using ASTM A325 or A490 Bolts." Therefore, the enlargement of bolt holes to facilitate field fit-up shall not result in bolt holes which are classified as oversized or slotted.
- 308.3 The allowable limits for reaming the connection bolt holes for fitting in the field shall conform to the requirements of AISC 303, Section 7.14. If fit-up of bolts during erection in the field cannot be obtained by reaming the fabricated bolt holes within these limits, it is considered that there are errors in fabrication, and these errors shall be rectified as noted above. Correction of misaligned bolt holes by the use of flame cutting is not permitted.

309. FIELD CONNECTIONS

- 309.1 Connections of new steel to existing Work or to steel Work by others shall be welded unless noted otherwise on the Design Drawings.
- 309.2 Unless otherwise indicated on the Design Drawings, all other connections shall be made by high-strength bolting.
- 309.3 Where new steel is to be connected to existing steel, Contractor shall verify the locations, dimensions, etc., of existing steel for alignment, prior to start of erection.

310. STRUCTURAL STEEL ERECTION DETAILS

- 310.1 Column stiffener plates at connection joints with beams and girders will be furnished and shipped loose and shall be installed by means of field welding by Contractor.
- 310.2 Setting and Grouting of Column Baseplates:
- a. Immediately prior to setting column baseplates for columns with sleeved anchor rods, remove the tops of the sleeves so that they are level with the surrounding concrete surface. Take care that no debris falls into the sleeves. Flush out any antifreeze that may have been placed in the sleeves.



- b. Roughen and clean concrete bearing surfaces that will receive grout. Clean the bottom surface of the base plates.
- c. Set loose, align, and properly support with shims, wedges, or other adjusting devices. The smaller dimension of shims and wedges shall be oriented in the direction of grout flow or packing. Shims and wedges shall be coated with a film of paraffin or form release agent to facilitate their removal, no grease or oil shall be used.
- d. Promptly after setting and aligning the column baseplates, grout solidly in accordance with the requirements of Section 036241. Finish exposed surfaces, protect installed materials, and cure in strict compliance with Section 036241 unless otherwise noted.
- e. Provide leveling bolts/screws, leveling plates, or steel shims beneath column base plates for setting the base plates to the correct elevation before grouting. Leveling nuts beneath the column base plates shall not be used. All shims and wedges used for support shall be carefully removed after the grout has set and hardened. The voids, resulting from the removal of these shims, wedges, and leveling screws, shall be filled with the same grout unless otherwise specified.

310.3 Tightening of Column Anchor Rods: Tighten anchor rods after the supported columns have been positioned and plumbed. The nuts shall be brought to a snug-tight condition, followed by an additional one-quarter of a full turn. Snug-tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.

310.4 Contractor shall remove all excess material, debris and Equipment used to perform the Work of this Section from the project site at the completion of the Work.

311. ERECTION WORK

311.1 Erection shall be performed in accordance with AISC 303 and as specified herein.

311.2 Welding shall conform to requirements of Section 050525.

311.3 High strength bolting shall conform to requirements of Section 050523.

311.4 Grating where needed or modified (Welded Bar Type):

- a. Grating shall be fastened at four corners of each grating section and at intermediate supports per MBG 531.
- b. When removable sections are indicated, use hold down clips with washers, nuts, and threaded studs welded to support member. The hold down clips and their fasteners shall be stainless steel, and shall be permanently fastened to the grating sections so that they do not become lost due to removal of grating sections.
- c. Retaining stop bars shall be field welded by the Contractor per the design drawings for removable, overhanging, and associated adjacent grating sections to prevent them from slipping off support steel when a section is removed. The retaining stop bars will be supplied with the grating sections.
- d. Special care shall be taken to anchor overhanging (cantilevered) grating sections securely. Grating sections shall be provided with stops to prevent any section from slipping off the supporting steel when an adjacent panel is removed. The proper number of fasteners required to hold down a cantilevered grating panel shall be the responsibility of Contractor.



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- e. Grating sections shall fit snugly against the adjacent panel with not more than 1/4 inch (6 mm) clearance for the entire section of grating. The clearance between grating and curb angles or guard plates shall be no more than 1/4 inch (6 mm) when the bearing bars are perpendicular to the edge and no more than the bearing bar spacing when the bearing bars are parallel to the edge.
- f. Holes in Grating:
 - f1. Holes for pipes passing through the grating which were not made in the shop shall be cut and banded in the field in accordance with field measurements of pipes in place and details on the design drawings.
 - f2. For holes provided in the field, grating shall be split around all pipes where possible, and shall be made into easily removable sections. Locations of junction lines between grating sections shall be determined from actual field measurements of pipes insofar as it is possible. . Grating banding shall be provided around openings in grating and neatly welded to bearing bars. Banding shall be of the same material as, and not less in size than, the bearing bars.
 - f3. When it is necessary, in the installation of a floor grating panel, to cut the grating at right angles to the bars at a point of support, suitable means of permanently holding the ends of the bars in alignment shall be provided.

312. FIELD CLEANING AND PAINTING

- 312.1 After erection is completed, Contractor shall clean and field touchup surfaces of the structural steel and gallery work erected by him in accordance with the requirements of Section 099113 unless otherwise indicated.

313. INSPECTION AND EXAMINATION

313.1 General Provisions:

- a. The Work is subject to inspection and examination by Owner at the project site, for full compliance with all requirements for the work.
- b. Contractor will retain, and pay for, the services of an independent testing or inspection agency to perform inspections and examinations. Owner's testing agency will not be available for Contractor's use. Contractor's inspection and testing service shall conform to the inspection and examination requirements in accordance with Section 051020.
- c. Contractor shall provide, and pay for, access and all rigging required by Owner or its inspection agency and for all personnel required to assist them.
- d. Before concrete placement on metal decks inspect the deck for tears, dents, or other damage that prevents the deck from acting as a tight and substantial form or impairs structural stability. Any section of deck with more than one flue damaged or missing shall be reinforced or replaced.

313.2 Inspection and examination of welding shall be as specified in Section 050525.

313.3 Inspection and examination of high-strength bolting shall be as specified in Section 050523.

313.4 Acceptance of Work by Owner or its Testing and Inspection Agency shall not relieve the Contractor in any manner from full responsibility for the Work.

END OF SECTION 051224

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SECTION 260520

CONTROL AND INSTRUMENTATION CABLE

PART 1 - GENERAL

101. GENERAL

101.1 This Section prescribes the minimum requirements for 300 volt instrument and control cable, if required.

102. REFERENCE DOCUMENTS

102.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated below, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date of contract.

- a. ASTM B8 – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- b. ASTM B33 – Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
- c. ICEA S-95-658 / NEMA WC70 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
- d. IEEE 1202 - Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies
- e. IEEE 1210 – Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable
- f. NEMA WC 57/ICEA S-73-532 – Standard for Control, Thermocouple Extension, and Instrumentation Cables.

103. RELATED WORK SPECIFIED IN OTHER SECTIONS

103.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:

- a. Section 011100 – Summary of Work



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PART 2 – PRODUCTS

104. CABLE DESIGN AND CONSTRUCTION REQUIREMENTS

- 104.1 Contractor shall ensure the cable construction is capable of meeting the following general criteria:
- a. Cables shall be suitable for under-ground and above-ground installation, in indoor or outdoor locations, and in wet or dry locations; in underground ducts, exposed conduits, and trays, direct buried (except for fiber optic cable); and for exposure to direct sunlight.
 - b. Each pair and triad shall be individually shielded with an aluminum foil laminated Mylar tape applied helically, aluminum side down with 25% minimum lap. Multi-pair and multi-triad cables shall have an overall shield of a construction comparable to the individual shield.
 - c. All cables supplied shall be new and unused. "New and unused" shall be further defined as to exclude cables which have been shipped to a project site or otherwise released from Contractor's warehouse and have been subsequently "returned to stock".
 - d. Cable which has been in long term un-protected (outside) storage for over two years will not be accepted. Cable manufactured outside of the United States is not acceptable.
 - e. Splice and/or rework of insulation and jacket shall not be done to eliminate defects, obtain specific shipping lengths, etc.
 - f. Cable shall be completely asbestos-free.

105. DETAILED DESIGN AND CONSTRUCTION REQUIREMENT

- 105.1 The required engineering and design shall begin immediately after Release for Engineering, regardless of the shipping date, and shall proceed in an expeditious and orderly manner until complete. Seller shall submit certified drawings and data as hereinafter listed to the Purchaser for review.



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Service	300 volt, instrumentation cable with shielded, twisted pairs or triads, as specified. NEC Type TC.
Insulation Material	Cross-linked polyethylene (XLPE) or Ethylene Propylene rubber (EPR) in accordance with NEMA WC 57/ICEA S-73-532, Part 3. Insulation thickness shall be in accordance with Table 3-1 of ICEA S-73-532 / NEMA WC 57.
Jacketing Material	Low-smoke, non-halogen polyolefin/low smoke, zero halogen (LSZH) or chlorinated polyethylene (CPE) or chlorosulfonated polyethylene (CSPE) meeting the requirements (NEMA WC 70/ICEA S-95-658). Include rip cord under the jacket to facilitate stripping.
Pair/Triad Shield	Aluminized Mylar tape with a 7-strand tinned-copper drain wire. Shields shall be isolated from all other assemblies.
Shield Material	Aluminized Mylar tape with tinned-copper drain wire.
Conductor Material	Class B stranded bare or tinned coated soft annealed copper per ASTM B-3 or B-33 conforming to ASTM B-8, 16 AWG.
Testing	All cables shall be tested in accordance with the requirements of ICEA S-73-532 / NEMA WC57 and the flame requirements of IEEE 1202.

Special Requirements:

1. Outer jacket of jacketed cable shall be permanently marked so as to identify the manufacturer, voltage, type of insulation and jacket material, number and size of conductors, year of manufacture and sequential footage. Identification markings shall be at intervals not to exceed 24 inches.
2. For LSZH jackets only, insulation and fillers used in the cable shall each have less than 0.2% halogen content when tested per MIL-C-24643.
3. All cables shall be suitable for indoor and outdoor locations and for installations in metal cable tray, steel conduits, and underground PVC conduit and duct banks.
4. Cable shall be suitable for continuous use at 90°C wet or dry per NEMA WC 57/ICEA S-73-532.
5. Color coding shall be ICEA S-73-532 / NEMA WC57, Appendix E, Method 9A, using the color-pigmented compounds. Each pair shall have one (1) white and one (1) black conductor with printed numbers for pair identification.



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Service	600 volt, shielded and unshielded, multiconductor, control cable, NEC Type TC.
Insulation Material	Cross-Linked Polyethylene (XLPE) or Ethylene Propylene Rubber (EPR) in accordance with ICEA S-73-532 / NEMA WC57. Insulation thickness shall be in accordance with Table 3-1 of ICEA S-73-532 / NEMA WC57.
Jacketing Material	Low-smoke, non-halogen polyolefin/low smoke, zero halogen (LSZH) or chlorinated polyethylene (CPE) or chlorosulfonated polyethylene (CSPE) meeting the requirements (NEMA WC 70/ICEA S-95-658). Jacket shall be black.
Shield Material	Aluminized Mylar tape with tinned-copper drain wire.
Conductor Material	Class B stranded bare or tinned coated soft annealed copper per ASTM B-3 or B-33 conforming to ASTM B-8, 14 AWG.
Testing	All cables shall be tested in accordance with the requirements of ICEA S-73-532 / NEMA WC57 and Flame test requirements of IEEE 1202.

Special Requirements:

1. For LSZH Jackets only, insulation and fillers used in the cable shall each have less than 0.2% halogen content when tested per MIL-C-24643.
2. Outer jacket of jacketed cable shall be permanently marked so as to identify the manufacturer, voltage, type of insulation and jacket material, number and size of conductors, year of manufacture and sequential footage. Identification markings shall be at intervals not to exceed 24 inches.
3. All cables shall be suitable for indoor and outdoor locations and for installations in metal cable tray, steel conduits, and underground PVC conduit and duct banks.
4. Cable shall be suitable for continuous use at 90°C wet or dry per ICEA S-73-532 / NEMA WC 57.
5. Color coding shall be ICEA S-73-532 / NEMA WC57, Appendix E, Method 2, using the color-pigmented compounds OR Conductors shall be identified by ICEA S-72-532 / NEMA WC57, Appendix E, Method 3 (conductor numbering).



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106. CABLE TESTS AND TEST REPORTS

- 106.1 Tests shall be performed and certified test reports, complete with data and test results, shall be submitted to the Owner to confirm compliance with these specifications. Tests shall consist of qualification tests, tests on production samples and tests on completed cable in accordance with the applicable standards as listed in this Specification.
- 106.2 Flame retardency tests shall be done on prototype samples that are comparable to the specified cables and shall be in accordance with the applicable standards as listed in this Specification.
- 106.3 Production tests done before and after the cable is completed shall include those tests defined in the applicable reference standards.
- 106.4 The Owner reserves the right to inspect the cable at the time of manufacture and to witness factory tests.
- 106.5 Certificates of Compliance with this specification shall be provided for all cables supplied.
- 106.6 The cable manufacturer shall provide a list of recommended compatible pulling lubricants. The compatibility of a cable lubricant shall be demonstrated in accordance with IEEE 1210. Any solvents recommended for use with these cables shall be tested in accordance with IEEE 1493.

PART 3 – EXECUTION

301. INSTALLATION

- 301.1 Contractor shall perform all required installation and related activities as defined in Section 011100 of this specification.

END OF SECTION



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SECTION 260533

CONDUIT AND SUPPORTS

PART 1 – GENERAL

101. EXTENT

- 101.1 All exposed conduit work and supports shall be designed, supplied, and installed by the Contractor in accordance with this specification, if required.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS

- 102.1 The work specified in this Section shall be coordinated with work specified in the following related Sections:

- a. Section 011100 - Summary of Work

103. REFERENCE DOCUMENTS

- 103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated below, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date of contract.

- a. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- b. IEEE C2 - The National Electrical Safety Code
- c. NECA 1 - Standard Practices for Good Workmanship in Electrical Construction
- d. NFPA 70 - National Electrical Code (NEC)
- e. OSHA - Occupational Safety and Health Act of 1970
- f. UL 50 - Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations

104. TECHNICAL REQUIREMENTS

- 104.1 It shall be the Contractor's responsibility to determine the most efficient and economical routing of all conduit runs. Contractor shall verify the locations of equipment to be connected. The proposed conduit routing shall be checked for possible interferences prior to installation. Any conduit or wiring that must be changed as a result of an interference shall be done by Contractor at no cost to Owner.
- 104.2 Contractor shall be fully responsible for the design of all supports, including all connections.
- 104.3 Contractor's installation of conduits and their supports shall account for expansion joints.



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- 104.4 Conduits are part of the grounding system and will carry ground fault current. Conduits runs shall be made electrically continuous.

PART 2 – PRODUCTS

201. MATERIAL

- 201.1 The material type for conduit, fittings and boxes shall be aluminum.
- 201.2 Flexible conduits shall be of liquid-tight type, with PVC jacket over a galvanized steel, flexible conduit.
- 201.3 Conduit supports and fasteners, such as pipe straps, U-Bolts, J-Bolts, shall be hot-dipped galvanized, electro-galvanized, or cadmium plated.
- 201.4 Junction and pull boxes shall conform to UL 50. Galvanized coatings for steel boxes shall conform to ASTM A653.

202. JUNCTION BOXES, PULL BOXES AND CONDUIT BODIES

- 202.1 Junction boxes shall be sized for the quantity of cable and conduit connections. The location and number of conduit connections shall be determined by the Contractor to permit training of cable at or above the minimum bend radius.
- 202.2 Pull boxes shall be sized on the following basis:
- a. For straight pulls, the length (parallel to the conduits) of the box shall not be less than four times the largest minimum bend radius of cables entering the box.
 - b. For angle or U pulls, the distance between a cable entering the box and its exit from the box in the plane of the cable shall be three times (in either axis) the largest minimum bend radius of cables entering the box.
- 202.3 Contractor shall locate pull boxes as necessary to prevent exceeding maximum cable pulling tension or side wall pressure during cable pulling operations.
- 202.4 Conduit bodies shall be used only if the pull, setting and training radii of the associated cables are not violated.
- 202.5 All junction boxes and pull boxes that are furnished by the Contractor shall be identified by a permanently attached nameplate bearing the equipment number. All nameplates shall be in plain view when the equipment is in place.

PART 3 – EXECUTION

301. INSTALLATION

- 301.1 Contractor shall perform all required installation and related activities as defined in Section 011100 of this specification.

END OF SECTION

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SECTION 260580

TESTING AND CHECKING OF ELECTRICAL EQUIPMENT

PART 1 - GENERAL

101. EXTENT

- 101.1 This Section prescribes the requirements for testing and checking of electrical equipment by the Contractor.
- 101.2 Test equipment required to conduct specified tests shall be supplied by the Contractor.
- 101.3 Testing shall be performed in accordance with equipment manufacturer's requirements.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS

- 102.1 The work specified in this section shall be coordinated with work specified in the following related sections:
 - a. Section 011100 - Summary of Work

103. REFERENCE DOCUMENTS

- 103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated below, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date of contract.
 - a. IEEE C2 - The National Electrical Safety Code
 - b. IEEE 95 - Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) with High Direct Voltage.
 - c. NECA 1 - Standard Practices for Good Workmanship in Electrical Construction
 - d. NECA 230 - Standard for Selecting, Installing, Maintaining Electric Motors and Motor Controllers
 - e. NEMA Publication PB2.1 - General Instructions for Proper Handling, Installation, Operation and Maintenance of Dead Front Distribution Switchboards Rated 600 Volts or Less.
 - f. NETA - International Electrical Testing Association:
 - g. ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment
 - h. NFPA 70 - National Electrical Code (NEC)
 - i. OSHA - Occupational Safety and Health Act of 1970



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PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

301. GENERAL

- 301.1 For some equipment, the purchase specification may include an allowance for a manufacturer's representative to be present during testing. The request for a manufacturer's representative shall be made 2 weeks in advance of the date the representative is required.
- 301.2 Occasionally, the manufacturer's responsibilities apply to both electrical and mechanical equipment. The request for the mechanical representative shall be coordinated with those responsible for the mechanical portion of the equipment.
- 301.3 Examine Contract Documents and carefully read manufacturer's O&M/instruction books prior to the start of any test or energization of any equipment.
- 301.4 Before any testing is started, safe job procedures shall be established by the Contractor. Contractor shall conduct all testing and checkout in accordance with Owner's Work Permit and Lockout Tagout (LOTO) Procedures.

302. TESTING

- 302.1 Control and Instrumentation Cable Testing:
- a. Check continuity of each conductor.
 - b. Check tightness of terminal contacts.
 - c. All wiring shall be verified (e.g., "ring-out" or "loop check") and compared to the Installation Wiring Drawings or Cable Tabulation for correct connections.
- 302.2 Remote Controls and Distributed Control System (DCS):
- a. Visually check all control, instrument and test switch developments.
 - b. Check terminal wiring against the Installation Drawings.
 - c. Check connections and calibrations of all instruments and meters.
 - d. With control circuits properly energized, check power operation of all control features, remote transmitting and receiving devices, etc. All electrical controls shall be tested by trial operation to see that each control function operates according to vendor's Logic Diagrams.
 - e. Check each alarm point by closing the trouble contact(s) and observe the status on the DCS.

END OF SECTION



SECTION 400510
ERECTION OF PIPING

PART 1 – GENERAL

101. EXTENT

- 101.1 This Section prescribes the requirements for the installation of the Hot Reheat (HR) System piping including its appurtenances, fittings, thermocouple wells, piping specialty items, valves, pipe supports, auxiliary steel and other accessories specified on project drawings, design drawings, data sheets, and/or other documents.
- 101.2 For balance-of-plant 2-inch and smaller (small bore) hot piping, work shall include, but not be limited to the following:
- a. Procure, furnish, deliver, receive, unload, store, protect, remove from storage, erect and install, field routed balance of plant small bore hot piping and tubing as necessary to connect to existing HR System drain, vent, and instrument connections including appurtenances and pipe/tube supports including auxiliary support steel. Pipe shall be furnished according to project Piping Design Tables (PDT). All erection work shall be performed per the design drawings and documents.
 - b. The Contractor's scope shall include the procurement and erection and support of all in-pipe appurtenances including but not limited to, valves, fittings, etc.
 - c. Cut into existing pipe systems, when specified on the design drawings or documents.
 - d. Furnish necessary welding rod including rod required for training welders and for field erection of 2-inch and smaller piping and tubing.
 - e. Select the type and quantity of welding rod required for field erection of all piping.
 - f. Perform all NDE as required by applicable code.
 - g. Perform hydrostatic testing as specified or per the applicable code.
 - h. All temporary piping required for hydrostatic testing and cleaning shall remain the property of the Contractor.
- 101.3 For balance-of-plant 2-1/2-inch and larger piping (large bore), work shall include, but not be limited to the following:
- a. Receive, unload, store, protect, remove from storage, erect and install, including pipe supports, balance-of-plant 2-1/2-inch and larger shop fabricated (large bore) piping and appurtenances. All erection work shall be performed per the design drawings and documents.
 - b. Cut into existing pipe systems, when specified on the design drawings or documents.
 - c. Furnish necessary welding rod including rod required for training welders and for field erection of large bore piping and tubing.
 - d. Select the type and quantity of welding rod required for field erection of all piping.
 - e. Perform all NDE as required by applicable code.



- 101.4 The project-specific materials and equipment quantities and attributes are shown on the project drawings, valve design tables (VDT), piping design tables (PDT), pipe line list, valve list, instrument list and/or other documents. Note that quantities for small bore cold piping, tubing, fittings, supports etc., are to be designed and generated by the Contractor.
- 101.5 Work by Others:
- a. Procurement, fabrication and delivery to site of large-bore (2.5" and larger) HR System piping and fittings.
 - b. Procurement, fabrication, and delivery to site of flow element FE-065.
102. SYSTEM DESCRIPTION OR DESIGN REQUIREMENTS
- 102.1 The piping line numbers shall be used for identification of the lines in all documentation.
- 102.2 Isometric drawings and hanger drawings are included in the Attachment 1.
- 102.3 The P&IDs show the piping diagrammatically only and are not to be used for physical layout; however, the isometric drawings and the piping diagrams shall be considered together, and any work called for or indicated on one and not the other shall be considered as part of the Work, unless otherwise specified.
- 102.4 Hanger drawings including auxiliary steel requirements will be provided by Owner.
- 102.5 Auxiliary steel shall meet the requirements of Division 05.
103. REFERENCE DOCUMENTS
- 103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated in Section 014219, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date indicated in Section 014219.
- 103.2 Abbreviations listed below and in Section 014219 indicate the form used to identify the referenced documents in the specification text.
- 103.3 ASME – American Society of Mechanical Engineers:
- a. B31.1 – Power Piping
- 103.4 ASTM – ASTM International:
- a. A335 – Standard Specification for Seamless Ferritic Alloy-Steel Pipe for High Temperature Service
- 103.5 ANSI – American National Standards Institute:
- a. B16.34 – Valves – Flanged, Threaded, and Welding End
- 103.6 NACE – NACE International:
- a. No. 3 – Joint Surface Preparation, Commercial Blast Cleaning Standard Item No. 21067.
- 103.7 SSPC – Society for Protective Coatings:



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- a. SP1 – Solvent Cleaning.
- b. SP3 – Power Tool Cleaning.
- c. SP6 – Commercial Blast Cleaning.
- d. SP10 – Near-White Blast Cleaning.
- e. SP16 – Brush-off Blast Cleaning of Non-Ferrous Metals.
- f. PA2 – Measurement of Dry Paint Thickness with Magnetic Gauges.

104. SUBMITTALS

104.1 Submit the following documents and other documents as required, for review in accordance with the submittal requirements of Section 013323:

- a. Test results.
- b. Erection drawings.
- b1. Method and procedure to be used for cleaning. Work shall not be performed prior to review of these procedures.
- c. As-built drawings.

105. GENERAL QUALITY CONTROL AND QUALITY ASSURANCE PROVISIONS

105.1 Comply with all requirements of ASME B31.1 or other designated piping code, as applicable.

105.2 Specified Products and Substitutions:

105.3 Mention of products or components by name as products of certain manufacturers is made to ensure that the proper quality and/or type are provided. Products of other manufacturers may be offered as substitutes with the Bid Proposal if the Contractor furnishes proof to the Engineers that the proposed substitute products are equal to or better than the specified products in quality, performance, design, and suitability for the intended use. Any purchase of proposed substitute products by the Contractor prior to acceptance by the Engineers will be at the Contractor's own risk.

105.4 Quality Control Documents to be Submitted:

- a. The following quality control documents shall be submitted to Sargent & Lundy:
 - a1. Procedures:
 - a1.1 Welding procedures and welding procedure qualifications.
 - a1.2 A list showing all weld procedures and the specific piping design tables or piping systems that are to be welded by each procedure.
 - a1.3 Nondestructive examination procedures (liquid penetrant, magnetic particle, radiography, ultrasonic, etc.), including a list of all shop and/or field welds showing the nondestructive examination requirements of ASME B31.1 and or applicable piping codes listed in Article 104, where applicable, for each weld.



- a1.4 Nondestructive examination procedures (liquid penetrant, magnetic particle and ultrasonic testing) for any field weld relating to shear lugs. Shear lugs on HR piping 2.5" and larger provided on the fabricated pipe spools by pipe fabricator, unless otherwise required by Contractor.
- a1.5 Post-weld Heat Treatment (PWHT) procedures.
- a1.6 Hydrolazing Cleaning procedures.
- a2. Documentation:
 - a2.1 Certification of chemical and physical tests and supplements required for piping, fittings, and valves.
 - a2.2 Radiographic film or electronic images, including Contractor's interpretation of the radiographs, technique report, and shooting sketch (all film negatives or electronic media with one copy of other data).
 - a2.3 Nondestructive examination reports.
 - a2.4 Records and charts of post-weld heat treatments including identification of weld location (one copy).
 - a2.5 Other records and data called for in this standard specification or in other standard specifications referenced in the project specification.
 - a2.6 Hot Piping & Support Walkdown Summary Report
 - a2.7 All documentation shall be fully identified. Identification shall include the following:
 - a2.7.1 Owner.
 - a2.7.2 Project and unit number.
 - a2.7.3 Specification number.
 - a2.7.4 Spool piece, shear lug number, fitting number, etc.

PART 2 - PRODUCTS

- 201. ACCEPTABLE MANUFACTURERS AND PRODUCTS
 - 201.1 Acceptable Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed below or listed in other Part 2 articles.
 - 201.2 The Contractor shall conform to all requirements of ASME B31.1, Power Piping, or other designated piping code, where applicable.
- 202. COMPONENTS
 - 202.1 Piping, Appurtenances, and Accessories:



- a. Provide all necessary miscellaneous piping, vents, drains, and piping accessories and appurtenances indicated on design drawings (except where specifically indicated to the contrary on project drawings or lists or as identified as to be re-used from the existing HR System), including, but not limited to, fittings, pipe supporting elements, insulation supports, pipe saddles for insulation protection, unions, couplings.
- 202.2 Manufacture: All components shall be of manufacture and type indicated in this Specification or on the design drawings, shall be of material suitable for the pressure-temperature conditions in each case, and shall be acceptable to the Consulting Engineers.
- 202.3 Miscellaneous Appurtenances: Install various instruments, other appurtenances, such as gauge glasses, safety valves, relief valves, etc., furnished by Others. Provide all pipe, fittings, and valves required for proper installation of the foregoing appurtenances.
- 202.4 Temporary Strainers shall be provided by Owner for use in testing if required. Strainers shall be removed when testing is complete, or as indicated by Owner.
- 203. FABRICATION REQUIREMENTS
- 203.1 Shop Fabricated Piping:
 - a. The Contractor shall review the Pipe & Fitting Supplier's pipe spool drawings. It is the responsibility of the Contractor to give a feedback to the engineer regarding field fit-up requirements.
 - b. It is the Contractor's responsibility to review and evaluate the location of the field welds on the drawings, and to give a feedback to the Consulting Engineers whenever field weld location needs to be relocated.
- 203.2 The Contractor may set up a temporary piping fabrication shop on the project site for hot small-bore (2" and smaller) piping.
- 203.3 Protection of Field Fabricated Materials:
 - a. Materials shall be provided with protection against damage, corrosion, and internal contamination in accordance with the following:
 - a1. Materials Stored at or Near the Project Site:
 - a1.1 All materials and equipment shall be packaged, packed, or prepared in a manner which will ensure arrival at destination in satisfactory condition. Procedure and details shall be submitted to Owner for review prior to start of shipment.
 - a1.2 All openings in piping and equipment furnished by the Contractor shall be securely plugged, capped, or otherwise blanked off, sealed with tape, and suitably protected against damage and entry of foreign materials and moisture. For shop-fabricated piping, this shall be done as soon as possible after shop cleaning.
 - a1.3 Weld ends on all valves, fittings, pipes, nozzles, etc., shall be capped and sealed with suitable, firmly attached protectors. Butt-weld ends on ferrous materials shall be coated with Special Chemicals Corporation Deoxaluminite, or acceptable equal, prior to capping, back to a ring whose length is the same as the weld preparation plus 2 inches minimum.



- a1.4 Protectors for beveled ends designed for backing ring or consumable insert shall have a plywood or hardboard liner disc held securely against the beveled end. Protectors for other weld ends may be metal caps without liner discs. Protectors shall not be welded to the weld end.
- a1.5 All protectors for openings and all braces, brackets, spacers, ties, bindings, and other shipping, packaging, and packing materials and appurtenances used for protection in shipping, storing, and handling of nonferrous piping and materials shall be of such design, type, and/or arrangement as to prohibit contact between ferrous and nonferrous materials.

204. SOURCE QUALITY CONTROL

204.1 Examination, Testing, and Inspection (See Table 1-03 and Table 1-04):

- a. Nondestructive Examination (NDE) and Testing:
 - a1. All pipe and fitting materials for critical piping systems shall receive all required testing and examination required by ASME B31.1, the applicable piping code, the applicable ASTM or ASME material specification, and this specification.
 - a2. Nondestructive examinations shall be in accordance with the examination procedures of ASME Section V and as herein specified. The examination shall be performed by personnel who have been qualified in accordance with SNT-TC-1A, supplements and appendices, as applicable, for the technique and methods used.
 - a3. All nondestructive examinations performed shall be executed in accordance with detailed written procedures and shall comply with the appropriate article of ASME Section V.
 - a4. Radiographic Examination of Welds: Examination shall be in accordance with ASME Section V, Article 2 and with the acceptance standards set forth in ASME B31.1 and ASME Section I, PW-51, or applicable piping code, whichever governs.
 - a5. Magnetic Particle, Liquid Penetrant, and Visual Examinations of Welds: Magnetic particle, liquid penetrant, and visual testing required by ASME B31.1 or applicable piping code shall be conducted and evaluated in accordance with ASME B31.1 or applicable piping code.
- b. Pressure testing, in accordance with the governing codes, of the completed piping system shall be the responsibility of the Contractor. The repair of any Fabricator's shop welds due to failure to pass the required pressure tests shall be to Fabricator's account.
- c. All welds shall pass a visual examination. In addition, welds shall receive nondestructive examinations (RT, UT, PT, or MT) in accordance with the governing codes where required, or as indicated in this Specification. All nondestructive examinations and acceptance standards shall be in accordance with ASME B31.1, Section 136 or applicable piping code.
- d. Radiography:
 - d1. 100% of field welds shall be radiographed.
 - d2. In addition to the required radiographs, additional spot checks of shop welds shall be included in Fabricator's Work. The Owner will inform the Contractor of the exact location of the field welds requiring this examination.
 - d3. Pipe Fabricator shall provide special access holes, hole reinforcement (weld metal buildup) or bosses, and plugs for all field welds requiring radiographic examination.



- d3.1 Access holes, hole reinforcement, bosses, and plugs shall conform to PFI Standard ES-16.
- d3.2 Access openings shall not deform pipe at weld ends beyond the limits of tolerances specified herein.
- d4. Test Data, Etc.:
 - d4.1 The supplier of materials covered in this Specification shall submit the following test data, etc., as specified herein and in the applicable ASTM or ASME specifications:
 - d4.1.1 Certified records of the results of the chemical analysis and mechanical tests.
 - d4.1.2 Photomicrographs.
 - d4.1.3 Test reports as required in Table 1-03 and Table 1-04.
 - d4.1.4 An affidavit certifying that the materials furnished meet the specified requirements.
 - e. Ultrasonic Tests:
 - e1. Ultrasonic tests are not required, unless otherwise noted.
- 204.2 Testing of Welds:
 - a. If for any reason it becomes necessary, in the opinion of the Consulting Engineers, to test the quality of welds that have been made by Contractor in field-fabricated assemblies, standard test specimens shall be removed from the designated welds by Contractor and tested in the presence of the Consulting Engineers.
 - b. Special Access Openings and Plugs for Radiographic Examination of Welds:
 - b1. Fabricator shall provide all access openings in piping required for radiographs and shall furnish all plugs required for access holes. The Fabricator shall provide any/all rings or other reinforcing required for the access holes.
 - b1.1 Access openings shall not be provided where radiographic geometrical unsharpness limitations cannot be met.
 - b1.2 Geometrical unsharpness limitations shall be as set forth in ASME Section V, Article 2, Paragraph T-285.
 - b1.3 Access openings shall not be provided in piping less than 6 inches NPS.
 - b2. Plugs and reinforcing shall be of the same material as the pipe in which they are installed; access holes, plugs, and reinforcing shall conform to requirements of the governing code(s) and shall be in accordance with Pipe Fabricator's Institute Standard ES-16. For applications on pipelines having design temperatures of 900°F and above the seal weld shall have a minimum 3/8-inch fillet weld.
 - b3. After radiographs are complete, the Contractor shall install plugs in all access holes for shop radiographs, and piping erector shall install plugs in all access holes for field radiographs.

PART 3 – EXECUTION

301. GENERAL



- 301.1 Completeness of Work: It shall be the Contractor's responsibility to furnish the services of all trades necessary to complete the Work covered by this Specification. All systems shall be placed in successful service by the Contractor to the satisfaction of the Consulting Engineers.
302. PREPARATION
- 302.1 Removal and Relocation of Present Work: Remove, relocate, and modify any present piping requiring such work, as indicated.
- 302.2 Connections to Present Work: Remove blind flanges on existing piping to which the work connects, cut or burn openings and weld to present piping, install and remove such temporary and permanent blind flanges, pipe plugs, shutoff valves, etc., as may be necessary during the progress of the work, and do all other similar work as may be reasonably required to complete the work. All cut-ins or connections made to existing systems shall be done only at such times as Owner may designate. As a safety measure, the Contractor shall determine that a system, or portion thereof, is shut down or isolated, and all Hold Card procedures have been implemented, before cutting in or making connection thereto.
303. ERECTION OF PIPING
- 303.1 Erection of the piping, including valves, pipe-supporting elements, and appurtenances, shall be done in an orderly and workmanlike manner and shall be scheduled to suit the requirements of the project. In addition to other applicable requirements specified herein, the following specific piping system erection requirements shall apply:
- a. Diagrammatic Connections: Any connections that are indicated only diagrammatically on the design drawings shall be installed in a neat and workmanlike manner, subject to acceptance by Owner.
- 303.2 Alignment and Drainage:
- a. Piping shall be erected so as to preserve accurate alignment. The Contractor shall check field measurements and allowance for makeup lengths or "closures" as may be necessary for accurate alignment and assembly, prior to fabrication and installation.
- 303.3 Terminals: Where the Work connects to equipment or piping furnished in-place by others, such connections shall be made by the Contractor, who shall properly complete the connections, in each case.
- 303.4 Closure: All piping shall be worked into place and the closing weld made without springing or forcing. It is the Contractor's responsibility to maintain surveillance of the piping system during erection to ensure that no stress from misalignment is imposed, and that dimensional requirements are met. Any discrepancies shall be noted to Owner's representative. This should include a review of the piping supports in the field to ensure that they are properly located and adjusted to the design position. Neutral points shall be maintained.
- 303.5 Clearance for Insulation: Piping shall be installed as required to maintain suitable clearance where pipes cross or run in parallel, or where pipes run close to equipment or building structures.
- 303.6 Most of the HR System Insulation will be reused from the existing HR System, but the Contractor shall provide sufficient additional insulation to match existing such that the entire HR system is appropriately insulated and lagged. Installation is by Contractor.
- 303.7 Attachments for Insulation, Pipe Supporting Elements, and Handling: Where attachments to piping furnished by others and erected by the Contractor are required, but not furnished and/or installed by others, the Contractor shall furnish and/or install such attachments.



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Hot Reheat Pipe Replacement
General Work Contract



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303.8 Floor Openings:

- a. The Contractor shall replace any existing guarding devices for the pipe openings. After all piping is erected, the Contractor shall provide additional guarding devices, if required.

303.9 Temporary Support:

- a. The Contractor shall furnish and install temporary supports or bracing as required, such as the following times.
 - a1. During demolition, rigging and erection activities by the Contractor, to prevent undue stress on the system's existing or new permanent piping supports and/or structural steel to withstand loading for which the infrastructure was not initially designed.
- b. The Contractor shall remove any/all temporary supports, anchors, and bracing furnished by the Contractor, from piping erected by the Contractor, prior to system turnover to Owner.

303.10 Pipe Supports:

- a. The Contractor shall install all hangers, supports, anchors, guides, braces, and snubbers as required for the entire piping system furnished by Others. This shall include all necessary structural steel (auxiliary steel or supplemental steel) to connect to Owner's steel in place, unless otherwise indicated.
- b. Welding of pipe support lugs or supplemental steel to Owner's structural steel in place shall be in accordance with AWS D1.1. See Section 050525.

303.11 Protection:

- a. For piping which is field fabricated by the Contractor, all openings of the fabricated piping and remaining cut pipe shall be provided with protectors, as soon as possible after cleaning. Protectors shall remain in place until removal is necessary for connection thereto.
- b. If connections to piping erected by the Contractor are to be made by Others, the Contractor shall ensure that the associated terminal connections are provided with protectors. Where such terminals are located in an area where they may be subject to damage from other operations at the project site or constitute a hazard, the Contractor shall provide barricades and/or warning signs around the terminals. Contractor shall provide suitable access to the terminals for external connection by Others.
- c. The Contractor shall, at the end of each working day, ensure that all remaining opening in piping erected by him and all new openings made by him in existing piping are provided with temporary protectors.

304. FIELD WELDING

304.1 The Contractor shall meet the requirements outlined in the requirements below.

304.2 It is the Contractor's responsibility to review and evaluate the location of the field welds on the drawings, and to give a feedback to the Consulting Engineers whenever field weld location needs to be relocated.

304.3 Welding Requirements:

- a. Welding of piping shall be in accordance with the applicable requirements of this specification, the governing piping code, drawings, and supplements.



- b. Welding Procedures and Qualifications:
 - b1. Contractor shall be responsible for the welding performed by his organization and shall establish his own welding procedures for each class and type of weld that will be used in the work.
 - b2. Qualification of welding procedures to be used and qualification of welders and welding operators shall comply with the latest requirements of Section IX of the ASME boiler and pressure vessel code and with other governing codes. Weld procedures and procedure qualifications shall meet all of the requirements of the latest issue of ASME Section IX in effect at the time of the contract award.
 - b3. Contractor shall conduct the tests required to qualify his welding procedures and shall conduct the performance qualifications of welders and welding operators who apply these procedures. All performance qualifications of jobsite Contractors shall be conducted at the site unless otherwise approved by the Owner. Procedures or qualification of procedures or welders by organizations other than the Contractor is not acceptable.
 - b4. The actual testing operations such as radiography may be conducted by an independent laboratory on samples prepared under the direction of the Contractor.
 - b5. The Contractor shall submit to the Consulting Engineers prior to use the Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) for each welding procedure employed in the performance of the work.
 - b6. Each welder/welding operator shall be qualified by the Contractor. Welder/Welding Operator Performance Qualifications (WPQ) certified by others will not be acceptable.
 - b7. Alternate Welding Processes: Alternate welding procedures will be considered if complete Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) are submitted to the Consulting Engineers and approved in writing by the Consulting Engineers.
- c. Process and Technique:
 - c1. Shielded metal arc welding, gas-shielded flux-cored arc welding, submerged arc welding (shop only), or gas tungsten arc welding (GTAW) processes shall be employed in the work, except where a specific welding process is called for in the project specification and except for shear lugs. The root and second pass of all piping shall be welded using the GTAW process except when the ID is accessible and double welded joints are used. The short circuit transfer mode is not permitted.
 - c2. When open root GTAW welds are made on ASME P-5 material or higher P-numbers, an inert gas purge shall be maintained for the root and second pass. Prior to welding the ID purge area shall be two percent oxygen or less.
 - c3. All socket weld shall have a minimum of two weld passes except 1 NPS or smaller may be welded in a single pass.
 - c4. Each weld pass shall be visually inspected for defects and slag. All defects and slag found shall be removed by chipping and grinding prior to the deposit of additional filler metal.
 - c5. Peening of weld metal is not permitted.
 - c6. The use of low carbon (e.g., E-9018B3L) electrodes/weld filler metal is not permitted on chrome-moly materials.



- c7. Full Penetration Welds: All welds (not including socket and fillet welds) shall be full penetration welds unless indicated otherwise on the design drawings. Where half couplings are used for NPS 2 and smaller branch connections, the end of the half coupling which is to be welded to the main line shall be beveled for a full penetration weld.
- c8. Piping Components Alignment Tolerances:
 - c8.1 Fit-up: Internal misalignment at the weld ends shall in no case exceed the limit specified in ASME B31.1 or applicable piping code.
 - c8.2 Open Root GTAW Joints: The internal misalignment tolerance for joints using open root GTAW shall not exceed 1/16 inch.
 - c8.3 Contractor shall notify Consulting Engineers when the average misalignment (δ Avg) and Stress Intensification Factor at a joint exceeds the tolerances listed in ASME B31.1, Appendix D.
 - c8.4 For open root GTAW welds, the root gap shall not exceed 3/16 of an inch.
 - c8.5 Consumable Insert Joints: Fit up tolerances for joints using a consumable insert shall conform to the "C" dimension tolerance shown on mechanical standard drawing MSDE-2.1.8.2.
 - c8.6 Minimum Wall Thickness: The minimum wall thickness specified by the Consulting Engineers for pipe, fittings, etc., shall be maintained at weld joints, as well as at other areas.
- d. Butt Weld End Preparation Details:
 - d1. Finished weld end preparations on alloy steel materials shall be machined to meet the configuration specified on the piping design table and shown in Mechanical Standard Drawings MSDE-2.1.8.2 and MSDE-2.1.8.5 as applicable, or as shown on the project design drawings.
 - d2. The weld end preparation for ends and joints in special wall piping and plate piping shall conform to the design drawings. Where dimensions A, B, C, D, and T for butt-weld end preparations on special wall pipe and fittings are not shown on the design drawings, they shall be subject to review and acceptance by the Consulting Engineers.
 - d3. Edges shall be cleaned of all grease, oil, paint, rust, scale, oxides, slag, dirt, or other contaminants prior to welding. The discoloration which may remain on flame cut end preparations is not considered a detrimental oxidation.
- e. Tack Welding:
 - e1. Tack welds shall be made by procedures and welders qualified in accordance with ASME Section IX.
 - e2. All filler metals used for tack welds shall be the same composition as the filler metal for the joint.
 - e3. Tack welds that are incorporated into the finished weld shall be visually inspected for defects. All defects shall be removed before covering tack welds with additional weld metal. Defect removal shall be verified with liquid penetrant or magnetic particle inspection.
- f. Weld Metal: The composition of filler metals and consumable inserts shall be of a chemical composition similar to the base material.



- g. Extent of Welding: All joints in the piping shall be welded unless otherwise indicated and except where piping is of such material that welding is not applicable, where flanges are required at certain equipment, etc., or where special conditions may dictate the use of flanged or other mechanical joints.
- h. Weld Contour: Weld reinforcement shall be in accordance with the applicable code.
- h1. The contour of the weld reinforcement on the inside and outside of each weld shall conform to the requirements of the governing code and (for welded pipe and fittings) to the material specification. For girth welds the contour shall be maintained as close as possible to the outline shown on the welding end detail drawings referenced in the project specification.
- h2. Welds shall have a gradual increase in thickness from the edges to the center and the surface transition shall be smooth without ridges or depressions, on the inside and outside of weld, except as hereinafter specified otherwise.
- h3. Where radiography is required, the inside and outside of finished surface of the weld in ferritic steel systems shall be ground smooth and flat within 1/32 in. of the base material, unless the Contractor can demonstrate to the satisfaction of the Consulting Engineers that the as-welded surface will not produce radiographic film indications that could mask a defect. The above shall also apply to welds in stainless steel systems, except that the inside surfaces (where accessible) shall be machined; no grinding of internal surfaces of stainless steel systems is permitted.
- i. Arc Strikes: All evidence of arc strikes or weld deposits adjacent to the weld preparation on the base metal shall be removed by grinding and if necessary, weld repaired; this also includes arc areas caused by magnetic particle inspection prods and weld areas remaining after the removal of temporary attachments. Arc strikes shall be repaired before stress relieving.
- j. Heat Treatment (Preheat and Interpass Temperature):
 - j1. Preheat and post-heat treatment of welded joints shall be in accordance with the requirements of the applicable codes.
 - j2. Appropriate heat sources (material dependent temperature control requirements) shall be used for preheat. Temperature monitoring with temperature-indicating crayons is acceptable for preheat.
 - j3. Piping components shall be at least 60°F prior to any welding.
 - j4. Preheating above 60°F shall conform to the applicable codes.
 - j5. Where preheating above 60°F is required, the interpass temperature shall be maintained at least equal to the preheat temperature.
 - j6. Temperature monitoring shall employ temperature indicating crayons or thermocouples.
 - j7. Electric heating sources, automatic or manual temperature control, and automatic chart recorders shall be used in post-heat treatment of welds. Heating and cooling rates during post-heat treatment shall be controlled in accordance with the governing code. For stress relieving in the shop, a gas-fired furnace may be used.
 - j8. Recorder charts of post-heat treatment, weld records showing welding procedure number (including preheat), welder, and radiograph reference (if performed), etc., shall be kept on file by the Contractor and shall be available to the Owner and Consulting Engineers for reference. After completion of the work, these records shall become the property of the Owner.



- j9. Electrical heat sources shall be used for field stress-relieving of piping.
- k. Pipe Cutting:
- k1. The finished cut end of the pipe shall be square to within 1/16 in.
- l. Stamping: All qualified welders shall be provided with an identification stamp of the low stress type. The welder shall stamp each of his welds with his identification. The stamp shall be located on the base material adjacent to the weld at minimum of 12" from the weld. An acceptable alternate to stamping is to have the welder's identification traceable to the joint by documentation.
- m. Temporary Welded Attachments for Handling:
- m1. Fabricator may have provided temporary lugs or fittings on piping for lifting or handling, but such items meet the requirements of the governing code and are designed in a manner so as in no way adversely affect the piping design.
- m2. Lugs on piping extending above grade shall be removed by the Contractor and shall be stress relieved as required by the applicable codes.
- 304.4 Field welds in piping systems requiring a high degree of cleanliness and a relatively smooth contour at the inside of the welded joint (Hot Reheat) shall be made using the gas tungsten arc process for the first welding pass. The remaining weld passes shall be made using one of the processes listed previously. All gas tungsten arc welds shall be made with the addition of filler metal.
- 304.5 Welding filler metal chemistry shall match that of the base material, unless otherwise specified. Similar metallurgical properties, i.e., yield strength equal to or greater than base metal, equal or better corrosion-erosion resistance and equal or better thermal properties shall be produced.
- 304.6 Preparation of weld ends and fit-up shall be in accordance with the requirements of ANSI/ASME standards. Base metals for butt weld joints shall be prepared by machining or mechanized oxygen cutting. In specific instances where the use of the above equipment is impractical, written permission from the Owner must be secured if hand oxygen cutting is to be substituted. All slag, irregularities and thermally-affected areas shall be removed from oxygen cut ends and hand ends shall be ground smooth.
- 304.7 Backing rings shall not be used in any piping system without prior written approval of the Owner. Backing rings, where allowed by Owner, shall be of the flat split ring type. The material of the backing rings shall be compatible with the composition of the pipe with which it is used.
- 304.8 Welding pre-heat and interpass temperature shall be maintained in accordance with the requirements of the applicable code. Electric or gas heat sources, which provide a uniform application of heat over the weld area, shall be used in accordance with ANSI/ASME B31.1 Section 131.
- 304.9 Stress relieving of all welds shall be performed in accordance with the requirements of the applicable piping code. All welding zones, bends and hot-formed sections shall be fully stress relieved as required by the applicable code.
- 304.10 Wherever possible, stress relieving shall be performed by slowly heating the entire assembly to the specified temperature, holding the temperature for the required length of time, and then allowing the assembly to cool. Where this procedure is impractical, local stress relieving may be employed.



- 304.11 Pipe bending shall be used only when specifically required or where the use of elbows is impractical. All bends shall be smooth, without buckles and truly circular. The allowable flattening, as determined by the difference between the minor and major axes, shall not be greater than 5 percent of the nominal diameter. Allowance shall be made for thinning of the pipe wall in accordance with the requirements of Paragraph 102.4.5 of ASME B31.1 to assure that minimum wall thickness after bending is not less than the minimum wall thickness required.
- 304.12 All lugs, ears and other attachments for support of piping shall be welded to the piping. Attachments for piping systems which must be stress relieved shall be welded to the pipe prior to final stress relieving. Attachments on shop fabricated piping which must be stress relieved shall be shop welded to the piping.
- 304.13 Field-welding on pressure parts shall be stress relieved as required by applicable codes.
- 304.14 The Contractor shall submit welding procedures, stress-relieving procedures and procedure qualification records to the Owner for review and approval prior to performing any welding.
- 304.15 Any combustible material or electric cables beneath or adjacent to welding operations shall be protected against sparks, splatter and molten material. The Contractor shall ensure that safe conditions exist prior to and during any welding in areas where coal dust and/or gas may be present. The Contractor shall be responsible for supplying any portable ventilation or other equipment necessary to ensure that safe conditions exist and are maintained.
- 304.16 All welds that have been made by the Contractor for temporary attachment shall be properly removed and the surfaces of the present work shall be finished clean and smooth. Appropriate NDE shall be implemented to verify there are no resultant defects.
305. FIELD QUALITY CONTROL
- 305.1 Inspection and Testing:
- a. The piping components (including valves), fabricated piping and the installation of the piping shall be tested and/or inspected in accordance with the applicable requirements of the governing code(s).
 - b. Components Furnished by the Contractor: Per the requirements of the applicable ASTM or ASME material and ANSI dimensional specifications, and the governing code.
 - b1. Initial Service Leak Test: All piping not hydrostatically tested, including any portions of piping under the preceding paragraphs having the specified hydrostatic test waived by Owner's representative.
 - c. Connections to Existing Systems: If the present steam system cannot be taken out of service for hydrostatic testing of the connecting new system, the field hydrostatic test requirement may be waived upon specific approval of Owner. This is to avoid damaging the sectionalizing valve between the new and the present system due to the extreme temperature difference that would exist across the valve if the hydrostatic test is made when the valve is hot.
- 305.2 Temporary Field Testing Facilities and Services:
- a. The Contractor shall furnish, install and remove blind flanges, pipe plugs (except as provided by pipe Fabricator), caps, spools, etc., and make all temporary connections necessary for field test by the Contractor.



- b. The Contractor shall disconnect and reconnect assemblies where it is necessary for tests by the Contractor. Equipment with pressure limitations lower than the test pressure to be used and instruments shall be protected by the Contractor against any damaging effects of hydrostatic tests.
 - c. The Contractor shall furnish hand or power driven pumps and all other necessary equipment, including heaters and piping connections and valves from the source of test medium, for making field tests by the Contractor.
 - d. The Contractor shall provide the necessary temporary piping and connections, with valves and blind flanges, and related parts as may be required for filling and draining the piping systems and equipment that will be tested by the Contractor.
 - e. The Contractor shall fill the systems and equipment that is to be hydrotested with water. After testing is completed, the Contractor shall drain the water and dispose of it in accordance with all federal, state and local regulations. The water used for hydrostatic testing shall be demineralized water, condensate, service water, or construction water, as directed by Owner's representative.
 - f. In conjunction with leak testing of the piping, the Contractor shall do all gagging of associated safety and relief valves required for the leak testing and shall remove gagging at the completion of the testing.
- 305.3 Supervision: All tests shall be made under the direction and supervision of Owner/Engineer or their authorized representatives, and the Work must in all cases be proven right to their satisfaction.
- 305.4 Documentation and Test Reports: Documentation and test reports shall be in accordance with the governing code and the following:
- a. Boiler Code Piping Data Reports, as called for in Section I of the ASME Boiler and Pressure Vessel Code.
 - b. The Contractor shall submit a complete report to Owner/Engineer covering the test results and his inspector's interpretation of test findings and their disposition.
 - c. Each test report shall include data identifying each system (or portion thereof), test method, test number, date of test, Contractor's name, contract number, Owner's name, and project and unit identification.
 - d. The Contractor shall furnish Owner/Engineer with three (3) copies of all tests specified and/or required.
- 305.5 Performance Test: After the piping system and all equipment installed by the Contractor is put in service, Owner will run a preservice check test to ascertain that the system and all the appurtenances are performing satisfactorily. The Contractor shall arrange to have his authorized representative present to assist and witness these tests.



- 305.6 Hot Piping & Support Walkdown: After the piping system and all equipment by the Contractor is put into service, Owner will walkdown the Work to ensure piping and pipe supports are installed per the Design Drawings and Vendor provided drawings. Owner walkdown shall inspect the engineered pipe supports to ensure “cold” and “hot” positions are adequately marked and any temporary “stays” or “pins” are removed. The Contractor shall arrange to have his authorized representative present to assist and witness this walkdown and inspection, and assist in preparation and identification of any punch list items. Contractor shall provide a walkdown summary report detailing the scope of the walkdown and all findings, including pictures, if required, to the Owner.

306. ADJUSTMENTS AND TIGHTNESS

- 306.1 The Contractor shall remedy all leaks in the piping system and appurtenances erected by the Contractor that may develop during testing and initial operation and shall retain the necessary field crew on the project after the main erection Work is completed to perform, at no addition to the contract price, the following Work as required to prepare the piping system for continuous operation:
- a. Recheck all bolted assemblies where necessary.
 - b. Make those adjustments on piping required by the manufacturer of apparatus to which the piping connects in order to relieve stresses and other conditions that arise after heating up of the pipelines.
 - c. Make such adjustments and do all such other Work as may be required by manufacturer’s service engineers or Owner/Consulting Engineer as required to place each piece of equipment erected by him into continuous operation.
 - d. Re-adjust tension of bolted assemblies in accordance with temperature rise.
 - e. Adjust pipe-supporting elements erected by the Contractor.
 - f. Install and remove temporary strainers for cleanout and checking.
 - g. Perform such additional cleaning and flushing of piping as may be required.
 - h. Tighten packing glands of all valves installed by the Contractor. Additional valve gland packing rings shall be added to all valve glands, if necessary, including valves furnished by others, so that a proper seal is assured and all valve glands are in correct working condition after placing in service.
 - i. Provide all replacement gaskets and packing (including additional packing) required after cleaning and/or testing of equipment and piping installed by the Contractor.
 - j. Exercise all valves to ensure proper operation.

- 306.2 All piping installed by the Contractor shall be tight at the maximum working pressures and temperatures.

307. CLEANING AND PAINTING

- 307.1 Piping Materials Furnished by Others:
- a. Fabrication by the Contractor: Where pipe fittings, flanges, etc., are furnished by others for fabrication by the Contractor, the Contractor shall after fabrication, clean such pipe in accordance with the requirements herein.



- b. Erection by the Contractor: Where valves and other specialties are fabricated by others for erection by the Contractor, such materials will be shop cleaned by others; however, the Contractor shall inspect the inside of such materials, upon receipt and prior to installation to ensure that they are clean. The Contractor shall re-clean such materials if necessary.
- c. Reused Materials: All pipe, fittings, valves and other appurtenances (if any) that have been removed by the Contractor or by others from present systems and which are to be reused by the Contractor, shall be thoroughly cleaned by him both inside and outside and all working parts of valves and other appurtenances shall be checked by the Contractor for proper functioning before they are installed. Any malfunctions shall be reported to Owner's Representative.

307.2 Cleaning During and After Erection:

- a. The Contractor shall ensure that all piping erected by him is maintained clean during erection.
 - a1. General: The inside of all piping shall be free of loose scale, welding icicles and spatter, oil, grease, rust, paint, welding fluxes, chalk, abrasives, carbon deposits, coatings, moisture, and all other foreign matter before it is placed in service. Cleaning shall be done in accordance with the following:
 - a2. After field fabrication, the interior surfaces of all principal piping systems, except lube oil systems, listed in this specification, shall be thoroughly cleaned by one of the following methods:
 - a2.1 Hot Reheat (HR) Piping:
 - a2.1.1 A Hydrolasing Cleaning (or Aqualazing or Water Lasing) process utilizing a high pressure water jet(s) to loosen and remove all mill scale, weld slag, debris, etc. from the interior pipe surface shall be employed prior to system startup and testing per the below:
 - SSPC-SP 12/NACE 5: Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating
 - Visible Contaminants (governed by SSPC-VIS 4/NACE VIS 7 visual standards) cleaning per WJ-1 requirements to remove all visible rust, coatings, mill scale, and foreign matter. Cleaning shall adhere to the guidance provided in SSPC-VIS 4/NACE VIS 7 for use with reference photographs and additional explanatory notes. Cleanliness requirements for conditions depicted are defined by the joint SSPC/NACE surface preparation specification for high- and ultrahigh-pressure water jetting (SP 12/NACE 5).
 - Contractor shall be responsible for providing (except as provided by pipe Fabricator) and installing plugs and/or caps on Hydrolazing (or Aqualazing) pipe connections, including 100% RT inspection of the welds.
 - a3. Bends after Fabrication: The interior of all bends shall also be thoroughly cleaned by the methods specified above.
 - a4. Closures: All openings shall be provided with temporary closures, as hereinafter specified, as soon as possible after cleaning.
 - a5. Cleaning Materials and Procedures: Prior to start of the Work, the Contractor shall submit to the Owner for review, his methods and procedures for cleaning the piping and type of acid and neutralizing agent to be used for pickling.



- a6. The Contractor shall clean out the inside of all cut-ins and openings made by him in existing piping for new connections. The Contractor shall blow out existing piping, prior to making new connections, if required, as directed by Owner's representative. If new connections to cut-ins are not made immediately, the openings shall be sealed with temporary protectors.
- a7. The Contractor shall perform blowing out, flushing, chemical cleaning, and other special cleaning operations on principal systems after erection, where required as directed by Owner/Engineer, and/or as indicated on the drawings.
- b. Painting:
 - b1. All exterior surfaces of ferrous metal pipe and fittings, except weld-end preparations, flange facings, and other machined surfaces, shall be painted in accordance with the following requirements:
 - b1.1 Surface Preparation: SSPC-SP6
 - b1.2 Surface Profile: Per Coating Manufacturer
 - b1.3 Generic Type Primer: Inorganic Zinc up to a pipe design temperature of 750F and Red Oxide for design temperature above 750F
 - b1.4 Approved Suppliers:
 - b1.4.1 Carboline
 - b1.4.2 International
 - b1.4.3 Sherwin Williams
 - b1.4.4 Ameron
 - b1.4.5 Tnemec
 - b2. All butt-weld end preparations on ferrous metal materials shall be coated with Deoxaluminite or equal, acceptable to the Consulting Engineers.
 - b3. All flanged facings and other machined surfaces of ferrous metal materials, except butt-weld end preparations, shall be coated with a suitable antirust compound.
 - b4. No paint or coating shall be applied to nonferrous metal materials, unless otherwise specified in the project specification.
- 307.3 Temporary Piping and Materials:
 - a. Owner will furnish lubricating and flushing oils, chemical solutions, and steam and water source for special field cleaning after erection, unless otherwise called for in the Contract Documents or on Design Drawings.
 - b. Compressed air, where required for field blowing out, shall be furnished by the Contractor, unless otherwise set forth in the Contract Documents.
 - c. The Contractor shall furnish and install all other temporary materials, equipment, and facilities required for cleaning, blowing out, flushing, etc., to be done by the Contractor, including valves, other piping, pumps, compressors, heaters, instruments, and controls.



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- 307.4 Cleaning Materials and Procedures: Prior to start of the work, the Contractor shall maintain for review by owner or owner's engineer, his methods and procedures for cleaning the piping and type of acid and neutralizing agent to be used for pickling.
- 307.5 Closures: All openings shall be provided with temporary closures, as hereinafter specified, as soon as possible after cleaning.
308. SUPPLEMENTS, STANDARDS, AND DRAWINGS
- 308.1 See Attachment 1 for Standard Details.



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EXAMINATION AND TESTING REQUIREMENTS OF PIPE MATERIAL FOR CRITICAL PIPING SYSTEMS IN FOSSIL FUEL PLANTS

TABLE 1-03

	Chemical & Mechanical	Ultrasonic	Hydrostatic	Radiographic	Magnetic Particle	Product Check Analysis	Transverse Tension Test 8# & Larger Diameter	Metal Structure and Etch Test	Photomicrographs Sizes 3" or Larger	Flattening	Documentation
Main Steam and Boiler Startup Bypass SA-335 and A 335 P11 or P22, or P91	X	X #1	X #8			X-S1 #5	X-S2 #2	X-S4 #2	X-S6 #3	X-S3 #2	X #4
Desuperheater Spray Water/Feedwater Recirculating SA-335 and A 335 P5 or P11, P22 or P91	X	X #9	X #8			X-S1 #5	X-S2 #2	X-S4 #2	X-S6 #3	X-S3 #2	X #4
Hot Reheat A 335 P11, P22, or P91	X	X #9	X #8			X-S1 #5	X-S2 #2	X-S4 #2	X-S6 #3	X-S3 #2	X #4
Hot Reheat A 691 Class 22 Grade 2-1/4 Cr Note #4	X	X	X #8	X	X-S7 #7	X-S1 #5	X-S1		X-S5 #3		X #4
Boiler Feed and Boiler Startup Bypass SA-106 and A106 B or C Note 5	X	X #9, #1	X #8			X-S1 #6	X-S2 #2 & #6	X-S5 #6		X-S4 #2 & #6	X #4
Cold Reheat A 672 Class 22, Grades B60, B65, B70 or C70 Note 5	X	X #9	X #8	X	X-S7 #7	X-S4 #5	X-S1		X-S5 #3		X #4

NOTES AND CLARIFICATIONS:

- #1 – Special wall pipe only
- #2 – Both ends each length
- #3 – One end each length
- #4 – Supporting test data must be submitted
- #5 - Each length, except in sizes 2 in. NPS and less, test only one length from each heat

- # 6 – Schedule 160 and heavier wall pipe only
- #7 – After stress relief
- #8 – Unless otherwise specified in P.O. each
- #9 – UT inspection may be used in lieu of hydrostatic or in addition per ASTM A335/A
- #10 – S1, S2, S3, etc. refers to current optional/additional testing requirements



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FITTING BASE MATERIAL/EXAMINATIONS AND TESTING
TABLE 1-04

Fitting Base Material	Chemical & Mechanical	Radiographic	Magnetic Particle	Product (Check) Analysis	Documentation
Main steam, hot reheat, or boiler startup SA-234 and A 234 WP11, WP22 or WP91	X	X #2	X-S53 in ASTM A960/A960M #4	X-S50 in ASTM A960/A960M	X #1
Desuperheater spray water/feedwater recirculation SA-234 and A 234 WP5, WP11, Wp22 or WP91	X	X #2	X-S53 in ASTM A960/A960M #4	X-S50 in ASTM A960/A960M	X #1
Main steam, hot reheat, or boiler startup SA-217 and A 217 WC6, WC9 or C12A	X	X-S5 in ASTM A703/A703M #3 & #6	X-S4 in ASTM A703/A703M #5	X	X #1
Main steam, hot reheat, or boiler startup, SA-182 and A 182 F11, F22 or F91	X	---	X-S55 in ASTM A961/A961M #4	X-S52 in ASTM A961/A961M	X #1
Boiler feed or boiler startup SA-216 and A 216 WCB	X	X-S5 in ASTM A703/A703M #3 & #6	X-S4 in ASTM A703/A703M #5	---	X #1
Boiler feed or boiler startup SA-234 and A 234 or WPB or WPC	X	X #3	X-S53 in ASTM A960/A960M #4	X-S50 in ASTM A960/A960M	X #1
Cold reheat A 216 WCB or WCC	X	X-S5 in ASTM A703/A703M #3 & #6	X-S4 in ASTM A703/A703M #5	---	X #1
Cold reheat A 234 WPB or WPC	X	X #3	X-S53 in ASTM A960/A960M #4	X-S50 in ASTM A960/A960M	X #1

NOTES:

- #1 Documentation for all examinations and testing shall be submitted.
- #2 100% radiographic examination of all welds, not base metal.
- #3 All parts.
- #4 Acceptance criteria per ASME B31.1.
- #5 Acceptance criteria per MSS SP-53.
- #6 Acceptance criteria per MSS SP-54.

END OF SECTION 400510

400510-21



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SECTION 400523

VALVES

PART 1 - GENERAL

101. EXTENT

- 101.1 This Section establishes the requirements for design, performance, manufacture, inspection, examination, testing, packaging and shipping for all valve configurations in all piping systems as follows:
- a. Steel valves, as follows:
 - a1. Socket-weld or threaded end valves in sizes 2 inches and smaller, forged Pressure Class 1500.
 - 101.2 The quantity, size, rating, material specifications, configuration, and other requirements are listed on the included Attachments 2 & 4.
 - 101.3 Manufacturer's valves and valve accessories shall conform to the requirements of the governing code(s) and shall satisfy all conditions and requirements of this Specification and attached Valve Design Tables (VDT) and data sheets.

102. DESIGN REQUIREMENTS

102.1 General Design Requirements:

- a. Valves and accessories shall conform to the requirements of the governing Code(s); in other respects, valves shall conform to the requirements of this Section and shall satisfy all conditions and requirements of the specification.
- b. In the event of variance between the general requirements delineated in this Section and the particular requirements set forth in the VDT or other data sheets, the VDT or data sheets shall take precedence.
- c. The valve requirements will be specified in Attachments 2 and 4.

103. REFERENCE DOCUMENTS

- 103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated in Section 014219, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date indicated in Section 014219.
- 103.2 ASME - American Society of Mechanical Engineers:
- a. B16.34 - Valves - Flanged, Threaded, and Welding End.
 - b. B31.1 - Power Piping.



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- 103.3 ASTM - ASTM International:
- a. A 182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
- 103.4 MSS - Manufacturers Standardization Society of the Valve and Fitting Industry:
- a. SP-25 - Standard Marking System for Valves, Fittings, Flanges and Unions.
104. SUBMITTALS
- 104.1 Submit documents for review in accordance with the submittal requirements of Section 013323.
- 104.2 Shop detail and erection drawings.
105. MAINTENANCE
- 105.1 Special Tools:
- a. A complete set of special tools required for repair, adjustment and complete dismantling and assembling of the valves shall be furnished. Tools shall be new and of first-class quality. Tools shall be shipped to the project in separate containers clearly marked with the name of the equipment for which they are intended.
- 105.2 Spare Parts:
- a. Provide a complete set of spare parts required for erection.

PART 2 - PRODUCTS

201. DESIGN REQUIREMENTS
- 201.1 Refer to attached Valve Design Table (VDT), valve list, and attached data sheets for specific design requirements.
202. MATERIAL REQUIREMENTS
- 202.1 Refer to VDT's and other attached data sheets for material requirements.
203. FABRICATION REQUIREMENTS
- 203.1 Protection:
- a. Valves shall be protected prior to shipment in accordance with manufacturer's standard practice and as follows:
- a1. All openings in valves and accessory equipment shall be securely plugged, capped, or otherwise blanked off, sealed with tape and suitably protected against damage and entry of foreign materials and moisture.
- b. Weld ends shall be capped and sealed with suitable, firmly attached protectors. Protectors for beveled ends shall have a plywood or hardboard liner disc held securely against the beveled end. Protectors for other weld ends may be metal caps without liner discs. Protectors for socket weld-ends may be plugs.
- c. Threaded connections shall be provided with plugs.



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- d. Contractor shall furnish Owner with instructions for storage and maintenance of his equipment prior to installation as well as for the period between completion of installation and the time that the equipment is placed in service.
- 203.2 Valve Identification and Marking:
- a. Marking:
 - a1. For butt-weld and flanged end steel valves: Per ASME B16.34
 - a2. For valves not covered above: Per MSS-SP-25.
 - b. Identification:
 - b1. In addition to the marking specified above, each valve and separate component shall be equipped with a stainless steel metal tag permanently attached in accordance with MSS-SP-25, bearing the corresponding identification number and its particular service indicated herein.
 - c. The valves shall be numbered to match the existing valves being replaced.

204. FINISH REQUIREMENTS

- 204.1 Valves shall be cleaned and painted in accordance with manufacturer's standard practice, and as follows:
- a. Grit Blasting: Interior of all valve bodies shall be thoroughly blast cleaned using metallic grit. Grit used for stainless steel valves shall be new alumina. All grit blasting materials shall be removed prior to painting.
- 204.2 No paint having an asphaltum base shall be used.
- 204.3 Paint for ferrous metal valves with hot service conditions shall be heat resistant.
- 204.4 Machined surfaces shall not be painted. Welding end preparations of ferrous metal valves shall be coated with Deoxaluminite, or equal, acceptable to the Consulting Engineers, back to a ring 6-inches from end.

PART 3 – EXECUTION

301. FIELD QUALITY CONTROL

- 301.1 Inspection and Testing by the Contractor.
- 301.2 Inspection and Testing by the Owner:
- a. After valves are put in service, Owner may run a performance test and hydrostatic test in accordance with applicable codes; and rectification of all defects shall be carried out by the Contractor at no extra cost to the Owner. Contractor shall, if specified in this Specification, have his/her authorized Representative present to witness and assist in the tests.
- 301.3 Examination for general compliance by the Engineer of Record:
- 301.4 Extent and method of examination and testing:
- 301.5 Acceptance Criteria:
- 301.6 Field Services:



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- a. Contractor shall, at the Owner's option, furnish field representatives to provide technical assistance for erection and installation of the Contractor's equipment and/or to provide technical assistance for commissioning and start-up of Contractor's equipment. Contractor shall, if required by the Owner, furnish training to the Owner's operations personnel

302. SUPPLEMENTS, STANDARDS, AND DRAWINGS

302.1 Supplements:

- a. Attachment 2 – Contains Valve Design Table (VDT)
- b. Attachment 4 – Contains Valve List

END OF SECTION 400523



SECTION 400533

PIPE SUPPORTS

PART 1 – GENERAL

301. EXTENT

- 301.1 This Section prescribes the minimum requirements for the installation of pipe supports.
- 301.2 The Work shall include, but not be limited to the following:
- a. Procure, locate, and install all pipe supporting elements, including hangers, supports, floor stands, anchors, guides, brackets, spring cans, and any supplementary steel required to attach supports to structures per the design drawings.
- 301.3 Except as otherwise specified in this Section, or as indicated on the design drawings, the methods, conditions, materials, and products specified herein apply to work whether performed in the shop or in the field.

302. REFERENCE DOCUMENTS

- 302.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated in Section 014219, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date indicated in Section 014219.
- 302.2 AISC - American Institute of Steel Construction
- 302.3 ASME - American Society of Mechanical Engineers:
- a. B 31.1 - Power Piping Code
- 302.4 ASTM - ASTM International:
- a. A 36 - Specification for Carbon Structural Steel
 - b. A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - c. A 153 - Specification for Zinc Coating (Hot-Dipped on Iron and Steel Hardware)
 - d. A 384 - Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
 - e. A 385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
 - f. A 386 - Standard Specification for Zinc Coating (Hot- Dip) On Assembled Steel Products
- 302.5 AWS - American Welding Society:
- a. D1.1 - Structural Welding Code - Steel



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- 302.6 MSS - Manufacturers Standardization Society of the Valve and Fitting Industry
- a. MSS-SP-58 – Pipe Hangers and Supports – Materials, Design Manufacture, Selection , Application and Installation
303. SUBMITTALS
- 303.1 Contractor shall provide as-built markups of support drawings to identify any modifications made in the field during installation of the supports.
304. GENERAL QUALITY CONTROL AND QUALITY ASSURANCE PROVISIONS
- 304.1 Pipe supports including auxiliary steel shall conform to the requirements of this Section. Additionally, supports for piping included under the jurisdiction of ASME B31.1 shall be designed, fabricated and tested in accordance with the requirements specified therein. Auxiliary steel shall be designed, fabricated, and tested in accordance with the applicable requirements of the AISC Manual of Steel Construction and AWS D1.1 Structural Welding

PART 2 - PRODUCTS

201. ACCEPTABLE MANUFACTURERS AND PRODUCTS
- 201.1 Acceptable Products: Subject to compliance with requirements, for new or replaced hot small-bore (2" and smaller) pipe supports and pipe support products that may be incorporated into the Work include, but are not limited to, products listed below:
- a. Anvil International,
- b. Lisega,
- c. Bergen Power Pipe Supports,
- d. Owner-approved equivalent.

PART 3 – EXECUTION

301. ERECTION, INSTALLATION OR APPLICATION INCLUDING TRAINING
- 301.1 Contractor shall perform all field fabrication, assembly, and installation required for the piping supports. Installation shall be done without damaging or altering structural steel.
- 301.2 Contractor shall design and locate all piping supports required for field fabrication and/or field-routed piping, unless otherwise indicated, including any special supports required for small piping.
302. FIELD QUALITY CONTROL
- 302.1 Field Services: Contractor shall furnish the following:
- a. Services of competent technical personnel to provide technical advice, assistance and guidance in the unloading and erection of the equipment furnished under this Specification.



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- b. Field personnel shall be qualified, and able to perform the duties required to the satisfaction of Owner and vested with authority to make decisions binding on Contractor.
- c. Necessary technical services as required to resolve preliminary operating problems as they develop until satisfactory operation is achieved. Field technical services for manufacturing errors shall be paid for by Contractor.

303. ADJUSTING AND CLEANING

- 303.1 Contractor shall make all adjustments and readjustments necessary on the piping supports erected by Contractor during erection, after piping systems are leak-tested, and during and after preliminary operation of the piping systems.
- 303.2 Contractor shall examine each restraint and guide, in both the cold and hot positions, to verify that pipe can move freely, and shall adjust if required. Where restraints or guides cannot be observed in the hot operating condition, actual measurements of the cold position of the pipe with respect to the restraint or guide shall be recorded; these measurements shall be compared with those shown on the design drawings for the purpose of verifying the adequacy of clearance for the piping movement.
- 303.3 After installation, the Contractor shall touch-up shop finish painted surfaces in accordance with support manufacturer's or supplier's recommendations.

END OF SECTION 400533



SECTION 404213

THERMAL INSULATION FOR PIPING

PART 1 – GENERAL

101. EXTENT

101.1 This Section prescribes the minimum requirements for thermal insulation for piping.

102. SYSTEM DESCRIPTION OR DESIGN REQUIREMENTS

102.1 Piping System Drawings:

- a. The design drawings and the diagrams shall be considered together, and any work called for or indicated on one and not on the other shall be considered as part of the Work, unless specifically noted to the contrary.
- b. Certain small piping systems (or smaller sized pipe runs) are only shown diagrammatically, or may be called for to terminate at a certain point not shown physically on the drawings. Contractor shall furnish and install insulation for any such piping in order to complete the system whether shown physically or not.
- c. The insulation for this project is for personnel protection, and is designed to maintain a maximum of 140°F skin temperature on all piping. Insulation type shall be calcium silicate for all large bore piping, and Pyrogel HPS for all small bore piping. Insulation thicknesses shall be as shown on the design drawings.

102.2 The Contractor shall remove and dispose of existing insulation on the removed piping.

102.3 The Contractor shall provide appropriate lagging and jacketing at transition points between new piping installation and existing piping and insulation. The existing piping will necessarily be the same insulation type or thickness as the Contractor's scope of supply.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated in Section 014219, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date indicated in Section 014219.

103.2 ASME – American Society of Mechanical Engineers:

- a. B31.1 – Power Piping

103.3 ASTM – ASTM International:

- a. C 592 – Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)

103.4 ISO – International Organization for Standardization

103.5 NAI – National Insulation Association

103.6 UL – Underwriters' Laboratories, Inc.



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104. SUBMITTALS

- 104.1 Submit documents for review in accordance with the submittal requirements of Section 013323.
- 104.2 Insulation Samples: A sample of each type of pipe insulation, together with thermal efficiency tables or curves based on a recognized authority, shall be submitted to the Owner for their information, if requested.
- 104.3 Expansion Details: Seller shall submit a sketch to the Owner showing the method proposed to provide for expansion and contraction of pipes due to temperature changes on those lines where supports have not been provided.

105. GENERAL QUALITY CONTROL AND QUALITY ASSURANCE PROVISIONS

- 105.1 It shall be Contractor's responsibility to ensure that all insulation and lagging is properly applied and secured, so that it will not come loose or unduly deteriorate under the operating conditions to which it will be subjected.
- 105.2 The workmen employed by the Contractor in the application of the materials shall be skilled in their work and under the direction of expert foremen. Workmanship and finish shall be of the highest quality and must be acceptable to the client.
- 105.3 In the event of variance between the general requirements delineated in this Section and the particular requirements set forth in the specification, the specification shall take precedence.
- 105.4 Contractor shall be solely responsible for advising the Owner to remedy any conflicts between the specification and Contractor's design, including performance and levels of quality. Contractor agrees that its obligations, liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of the specification.
- 105.5 Substitutions:
- a. Mention of material by name or products of certain manufacturers in the Specification, design drawings, etc., is made to ensure that the proper quality and/or type is provided. No substitutions for said items will be permitted unless approval is granted in writing by the Owner.

106. SEQUENCING

- 106.1 Contractor shall remove existing insulation blanket system and coordinate with Owner to store the insulation blankets appropriately for re-use with the new HR System piping. All new insulation shall match the existing insulation blanket in material and density.

107. WARRANTY

- 107.1 It is mutually understood that Contractor has verified that the types, thickness, combinations and methods of application of the insulating materials called for in the specification and herein are suitable for the specified service conditions. Therefore, Contractor warrants that the materials furnished are correct for their specified service and will maintain their thermal efficiency, physical qualities and mechanical strength without deterioration under the conditions for which they will be used.

PART 2 - PRODUCTS

201. MATERIAL REQUIREMENTS

- 201.1 Insulating materials shall match the existing materials to the greatest extent practical.



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- 201.2 The use of asbestos or ceramic fibers or any insulating materials, cloths, tapes, etc., containing asbestos or ceramic fibers is prohibited.
- 201.3 All new or additional insulating materials shall be new and suitable for the purpose intended and shall be of such durability as to be capable of giving effective service for the life of the plant under normal operating conditions.
- 201.4 All insulation for hot surfaces shall be of high thermal efficiency and shall be capable of withstanding the maximum specified work temperatures to which they will be subjected, without deterioration and without loss of thermal efficiency.
- 201.5 Contractor shall not install any cracked or damaged insulation. Insulation that is cracked or damaged during its installation shall be removed and replaced by Contractor at his expense.
- 201.6 All insulating materials, adhesives, finishes, tapes, lagging materials, insulation sealant, mastics, vapor barriers, etc. shall be received in the manufacturers' unopened cartons and shall be kept dry and protected against the elements during storage and during all stages of application.
- 201.7 All insulating materials shall conform to the respective requirements of the applicable ASTM Specifications. All references to the ASTM Specifications are to the latest issue in each case.
- a. See Attachment 1 for Existing HR System Plant Insulation Specification.
- 201.8 Perm rating of vapor proof mastics shall not exceed 0.05 perm. All mastics must be "UL" labeled.
- 201.9 Insulation Thickness:
- a. Insulation for various surfaces shall be of such quality and thickness to ensure that the temperature of the finished outside surface or outside surface of casings or lagging will in no case exceed 140°F.
202. SOURCE QUALITY CONTROL
- 202.1 Contractor shall prepare and submit an Inspection and Test Plan for review and acceptance by the Owner. The plan shall address all examination and testing and submittal of documentation required by the governing code(s).
203. FINISH REQUIREMENTS
- 203.1 All painting and coating of insulation shall match existing as approved by the Owner.

PART 3 – EXECUTION

301. GENERAL
- 301.1 Insulation shall not be applied to piping until all piping tests have been completed, subject to the approval of the Owner. Insulation shall not be applied on flanged joints until approval is given by the Owner.
- 301.2 Metal Protection:
- a. Where dissimilar metals are in contact with each other, (e.g., aluminum and plain steel) means for isolating such surfaces shall be provided, as approved by the Owner.



302. PREPARATION

- 302.1 Before insulation is applied on any piping, the surfaces to be insulated shall be cleaned and wire brushed, if necessary, to remove any accumulation adhering to the surfaces. A stainless steel brush shall be used on any stainless steel piping requiring brushing. Additionally, any surface where adhesion to the surface is used as a means to support the insulation, the surface shall be free of all oil film.

303. INSTALLATION

303.1 Multiple Layer Insulation:

- a. All block, segmental and sectional insulation for all piping 3 inches and over in total thickness (not including finish coat) shall be applied in 2 or more layers unless otherwise specified.
- b. In the case of 2-layer insulation, the inner layer thickness shall be 1/2 of the total specified thickness. Where this is not practical, the inner layer thickness shall be 1/2 inch less than the outer layer thickness.
- c. Staggered joint construction shall be used for joints in both directions on all multiple layer insulation.

303.2 Insulation Fastening Wire:

- a. Fastening wires for pipe insulation shall be in accordance with the following:
 - a1. Single-layer insulation and the outer layer of insulation for all double-layer applications shall be fastened with 16 gauge or heavier galvanized steel wire.
 - a2. The inner layer of insulation for all double layer application shall be fastened with 16-gauge or heavier stainless steel wire.
- b. In addition to the above requirements, any fastening wire coming in contact with surfaces over 499°F shall be 16 gauge or heavier stainless steel.

303.3 Joints:

- a. All insulation shall be laid with tightly butted joints and all voids, chipped corners or other openings in the insulation sections or blocks shall be filled, not merely pointed, with approved insulating cement, finished smooth and neat.
- a1. In the event the existing insulation is too small for the pipe spools / segments, the resulting void or opening in the insulation sections shall be filled with approved insulation after notification and prior approval of the Owner.
- b. All forms of insulation shall present a smooth even surface so that no joints or wire grooves will appear on the finished surface.

303.4 Insulation for Hot Piping:

- a. Insulation for all of the specified piping systems shall include insulation for main lines, bypasses, cross connections, valves, valve bypasses, flanges and fittings, unless otherwise specified. On pipelines that originate or terminate at a piece of equipment, insulation shall be finished complete to the equipment.
- b. All protective hanger lugs and hanger clamps on piping with operating temperatures of 300°F and above shall be completely insulated with the same type and thickness of insulation as that specified for the pipeline in which the hanger is located.



- c. Not less than 3 insulation tie wires shall be applied on each 3-foot long section of sectional pipe insulation. All fastening wire shall be at right angles to the axis of the pipe, not diagonally wound on. End tie wires shall be applied 3 inches in from the end of each insulation section. Ends of tie wires applied to outer layers shall be tightly twisted together, bent over and pressed into the insulation so as to leave no projection visible on the finished surface.
- d. Each layer of insulation shall be fastened independently of other layers.
- e. Insulation on vertical runs of pipe shall be supported to prevent displacement due to slipping or contraction. Certain piping systems, as indicated on the drawings, will be provided with insulation support lugs and insulation support rings furnished in place by others. However, Contractor shall provide friction clamps or shall attach clip angles, studs, etc. to such other vertical runs of pipe as may be required to properly support the insulation. Friction clamps, clip angles, studs, etc. and method of attachment shall be as approved by the Owner.
- f. Contractor shall recognize that there is a possibility that a reduction in insulation thickness may be required due to proximity of pipes to conduits, steel supports, other piping, etc. Contractor shall obtain approval from Owner prior to any reduction in insulation thickness.

303.5 Insulation for Hot Valves and Fittings:

- a. All valves and fittings shall be covered with insulating materials of the same kind and thickness as that specified for the pipelines in which they are installed. In the case of reducing fittings, the largest pipe size shall determine the thickness of the insulation to be used.
- b. All valves, including safety and relief valves (except electromatic relief valves) installed in pipes to be insulated, shall be completely insulated to and include the valve bonnet joint in each case.
- c. Each insulated safety valve shall be provided with a metal sleeve through the insulation to provide access to those portions that require adjusting, such as the ring pin. Existing metal sleeves shall be re-used if possible. Contractor shall replace in kind if necessary.
- d. Insulation sections or segments used for covering valves, fittings, etc. shall be properly mitered as required and shall fit together snugly. Insulation shall be properly secured by tie wire as specified.
- e. Insulation for valves and fittings where the OD of the insulation is 6 inches or greater shall be reinforced with 1-inch mesh, 18-gauge galvanized wire netting and finished with a ½-inch thick, when dry, coating of hard finish cement. Netting shall not be visible through cement finish. Insulation for valves and fittings made in accordance with ASTM Specification C450 will not require mesh-reinforced cement over the insulation.
- f. Mineral wool insulating cement may be used to insulate valves and fittings in 2-inch and smaller piping to be insulated with 2 inches or less of insulation.

303.6 Removable Covers for Valves and Fittings:

- a. Removable, reusable covers for valves, flanges, etc., shall be provided to accommodate maintenance.
- b. Removable covers shall be of the following types:
 - b1. Metal Mesh Encased Blankets
 - b2. Fabric Encased Blankets



- c. Metal Mesh Encased Blankets:
 - c1. Blankets shall consist of 11-lb/ft³ minimum density mechanically-bonded glass fiber insulating blanket having a temperature use limit of not less than 1000°F.
 - c2. Each blanket shall be completely encased in a closely knitted wire mesh jacket consisting of 304 stainless steel wire woven to a 60-density mesh size.
 - c3. Blankets shall be tufted on 6-inch centers, starting 3 inches back from the edge. Tufting shall be performed by employing the following method:
 - c3.1 No. 16 BWG Type 300 series stainless steel wire shall be looped through two double eyelet washers and the blanket in a sandwich-like manner. The wire shall be of sufficient length so that its free ends can be twisted together and bent down flat against the washer. In addition, blanket fastening devices, consisting of either one-eighth inch 300 series stainless steel closed rings, (lacing eyes) or an extra double eyelet washer shall be secured to the washers and wires located 3 inches back from the blanket edge.
 - c3.2 All blankets shall have square edges with seams that are fourfold and stapled and/or stitched continuously with a 300 series stainless steel wire, stainless steel lacing anchor and stainless steel hog rings to match existing insulation system.
 - c3.3 Filler material shall consist of blanket insulation.
 - c3.4 Packing with loose or bulk filler is not acceptable.
 - d. Fabric Encased Blankets:
 - d1. Blankets shall consist of 11-lb/ft³ minimum density mechanically bonded glass fiber insulating blanket having a temperature use limit of not less than 1000°F. Each blanket shall be completely encased in a suitable fabric as approved. Fabric shall be suitable for the temperatures to which it will be subjected.
 - d2. Blankets shall be tufted on 6-inch centers, starting 3 inches back from the edge. Tufting shall be performed by the following method:
 - d2.1 No. 16 BWG Type 300 series stainless steel wire shall be looped through two double eyelet washers and the blanket in a sandwich-like manner. The wire shall be of sufficient length so that its free ends can be twisted together and bent down flat against the washer. In addition, blanket fastening devices, consisting of either one-eighth inch 300 series stainless steel closed rings, (lacing eyes), or an extra double eyelet washer shall be secured to the washers and wires located 3 inches back from the blanket edge.
 - d2.2 All blankets shall have square edges with seams that are fourfold and stapled and/or stitched continuously with a 300 series stainless steel wire, stainless steel lacing anchor and stainless steel hog rings to match existing insulation system.
 - d2.3 Filler material shall consist of blanket insulation.
 - d2.4 Packing with loose or bulk filler is not acceptable.
- 303.7 Personnel Protection:
- a. Personnel protection insulation shall be provided for:
 - a1. All tapped and untapped vent and drain piping that operates at a temperature of 140°F and above.



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- b. These drains and vents inside the building shall be re-insulated as necessary based on the degree of demolition and removal performed in order to demolish and remove the existing HR System piping.
 - c. The above drains and vents shall be insulated with materials to match the existing insulation (and lagging) system, as necessary.
 - d. Insulation for the above drains and vents shall be of such quality and thickness to assure that the temperature of the finished outside surface or outside surface of casings or lagging, will in no case exceed 140°F when the surrounding air is 100°F unless otherwise specified.
- 303.8 Ends of pipe insulation at intervals of not more than 9 feet on continuous runs of pipe, and at flanges, valves and fittings, shall be sealed off with a vapor-proof mastic.
- 303.9 All longitudinal laps in the fire-retardant vapor barrier jacket shall be stapled. Staples shall be of the outward clinching type placed on not greater than 4-inch centers. After the staples are in place, a brush coat of vapor-proof mastic shall be applied over each staple.
- 303.10 Hanger rods shall be caulked and sealed with vapor-proof mastic prior to installation of the jacketing.
- 303.11 Hangers and pipe clamps with thickness of ½-inch or smaller that are attached directly to the pipe may be buried in the specified thickness of insulation. All other hangers and pipe clamps shall be covered with a sleeve or oversized pipe insulation section.
- 303.12 Hangers attached directly to the pipe shall be covered with insulation the same thickness as that specified for the pipeline in which the hanger is located.
- 303.13 Hanger penetrations shall be properly sealed to prevent condensation.
- 303.14 Canvas Jacketing:
- a. All insulation (except that which is covered with metal coatings or where otherwise specified) shall be provided with a canvas jacket, securely pasted on in a neat and workmanlike manner. Canvas shall be of a texture suitable for the purpose intended and shall weigh not less than eight ounces per square yard except where otherwise specified.
 - b. All canvas shall be field-applied. Factory-applied canvas is not acceptable.
 - c. Before the canvas jacket is applied, care shall be taken to ensure that all joints and irregularities on the insulation are properly pointed up and filled with cement to present a smooth surface for the canvas.
 - d. The canvas adhesive shall be mold inhibiting type and shall be tinted (light blue) so that it can be readily determined that the canvas is completely coated. Color density shall be as approved.
 - e. In applying canvas covering, it shall be cut so as not to come in contact with any hot metal surfaces such as pipe supports, flanges, etc.
 - f. Where metal surfaces at edges of insulation are in excess of 200°F, a 6-inch wide strip of fiberglass cloth shall be pasted on over the insulation instead of the canvas. This shall apply where the canvas would make contact with metal having operating temperatures above 200°F such as valve bonnets, flanges, piping, etc.

END OF SECTION 404213



SECTION 409125

INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

101. EXTENT

101.1 Section prescribes the minimum requirements to provide instrumentation and controls. The work shall include, but not be limited to, the following:

- a. Furnishing all labor, materials, equipment, tools and services necessary to furnish, deliver, unload, store (in a suitable dry and protected location), install, connect, test and place in satisfactory operation the instrumentation and controls equipment, services and systems as shown on the drawings and as specified. The Work shall include everything requisite and necessary to complete the Work properly and to provide a complete and satisfactory operating system notwithstanding the fact that every item involved may not be specifically mentioned, listed, or described herein. The Work shall include but not be limited to the Work described herein.
- b. Furnishing all installation material for the installation of instrumentation and control equipment and devices, furnished by the Contractor as identified in Design Drawings.
- c. Complete installation, connection, piping/tubing, testing and calibration, and placing in service the instrumentation and control panels/enclosures, equipment, and devices described herein, including, but not limited to, the following:
 - c1. Receiving, handling, and storing of all of Contractor's furnished instrumentation and controls equipment and devices.
 - c2. Installation of Contractor's furnished instrumentation and controls equipment and devices as identified in Design Drawings.
 - c3. Re-installation of existing instruments as identified in Design Drawings.
 - c4. Providing support hardware and brackets required for the installation of the control and instrument equipment and devices specified herein and/or as part of the equipment furnished under this specification.
 - c5. Providing primary instrument installation hardware including instrument piping/tubing from the process connection shutoff valve (root valve) and all required fittings and valves, for Contractor supplied equipment. Contractor shall provide root valves, instrument valves, and instrument sensing line material per this specification.
 - c6. Installation of primary process connections for pressure instruments.
 - c7. Providing all main and branch control air supply headers, and all individual air supply tubing for all field mounted or panel/enclosure mounted pneumatic devices as indicated in this specification. This includes furnishing and installing all air supply shutoff valves in main branches and in individual air supply headers, and furnishing and installing individual air supply filter/regulators.



- c8. Providing tubing between a major item of equipment and the panels/enclosures supplied with the equipment.
 - c9. Providing weatherproof heated instrument enclosures for individual instruments mounted outdoors.
 - c10. Installation of primary flow elements and associated flanges and process connections.
 - c11. Installation of in-line devices such as sight flow indicators, flow switches or flow meters and thermowells.
 - c12. Installation of control valves in process piping.
 - c13. Thermal insulation or freeze protection work on instrument primary piping, pneumatic tubing, or air supply lines.
 - c14. Electrical connection work except as specified otherwise herein.
 - c15. Locate instrumentation and control devices, as required, to allow convenient access for monitoring and testing of the equipment.
- 101.2 The work in this Specification shall be coordinated with work specified in other Sections of this Specification.
102. DESIGN REQUIREMENTS
- 102.1 All field mounted instruments and control devices shall be designed to withstand site ambient outdoor temperature, indoor plant temperature extremes, and site relative humidity throughout the temperature range without loss of accuracy.
- 102.2 All Instrumentation and Control (I&C) equipment furnished by the Contractor shall have been proven in power plant operation.
- 102.3 Contractor shall verify that all new instruments and control devices are calibrated. Calibration shall be certified by an independent laboratory or agency with traceability to the National Bureau of Standards.
- 102.4 System electronics shall be shielded against electromagnetic interferences and shall be capable of withstanding surges in power supplies.
- 102.5 Hazardous Locations: The instrumentation and control devices and equipment located in a hazardous location (area) shall be in accordance with NFPA 70.
- 102.6 All instrumentation and systems shall be designed to provide safe and reliable operation of the unit in accordance with all applicable codes and standards. All instrumentation shall be of heavy-duty industrial quality design with all materials of construction suitable for the application. All instrumentation and control devices supplied shall be NEMA 4X rated unless noted otherwise herein or dictated by code.
- 102.7 All differential pressure instrumentation shall be supplied with three valve manifolds. Two valve manifolds shall be supplied for all pressure instruments.
- 102.8 Instruments containing mercury are prohibited.



- 102.9 Electrical components shall be designed, built, and tested in accordance with applicable NEMA and IEEE standards.
- 102.10 All piping components and fabrication shall be in accordance with the following documents insofar as they apply to the scope of work covered within this specification:
- a. ASME B31.1, Power Piping, of the ASME Standard Code for Pressure Piping.
 - b. Section I (Power Boilers) of the ASME Boiler and Pressure Vessel Code.
- 102.11 All instrument scales shall be calibrated and printed in the system of units as specified by the Contractor. All scales shall be graduated and marked in English units only. Scales and charts shall have linear graduations. This requirement does not apply to digital type indicators.
- 102.12 Instrument scales shall be white with black division marks and, where practical, the divisions shall be based on multiples of 10. This requirement does not apply to digital type indicators.
- 102.13 Preferably, instrument ranges shall be selected to have the “normal” reading at 75% of full scale. This requirement does not apply to digital type indicators.
- 102.14 Instrument Marking - The Contractor shall provide stamped stainless steel tags for the following:
- a. All process root valves shall be tagged with the associated instrument tag number(s). Tags shall protrude from any insulation.
 - b. All instruments shall be tagged with the appropriate instrument tag number, generated based upon the use of the Owner tagging system. Tags shall be secured with stainless steel wire with ends crimped together or permanently attached.
 - c. Equipment/instruments and valves shall be tagged in accordance with the Project requirements.
103. REFERENCE DOCUMENTS
- 103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials shall comply with applicable or specified portions of the referenced documents, in addition to federal, state or local codes having jurisdiction. References to these documents are to the issue date of each document identified in Section 014219, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, thereto, in effect as of the date identified in Section 014219:
- a. AGA - American Gas Association
 - b. ASME - American Society of Mechanical Engineers:
 - b1. B31.1 - Power Piping
 - b2. MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi
 - b3. PTC 19.3 TW - 2010 - Thermowells
 - b4. PTC 19.5 - Flow Measurement



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- b5. ASME - Fluid Meters – Their Theory and Application
 - c. ASTM - ASTM International
 - d. ICEA - Insulated Cable Engineers Association
 - e. ISA - International Society of Automation:
 - e1. S5.1 - Instrumentation Symbols and Identification
 - e2. ANSI/ISA-77.70-1994 (R2005) Fossil Fuel Power Plant Instrument Piping Installation
 - f. NBS - National Bureau of Standards
 - g. NEC - National Electrical Code
 - h. NEMA - National Electrical Manufacturer's Association
 - i. NESC - National Electrical Safety Code
 - j. NFPA - National Fire Protection Association:
 - j1. 70 - National Electric Code
 - k. UL - Underwriter's Laboratories, Inc.
- 103.2 The Contractor shall comply with the above listed standards and all rules and regulations of public administrative authorities having jurisdiction over the work covered by this Specification. The Contractor shall include all costs related to the modification and installation of equipment and wiring which are incurred in order to comply with the standards, codes, and local laws.
104. SUBMITTALS
- 104.1 Submit documents for review in accordance with the submittal requirements of Section 013323.
 - 104.2 Shop detail and erection drawings.
 - 104.3 Samples.
 - 104.4 Test reports.
105. GENERAL QUALITY CONTROL AND QUALITY ASSURANCE PROVISIONS
- 105.1 Substitutions:
 - a. Materials, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number to establish the desired quality or style of components and are identified in the Acceptable Contractors list given in Article 201. For any substitution, the Contractor shall submit a request to the Owner to include why the manufacturer on Acceptable Contractor is not suitable and shall provide information following in this section. The Owner will review each request and provide approval if acceptable to the Owner.



- b. The quality of substitutes proposed by the Contractor shall equal or exceed the quality of items specified. The Owner reserves the right to require submittal of shop or manufacturer's drawing for and a sample of any substitute proposed.
- c. Where substitutions alter the design or space requirements, the Contractor shall accomplish the revised design and construction with no additional charge to the Owner.
- d. Instruments for which there is no category listed in Article 201 must be reviewed and approved by the Owner.

106. PROJECT/SITE CONDITIONS

- 106.1 Ambient Conditions: Outdoor temperature extremes that equipment must be capable of continuously operating within are from minus 20°F to positive 110°F with relative humidity ranging from 5% to 95%. Indoor equipment shall operate from 40°F to 150°F. The indoor relative humidity ranges are from 5% to 95%.

107. MAINTENANCE

107.1 Special Tools:

- a. Any special tools required to adjust or dismantle each type of equipment shall be new and furnished by the Contractor. Tools and accessories shall be shipped to the jobsite in a suitable separate container clearly marked with the name of the equipment for which the tools are intended.

PART 2 - PRODUCTS

201. ACCEPTABLE MANUFACTURERS AND PRODUCTS

- 201.1 The following listing is general and not to be construed to mean that all manufacturers and their products meet the specifications. Contractor shall select the certain manufacturers and their particular model numbers or designs that meet the specifications.
- a. Air Filter/Regulator:
 - a1. Fisher
 - b. Fittings, Tube:
 - b1. Swagelok
 - b2. Parker
 - c. Manifolds:
 - c1. Anderson-Greenwood
 - c2. PGI
 - d. Pressure Indicators:
 - d1. Wika
 - d2. Ashcroft



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- e. RTD (general purpose):
 - e1. Thermo Electric
 - e2. WIKA Alltemp Sensors
- f. Temperature Indicators:
 - f1. Ashcroft
 - f2. Tel-Tru
- g. Thermocouples:
 - g1. Thermo Electric
 - g2. WIKA Alltemp Sensors
 - g3. Sandelius
- h. Thermowells:
 - h1. Thermo Electric
 - h2. WIKA Alltemp Sensors
 - h3. Texas Thermowell
 - h4. Sandelius
- i. Transmitters – Differential Pressure or Pressure:
 - i1. Rosemount
- j. Valve – Instrument:
 - j1. Swagelock-Whitey
 - j2. Parker
- k. Valve – Solenoid:
 - k1. ASCO
 - k2. Parker Hannifin
- l. Flow Elements – Orifice:
 - l1. Daniel Measurement
 - l2. Fluidic Techniques



202. COMPONENTS

202.1 Analyzers (as applicable):

- a. Analyzers shall have solid-state electronics and shall produce an analog 4-20 mA signal linear with the measured variable with a digital HART protocol signal superimposed. Analyzers shall have a LCD display on the front enclosure, be loop powered, or powered with 120VAC and shall be suitable for the process being measured.
- b. Transmitters shall have zero and span adjustments, which shall be capable of being set at any point within the transmitter's range.
- c. Overrange pressure protection shall be provided to allow overpressurization to a minimum of 50% above full design pressure without affecting transmitter accuracy or calibration.
- d. Wetted materials shall be selected based on the process fluid, to preclude any corrosion or scaling.
- e. All transmitters shall be designed to prevent the process medium from contacting the electronics or from entering the wiring circuit if the measuring element fails.
- f. Each transmitter shall have an integral junction box with terminal strip, integral test jacks, and conduit connection, and shall be complete with all mounting accessories.

202.2 Pressure and Differential Pressure Transmitters:

- a. Transmitters shall have solid-state electronics of the "Smart" type, be two-wire design, NEMA 4X housing, and shall produce a user selectable linear or square root 4-20 mA output with a digital HART protocol signal superimposed, and shall be powered from its primary user system. Transmitters shall have local LCD indication which shall functionally replace local indicators whenever possible.
- b. Transmitters shall have zero and span adjustments, which shall be capable of being set at any point within the transmitter's range.
- c. Overrange pressure protection shall be provided to allow overpressurization to a minimum of 50% above full design pressure without affecting transmitter accuracy or calibration.
- d. Wetted materials shall be selected based on the process fluid, to preclude any corrosion or scaling.
- e. Transmitter performance specifications shall include:
 - e1. Accuracy: $\pm 0.1\%$ of calibrated span – total performance, including reference accuracy, ambient temperature effect and line pressure effect.
 - e2. Stability: $\pm .125\%$ of upper range value for 5 years.
- f. All transmitters shall be designed to prevent the process medium from contacting the electronics or from entering the wiring circuit if the measuring element fails.
- g. Each transmitter shall have an integral junction box with terminal strip, integral test jacks, and conduit connection, and shall be complete with all mounting accessories.

- h. All pressure and differential pressure transmitters shall be furnished with manifolds with mounting hardware for rack or pipe mounting.
- i. The differential transmitters with high or low pressure side vented to atmosphere shall be capable of withstanding the possible maximum operating pressure without damage to the instrument. The transmitter potentially subjected to vacuum shall be capable of withstanding total vacuum without damage.
- j. Sealing diaphragm shall be used as an isolate layer for corrosive process fluids, slurries or highly viscous oils. The seal diaphragm shall be of the flanged type, and shall be suitable for the same conditions as those for the transmitter. The diaphragm shall be provided with flushing connection.

202.3 Level Transmitters (as applicable):

- a. Level transmitters based on differential pressure measurement method shall conform to the pressure and differential pressure transmitter requirements above. The following requirements shall apply to non-differential pressure type level transmitters.
- b. Level transmitters shall have NEMA 4X housing, and local LCD indication. The transmitters shall produce a 4-20mA output signal proportional to the level of the process with a HART signal superimposed, and with adjustable zero and span. Wetted materials shall be selected based on the process fluid, to preclude any corrosion or scaling.
- c. Flange mounted capacitive, ultrasonic or radar type level transmitters shall be used for non-contact type level measurements of large storage tanks, bins or hoppers containing liquids or solids. If foaming is present in a liquid level measurement, ultrasonic type measurement shall be avoided, radar type is preferred. Flange mounted differential pressure type level transmitters shall also be used on large liquid storage tanks where access to the top of the tank is not available or not convenient.
- d. Condenser hotwell level, feedwater heater levels and any level measurements of processes under vacuum shall use a magnetically coupled, float chamber type level sensor/transmitter. The chamber shall be of welded stainless steel construction (or other material as appropriate for the process), and shall meet the requirements of ASME B31.1. The chamber shall be fitted with insulation for hot services. The float shall be constructed of stainless steel (or other material as appropriate for the process), have a 360° magnetic ring positioned at the liquid level, be hermetically sealed, and shall have a top lug for extraction purposes. The magnetically coupled transmitter shall be mounted to the chamber.

202.4 Flow Elements (as applicable):

- a. Orifice plates shall generally be used for low pressure, low temperature water flow measurements, where flanged construction and higher-pressure loss are acceptable and shall have a minimum accuracy of +/- 3% of full scale and a turndown of 4:1 or greater. Orifice plates shall be of the paddle type, constructed of type 304 stainless steel or better as required by the application. Orifice flanges shall be provided with the orifice plates. Orifice flanges shall be of the raised face weld neck type (300 lb. ASME class, minimum) with dual sets of taps Beta ratios shall be between 0.6 and 0.7.
- b. Flow nozzles shall generally be used for high pressure and/or high temperature water flow measurements and for critical measurements where weld-in construction is required, and shall have a minimum accuracy of +/- 1.5% of full scale and a turndown of 4:1 or greater. Flow



nozzles shall be have dual sets of pressure taps, and shall be constructed of type 304 stainless steel or better as required by the application. The flow nozzle shall be ring welded as ring type with the holding ring material compatible with pipe. Installation of flow nozzles and pressure taps will be made in the pipe fabricator's shop. When required, flow nozzles shall be designed, constructed, and calibrated in accordance with ASME PTC 19.5.

- c. Venturis shall generally be used for steam flow measurements and shall have a minimum accuracy of $\pm 1.5\%$ or full scale and a turndown of 5:1 or greater. The venturi flow meter shall have entrance, convergent, throat and divergent sections designed, constructed, and calibrated in accordance with ASME PTC 19.5 and ASME MFC-3M. These flow elements shall be constructed of stainless steel and rated for the static design pressures required for the service.
- d. "Annubar" averaging pitot tubes shall be used for large diameter water flow measurement and measurements where pressure loss is critical and conditions permit their reliable performance. Annubars shall have a minimum accuracy of $\pm 1.5\%$. Elbow mounted Annubars shall have a minimum accuracy of $\pm 3\%$ of full scale. Annubars and elbow-mounted Annubar shall have turndowns of 6:1 or greater. These flow elements shall be constructed of Type 316 stainless steel and rated for the static design pressures required for the service. Annubar flow elements shall be complete with all required installation hardware, including opposite side support for flow applications in piping over 3 inches nominal diameter or for applications with high fluid velocity.
- e. The materials of differential pressure type flowmeters and their associated parts shall not be deteriorated by the working fluid.
- f. Where required, flow metering shall be temperature and/or pressure compensated.
- g. Flow nozzles with dual sets of pressure taps shall be used for critical measurements where weld-in construction is required.
- h. Magnetic or vortex flowmeters may be used when process conditions exclude the use of a differential pressure type primary flow element.
- i. Each flow element shall be designed to produce rated differential pressure at its maximum flow. The differential pressure range for orifice, nozzle, and venturi meters shall typically be between 100 and 300 inches of water.
- j. Flow elements and upstream and downstream piping straight runs shall be designed according to ASME MFC-3M, "Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi" and ASME PTC 19.5, "Flow Measurement".
- k. All primary flow elements and accessories shall conform to the latest applicable ASME, ISA, and AGA standards. Primary flow elements and installations shall be designed in accordance with ASME "Fluid Meters" 6th Edition Part Two, "Application of Fluid Meters."
- l. Contractor shall provide flow calculations and flow calibration test results for each flow element provided. Annubar type flow elements do not require flow testing.



202.5 Temperature Sensors:

- a. Unless stated otherwise, temperature detectors shall preferably be thermocouples. If RTDs are to be used, the RTDs shall be 100 Ω platinum. Motor and pump bearing and motor winding temperature elements shall be 100 ohm platinum RTDs.
- b. Thermocouples and RTDs shall have 3/8" O.D. stainless steel sheathed elements spring-loaded to provide good thermal contact with the well or protecting tube. The sheath shall have compacted magnesium oxide insulation. All connection heads shall be weatherproof with screwed covers, and supported from the well by a stainless steel extension nipple. Connection heads shall be approximately 4 inches in diameter with stainless steel screw cover. The arrangement shall be such that rotation of the screw cover does not damage the internal components. A chain shall be provided to prevent loss of the cover. A grounding terminal shall be provided in each connection head. Thermocouple terminal blocks shall be marked with polarity. RTD connection heads shall have properly labeled terminal blocks.
- c. Minimum thermocouple wire size shall be #18 AWG. Thermocouples including wire color coding shall be manufactured in accordance with ISA Standard MC96.1, "Temperature Measurement Thermocouples." Thermocouples shall be dual-element chromel-constantan (Type E) or dual-element iron-constantan (Type J), unless higher process temperatures require dual-element chromel-alumel (Type K). Thermocouples shall be of the ungrounded type, unless fast response time is required, in which case a grounded element shall be used. Thermocouples shall be of standard tolerance for all applications unless higher accuracy is required, in which case the special tolerance shall be applied. The standard and special tolerances shall be as defined in ISA Standard MC96.1.
- d. Resistance temperature detectors (RTDs) shall be the three-wire type, dual element, 100 Ω platinum resistance elements and shall be high vibration resistant. RTDs shall be accuracy Class A with a temperature coefficient of 0.00385. The minimum RTD accuracy shall be within ± 0.5 percent of measured temperature up to the full range.
- e. Temperature element should be purchased with matching thermowell to avoid incompatible fitment. Temperature element sizing shall be the responsibility of the Contractor.

202.6 Thermowells:

- a. All temperature instruments shall be supplied with thermowells. Thermowells shall be designed based on the process conditions, piping materials and the conditions of total combined stress and resonance frequency imposed by the line pressure, temperature and velocity.
- b. Thermowells shall be a stepless, tapered design, shall be machined from solid forged bar stock and shall have smooth polished surfaces free from burrs, machine marks and all other irregularities. Threaded thermowells in lines operating above 600 psi shall be seal welded after installation. The bore of each well shall be concentric with the outside diameter within $\pm 10\%$ of the wall thickness.

- c. Thermowells shall be furnished with the appropriate lagging extension length based on the pipe insulation. Lagging extensions shall be used for test wells and temperature indicators. Thermocouples and RTDs shall use a nipple extension length suitable for the insulation thickness.
- d. All thermowells shall be designed to prevent excessive vortex-induced vibration over the range of velocities encountered in normal service in accordance with ASME Performance Test Code 19.3 TW-2010, Thermowells.
- e. Temperature detectors in exhaust gas ducts shall be mounted in protecting tubes to provide mechanical support and to permit replacement while in operation. Duct connections shall consist of screwed couplings or adapter flanges welded to the ducts, into which the bushings on the protecting tubes can be threaded. Duct connections shall be located to minimize the effect of temperature stratification within the ducts. If stratification cannot be avoided, then a suitable quantity of duct thermocouples shall be installed to produce a representative temperature measurement.
- f. Test wells shall meet all the criteria for material, design, construction, and certification specified for thermowells. Each test well shall be furnished with an extension nipple and screwed cap. Extension nipple length shall be as determined by the manufacturer, unless otherwise specified in the Technical Requirements.
- g. Temperature element should be purchased with matching thermowell to avoid incompatible fitment. Temperature element sizing shall be the responsibility of the Contractor.

202.7 Process Switches (as applicable):

- a. Process switches shall be avoided in favor of transmitters wherever possible with control logic to replace functionality of the process switch. The use of process switches shall be submitted for Owner approval, and if received, then Articles 202.7a1 through 202.7a5 apply:
 - a1. Process switches shall be installed with suitable isolation valves to permit removal while the system is in operation.
 - a2. Each switch shall provide safe and reliable electrical contacts for alarm, interlock and/or indicating purposes. Setpoints shall be field-adjustable or fixed as required by the process. Field-adjustable switches shall include a calibrated scale to indicate setpoint. All switches shall have a minimum of one double pole-double throw contact. Process switches shall be equipped with screw-type terminal connections on a terminal block for terminating field wiring. Contacts shall be arranged and wired for electrically independent circuits in all cases. Switch element leads shall be of high temperature construction. Contacts shall be of the snap acting dry contact type. Switch elements shall be vibration resistant. Process switches shall have a setpoint repeatability within $\pm 1\%$ of the upper range value.
 - a3. Process switches shall have the following minimum contact ratings:

TABLE 2-1

PROCESS SWITCH CONTACT RATINGS

Voltage Rating, volts	Continuous Rating, amperes	Maximum Rating (Break), amperes	Switching Rating (Break)
120 ac	5.0	5.0 (resistive)	600 volt-amperes (resistive)



Voltage Rating, volts	Continuous Rating, amperes	Maximum Rating (Break), amperes	Switching Rating (Break)
125 dc	2.5	0.50	63 watts

- a4. For monitoring of level inside a vessel containing clear and non-corrosive liquid, displacement/cage type level switch external to the vessel shall be provided. Switch action is through magnetic coupling as the liquid level varies. Piping connections shall be made on the side and bottom of the cage and shall have 1 inch socket weld ends. Depending on the application condition, an adjustable balance float or displacer type level switch for mounting at top of the tank can be provided (such as for sumps). Switching elements for moving and displacement-type-float level switches shall have float and body construction appropriate to the service conditions of the systems to which they are connected.
- a5. For temperature switches, the thermal sensor element, extension neck, fittings under pressure, and armored capillary shall be made of stainless steel. A separate thermowell meeting the above requirements shall also be provided.

202.8 Local Indicators:

- a. Local indicators are to be avoided in favor of integral electronic indicators on process transmitters. If the use of a local indicator is submitted to the Owner, and approval is received, then the following Articles 202.8a1 through 220.8a8 apply:
- a1. Ranges on local indicators shall be selected such that the operating point falls between 1/3 and 2/3 of the full scale range. Dial faces shall be a minimum of 4 1/2" in diameter.
- a2. Indicators shall be located such that they are visible from the floor elevation or adjacent operating platforms.
- a3. Thermometers for local mounting shall be 4-1/2 inch or 5 inch dial, every angle, gas-actuated or bimetallic thermometers. Dial scales shall be so that the normal operating range is in the middle third of the dial range. Separate nameplates shall be furnished to identify the service. Thermowells meeting the above requirements shall be furnished for all thermometers. All thermometers shall be scaled in degrees F.
- a4. Thermometers for panel/enclosure mounting shall be gas actuated or similar type with stainless steel armored capillary tubing of length required for the installation. The dials shall be engraved with service legends, or separate nameplates shall be attached to the dial faces to identify the service. Thermowells meeting the above requirements shall be furnished for all thermometers.
- a5. Local Pressure Indicators/Pressure Gauges - Gauges for control air supply and signal pressures integral to the instrument shall be in accordance with the control manufacturer's standards. All other gauges shall be as specified herein. Gauges shall have a 4-1/2 inch dial and a 316 SS direct drive bourdon tube. All gauges, except on control air service, shall have stainless steel movements and nylon bearings. Gauges shall have a blowout disc in the back. Gauges for separate mountings shall have 1/2 inch NPT bottom connections. Where required, gauges shall be furnished with a throttle screw of the same material as the Bourdon tube where required. Pressure gauges shall be scaled in psig, psia, inches H₂O, or inches Hg.



- a6. Local Level Indicators (Gauge Glasses): Tubular gauge glasses shall be used for low-pressure applications. Transparent or reflex gauges shall be used for high-pressure applications. Gauge glasses in steam service shall be transparent type with mica shields. All gauge glasses shall be equipped with gauge valves including a safety ball check. Transparent gauges shall be illuminated. Separate stainless steel name tags shall be furnished to identify service. Gauge glasses shall cover the entire operating range including startup and shutdown signal range.
 - a7. Sight flow and variable flow indicators shall be used for low-pressure and low temperature applications. The use of sight and variable flow indicators will be restricted to applications where quantitative measure of flow is not required. Separate stainless steel name tags shall be furnished to identify service. Flow indicators for high-pressure and high temperature applications are not anticipated.
 - a8. Contractor shall ensure the measuring accuracy and provide a complete set of the required accessories.
- 202.9 Manifolds:
- a. The requirements of ASME B31.1 shall apply to all instrument valve manifolds for instruments.
 - b. Manifolds shall be supplied for each transmitter, indicator, or switch. Manifolds shall be as follows:
 - b1. All with 1/2" FNPT Process Connection x Instrument Flange x 1/4 inch FNPT Test Connection
 - b2. Includes Manifold Mounting Bracket
 - b3. 2-Valve – for pressure transmitters, indicators, and switches
 - b4. 3-Valve – for differential pressure transmitters, indicators, and switches
 - c. All manifolds shall be supplied with manifold manufacturer produced universal mounting brackets.
- 202.10 Chemical Seals (if applicable):
- a. Chemical seals shall be furnished wherever the process fluid may be corrosive to the instrument's internals, or wherever leaking process fluid would create a hazardous spill. The chemical seal shall isolate the process fluid from instruments and shall meet the following requirements:
 - a1. Diaphragm and all parts in contact with the process fluid shall be suitable for the pressure, temperature and chemical composition of the fluid.
 - a2. Size of seal-to-system connection shall be 1 inch for pressure connections and 2 inches for level connections.
 - a3. The diaphragm shall transmit changes in pressure of the process fluid to the seal's liquid fill and connected instrument without loss of sensitivity.
 - a4. It shall be possible to remove the instrument from the seal without loss of process fluid or damage to the diaphragm with the process on-line.



- a5. The seal shall be suitable for either horizontal or vertical mounting.
- 202.11 Control Drives And Actuators (as applicable):
- a. The following requirements apply to all control drive units provided by the Contractor, see Approved Contractors List given in Article 201.
 - b. Control drive units shall be sized to operate against the resistance or moment of equipment under rated design conditions with reserve margin. Control drive units shall have adequate torque to accommodate operating resistance due to dirt, corrosion and wear that may develop during the life of the dampers. As a guideline, Contractor shall supply drive units that produce, as a minimum, 150% of maximum damper torque requirements.
 - c. Control drive units shall be provided with an external, visible position indicator, and NEMA 4X enclosure. All control drive units shall be furnished with a declutching mechanism and manual handwheel or operating lever, which will allow one man locally to produce specified drive unit torques. This is in addition to remote manual operation from the control systems.
 - d. Drive shall provide modulating control through an integral, solid-state electronic signal receiver which positions the drive in proportion to the 4-20 mA range control input signal. Drive shall be equipped with a contactless position sensing module for remote position indication.
 - e. Upon loss of control signal, loss of air, or electrical power each drive unit shall remain in its existing position so as to maintain steady rating and stable conditions. Indication of the loss of electrical power or air shall be provided for alarm within Owner's control system.
 - f. Contractor shall design and furnish the required linkage, utilizing mechanical advantage to achieve the most economical control drive unit sizing, and shall prepare installation drawings based on this optimum linkage design. Linkage material shall be provided for field fitting as required by the linkage installation drawings and as required to suit job requirements. All control drive units shall be furnished complete with pre-engineered linkages of steel construction consisting of, but not limited to, clevises and connecting rods. Proposed linkage arrangement drawings and curves, including torque output as a function of drive position shall be furnished for each drive unit.
 - g. All control drive units shall be furnished complete with all necessary pedestals, supports, all electric components, and moving parts. Drive units shall be of substantial construction suitable for floor installation, or installation on the damper frame or ductwork.
 - h. A variation in the input signal to the control unit shall produce a linear output of the measured variable. Characterization, if required, shall be performed in the DCS.
 - i. For electrical control drive units, Owner will provide 120 VAC single phase or 480-volt ac (1/2 HP or greater), three-phase 60-Hz sources as required for control drives. The control drives shall be subject to review by the Owner.
 - j. For pneumatic control drive units, Owner shall provide clean, dry instrument air between 70 to 120 psig. Contractor shall provide a regulator if required. Contractor's drive unit shall produce rated torque at 70 psig.



- k. Drive units shall each be provided with a wiring terminal box containing a terminal block to which all field cable terminations are made. Boxes shall be firmly attached to, or form a part of, the drive unit enclosure.
- 202.12 Solenoid Valves (as applicable):
- a. Solenoid valve coils shall be high temperature construction and shall be designed for continuous duty. Three-way solenoid valves shall be designed for universal operation so that the supply air may be connected to any port. Solenoid valves shall have either pigtail wires or screw terminals for electrical connections. Separate stainless steel name tags shall be furnished to identify service. Valves shall be selected to incorporate body construction, trim materials, and internal arrangements suitable to the application and shall be acceptable to the Owner. Solenoid enclosures shall be NEMA 4, unless otherwise specified. Solenoid coils shall be Class H high temperature construction and shall be suitable for continuous duty. Solenoids shall be dual voltage and shall operate on either 120 VAC or 125 VDC.
- 202.13 Specification For Local Process-Connected Instrument Enclosures And Racks:
- a. Extent:
 - a1. The fabrication of local process-connected instrument enclosures and racks shall include all Work required to furnish complete and operable enclosures and racks. The Work shall conform to all of the requirements of this Specification and the project design drawings.
 - a2. Contractor shall design, develop, fabricate, furnish, and deliver all other local process-connected instrument enclosure(s) as listed on the Contractor's design drawings. Contractor shall install on these enclosures the Contractor's instruments, controls, and electrical devices.
 - a3. Contractor shall provide all local enclosure wiring, conduit, junction boxes, tubing, fittings, valves, supports, and piping for all the instruments and devices furnished by the Contractor which are to be mounted by the Contractor.
 - a4. Contractor shall mount, pipe, and wire all instruments supplied by Contractor or Contractor's subcontractors. Wiring terminal blocks shall be enclosed in terminal cabinets, and piping terminations shall be at the outer edges of the enclosures (top, bottom, and sides).
 - b. Enclosure Arrangement and Construction:
 - b1. The enclosures shall be arranged to accommodate all instruments indicated on the Contractor's design drawings. The Owner shall review final enclosure arrangement.
 - b2. Each enclosure shall be a rigid, free-standing structure, suitably braced, stiffened, and reinforced to withstand all stresses incidental to shipping, installation, and operation without warping or twisting greater than 1/4-inch as measured with a straight edge over the greatest straight line length across the enclosure section. The enclosure structure shall be fabricated of not lighter than 1/4-inch thick channel, angle, or plate of hot or cold-rolled steel. Welded construction shall be used throughout.



- b3. Instrument devices exerting strong cantilever forces on the enclosure face shall be adequately supported to remain plumb and true within 1/16-inch of vertical and horizontal alignment. Where devices are too large to be adequately supported for shipment to the project site and necessitate partial disassembly of the equipment, junction boxes shall be furnished and install at all points where conduit is disconnected. Terminal blocks shall be furnished in these boxes. Contractor shall furnish all necessary flexible conduit and fittings to connect between junction boxes.
- b4. The enclosure(s) shall be designed to be bolted (1/2-inch diameter bolts) to the Contractor's floor supports.
- b5. Each device shall be so mounted and piped with adequate spacing allowed for wiring so that instrument removal, replacement, and servicing may be accomplished without interruption of service to adjacent devices or unduly disturbing piping and tubing. All devices mounted inside the terminal boxes shall be so located that terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.
- b6. Insofar as practical, arrangement of instruments and conduits on enclosures shall place the electrical devices out of likely paths of condensate or water drains such as would occur when testing or calibrating instruments.
- b7. Instruments shall not be mounted with centerlines lower than 30 inches, nor higher than 66 inches above the bottom of the instrument enclosure without the written approval of the Owner.
- b8. Instruments located outdoors shall be mounted in NEMA 4X stainless steel panels/enclosures. Instruments located indoors shall be mounted on pedestals mounted to the floor, steel column, or wall. The maximum number of instruments on a pedestal shall be three (3). Where there is a concentration of more than three (3) instruments, they shall be located instrument enclosures.
- b9. Instrument enclosures and instrument racks shall be delivered to the site with all tubing, valves, manifolds, fittings, and instruments shop-installed. The connection to field-run tubing shall be through bulkhead compression fittings.
- b10. Heated enclosures are required for field instruments for water and steam services, which are mounted outdoors. Heated enclosures shall contain redundant Chromalox strip heaters that are thermostatically controlled by redundant Chromalox thermostats. All enclosures shall have a thermometer measuring temperatures within the enclosure. The thermometer shall be mounted to the front of the enclosure.
- b11. All enclosures shall contain internally mounted terminal blocks. Separate terminal blocks should be provided for incoming 120 VAC power and for instrument wiring. All instruments mounted in an enclosure shall be prewired to terminal blocks.
- b12. All instrument enclosures and panels shall contain an incandescent light which automatically switches on by a limit switch when the enclosure door is opened.
- b13. All instruments shall be positioned such that the digital indicator is clearly visible from the front view of the enclosure or rack.



c. Enclosure and Component Identifications:

c1. Contractor shall provide nameplates of engraved white lamicon with black letters machine-engraved through the facing to the core for all panel/enclosure-mounted instruments and each panel. One-sixteenth of an inch, 3-ply lamicon may be used for nameplates up to 6 inches long. One-eighth of an inch, 5-ply lamicon shall be used for larger nameplates. Nameplates shall be mounted to the panel/enclosure or equipment brackets with rustproof, self-tapping screws, and located above all valves and below or adjacent to all other devices. Nameplates shall provide the instrument number and service description for each instrument in accordance with the Instrument Index. Contractor shall provide a list of all nameplates to the Owner for approval prior to manufacture. The height of letters shall be agreed upon with the Owner, with a minimum height of 3/16 inch. Also, each enclosure shall have a nameplate providing the associated enclosure number. Size shall be a minimum of 2-inches high times 5 inches long, and have lettering 3/8 inches or greater.

c2. All instrument shutoff, manifold, and blowdown valves shall be identified by the instrument number of the instrument that they service.

c3. Contractor's monograms shall not be mounted on the enclosure(s).

d. Piping Requirements:

d1. All instrument piping, tubing, valves, and fittings shall be installed and securely fastened to the enclosures as required, grouped in an orderly manner and terminated with fittings and plugs at points located at the top or bottom of each enclosure. A stainless steel tag bearing the number of the instrument associated with the sensing line shall identify each terminal point. All clamps, pads, and supports in direct contact with stainless steel pipe or tubing shall be of stainless steel material.

d2. All process-sensing line piping, tubing, fittings, and welding within the enclosures, unless otherwise noted in this Specification, shall conform to the ASME B31.1 Code for Power Piping. Contractor shall certify that the design, materials, fabrication, construction, and testing of all piping provided by him conforms to ASME Code B31.1

d3. Piping or tubing shall not be routed across the face or rear of an instrument, junction box, or other device in such a manner as to prevent the opening or removal of covers or to obstruct access to leads, terminals, or instruments or servicing.

d4. Provisions shall be provided so that each device can be calibrated and checked without its removal from the enclosure.

d5. All valves located within tubing runs (tube connection at inlet and outlet) shall be mechanically supported to the enclosure structure. Valves in piping runs may be supported by the pipe, provided adequate pipe supports are utilized.

203. MATERIAL REQUIREMENTS

203.1 Not used

204. SOURCE QUALITY CONTROL

204.1 Inspection And Testing – General:



- a. All components, fabricated piping, wiring, and installation thereof shall be inspected and tested in accordance with the applicable requirements of the governing code(s), as set forth in this Specification and otherwise as follows.
- b. Test procedures and results shall be subject to the approval of the Owner's quality assurance representative. All test procedures and certified copies of the test data and reports shall be submitted to the Owner prior to the preparation for shipment of the enclosures. Contractor shall schedule the test far enough in advance of the shipping date to allow time to correct any errors or omissions discovered during testing.
- c. The electrical test shall demonstrate freedom from grounds and accuracy of the wiring of all enclosure-mounted devices. The test shall include point-to-point continuity tests and electrical insulation test in accordance with the applicable IEEE Standard. (Note: Megger or other high voltage shall not be applied to any coaxial-shielded cables or solid state equipment.) The Contractor shall be responsible for proper protection of instruments and devices that may be damaged by high voltage tests. All tests shall be made in accordance with IEEE Standards. Tests and checks shall be made by Contractor, before shipment, to ensure that all electrical equipment and wiring furnished and installed by Contractor is in proper operating condition and that the wiring is in exact accordance with the wiring diagrams and that all wiring will function as intended. All wiring for instruments shipped separately or at a later date than the enclosure shall be completed and tested prior to shipment of the enclosure. The expense of any necessary reworking of the wiring, to make it conform to the wiring diagrams, may be back-charged to the Contractor.
- d. The wiring shall be capable of withstanding a 1-minute field test at 1500V AC, all parts to ground. Acceptance tests, when made by the Owner, will be in accordance with IEEE Standards.

205. FABRICATION REQUIREMENTS

205.1 Not used

206. FINISH REQUIREMENTS

206.1 Enclosure/Panel Painting:

- a. All welding on the enclosure/panel structure shall have been completed prior to applying the finish. The metal surface shall be cleaned and wire-brushed to remove all adherent scale and rust.
- b. Finish paint color shall be Munsell N 6.1 / (formerly known as "ANSI #61 Gray").

PART 3 – EXECUTION

207. INSTALLATION

207.1 General:

- a. These specifications shall apply to all instrumentation and control devices, equipment, labor, tools, test equipment, services, and supplies.
- b. All work shall be done in a neat and workmanlike manner.



- c. Equipment and materials shall be assembled and installed in accordance with the following provisions, as applicable, supplemented by such additional requirements as may be specified elsewhere in these Specifications.
- c1. All equipment and materials shall be installed in accordance with these Specifications, at the proper locations as shown on the drawings or as may be selected by the Owner and in accordance with special instructions issued by the manufacturer. The Contractor shall place accurately in position, assemble and erect where required, protect, connect, adjust, test, and clean as required, all Contractor furnished equipment and materials, and perform any miscellaneous work or operations involved with any equipment or the identifications thereof. The Contractor shall be responsible for and shall correct by repair or replacement, at its own expense, any damage to or failure of any items of equipment or material, or any part thereof, which shall have been caused by faulty installation or assembly. The Contractor shall cooperate with the Owner in coordinating the Work to permit any preliminary checking and all final operational and functional testing that may be required. The completion of all circuitry shall be performed insofar as practicable to permit the completion, where feasible, of all tests related to the individual phases of any particular control scheme.
- c2. The Contractor shall provide all anchoring material and mounting hangers, brackets and miscellaneous steel as approved by the Owner and as required for installing items.

207.2 General Requirements for Installation of Instrumentation and Controls:

- a. Extent:
 - a1. All instrumentation and controls equipment and devices shall be installed in accordance with the requirements of this Specification. Any installation procedures not specified herein shall be performed in accordance with instrumentation and controls manufacturer's recommendations and good engineering practices.
 - a2. Experienced trade workers who are trained in performing this type of work shall perform all instrumentation and controls installation, tubing, and piping.
- b. Installation of Locally Mounted Equipment:
 - b1. In addition to the installation requirements indicated on the drawings and the manufacturer's submittals, the requirements specified herein shall apply.
 - b2. Field mounted instrumentation and control devices shall be located in areas that are freely accessible for maintenance/calibration without impinging on the access to other plant equipment. These locations shall be free of mechanical vibrations and greatly varying environmental conditions. All installations shall be designed such that the instruments, valves and manifolds can be physically removed without disturbing any other installed devices or equipment.
 - b3. Instruments shall not be located in areas classified as hazardous unless they are appropriately rated and marked as suitable for that NEC classification.
 - b4. To the greatest practicable extent, components that are not vessel mounted shall be mounted on local instrument racks or enclosures and connected to the process with stainless tubing or pipe. The racks and enclosures shall be configured in a manner to consolidate multiple devices in the same plant area to a centralized location for cable routing and facilitate equipment servicing.



The location chosen for these racks and enclosures shall also consider the length of instrument impulse line and the subsequent effects on instrument response time(s).

- b5. Instrument installation shall be designed for proper sensing of the intended process variable. Taps on process lines shall be located in such a manner that the impulse lines for water services are free from entrapped air and impulse lines for air or gas services are free from liquid. Vent valves shall be provided where required per installation detail drawing. Impulse lines for steam services shall be installed so that they will collect water or allow the line to be filled with water from an external source. These lines shall then be subject to the same criteria as water filled lines. The connection of impulse lines to the high temperature process lines shall have provisions to allow for the thermal growth of the process line and also the impulse line.
- b6. Each instrument shall have its own isolation valve(s) in close proximity to the instrument. All additional valved connections shall be provided between instrument isolation valve and the instrument for testing/in-situ calibration.
- b7. Pigtail siphons shall be installed for water applications above 150°F and steam applications, pressure snubbers for pulsation pressure/flow applications.
- b8. Solenoid valves and control loop accessories not located in enclosures or mounted on valves shall be mounted in easily accessible protected locations near the components with which they are associated.
- b9. Thermal elements which are to be installed in gas or air ducts shall be provided with structural supports as recommended by the manufacturer and as required to prevent excessive deflection of the elements due to their own weight, or to the flow of the gas or air within the ducts.
- b10. Transmitters or other instruments designated to be locally mounted shall be mounted on building walls or columns, approximately 4'-6" above floor level.
- b11. All pressure gauges shall be installed near the process connection unless otherwise directed by the Engineer, and located where they may be easily read. Pressure gauges on pump or air compressor discharges shall not be installed directly on the discharge piping but shall be mounted to pedestals on building walls or columns.
- b12. All brackets, stands, supports, and other miscellaneous hardware required for mounting devices shall be furnished and installed.
- b13. Topworks of transmitters, controllers, and switches shall be rotated to positions which provide convenient access for operation and maintenance. Indicating displays on transmitters shall be clearly visible from the front of the rack or enclosure. Such work shall be accomplished prior to installation of wiring and tubing to the devices.
- b14. Enclosures shall be shimmed for proper alignment and bolted to their foundations or building structure as required. The enclosures shall be protected from damage during the construction period. Shipping crates modified to permit necessary access may be used for enclosure protection.
- c. Connection of Instruments, Equipment and Devices:
 - c1.1 All primary instrument tubing, pneumatic signal tubing, and air supply tubing shall be furnished and installed in accordance with the requirements stated herein.



- c1.2 Primary tubing for instruments located locally or on racks or enclosures shall be furnished and installed. Such tubing shall include all tubing, fittings, and valves/manifolds from the outlet of the last process shutoff valve to the instrument or rack bulkhead fitting, including blowdown connections and valves where required. Secondary instrument valves shall be provided where locally mounted instrumentation is not within arm's reach of the primary process shutoff valve. Equalizing valves & drain valves shall be provided for differential pressure instrumentation. Blowdown valves shall be provided where blockage of the instrument tubing may occur.
- c1.3 316 Stainless steel shall be used for all primary instrument-sensing. Such tubing shall be continuously supported, and except as otherwise specified, shall be no smaller than ½ inch O.D. All compression type tube fittings shall be from Swagelok or approved equal. Only one manufacturer's fittings shall be used throughout the plant.
- c1.4 Unions shall be installed in connecting piping or tubing as required. Every precaution shall be taken in installing unions in order that the adjoining seating surfaces fit up squarely without forcing.
- c1.5 Instrument tubing shall be installed with a minimum number of joints.
- c1.6 Tubing bends shall be made with tube benders without excessive metal thinning or excessive tool marks. Wall thickness of tubing shall be the next standard size larger than that calculated for the design pressure and temperature conditions, with due allowance for threading, corrosion, bending and deformation from fitting application.
- c1.7 All outdoor impulse tubing and impulse piping shall be heat-traced and insulated in the field.
- c1.8 Instrument sensing line piping, valves, tubing, manifolds, fittings, etc. shall conform to the requirements of ASME-B31.1, "Power Piping," section 122.3, where applicable.
- c1.9 All process tubing shall be ASTM A213 TP316 annealed, seamless, drawn tubing. All joints from the root valves, down to the local instrument installation, shall use socket weld fittings. All connections at the instrument shall be compression swage fittings.
- c1.10 All instrument installations shall include instrument shutoff and drain valves at the instrument. All pressure transmitters shall include a 2-valve manifold, and all differential pressure transmitters shall include a 5-valve manifold; all manifolds shall include plugged calibration test ports. Manifolds shall be direct-connect type (pipe-to-flange), and shall be mounted to the instrument enclosure, pedestal or instrument rack. The transmitters shall then be bolted directly to the manifolds. All installations shall be designed such that instruments, valves, and manifolds can be physically removed without disturbing any other installations.
- c1.11 Installation of instrument primary piping and tubing shall be in accordance with the following criteria:
- c1.12 Instrument primary piping and tubing shall be kept to a maximum of 50 feet in order to minimize response time.
- c1.13 Horizontal runs shall have a slope of not less than one (1) inch per foot and must be adequately supported to maintain a constant slope. Provisions for venting of the air in the high point of the line shall be provided. Condenser vacuum sensing lines and low pressure steam extraction pressure sensing lines shall always slope up to the instrument.



- c1.14 Instrument primary piping for steam flow, liquid flow, and manometer level measurement systems shall slope downward from the primary element connections to the instrument. Instrument primary piping for flue gas and airflow measurement systems shall slope upward from the primary element connections to the instrument. If these requirements cannot be met, special venting and drain provisions will be required.
- c1.15 Primary piping instrument taps shall not be located on the bottom of the pipeline. Redundant transmitters shall not use the same process connections.
- c1.16 Instrument primary piping and tubing shall be supported in accordance with support requirements for process piping. Tubing using compression type joints shall be continuously supported using tubing tray. Tubing using socket weld type joints can be non-continuously supported with spacing every five (5) feet. Compression type joints that are installed in tray shall have the tubing lifted or off-set from the tray for ease of inspection and maintenance.
- c1.17 Compression type tubing joints shall only be used up to a temperature of 800°F. Above 800°F socket weld tubing joints shall be used.
- c1.18 Tubing supports shall be aluminum or galvanized steel and shall be complete with fittings, spacers, clamps, guides and other accessories as required. Tubing supports shall be Tubetrack channel with channel fittings as manufactured by James C. White Company (Greenville, SC) or acceptable equal. These supports shall be furnished and installed in accordance with the support requirements for main plant piping.
- c1.19 Each pressure sensing tube for boiler furnace and flue gas duct shall be provided with a purge device constantly purging the tube with low pressure instrument air to prevent plugging by fly ash or slag. Process tubing for measuring boiler furnace and flue gas duct, and other very low pressure applications, shall have a minimum diameter of 2" OD.
- c2. Flowmeter Tubing:
 - c2.1 If condensing reservoirs are required by the meter design, the reservoirs shall be mounted at or above the elevation of the taps and both reservoirs shall be at the same elevation within a tolerance of 1/8 inch. Support brackets shall be attached to the main line if required to assure that the position of the reservoirs is accurately maintained.
- c3. Level Instrument Tubing:
 - c3.1 Reservoirs or constant head chambers shall be installed as required at the specified elevation and connecting tubing from the vessel to the reservoir or constant head chamber shall slope continuously without pockets to the vessel.
- c4. Air Supplies and Air Sets:
 - c4.1 Each device requiring an air supply shall be provided with a Fisher 67C series combination filter regulator with integral pressure indicator or approved equal. Devices mounted together on a valve yoke may be served by a single regulator, providing the single supply pressure is satisfactory and the regulator capacity is not exceeded. Filter regulators shall be mounted on the device served. Filter regulators shall be suitable for a 150 psi maximum inlet pressure.



- c4.2 All air supply headers and miscellaneous connecting tubing for air supply to transmitters, controllers, control loop, accessories for control valves, control drives, electric-to-pneumatic converters, and panel mounted pneumatic devices shall be furnished and installed. This shall include the main air supply headers, installation of the branch air supply lines and shutoff valves, and installation of a combination filter regulator with integral pressure indicator for each device requiring air that is not located in an instrument enclosure. Pressure regulators for control valves will be furnished with the valves.
- c4.3 Instrument air shall be distributed to individual or groups of pneumatic devices via header/sub-header. Pneumatic devices shall have an isolation valve installed in the instrument air supply line to that device upstream of the air set or filter/regulator.
- c5. Flexible Hoses:
 - c5.1 Flexible hoses shall be furnished and installed on all air supply and signal lines for control valves and pneumatic control and instrumentation devices. This shall include, but not be limited to, controllers installed on tanks or pressure vessel instrumentation columns and controllers installed on valve yokes.
 - c5.2 Unless otherwise specified, each flexible hose shall be 5 feet long.
 - c5.3 End connections of flexible hoses shall be supported and affixed such that any relative movements between the pneumatic device and the building structure is absorbed by the flexible hose itself, and not by the tubing to which it is connected.
- c6. Instrument Valves:
 - c6.1 Instrument valves and manifolds shall be as specified herein.
 - c6.2 Instrument shutoff, equalizing, vent, and blowdown valves for instrument lines shall be 316 stainless steel, Swagelok NB-series valves or approved equal. Instrument manifolds shall be as specified, PGI or approved equal.
 - c6.3 The instrument valves are in addition to the process connection isolation (root) valves.
- c7. Nameplates:
 - c7.1 Nameplates shall be provided for all control and instrumentation furnished or installed under these specifications unless already provided. Nameplates shall be of either laminated phenolic engraving (black lettering on white background), or stainless steel. The nameplates shall be engraved or stamped with the equipment tag numbers as directed by the engineer. Phenolic type nameplates shall be attached by machine screws or permanently affixed by adhesive. Stainless steel nameplates shall be attached by machine screws, drive screws, or if acceptable to the Owner, by a short loop of wire.
- d. Installation of Instrument Racks, Enclosures, and Cabinets:
 - d1. Free-standing cabinets shall be attached to the floor, concrete equipment bases or supporting steel. Cabinets shall be shimmed for proper alignment before bolting to the floor. Adjacent cabinets shall be shimmed to maintain mutually level appearance before they are attached to the floor.



- d2. Non-free-standing racks, enclosures, or cabinets shall be mounted in accessible locations on columns, walls, or stands. Brackets and stands shall be fabricated as required to install to the local racks and cabinets in a workmanlike manner.
- d3. Rough edges and welds on all fabricated supports shall be ground smooth. The supports shall be finished with two coats of primer and two coats of Munsell N 6.1 / (formerly known as "ANSI #61 Gray") gray enamel paints.
- e. Thermowells:
 - e1. Socket welding type wells shall be strength welded into the piping using a welding rod material recommended by the welding rod manufacturer in consideration of the high alloy content of the wells shall be used.
 - e2. Thermowells shall be installed with the axis of the thermowells at right angles to the pipeline or duct wall for all ducts, and for all pipelines larger than 2-1/2 inches in nominal size. For pipelines 2-1/2 inches in nominal size and smaller, thermowells shall be installed in a tee.
 - e3. Thermowells should generally be mounted on the top centerline of horizontal process piping. Thermowells should generally be located at least 5 pipe diameters or one foot (whichever is greater) downstream of any instrument pressure tap and 8 diameters downstream of flow elements. Thermowells may be located at least 10 pipe diameters upstream of any instrument pressure tap and 20 diameters upstream of any flow element; however, this is not a preferred installation and should be avoided if possible.
 - e4. Wells shall have suitable clearances so that the elements may be removed when operating at maximum temperature.
 - e5. Qualified welders shall be used for seal welding. The welds shall be made with filler metals that shall be compatible with and of equal or greater strength than the base metals. The welding current and voltage characteristics shall be in accordance with the filler metal manufacturer's recommendations. Seal welds on threaded connections shall entirely cover the threads.
- f. Thermal Expansion:
 - f1. Instrument piping and tubing shall be installed to provide for thermal expansion during line blowdown.
 - f2. Expansion loops shall be provided in all small hot lines if required.
- g. Special attention to thermal expansion shall be given, but not limited to, draft and pressure sensing lines to the steam generator, high pressure process sensing lines and all process steam piping systems.

208. FIELD QUALITY CONTROL

208.1 Contractor shall be responsible for performing all final testing, calibration, and tuning for the instrumentation and controls within its scope. Owner shall be notified at least 10 days before all tests so that Owner may have the opportunity to witness testing. Contractor shall furnish all test equipment. All test expenses shall be borne by Contractor. Contractor shall correct, at its own expense, any problems encountered during the tests.

208.2 Inspection and Testing:



- a. The Contractor shall furnish all electrical and mechanical test equipment and all meters, instruments and miscellaneous equipment and perform all Work required as directed by the Owner to test all instrumentation and control equipment. The Contractor shall submit a calibration procedure for testing equipment for approval by the Owner. The Contractor shall furnish the Owner three (3) copies of all test data taken for tests performed by the Contractor which shall be properly signed by an authorized Contractor's representative. The test data forms used for tabulating the information required shall be furnished by the Contractor for the Owner. Procedures, data and forms shall be submitted in accordance with the requirements of the Specification.
- b. If, in the opinion of the Owner, test results show improper adjustments, operation, or performance of any equipment, and such deficiencies are due to unsatisfactory installation by the Contractor, the Contractor shall furnish all plant, labor, and equipment and materials required to remedy the situation to the satisfaction of the Owner and at no cost to the Owner.
- c. All tests required to insure the satisfactory installation, adjustment, operation and performance of all Contractor furnished equipment and materials erected and installed under, and in accordance with, these Specifications or if not specified, in conformity with the best modern approved methods for the particular type and class of work, shall be performed by the Contractor. Unless waived in writing by the Owner, all tests and trials shall be made in the presence of the Owner. When the presence of the Owner is so waived, three copies of sworn statements of each test and its results shall be furnished to the Owner by the Contractor as soon as possible after the test is made. Contractor shall perform construction checks. In addition, Contractor shall provide craft support for startup and commissioning of equipment supplied by Contractor.
- d. Pressure Testing:
 - d1. The Contractor shall test material and equipment as specified herein, and as required by code and local and state regulations.
 - d2. The Contractor shall furnish all materials, equipment, tools, instruments, blocking, bracing, bulkheads, blanking plates, and all labor required to complete the tests.
 - d3. Personnel performing the tests shall be qualified and experienced. Tests shall be performed as many times as necessary to assure proper quality of materials and workmanship. If any tests reveal unsatisfactory materials or workmanship, such materials or installation shall be repaired or replaced to the satisfaction of the Owner. Tests shall be witnessed by the Contractor's Quality Control and results reported on Pressure Test Reports for each instrument.
- e. Air Testing:
 - e1. All instrument air headers, branches, and short tubing drops; and all pneumatic control signal tubing shall be air tested using a nonflammable nontoxic gas. The test pressure shall be 1.5 times design pressure.
 - e2. All instrument air headers and instrument supply takeoffs shall be blown out with clean dry air using full receiver air pressure. Larger headers shall be blown first, using full size valves. Smaller headers and takeoffs shall be blown last. All supply headers shall be blown before any instrument connected to the header system is turned on. All instrument air headers and branch lines to the individual instrument's air shutoff valve shall be tested. Tests shall not commence



until pressure is established at or above the prescribed test pressure and the pressurizing source had been disconnected from the system. The pressure decay shall be zero for a period of 10 minutes. Should pressure decay occur, the test pressure shall be reduced to design pressure and the system checked for leaks. The test shall be repeated after the system defects have been repaired.

- e3. All pneumatic testing shall conform to ASME B31.1 - Code for Pressure Piping, Paragraph 137.
- e4. Before the leak tests are begun, all instrument tubing welds and all screwed connections shall be inspected. Welds shall be visually inspected for defects and screwed connections shall be inspected for tightness.
- e5. Tests shall be made with the tubing system isolated from the process lines and the instruments served by the system. Isolation shall be achieved by closing the root valves and by closing the instrument manifold valves and disconnecting the instruments.
- f. Hydrostatic Test:
 - f1. Demineralized water shall be used for all hydrostatic testing and the test shall be in accordance with the requirements of ASME B31.1 or as specified in this Specification.
 - f2. All tubing and piping connections, weld and valve stems, and seats shall be checked for leaks. Detectable leakage will not be accepted. Leaks shall be repaired and equipment retested.
 - f3. During the hydrostatic test, all instrument devices shall be disconnected beyond the shutoff valves. Valves will be placed in an open condition and the line or valve capped. This is intended to test the valve bodies only and prevent damage to the valve seals.

208.3 Inspection and testing by the Owner.

208.4 Examination for general compliance by the Engineer of Record.

208.5 Extent and method of examination and testing.

208.6 Acceptance Criteria.

209. INSTRUMENT CALIBRATION

209.1 General:

- a. Contractor shall follow the calibration procedure as stated in the instrument manufacturer's instruction book when fulfilling the requirements of this Specification. Setpoints and calibration data shall be in accordance with drawings, instrument database, instrument reports, instrument index, instrument/valve data sheets and/or manufacturer's instructions. Procedures shall be documented and shall include calibration for the device ranges as shown on the aforementioned instrumentation documents and/or drawings. Contractor shall advise the Owner in writing of any field changes to Contractor's documents during instrument calibration on all instrumentation that has not been bench calibrated. This installed calibration shall consist of a "unique-device" calibration and a "loop" calibration.
- b. Contractor shall perform a bench calibration on all pressure (and differential pressure) gauges, temperature gauges and temperature switches. This bench calibration shall consist of a visual inspection for damage, an identification of each instrument, including instrument number and



service description, and a verification of range. All pressure (differential pressure) gauges shall be tested at 0, 50% and 100% of scale and adjusted to within manufacturer's stated accuracy. All temperature gauges shall be tested at 0 and 100% of scale. Contractor shall check at 50% of scale to verify linearity and take appropriate action if not within manufacturer's stated accuracy. Temperature switches shall be adjusted for their respective setpoint and reset differential. Each switch shall then be rechecked to verify the setpoint and reset differential. Contractor shall complete an instrument calibration data sheet for each calibrated instrument.

- c. Contractor shall perform an installed calibration on all plant instrumentation in the specification scope which has not been bench calibrated or is not presently calibrated under the various manufacturers' system scope of work. Contractor shall not perform an installed or bench calibration of factory calibrated smart pressure and differential pressure transmitters. The installed calibration shall consist of a visual inspection for damage, an identification of each instrument, including instrument number and service description, a verification of range, correct valve line-up, correct test connection, and verification that instrument is restored to a serviceable condition. Contractor shall determine any static head corrections necessary to maintain the required accuracy and adjust the instruments. All vital instrument data shall be entered onto an instrument calibration data sheet. The installed calibration shall further consist of two distinct parts:
 - c1. A "unique-device" calibration shall be performed with the instrument not connected to any other instrument nor wired to any power supply. Contractor shall provide the required power supply and calibrate each instrument at test points of 0, 25%, 50%, 75% and 100% of scale, adjusting to within manufacturer's stated accuracy.
 - c2. A "loop" calibration shall be performed after the "unique-device" calibration and after Contractor has completed all connections to the instrument, including the power supply and wiring to the other instruments within the loop and construction checks. In addition, Contractor shall provide craft support for performing the loop checks. Contractor shall coordinate and schedule the loop calibrations with the respective control system(s) representatives.
 - c2.1 For each analog electronic transmitter type loop:
 - c2.1.1 Provide calibration test points at 0, 25%, 50%, 75%, and 100% of signal range to be measured at the receiving devices.
 - c2.1.2 Inputs to the control system(s) associated with the loop will be checked and verified by the respective system(s) vendor representative or the Owner. As directed by Owner, Contractor shall provide assistance to work under the supervision of the control system vendor representative or under supervision of the Owner.
 - c2.1.3 Outputs from the control system(s) associated with the loop will be checked and verified by the control system(s) vendor representative or the Owner. The control system representative will calibrate outputs that require adjustment. As directed by Owner, Contractor shall provide assistance to work under the supervision of the control system vendor representative or under supervision of the Owner.
 - c2.1.4 Inputs to other plant system(s) associated with the loop will be checked and verified by the system(s) vendor. The system(s) vendor will make system adjustments as required. As directed by Owner, Contractor shall provide assistance to work under the supervision of the control system vendor representative or under supervision of the Owner.



- c2.2 "Loop calibration" for digital devices (i.e., pressure and differential pressure switches, flow switches, temperature switches, level switches) will follow the same format as for the analog type loop except the test points expressed as a percentage of the signal range will now be a single test point and reset point. Each digital device shall be rechecked to verify the setpoint and reset differential during startup and documented for the Owner.
- c2.3 For local pneumatic analog control loops (i.e., local controllers and pneumatic valve positioners), Contractor shall provide controller test points of 0, 25%, 50%, 75%, and 100% of scale for setpoint and indicators and verify that associated valves have responded accordingly when an error signal is present.
- c2.4 I/P converters, valve positioners, limit switches, and drive units are exceptions which may not require loop calibration but will require that each device shall be rechecked by Contractor and verified by the control system representative or the Owner. Furthermore, these devices then may require adjustments to be made by Contractor.
 - c2.4.1 Adjust limit switches mounted on valves or dampers when positioners or control drive units are calibrated.
 - c2.4.2 Stroke pneumatic valves and adjust limit switches mounted on valves.
- d. Provide assistance as required by the Owner for calibration or trouble-shooting of the Owner's control system(s). The startup tests shall be performed by the Owner's startup team. The scope of work shall include, but not be limited to, the following:
 - d1. Static head corrections for all pressure gauges which were bench calibrated.
 - d2. Adjustments of valve positioners, limit switches, position transmitters, local controllers and valve positioners, and drive units during the tuning of the control system(s).
 - d3. Assistance to measure the output of a transmitter. Assistance to manufacturer's representatives to simulate or measure a signal to or from a manufacturer's control system and/or verify setpoints and calibration data of internal controls on manufacturer's equipment.
- e. Calibration equipment used by Contractor shall be as accurate as dictated by the current "state-of-art." Calibration of equipment used for calibration described herein shall be traceable to the National Bureau of Standards. Contractor shall state Manufacturer, Model Number and Repeatability of test equipment. Contractor shall state accuracy of calibration. Contractor shall certify the accuracy and calibration. Contractor shall certify the accuracy and calibration program to maintain accuracy certification. The Owner reserves the right to either accept or reject the use of that equipment.
- f. Calibrate instrumentation and controls within the accuracy and repeatability limits as stated in the instrument manufacturer's specifications and as required for a smoothly operating system. The test equipment used for calibration shall have an accuracy of 0.10% or better of full range. On the calibration of loops, an accuracy of 0.25% must be maintained throughout the loop.
- g. Complete an instrument calibration data sheet for each instrument calibrated. All entries on the data sheets shall be typed or word-processed in database format compatible with Owner's instrument database.
- h. Maintain an Instrument Calibration Data Book of all completed data sheets. This Instrument Calibration Data Book shall be kept current and shall be available at all times for inspection by the Owner. The Data Book shall include records of test equipment certifications and the inspection/calibration program to maintain accuracy certification. The Data Book shall include "generic" calibration procedures for each type of instrument, with an attachment to each



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
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"generic" procedure detailing all peculiarities and special features to a particular instrument and referencing the applicable manufacturer's Instruction Manual for that instrument. All calibration procedures will be subject to review by the Owner.

- i. As requisite to the successful execution of the work, Contractor shall also be responsible for familiarization with the utilization of other drawings and documents proposed and issued by the Owner (e.g., DCS I/O List, Alarm List, Master Schematics, etc.) and all applicable manufacturers' instrumentation drawings and data (e.g., Instruction Manuals, DCS I/O Listings, equipment and instrument listings, etc.).

END OF SECTION

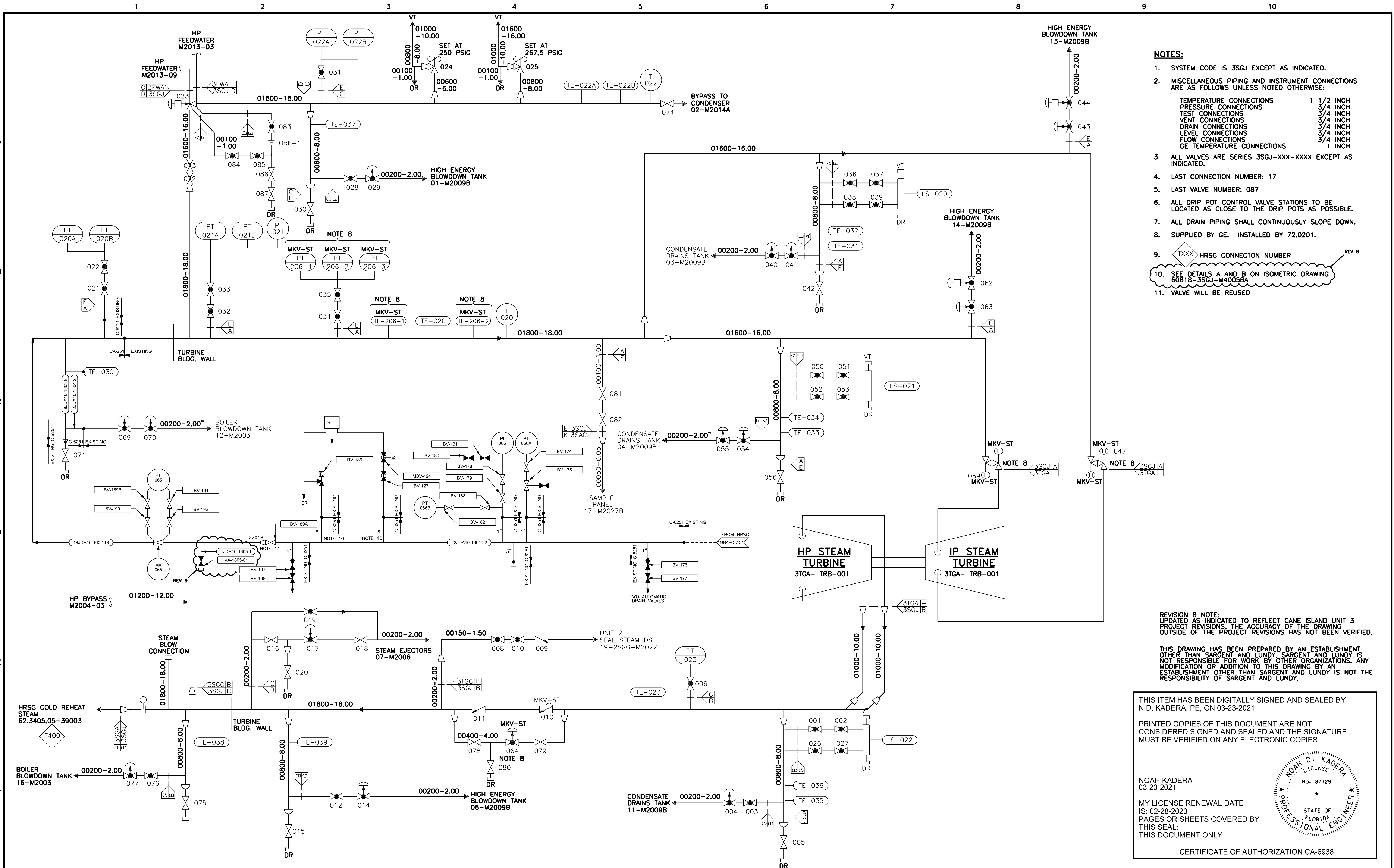


Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
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ATTACHMENT 1
DESIGN DRAWINGS



- NOTES:**
- SYSTEM CODE IS 3SGJ EXCEPT AS INDICATED.
 - MISCELLANEOUS PIPING AND INSTRUMENT CONNECTIONS ARE AS FOLLOWS UNLESS NOTED OTHERWISE:

TEMPERATURE CONNECTIONS	1 1/2 INCH
PRESSURE CONNECTIONS	3/4 INCH
TEST CONNECTIONS	3/4 INCH
VENT CONNECTIONS	3/4 INCH
DRAIN CONNECTIONS	3/4 INCH
LEVEL CONNECTIONS	3/4 INCH
FLOW CONNECTIONS	3/4 INCH
GE TEMPERATURE CONNECTIONS	1 INCH
 - ALL VALVES ARE SERIES 3SGJ-XXXX EXCEPT AS INDICATED.
 - LAST CONNECTION NUMBER: 17
 - LAST VALVE NUMBER: 087
 - ALL DRIP POT CONTROL VALVE STATIONS TO BE LOCATED AS CLOSE TO THE DRIP POTS AS POSSIBLE.
 - ALL DRAIN PIPING SHALL CONTINUOUSLY SLOPE DOWN.
 - SUPPLIED BY GE. INSTALLED BY 72.0201.
 - XXXX HRSJ CONNECTION NUMBER
 - SEE DETAILS A AND B ON ISOMETRIC DRAWING 60818-3SGJ-M40058A
 - VALVE WILL BE REUSED

REVISION 8 NOTE:
UPDATED AS INDICATED TO REFLECT CANE ISLAND UNIT 3 PROJECT REVISIONS. THE ACCURACY OF THE DRAWING OUTSIDE OF THE PROJECT REVISIONS HAS NOT BEEN VERIFIED.

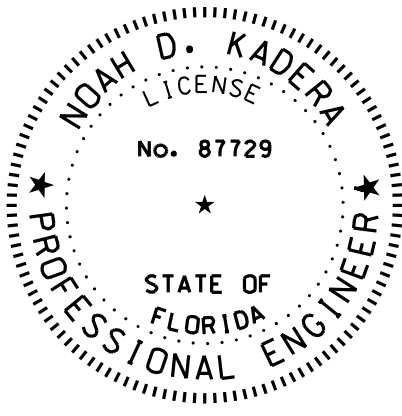
THIS DRAWING HAS BEEN PREPARED BY AN ESTABLISHMENT OTHER THAN SARGENT AND LUNDY. SARGENT AND LUNDY IS NOT RESPONSIBLE FOR WORK BY OTHER ORGANIZATIONS. ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ESTABLISHMENT OTHER THAN SARGENT AND LUNDY IS NOT THE RESPONSIBILITY OF SARGENT AND LUNDY.

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY
N.D. KADERA, PE, ON 03-23-2021.

PRINTED COPIES OF THIS DOCUMENT ARE NOT
CONSIDERED SIGNED AND SEALED AND THE SIGNATURE
MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

NOAH KADERA
03-23-2021

MY LICENSE RENEWAL DATE
IS: 02-28-2023
PAGES OR SHEETS COVERED BY
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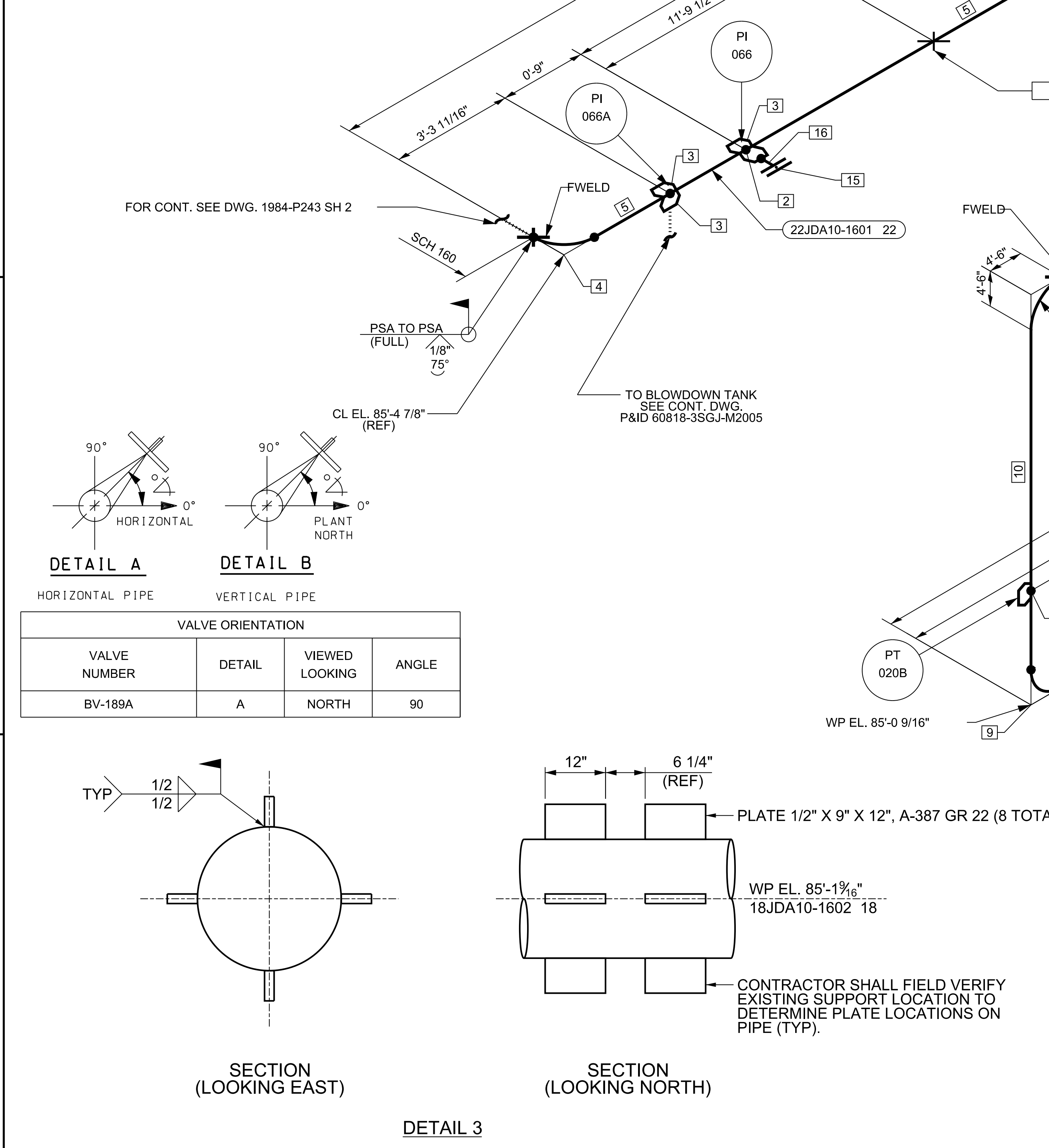
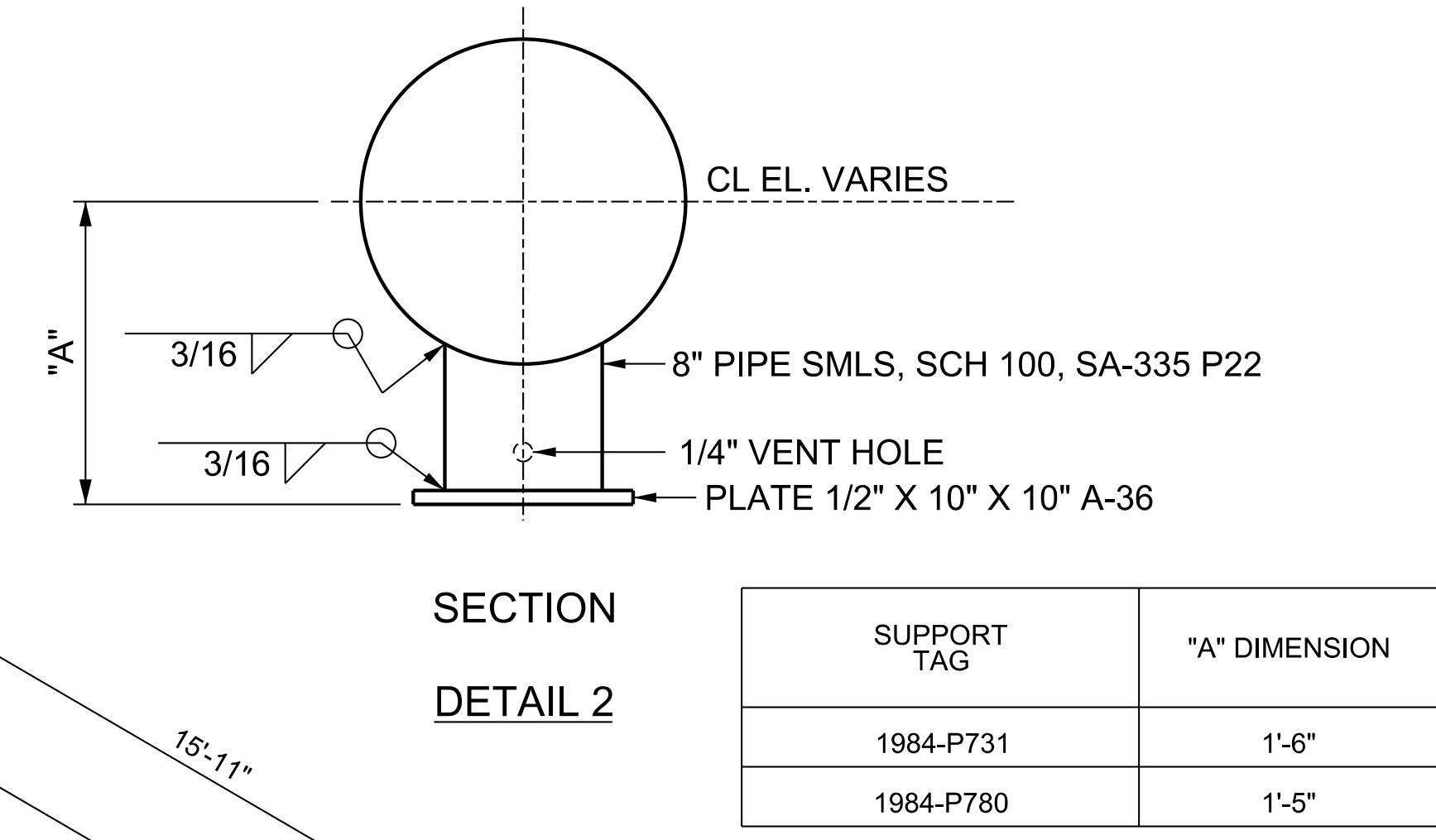
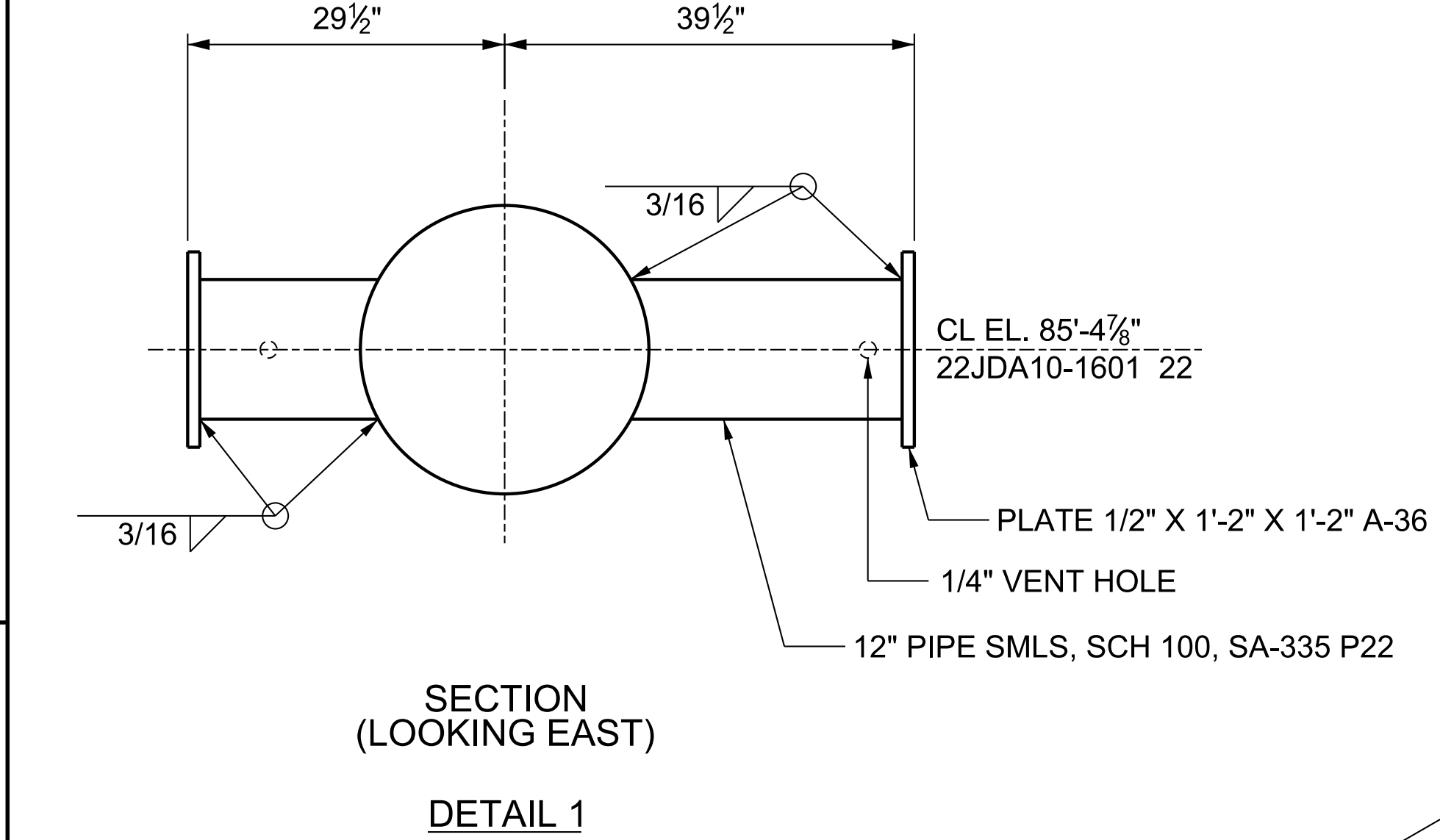
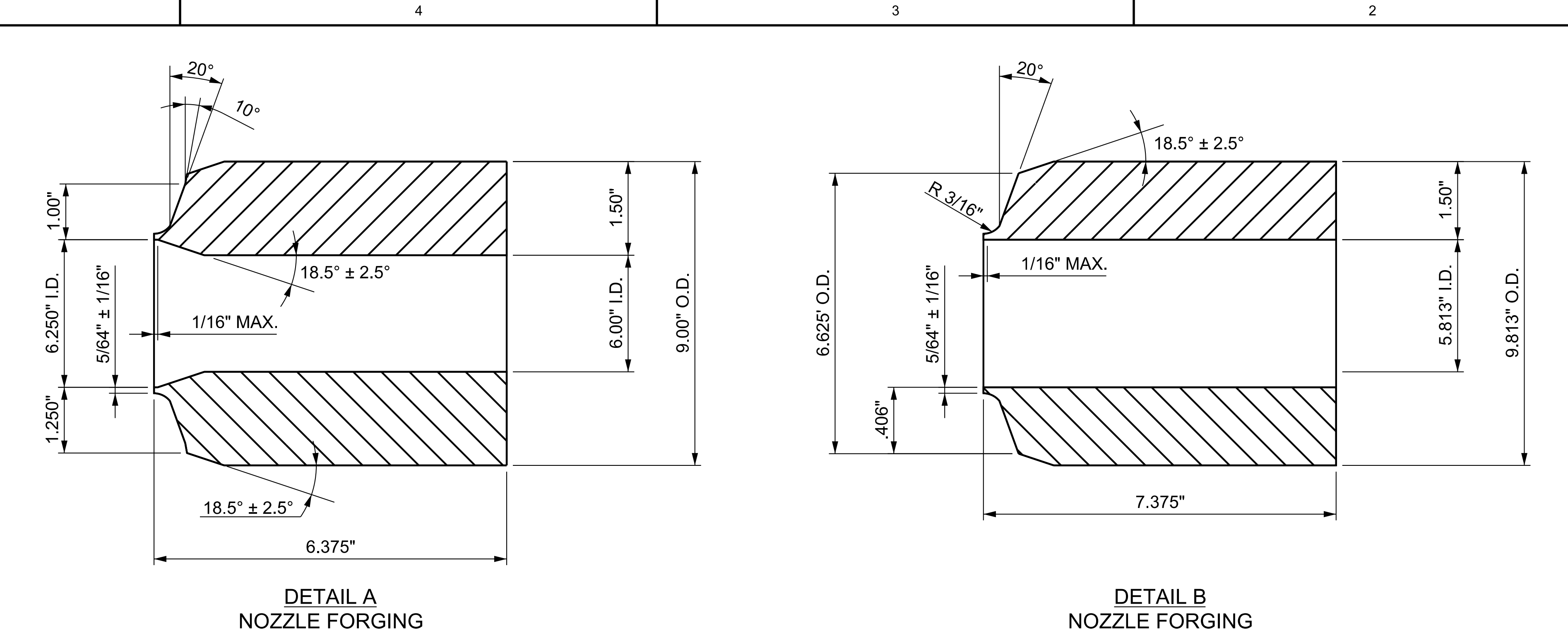
CERTIFICATE OF AUTHORIZATION CA-6938

8	03-12-2021	FOR CONSTRUCTION	ESBJDWJW	3	04-13-2000	GENERAL REVISION	CLTMSHMMJPBSMG
7	02-24-2021	FOR CONSTRUCTION	ESBJDWJW	2	3-27-2000	REVISED AS NOTED	CLTMSHMMJPBSMG
6	03-20-2002	CONFORMED TO CONSTRUCTION RECORDS	JPSDJCMWQDJCRU	9	03-23-2021	ISSUED FOR CONSTRUCTION	ESBJDWJW
5	10-06-2000	REV SYS CODE BREAK, VALVE 084 & 085, ADD 086 & 87	TLSMSHMMKAVRTU	0	02-25-2000	ISSUED FOR FABRICATION (CONT. 62.2201)	CLTMSHMMJPBSMG
4	05-17-2000	APPROVED FOR CONSTRUCTION (CONT 72.0201)	CLTMSHDAHJPBSMG	NO	DATE	REVISIONS AND RECORD OF ISSUE	DRNDESCHKAPVAPP

BLACK & VEATCH	ENGINEER	MSH	DRAWN	CLT
CHECKED	MMM	DATE	02-25-2000	

PROJECT	DRAWING NUMBER	REV
GISSIMMEE UTILITY AUTHORITY CANE ISLAND PLANT - UNIT 3	60818-3SGJ-M2005	8
PIPING AND INSTRUMENT DIAGRAM REHEAT STEAM	CODE	AREA

BILL OF MATERIALS					
ITEM NO.	QTY.	SIZE	PDT NUMBER	PIPING CODE	DESCRIPTION
1	1	22 X 18 IN	CH1525	B31.1 NBEP	CONCENTRIC REDUCER
2	1	22 X 3 IN	CH1525	B31.1 NBEP	WELDOLET
3	4	22 X 1 IN	CH1525	B31.1 NBEP	SOCKOLET
4	2	22 IN	CH1525	B31.1 NBEP	90 DEG LR ELBOW
5	38 FT	22 IN	CH1525	B31.1 NBEP	PIPE
6	1	18 X 8 IN	CH1525	B31.1 NBEP	REDUCING TEE
7	1	18 X 1 IN	CH1525	B31.1 NBEP	SOCKOLET
8	1	18 X 3/4 IN	CH1525	B31.1 NBEP	SOCKOLET
9	1	18 IN	CH1525	B31.1 NBEP	90 DEG LR ELBOW
10	74 FT	18 IN	CH1525	B31.1 NBEP	PIPE (BEND LENGTHS INCLUDED)
11	1	8 X 2 IN	CH1525	B31.1 NBEP	SOCKOLET
12	1	8 X 3/4 IN	CH1525	B31.1 NBEP	SW HALF COUPLING
13	1	8 IN	CH1525	B31.1 NBEP	CAP
14	2 FT	8 IN	CH1525	B31.1 NBEP	PIPE
15	1	3 IN	CH1525	B31.1 NBEP	RF BLIND FLANGE (CLASS 1500)
16	1	3 IN	CH1525	B31.1 NBEP	RF WELD NECK FLANGE (CLASS 1500)
17	1	22 X 6 IN	CH1525	B31.1 NBEP	FORGING SW 22" X 6" I.D. X 1.5" MIN WALL THICKNESS SA-102
18	1	22 X 6 IN	CH1525	B31.1 NBEP	FORGING SW 22" X 6" I.D. X 1.50" MIN WALL THICKNESS SA-102



INSULATION TABLE		
PIPE SIZE	INSULATION TYPE	INSULATION THICKNESS
1.5" AND UNDER	PYROGEL HPS	1"
2"	PYROGEL HPS	1.5"
8"	CALSIL	6"
18"	CALSIL	6.5"
22"	CALSIL	7"

- ### REFERENCE DRAWINGS
- P&ID 60818-3SGJ-M2005
 - ISOMETRIC DRAWING 1984-P103
 - ISOMETRIC DRAWING 1984-P243
 - ISOMETRIC DRAWING 60818-3SGJ-M4005AA
 - ISOMETRIC DRAWING 60818-3SGJ-M4005AB
- ### SAFETY NOTES
- ALL WORK DONE BY CONTRACTOR/INSTALLER PURSUANT TO THIS DRAWING SHALL:
(A) CONFORM TO THE GOVERNING CONTRACT DOCUMENTS;
(B) BE PERFORMED EXCLUSIVELY BY ITS TRAINED, COMPETENT PERSONNEL, OR, WHERE PERMITTED, THAT OF ITS SUBCONTRACTOR(S); AND
(C) COMPLY WITH ALL APPLICABLE SAFETY LAWS, REGULATIONS, PROGRAMS AND PRACTICES TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING THE CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.
 - UNDERGROUND OR EMBEDDED UTILITIES MAY EXIST WITHIN THE AREA OF AND ADJACENT TO THE LIMITS OF THE WORK. THE LOCATION OR IDENTIFICATION OF SUCH UTILITIES HAS NOT BEEN VERIFIED BY OWNER OR BY SBL. CONTRACTOR/INSTALLER IS RESPONSIBLE FOR FIELD LOCATING AND IDENTIFYING UNDERGROUND OR EMBEDDED UTILITIES AND ANY OTHER UNDERGROUND OR EMBEDDED UTILITY DIMENSIONS.
 - REFERENCES USED HAVE BEEN IDENTIFIED ON EXCAVATION/FOUNDATION/DEMOLITION DRAWINGS AND HAVE BEEN PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING EXISTING UTILITIES AND OTHER POTENTIAL UNDERGROUND OR EMBEDDED INTERFERENCES. THESE REFERENCES ONLY SHOW THE APPROXIMATE LOCATION OF POTENTIAL UNDERGROUND OR EMBEDDED UTILITIES AND MAY NOT INDICATE OR REFLECT ALL EXISTING UNDERGROUND OR EMBEDDED UTILITIES OR THEIR ACTUAL LOCATIONS.
 - REFERENCES IDENTIFIED SHALL NOT SUBSTITUTE FOR THE CONTRACTOR'S/INSTALLER'S OBLIGATION TO FIELD LOCATE ANY UNDERGROUND OR EMBEDDED UTILITIES OR INTERFERENCES THAT MAY AFFECT THE WORK.
 - DUE CAUTION SHALL BE TAKEN DURING ANY EXCAVATION/FOUNDATION/DEMOLITION WORK WITHIN THE AREA OF AND ADJACENT TO THE LIMITS OF THE WORK DUE TO POSSIBLE INTERFERENCES THAT MAY NOT BE REFLECTED ON THE REFERENCES IDENTIFIED.
 - SLOPE 1/16" PER FOOT AS INDICATED.

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	02-24-2021	FOR CONSTRUCTION
1	03-17-2021	FOR CONSTRUCTION

ISSUE PURPOSE: FOR CONSTRUCTION

SPECIFICATION: C-6250

PROJECT NO.: 13840-007

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NOAH D. KADERA

03-17-2021

MY LICENSE RENEWAL DATE IS: 02-28-2023

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CERTIFICATE OF AUTHORIZATION CA-6938

CAD FILE NAME: 60818-3SGJ-M4005BA.DGN

PREPARED BY: A.M.

REVIEWED BY: K.F.

APPROVED BY: J.W.

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Sargent & Lundy

SARGENT & LUNDY
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

PROJECT

FLORIDA MUNICIPAL POWER AUTHORITY
CANE ISLAND PLANT
UNIT 3

DRAWING TITLE

HOT REHEAT PIPE REPLACEMENT PROJECT
PIPING ISOMETRIC
HOT REHEAT STEAM

DRAWING NUMBER

60818-3SGJ-M4005BA

REVISION

1

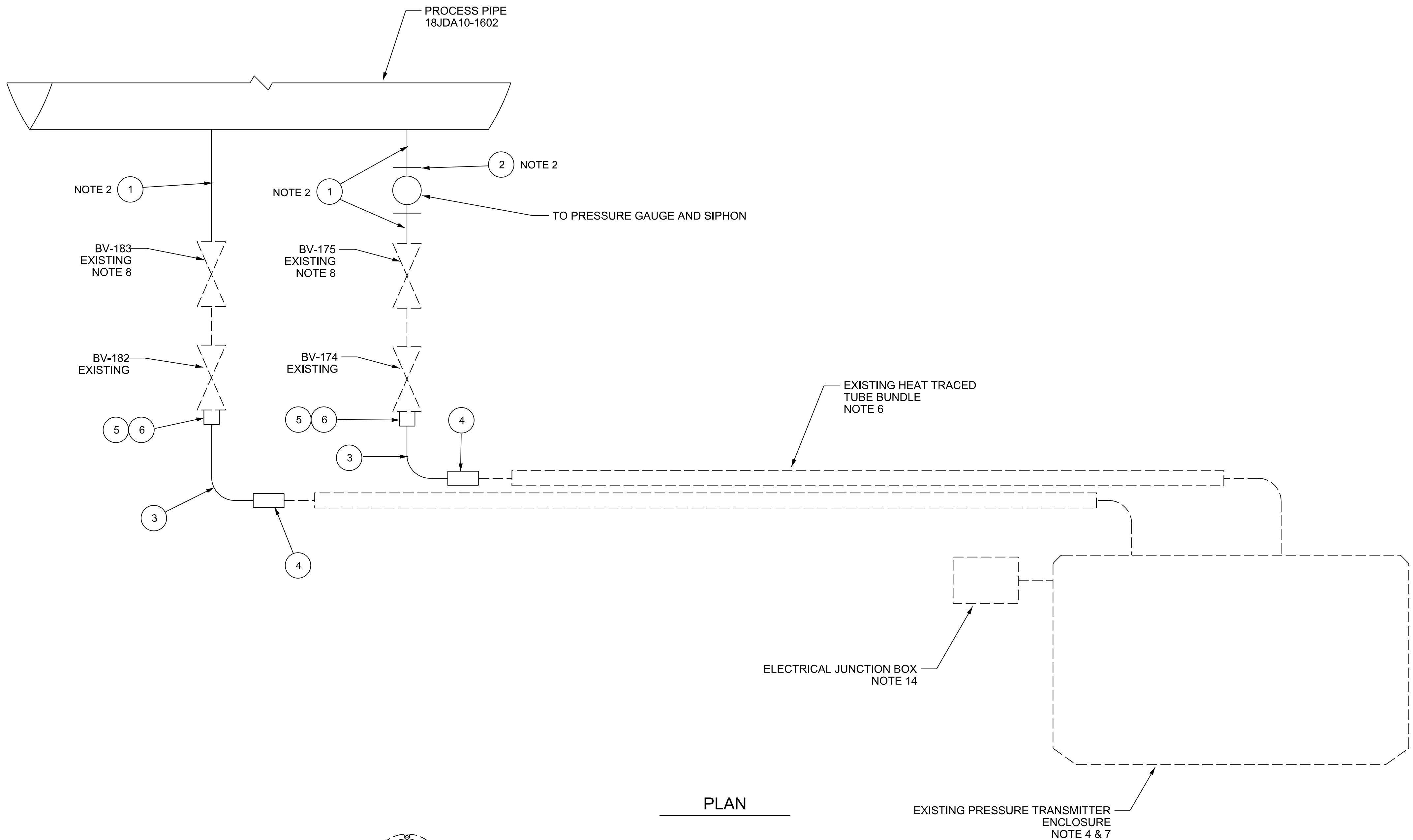
SHEET

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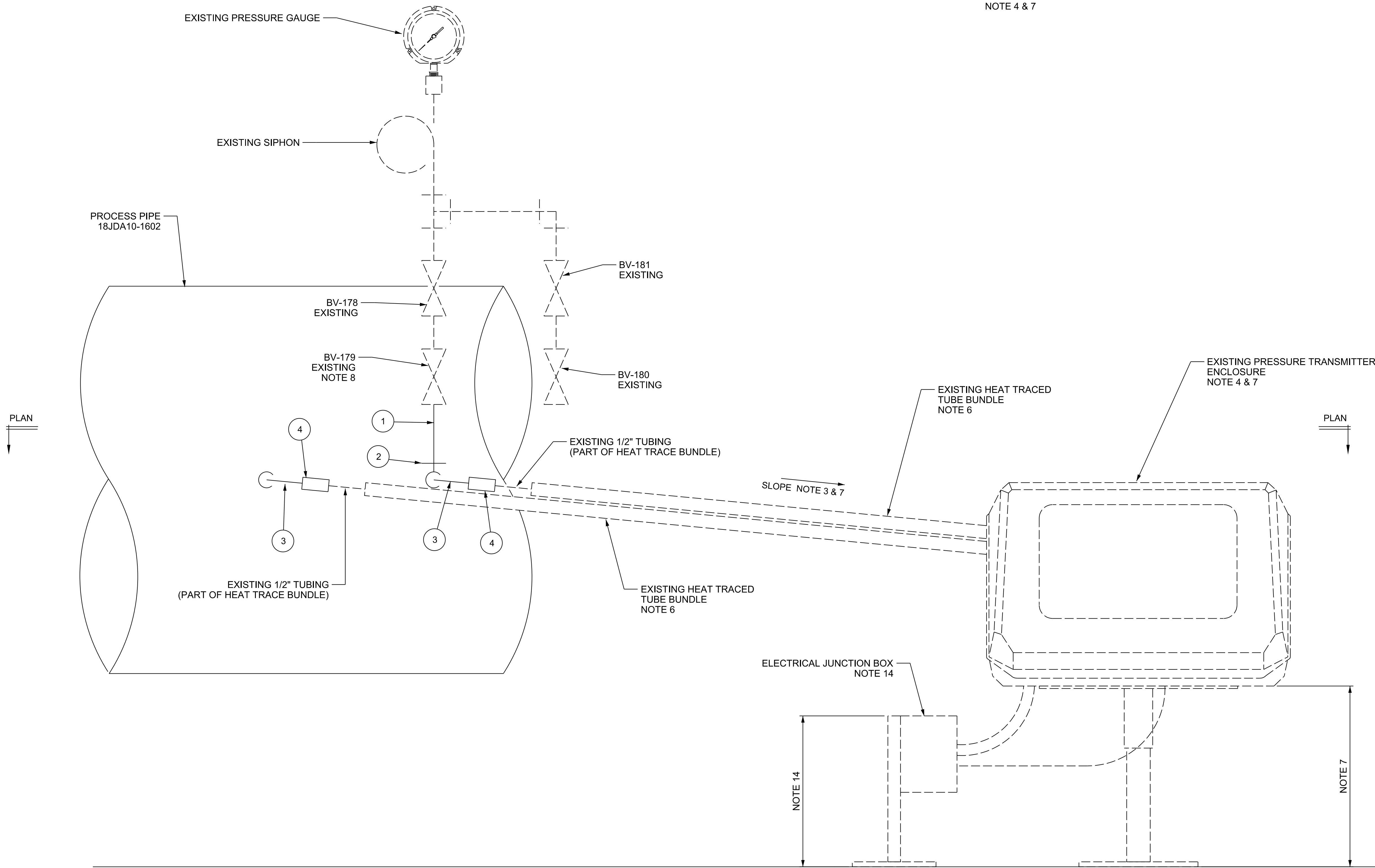
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ZL11077087141D\CANE ISLAND 3DETAILS 2021\6018-3SGJ-K2001.dgn
Form GDC-040-1-01-06, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



PLAN



ELEVATION

BILL OF MATERIAL

- PIPE, 1", SCHEDULE AND MATERIAL PER PDT CI-1525.
- TEE, 1" S.W., CLASS AND MATERIAL PER PDT CI-1525.
- TUBE, 1/2" O.D. X 0.065" MIN WALL, MATERIAL PER PDT 1559.
- UNION CONNECTOR, 1/2" O.D. TUBE, MATERIAL PER PDT 1559.
- NUT, 1/2" O.D. TUBE, MATERIAL PER PDT 1559.
- FERRULE SET, 1/2" O.D. TUBE, MATERIAL PER PDT 1559.

NOTES:

- EXISTING PIPING OR EQUIPMENT SHOWN DASHED.
- FOR PIPING AND VALVE SPECIFICATIONS (EXCEPT AS NOTED) REFER TO THE MAIN LINE PIPING DESIGN TABLE CI-1525.
- SENSING LINES TO BE SLOPED 1 IN./FT. MINIMUM DOWN TO DRAIN VALVE WITHOUT FORMING LOW POINTS OR AIR POCKETS.
- INSTRUMENT ENCLOSURE SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION AS CLOSE TO THE PRIMARY CONNECTION AS POSSIBLE.
- ALL VALVES, TUBING, PIPING & SUPPORTS. FURNISHED & INSTALLED BY INSTRUMENT INSTALLER UNLESS OTHERWISE NOTED.
- TUBE ROUTING AND SUPPORT DESIGNS SHALL INCLUDE PROVISIONS FOR THERMAL EXPANSION OF BOTH THE PROCESS CONNECTION & THE INSTRUMENT SENSING LINE.
- HEIGHT OF EXISTING INSTRUMENT ENCLOSURE SHALL BE LOWERED TO ALLOW DOWNWARD SLOPE OF INSTRUMENT SENSING LINE PER NOTE 2.
- WASH OUT FITTING END AND PREPARE EXISTING FITTING FOR RE-USE.
- INSTALLATION, WELDING AND INSPECTION TO BE PER ASME B31.1 LATEST EDITION.
- SENSING LINES ARE TO BE ROUTED AND SECURELY SUPPORTED FROM THE PROCESS CONNECTION DOWN TO THE DRAIN / BLOWDOWN VALVE OR INSTRUMENT WITHOUT FORMING LOW POINTS AND POCKETS. FOR LIQUID MEASUREMENT IT IS PREFERRED THAT THE SENSING LINE SLOPE DOWN FROM THE TAP TO THE INSTRUMENT AND FOR GAS MEASUREMENT, IT IS PREFERRED THAT THE SENSING LINE SLOPE UP FROM THE TAP TO THE INSTRUMENT. IN EITHER CASE, THE SLOPE SHALL BE 1" PER FOOT MINIMUM.
- CONTRACTOR SHALL SUPPLY ALL NECESSARY TUBE AND TUBE TRAY SUPPORTS.
- ALL TUBE FITTINGS SHALL BE BY "SWAGelok", NO SUBSTITUTIONS.
- MINIMUM BEND RADIUS OF TUBING TO BE 3 DIAMETERS.
- ADJUST HEIGHT OF EXISTING ELECTRICAL JUNCTION BOX TO MATCH HEIGHT OF THE INSTRUMENT ENCLOSURE THAT WAS LOWERED PER NOTE 7.
- FOR TUBING AND ASSOCIATED FITTING SPECIFICATIONS, REFER TO PIPING DESIGN TABLE 1559.

REFERENCE DRAWINGS:

- P&ID 60818-3SGJ-M2005
- ISOMETRIC DRAWING 60818-3SGJ-M4005BA

SAFETY NOTES

- ALL WORK DONE BY CONTRACTOR/INSTALLER PURSUANT TO THIS DRAWING SHALL:
(A) CONFORM TO THE GOVERNING CONTRACT DOCUMENTS;
(B) BE PERFORMED EXCLUSIVELY BY ITS TRAINED, COMPETENT PERSONNEL, OR, WHERE PERMITTED, THAT OF ITS SUBCONTRACTOR(S); AND
(C) COMPLY WITH ALL APPLICABLE SAFETY LAWS, REGULATIONS, PROGRAMS AND PRACTICES TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING THE CONTRACTOR'S/ INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.
- UNDERGROUND OR EMBEDDED UTILITIES MAY EXIST WITHIN THE AREA OF AND ADJACENT TO THE LIMITS OF THE WORK. THE LOCATION OR IDENTIFICATION OF SUCH UTILITIES HAS NOT BEEN VERIFIED BY OWNER OR BY S&L. CONTRACTOR/INSTALLER IS RESPONSIBLE FOR FIELD LOCATING AND IDENTIFYING UNDERGROUND OR EMBEDDED UTILITIES AND ANY OTHER UNDERGROUND OR EMBEDDED UTILITY DIMENSIONS.
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- DUE CAUTION SHALL BE TAKEN DURING ANY EXCAVATION/FOUNDATION/DEMOLITION WORK WITHIN THE AREA OF AND ADJACENT TO THE LIMITS OF THE WORK DUE TO POSSIBLE INTERFERENCES THAT MAY NOT BE REFLECTED ON THE REFERENCES IDENTIFIED.

HOLD INFORMATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	03-23-2021	FOR CONSTRUCTION

ISSUE PURPOSE: FOR CONSTRUCTION

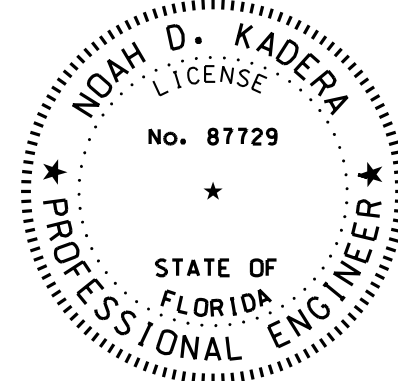
SPECIFICATION: C-6251

PROJECT NO.: 13840-007

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY N.D. KADERA, PE, ON 03/23/2021.

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NOAH KADERA
03/23/2021
MY LICENSE RENEWAL DATE
IS: 02-28-2023
PAGES OR SHEETS COVERED BY
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CERTIFICATE OF AUTHORIZATION CA-6938

CAD FILE NAME: 6018-3SGJ-K2001.DGN

PREPARED BY: R.R.YONAN

REVIEWED BY: S.ROYZEN

APPROVED BY: S.ROYZEN

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SARGENT & LUNDY
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

PROJECT

FLORIDA MUNICIPAL POWER AUTHORITY
CANE ISLAND PLANT
UNIT 3

DRAWING TITLE

HOT REHEAT PIPE REPLACEMENT PROJECT
INSTRUMENT INSTALLATION DETAIL
HOT REHEAT STEAM PRESSURE TRANSMITTER

DRAWING NUMBER

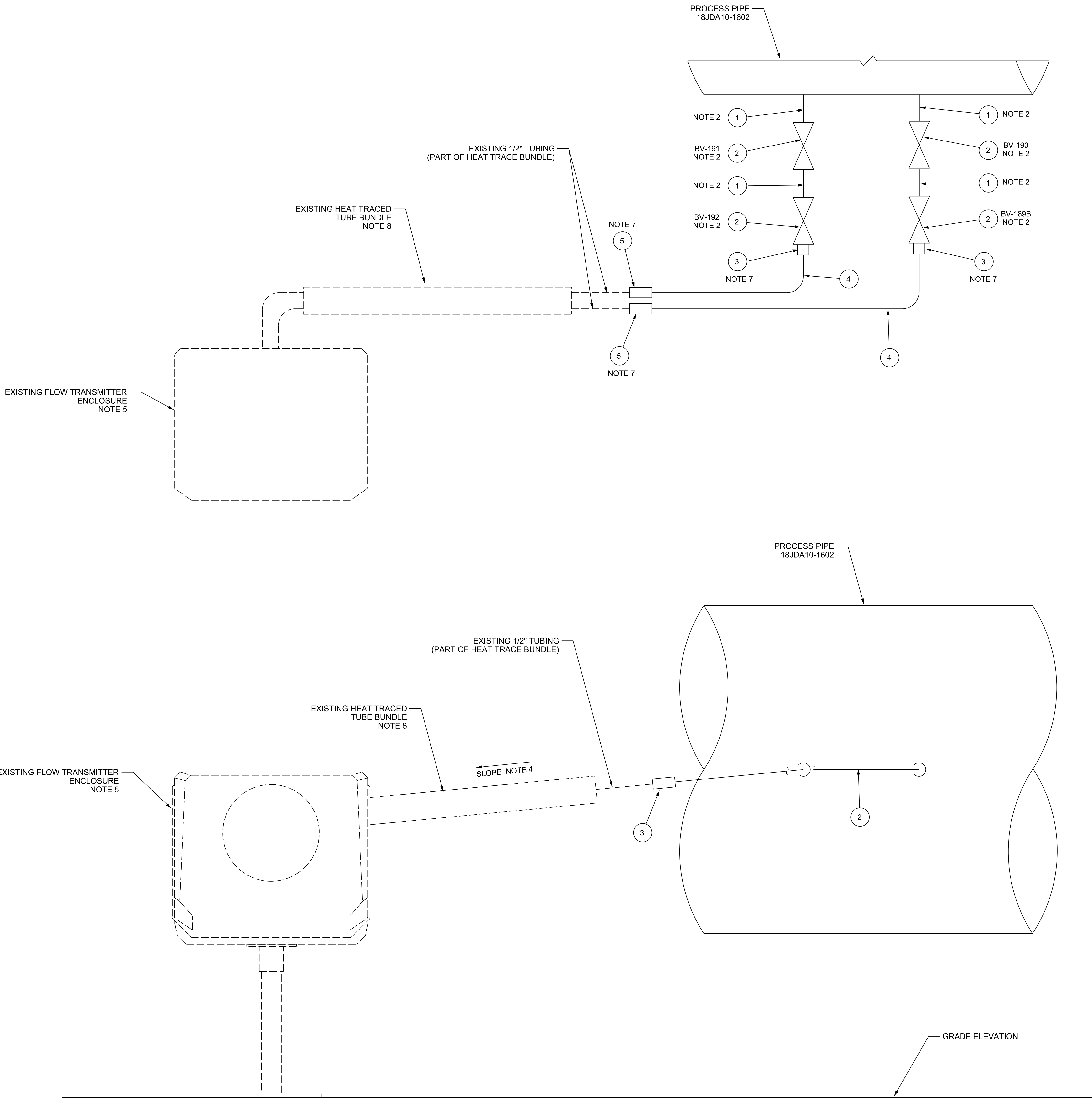
6018-3SGJ-K2001

REVISION

0

SHEET 1 OF 1

ZL11071087141.D\CANE ISLAND 31DETAILS 2021\6018-3SGJ-K2002.dgn
Form GDC-040-1-01-06, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



BILL OF MATERIAL

- PIPE, 1", SCHEDULE AND MATERIAL PER PDT CI-1525.
- VALVE, 1" S.W. ENDS, CLASS AND MATERIAL PER PDT CI-1525.
- MALE WELD CONNECTOR, 1" PIPE X 1/2" O.D. TUBE, MATERIAL PER PDT 1559.
- TUBE, 1/2" O.D. X 0.065" MIN WALL, MATERIAL PER PDT 1559.
- UNION CONNECTOR, 1/2" O.D. TUBE, MATERIAL PER PDT 1559.

NOTES:

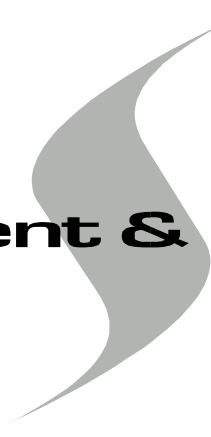
- DASHED LINES REPRESENT EXISTING PIPING OR EQUIPMENT.
- FOR PIPING AND VALVE SPECIFICATIONS (EXCEPT AS NOTED) REFER TO THE MAIN LINE PIPING DESIGN TABLE CI-1525.
- FLOW ELEMENT (PRIMARY ELEMENT) TO BE INSTALLED PER THE ELEMENT SUPPLIER DRAWINGS AND INSTRUCTIONS OR AS SPECIFIED ON THE INSTRUMENT DATA SHEETS.
- SENSING LINES TO BE SLOPED 1 IN./FT. MINIMUM DOWN TO DRAIN VALVE WITHOUT FORMING LOW POINTS OR AIR POCKETS.
- INSTRUMENT ENCLOSURE SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION AS CLOSE TO THE PRIMARY CONNECTION AS POSSIBLE. EXISTING INSTRUMENT ENCLOSURE WILL BE RE-USED.
- ALL VALVES, TUBING, PIPING & SUPPORTS. FURNISHED & INSTALLED BY INSTRUMENT INSTALLER UNLESS OTHERWISE NOTED.
- H.P. & L.P. METER CONNECTIONS TO BE CONNECTED TO ELEMENT H.P. & L.P. CONNECTIONS RESPECTIVELY.
- TUBE ROUTING AND SUPPORT DESIGNS SHALL INCLUDE PROVISIONS FOR THERMAL EXPANSION OF BOTH THE PROCESS CONNECTION & THE INSTRUMENT SENSING LINE.
- INSTALLATION, WELDING AND INSPECTION TO BE PER ASME B31.1 LATEST EDITION.
- SENSING LINES ARE TO BE ROUTED AND SECURELY SUPPORTED FROM THE PROCESS CONNECTION DOWN TO THE DRAIN/ BLOWDOWN VALVE OR INSTRUMENT WITHOUT FORMING LOW POINTS AND POCKETS. FOR LIQUID MEASUREMENT IT IS PREFERRED THAT THE SENSING LINE SLOPE DOWN FROM THE TAP TO THE INSTRUMENT AND FOR GAS MEASUREMENT, IT IS PREFERRED THAT THE SENSING LINE SLOPE UP FROM THE TAP TO THE INSTRUMENT. IN EITHER CASE, THE SLOPE SHALL BE 1" PER FOOT MINIMUM.
- CONTRACTOR SHALL SUPPLY ALL NECESSARY TUBE AND TUBE TRAY SUPPORTS.
- ALL TUBE FITTINGS SHALL BE BY "SWAGelok", NO SUBSTITUTIONS.
- MINIMUM BEND RADIUS OF TUBING TO BE 3 DIAMETERS.
- FOR TUBING AND ASSOCIATED FITTING SPECIFICATIONS, REFER TO PIPING DESIGN TABLE 1559.

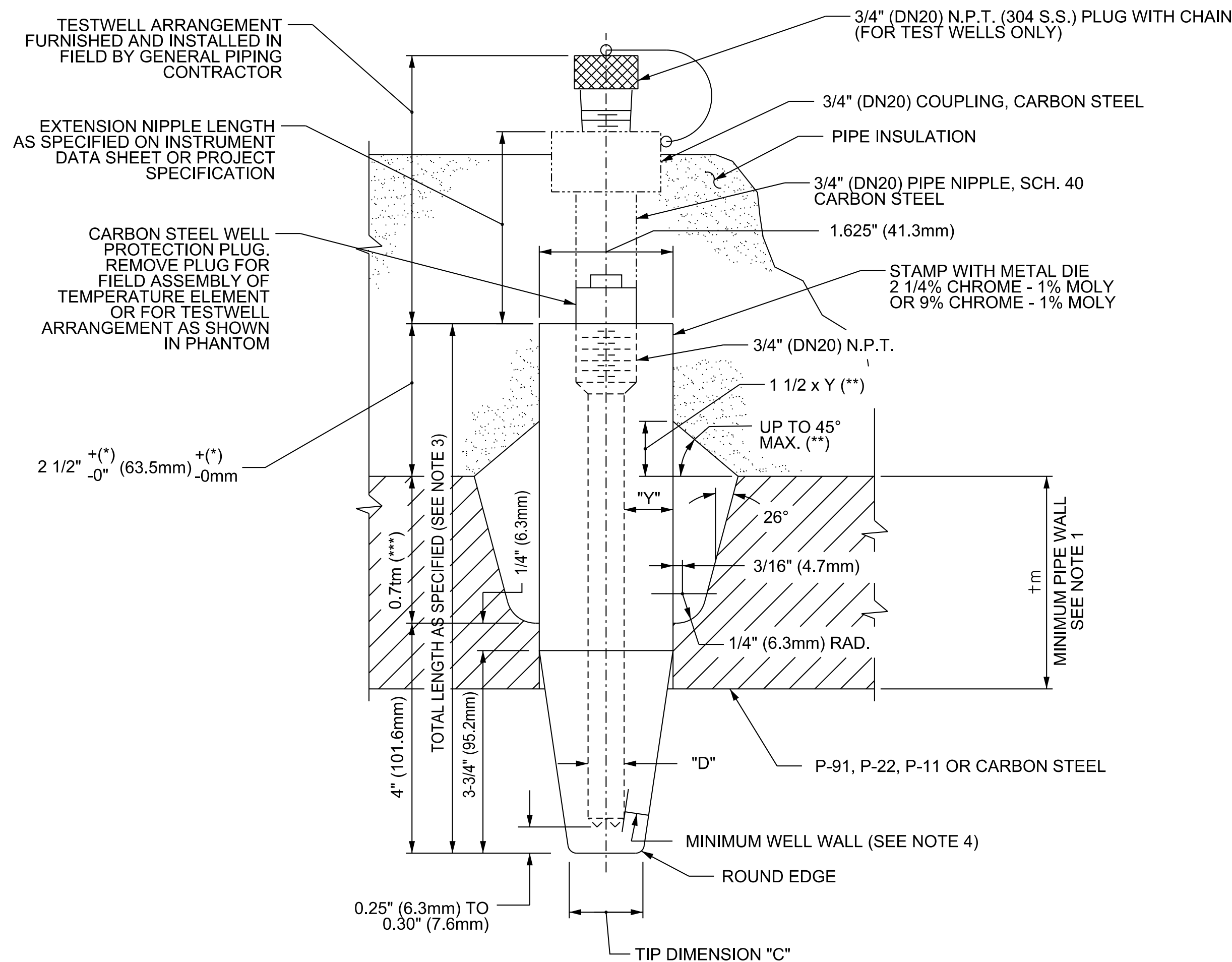
REFERENCE DRAWINGS:

- P&ID 60818-3SGJ-M2005
- ISOMETRIC DRAWING 60818-3SGJ-M4005BA

SAFETY NOTES

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HOLD INFORMATION		
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RELEASE INFORMATION		
REV.	DATE	DESCRIPTION
0	03-23-2021	FOR CONSTRUCTION
ISSUE PURPOSE: FOR CONSTRUCTION		
SPECIFICATION: C-6251		
PROJECT NO.: 13840-007		
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY N.D. KADERA, PE, ON 03/23/2021.		
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NOAH KADERA 03/23/2021 MY LICENSE RENEWAL DATE IS: 02-28-2023 PAGES OR SHEETS COVERED BY THIS SEAL: THIS DOCUMENT ONLY. CERTIFICATE OF AUTHORIZATION CA-6938 CAD FILE NAME: 6018-3SGJ-K2002.DGN PREPARED BY: R.R.YONAN REVIEWED BY: S.ROYZEN APPROVED BY: S.ROYZEN ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.  SARGENT & LUNDY 55 EAST MONROE STREET CHICAGO, ILLINOIS 60603-5780		
PROJECT		
FLORIDA MUNICIPAL POWER AUTHORITY CANE ISLAND PLANT UNIT 3		
DRAWING TITLE		
HOT REHEAT PIPE REPLACEMENT PROJECT INSTRUMENT INSTALLATION DETAIL HOT REHEAT STEAM FLOW TRANSMITTER		
DRAWING NUMBER		REVISION
6018-3SGJ-K2002		0
SHEET	1	OF 1



SERVICE	WELL MATERIAL	TIP DIMENSION "C"	DRILLING DIMENSION "D"
STEAM 3	ASTM A182 F22	1" (25.4mm)	0.25" +1/64", -0" (6.4mm +0.4mm, -0mm) (SEE NOTE 6)
STEAM 4	ASTM A182 F22	1 1/2" (38.1mm)	
STEAM 5	ASTM A182 F91	1" (25.4mm)	
WATER	ASTM A182 F22	1 1/8" (28.6mm)	

SERVICE	STEAM	WATER
MAX. VELOCITY	STEAM 3 & 4 300 FPS (91.4m/s) STEAM 5 333 FPS (101 m/s)	30 FPS (9.1m/s)
MAXIMUM PRESSURE AND TEMPERATURE RELATIONSHIP	STEAM 3 1015° F, 2770 PSIG (546.1° C, 191.0 BAR) STEAM 4 1075° F, 2230 PSIG (579.4° C, 153.7 BAR) STEAM 5 1100° F, 3900 PSIG (593° C, 268.8 BAR)	650° F, 6750 PSIG (343.3° C, 465.4 BAR)

CHROME-MOLY THERMOWELL TYPE "A" INSTALLATION
IN P-91, P-22, P-11 OR CARBON STEEL ASME B31.1 PIPE

GENERAL SPECIFICATIONS FOR INSTRUMENT & TEST THERMOWELLS

1. THERMOWELLS SHALL CONFORM TO THE REQUIREMENTS INDICATED ON THE PROJECT INSTRUMENT DATA SHEETS AND THE STANDARD DETAIL SPECIFIED. INSERTION LENGTH SHOWN ON THE STANDARD DRAWING SHALL APPLY UNLESS OTHERWISE SPECIFIED.
2. THE THERMOWELL DETAIL AS INDICATED ON THIS STANDARD DRAWING HAS BEEN ESTABLISHED BY TAKING INTO ACCOUNT THE CONDITIONS OF TOTAL COMBINED STRESS AND RESONANCE SUSCEPTIBILITY NORMALLY ANTICIPATED FOR THE VARIOUS CRITICAL PIPING SYSTEMS. MANUFACTURER SHALL, HOWEVER BE RESPONSIBLE FOR CHECKING THE DESIGN OF EACH THERMOWELL FOR THE SPECIFIED SERVICE AND SHALL CERTIFY ON THE DRAWINGS THAT EACH WELL PROVIDED IS SUITABLE FOR THE PRESSURE, TEMPERATURE, LINE VELOCITIES AND OTHER FORCES INVOLVED. IN CHECKING EACH THERMOWELL DESIGN, MANUFACTURER SHALL TAKE INTO ACCOUNT THE FREQUENCY CONSIDERATIONS AS BROUGHT OUT IN ASME PTC 19.3 TW-2010.
3. EXTENSION NIPPLE BETWEEN WELL AND CONNECTION HEAD PROVIDES FOR LAG EXTENSION.
4. WELLS SHALL BE MACHINED AND BORED FROM SOLID BAR STOCK.
5. THE IMMERSED PORTION OF THE WELLS SHALL HAVE SMOOTH POLISHED SURFACES AND SHALL BE FREE FROM BURRS, MACHINE MARKS AND ALL OTHER IRREGULARITIES.
6. DIMENSIONS BASED ON ENGLISH UNITS WITH DIRECT METRIC EQUIVALENT CONVERSION SHOWN IN BRACKETS (EXCEPT FOR CONVERSION OF NOMINAL PIPE SIZE).

NOTES:

1. THIS THERMOWELL INSTALLATION DETAIL SHALL BE USED IN PIPING HAVING AN ACTUAL WALL THICKNESS GREATER THAN 0.54" (13.7mm).
2. STRENGTH WELD SHALL BE STRESS RELIEVED AS SPECIFIED UNDER ASME B31.1 POWER PIPING CODE FOR THE APPLICABLE PIPING MATERIAL.
3. WELL SHALL CONFORM TO GENERAL SPECIFICATIONS (THIS DRAWING) AND PROJECT INSTRUMENT DATA SHEETS.
4. MINIMUM WELL WALL THICKNESS SHALL IN NO CASE BE LESS THAN 0.222" (5.6mm).
5. WELD ELECTRODES:
FOR P-91 AWS A5.5.E9018-B9 (SEE NOTE 7)
FOR P-22 AWS A5.5.E9018-B3
FOR P-11 AWS A5.5.E9018-B2
FOR CS AWS A5.5.E7018
6. DRILLING DIMENSION MAY BE REDUCED ON SPECIAL THERMOWELLS TO ACCOMMODATE A SMALLER DIAMETER ELEMENT.
7. P91 WELDING REQUIREMENTS:
SEE WELDING NOTES df, dg, dh, di and dj IN THE APPLICABLE P91 PIPING DESIGN TABLE (PDT).
8. INSTALLATION, WELDING AND INSPECTION TO BE PER ASME B31.1 LATEST EDITION.

(*) AS REQUIRED TO OBTAIN A PRACTICAL EVEN TOTAL WELL LENGTH

(**) THE DIMENSION OF VERTICAL LEG OF WELD SHALL BE 1 1/2 TIMES Y PROVIDING BASE ANGLE IS LESS THAN 45°. ONCE THE BASE ANGLE REACHES 45°, IT SHALL GOVERN THE HEIGHT OF THE VERTICAL LEG.

(***) 0.7m AND NOT LESS THAN 0.375" (9.5mm)

REFERENCE DRAWINGS:

1. P&ID 60818-3SGJ-M2005
2. ISOMETRIC DRAWING 60818-3SGJ-M4005BA

HOLD INFORMATION	
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RELEASE INFORMATION		
REV.	DATE	DESCRIPTION
0	03-23-2021	FOR CONSTRUCTION

ISSUE PURPOSE: FOR CONSTRUCTION

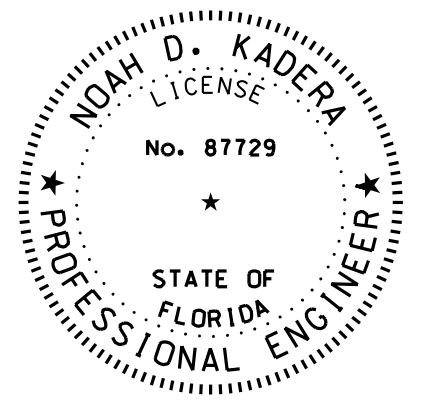
SPECIFICATION: C-6251

PROJECT NO.: 13840-007

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NOAH KADERA
03/23/2021
MY LICENSE RENEWAL DATE
IS: 02-28-2023
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CERTIFICATE OF AUTHORIZATION CA-6938

CAD FILE NAME: 6018-3SGJ-K2003.DGN

PREPARED BY: R.R.YONAN

REVIEWED BY: S.ROYZEN

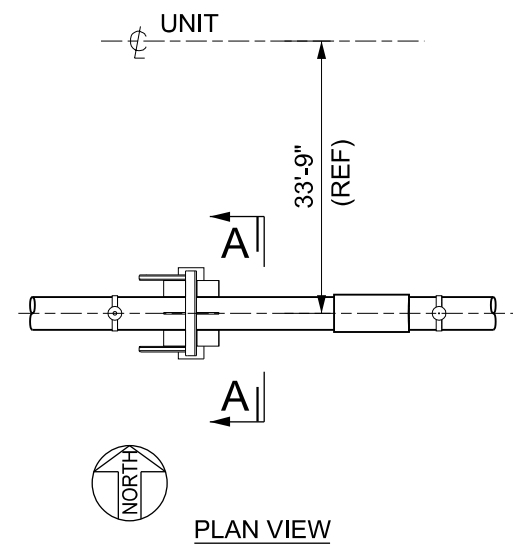
APPROVED BY: S.ROYZEN

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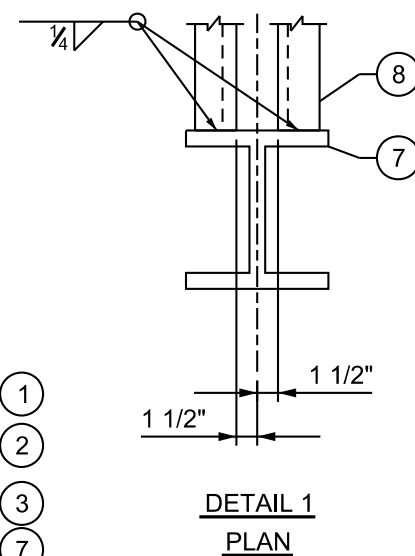
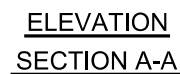
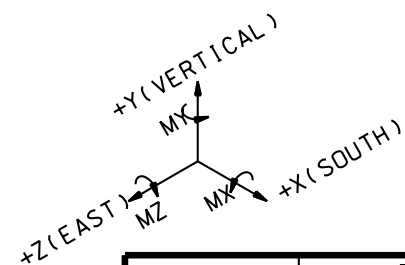
SARGENT & LUNDY
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

PROJECT	
FLORIDA MUNICIPAL POWER AUTHORITY CANE ISLAND PLANT UNIT 3	
DRAWING TITLE	
HOT REHEAT PIPE REPLACEMENT PROJECT INSTRUMENT INSTALLATION DETAIL THERMOWELL TYPE "A" WELD-IN	
DRAWING NUMBER	REVISION
6018-3SGJ-K2003	0
SHEET 1 OF 1	1



DIR.	THERMAL MOVEMENT		SUST. + OCCL MOVEMENT	
X	2.08"	0"	2.49"	-0.55"
Y	0"	-1.58"	-0.12"	-1.76"
Z	0"	0"	0"	0"

P.E. SEAL[illegible]



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LOADS SHOWN ARE THOSE THAT THE SUPPORT EXERTS ON THE PIPE.

STRUCTURAL AND ANALYSIS REVIEW

STRUCTURAL		DATE	REVISION
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PIPE SUPPORT - PSA-1601-A

NO SCALE		DRAWING NO.	REV.
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PROJECT NO.		DRAWING NO.	REV.

PROJECT NO:			
00000-000		1994-P739	

000000 000 Sargent & Lundy LLC 1904-1129 C

000000-000		SHEET 1
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REFERENCE	DWG. NO.	DWG. NO.	FILE ID : PSA-1601-A.DGN

~	THERMAL	SUST. + OCCI
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DIR.	THERMAL MOVEMENT	SUST. + SECL. MOVEMENT
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
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16	16	16
17	17	17
18	18	18
19	19	19
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86	86	86
87	87	87
88	88	88
89	89	89
90	90	90
91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

	MOVEMENT		MOVEMENT	
Y	0.84"	0"	0.84"	-0.01"

λ	0.64	0	0.64	-0.01
Y	0''	-4.92''	0''	-4.93''

7	0"	-1.58"	0"	-1.58"
---	----	--------	----	--------

DRAWING RELEASE RECORD

REV.	DATE	REL'D	PREPARED	REVIEWED	APPROVED
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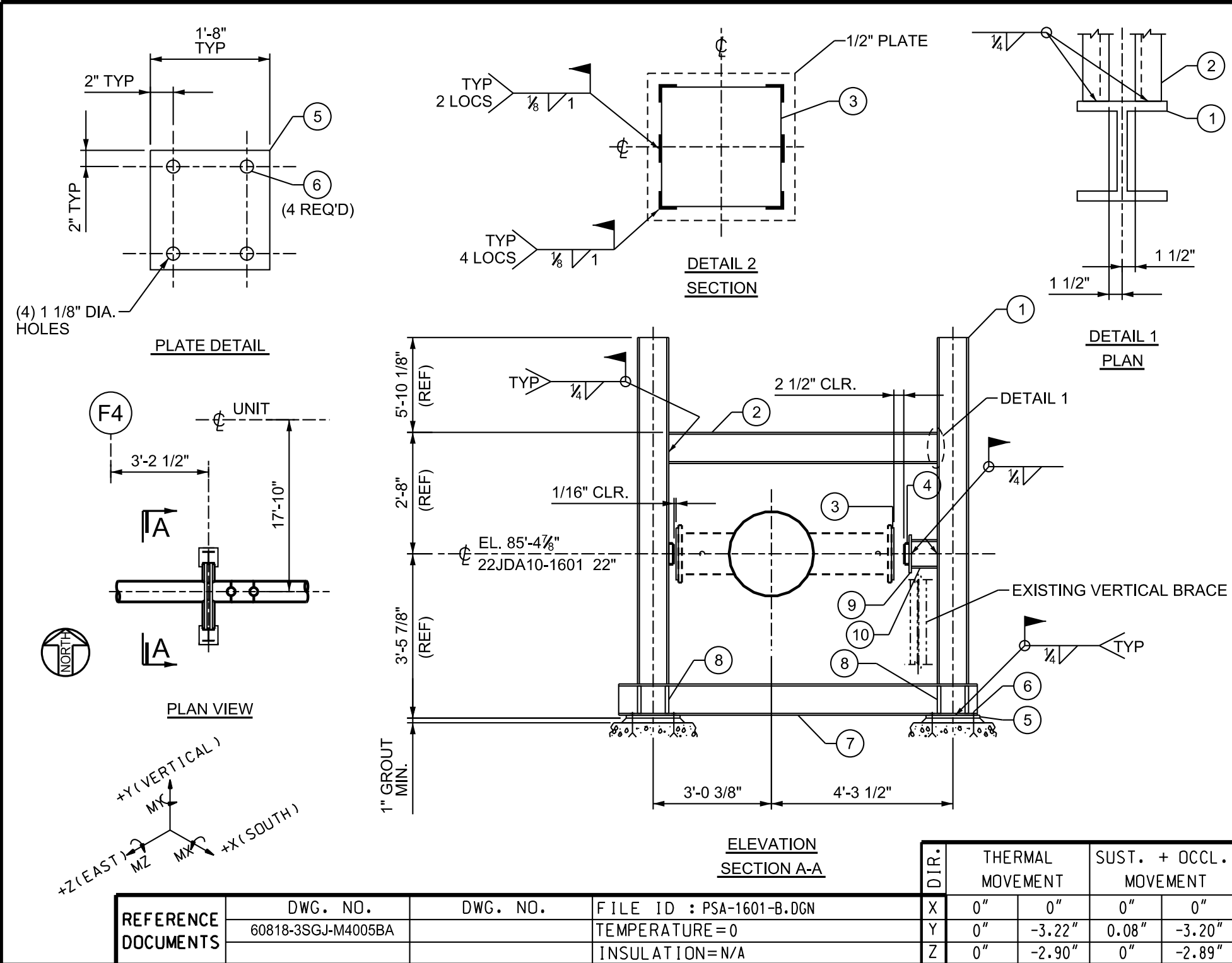
0	XX-XX-2020	A. MAI DONADO	XXXXXXXXXX	XXXXXXXXXX
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9	7077072020	7077072020	7077072020	7077072020

PURPOSE				

	PURPOSE

P.E. SEAL

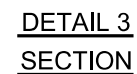
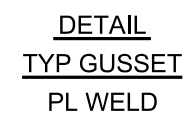


BILL OF MATERIAL						
ITEM	QTY.	FIG. NO.	DESCRIPTION			
1	2	---	W8 X 35 X 7-6 1/4" LG. A-36 (REUSE EXISTING MEMBER)			
2	2	---	C10 X 20 X 6'-3 5/8" LG. A-36 (REUSE EXISTING MEMBERS)			
3	2	---	SS PL 1/8" X 12" X 1'-0" LG., A240-TP304 (SEE DETAIL 2)			
4	2	2-854400C	4" SLIDE PLATE ASSEMBLY (SEE DETAIL 3 ON SHEET 2)			
5	2	---	PL 1" X 1'-8" X 1'-8" A-36 (REUSE EXISTING)			
6	8	---	1" DIA. X 6" EMB DEPTH HILTIKWIK BOLT (REUSE EXISTING)			
7	1	---	W12 X 79 X 8-10" LG. A-36 (REUSE EXISTING MEMBER)			
8	8	---	GUSSET PLATE 3/4" X 5 13/16" X 10 7/8" A-36			
			(REUSE EXISTING MEMBERS)			
9	1	---	PL 1/2" X 0'-8" X 0'-8" A-36			
10	1	---	W6 X 25 X 0'-4" LG. A-36 (CUT TO SUIT)			
FIG. NOS SHOWN ARE BY LISEGA EQUIVALENT SUBSTITUTIONS MAY BE MADE.						
CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.						
SUBSYSTEM		LOADS				
		FORCE (LBS)			MOMENT (FT/LBS)	
N.P. 115		FX	FY	FZ	MX	MY MZ
SUSTAINED		-6127	0	0	0	0 0
SUSTAINED		15301	0	0	0	0 0
SUST. + OCCL.		-10981	0	0	0	0 0
SUST. + OCCL.		20154	0	0	0	0 0
HYDRO		106	0	0	0	0 0
LOADS SHOWN ARE THOSE THAT THE SUPPORT EXERTS ON THE PIPE.						
STRUCTURAL AND ANALYSIS REVIEW						
STRUCTURAL				DATE	REVISION	
ANALYSIS				DATE	REVISION	

DRAWING RELEASE RECORD				
REV.	DATE REL'D	PREPARED	REVIEWED	APPROVED
0	XX-XX-2020	A. MALDONADO	XXXXXXXXXX	XXXXXXXXXX
PURPOSE				

P. E. SEAL			
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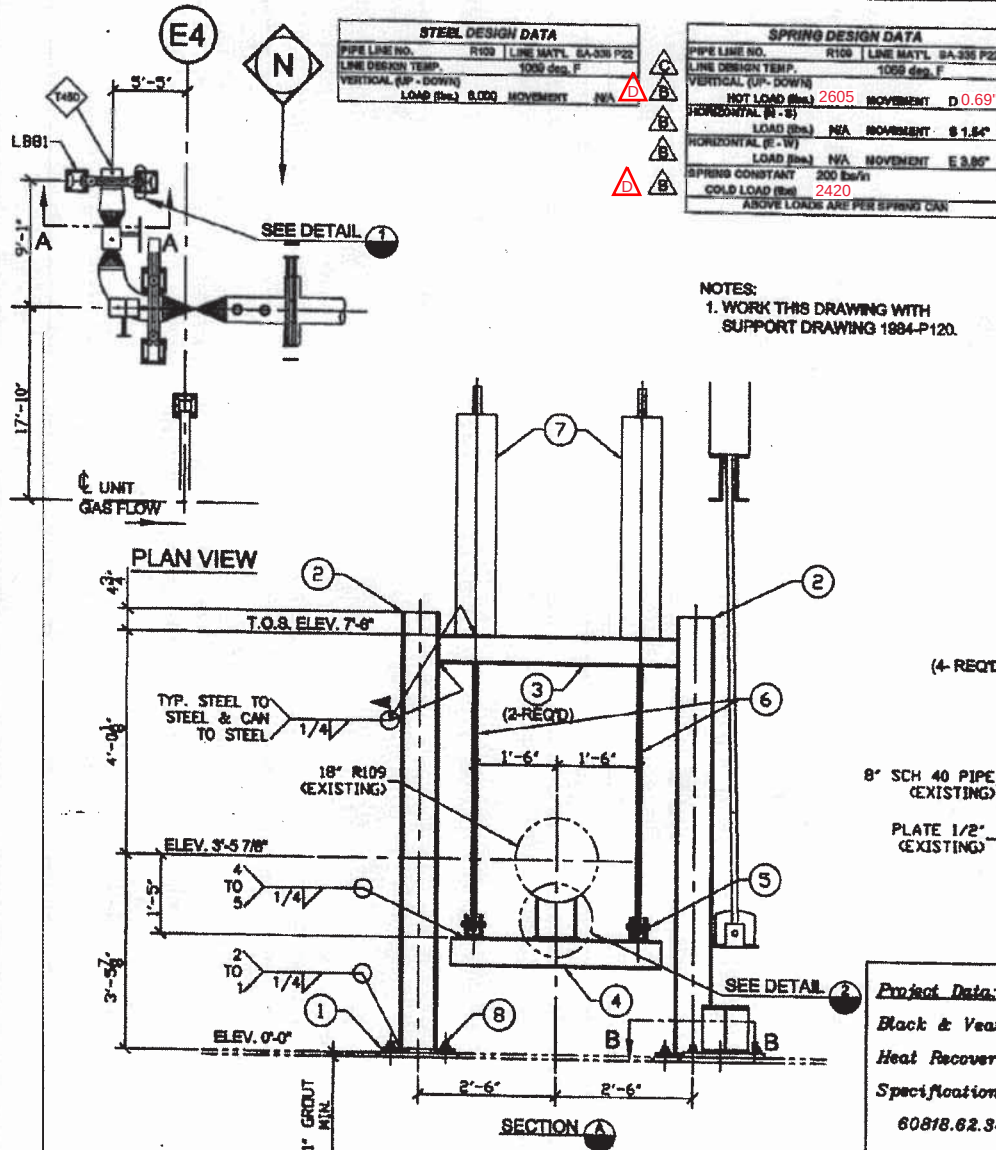
PIPE SUPPORT - PSA-1601-B HOT REHEAT PIPE HOT REHEAT REPLACEMENT PROJECT CANE ISLAND PLANT UNIT 3 FLORIDA MUNICIPAL POWER AUTHORITY			
NO SCALE	 Sargent & Lundy LLC	DRAWING NO.	REV.
PROJECT NO.		1984-P730	E
00000-000			
00000-000			
		SHEET 1 OF 2	



DIR.	THERMAL MOVEMENT		SUST. + OCCL. MOVEMENT		
	X	0"	0"	0"	0"
Y	0"	0"	0"	0"	0"
Z	0"	0"	0"	0"	0"

P.E. SEAL

[illegible]



THIRD ANGLE PROJECTION

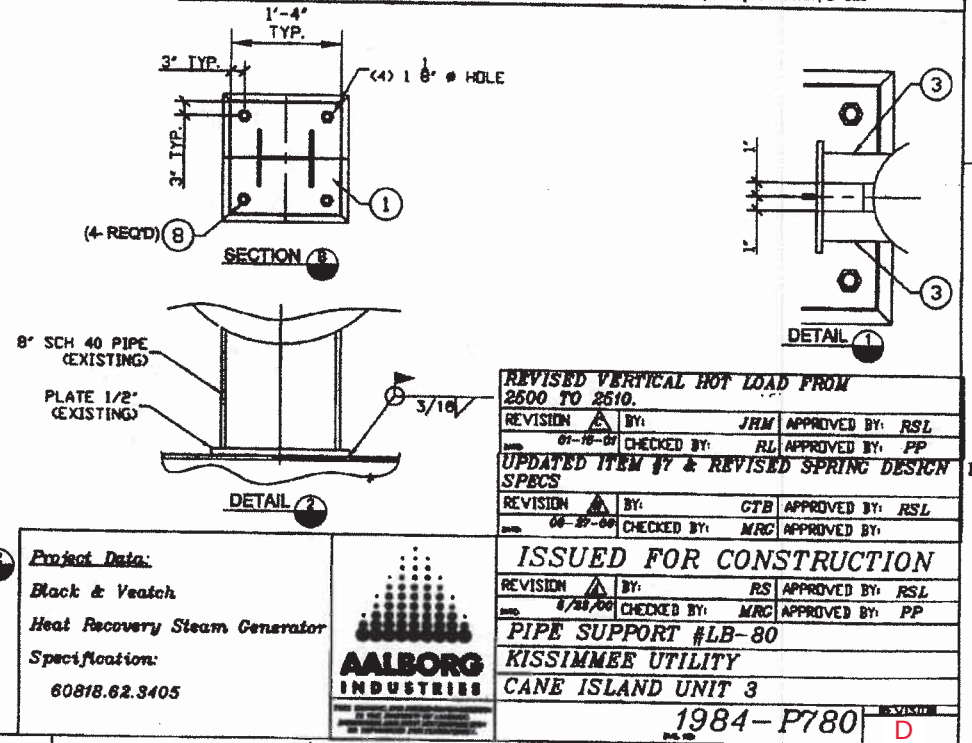
QUANTITIES SHOWN ARE THE TOTAL REQUIRED PER THIS ORDER NUMBER

MATERIAL LIST

Rev	Ship	Item No.	No.	Description	APR
	S	LB80	1	PIPE SUPPORT "LB80" PER THIS DRAWING TAG QTY (1) 1984-P780-LB80	42
		1	2	PLATE 3/4" x 1'-4" x 1'-4" A-36	
		2	2	W8 x 31 x 7'-10" LG. A-36	
		3	2	C6 x 13 x 4'-4" LG. A-36	
		4	1	W8 x 12 x 3'-10" LG. A-36	
		5	2	WELD BEAM ATTACHMENT	
		6	2	WELDED EYE ROD	
	B	7	2	GRINNELL TRIPLE SPRING HANGER, SPRING SIZE-13, TYPE "D"	
		8	8	1" DIA. x 6" EMB DEPTH HILTI KWIK BOLT I	

ABOVE ITEMS LISTED FOR PIPE SUPPORT TO BE Banded AND PACKAGED IN A PRACTICAL MANNER AND TAGGED AS (1) SET FOR SHIPPING.

Legend for shipping: A=Ship to Assembler, D=Crane Manufacturer, B=Export Packer, S=Site



54

RECEIVED 4/19/02
RA

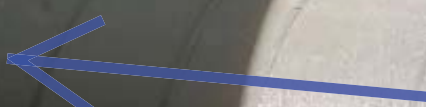
A photograph of an industrial facility, likely a power plant or refinery, featuring a complex network of large, horizontal pipes and green-painted structural steel beams. A vertical cable or rope hangs from a support point in the upper center of the frame. The scene is brightly lit, suggesting daylight. Several text boxes are overlaid on the image, providing technical specifications and construction notes.

MSK-161366-B2V

CONSTRUCTION NOTES:
REINSTALL SUPPORT
CONNECTION HARDWARE OR
REPLACE IN KIND

PTP-4 SIZE 120, TYPE C
COLD LOAD: 2256 LB
HOT LOAD: 2684 LB
SPING RATE: 225LB/IN

161366-B2V

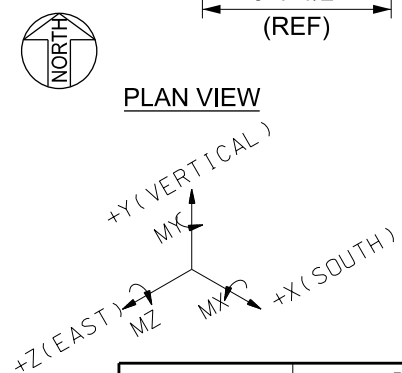
A blue arrow pointing from the right towards the left, positioned below the '161366-B2V' label.

MSK-PSP-PH102

PH-102

RESET SPRING
CL=5015 lbs,
HL=6560 lbs.





DIR.	THERMAL MOVEMENT		SUST. + OCCL MOVEMENT	
X	1.05"	0"	1.15"	-0.12"
Y	0"	-0.59"	-0.13"	-0.85"
Z	0"	-2.75"	0"	-2.75"

P.E. SEAL[illegible]

WELDING END DETAILS: GENERAL NOTES

1.0 GENERAL NOTES

- 1.1 THERE SHALL BE NO WELDS INCLUDED IN PIPE BENDS BECAUSE THE MACHINING DIAMETER "C" MAY REMOVE THE BENDING ALLOWANCE. IF AVAILABLE PIPE LENGTHS ARE NOT SUFFICIENT FOR A COMPLETE BEND, THE ACTUAL PIPE DIAMETER AND WALL DIMENSIONS SHALL BE SUBMITTED TO SARGENT AND LUNDY WITH A REQUEST FOR A SPECIAL WELDING END DETAIL.
- 1.2 PLATE PIPING SHALL BE RESIZED AT EACH END (FOR AT LEAST 4 INCHES (100mm) FROM THE END) BY MACHINING TO MINIMIZE OUT-OF-ROUNDNESS, SUCH THAT THE MAXIMUM OR MINIMUM O.D. SHALL NOT DIFFER FROM THE AVERAGE BY MORE THAN $\pm \frac{1}{16}$ INCH. (1.6mm)
- 1.3 WHEN MACHINING THE ENDS FOR WELDING, THE PIPE SHOULD BE CENTERED ON THE AXIS OF THE FOLLOWING DIAMETER TO INSURE AGAINST UNDERCUTTING THE MINIMUM WALL:

FORGED & BORED.....I.D.	SCHEDULE PIPE.....O.D.
EXTRUDED.....I.D.	HOLLOW FORGED.....O.D.
	PLATE.....O.D.
- 1.4 FOR LARGE DIAMETER PIPING, WHERE THE I.D. OF THE PIPE IS READILY ACCESSIBLE FOR WELDING, DOUBLE WELDED JOINTS MAY BE USED. AFTER WELDING THE FIRST SIDE, THE WELD SHALL BE ARC GOUGED AND/OR GROUND TO SOUND METAL FROM THE SECOND SIDE AND THEN WELDED TO COMPLETION.
- 1.5 IF THE I.D. OF A PIPE OR FITTING IS TOO LARGE TO PERMIT MACHINING TO THE "C" DIMENSION, CONTRACTOR SHALL DEPOSIT SUFFICIENT WELD METAL ON THE INSIDE TO PROVIDE FOR PROPER MACHINING. SUCH WELD METAL SHALL HAVE THE SAME COMPOSITION AS THE PIPE OR FITTING. SEE FIGURE 1 THIS PAGE.
- 1.6 WELD REINFORCEMENT (FIGURE 2 THIS PAGE) SHALL BE PER APPLICABLE CODE.
- 1.7 TRANSITION BETWEEN PIPE AND CASTINGS SHALL BE IN ACCORDANCE WITH FIGURE 3 THIS PAGE.
- 1.8 MACHINING DIMENSIONS:
 - A. REFER TO ASME B16.25 (BUTTWELDING ENDS) TABLE A1 FOR DIMENSIONS "A", "B", "C" AND "t" FOR PIPE SIZES NPS 2½ (DN 65) THROUGH NPS 36 (DN 900). EXCEPTIONS TO THE DIMENSIONS LISTED IN TABLE A1 ARE ALLOWED FOR THE CONDITIONS DESCRIBED IN PARAGRAPH 4.3 OF ASME B16.25.
 - B. ALL INTERSECTING MACHINED EDGES SHALL BE SLIGHTLY ROUNDED.
 - C. REFER TO THE PROJECT SPECIFICATION AND/OR PROJECT DRAWINGS FOR SPECIAL WALL PIPE MACHINING DIMENSIONS.

2.0 WELDING REQUIREMENTS

- 2.1 JOINTS DETAILS:
 - A. REFER TO MSDE-2.1.8.2 WELDING END DETAILS FOR BUTT WELDS USING CONSUMABLE INSERTS.
 - B. REFER TO MSDE-2.1.8.3 WELDING END DETAILS FOR BUTT WELDS USING SPLIT RECTANGULAR FLAT BACKING RINGS WHEN THE NOMINAL PIPE WALL THICKNESS "t" IS LESS THAN 0.562 INCH (16mm) AND THE NOMINAL RATING IS ASME CLASS 300 OR LESS.
 - C. REFER TO MSDE-2.1.8.4 WELDING END DETAILS FOR BUTT WELDS USING SOLID MACHINED RECTANGULAR FLAT BACKING RINGS WHEN THE NOMINAL PIPE WALL THICKNESS "t" IS GREATER THAN OR EQUAL TO 0.562 INCH (16mm).
 - D. REFER TO MSDE-2.1.8.5 WELDING END DETAILS FOR BUTT WELDS USING OPEN ROOT GTAW WELDING. THE ROOT AND SECOND PASS SHALL BE MADE WITH THE GTAW PROCESS AND THE BALANCE OF WELD COMPLETED BY AN APPROVED PROCEDURE.
- 2.2 OTHER WELDING END DETAILS MAY BE USED WITH PRIOR APPROVAL BY SARGENT & LUNDY.
- 2.3 GAS PURGE

AN INTERNAL GAS PURGE IS OPTIONAL FOR CARBON STEEL AND LOW ALLOY STEEL UP TO ASME SECTION IX P NO. 4. BUT GAS PURGE IS REQUIRED FOR P NO. 5A, 5B, 5C AND HIGHER ALLOYS. THE INTERNAL INERT GAS PURGE SHALL BE MAINTAINED DURING THE ROOT AND SECOND PASS.

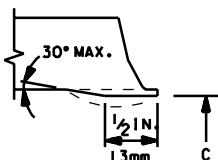


FIGURE 1

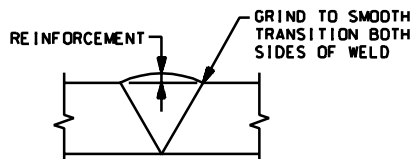


FIGURE 2

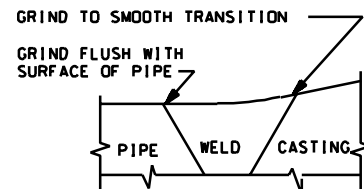
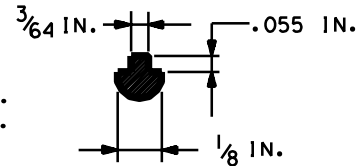
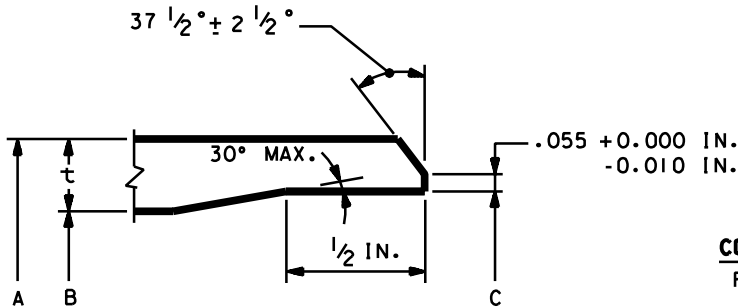


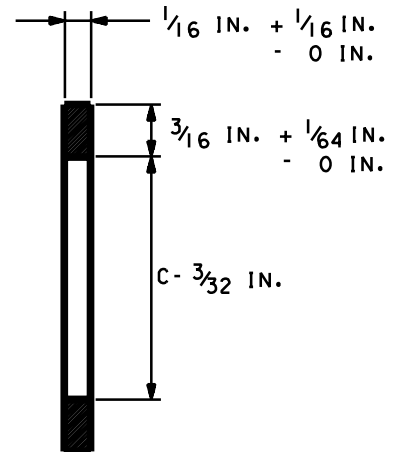
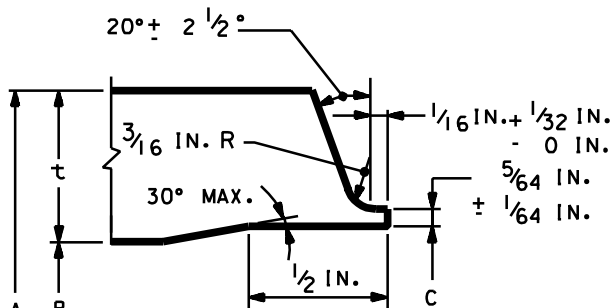
FIGURE 3

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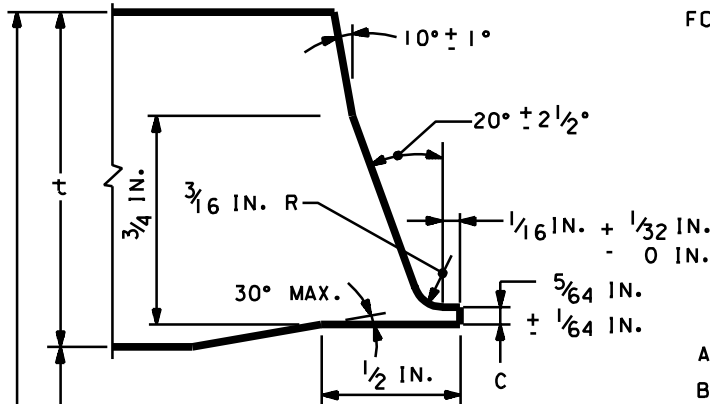
WELDING END DETAILS: CONSUMABLE INSERTS



CONSUMABLE INSERT RING
FOR USE WITH DETAIL 1



CONSUMABLE INSERT RING
FOR USE WITH DETAILS 2 & 3



LEGEND

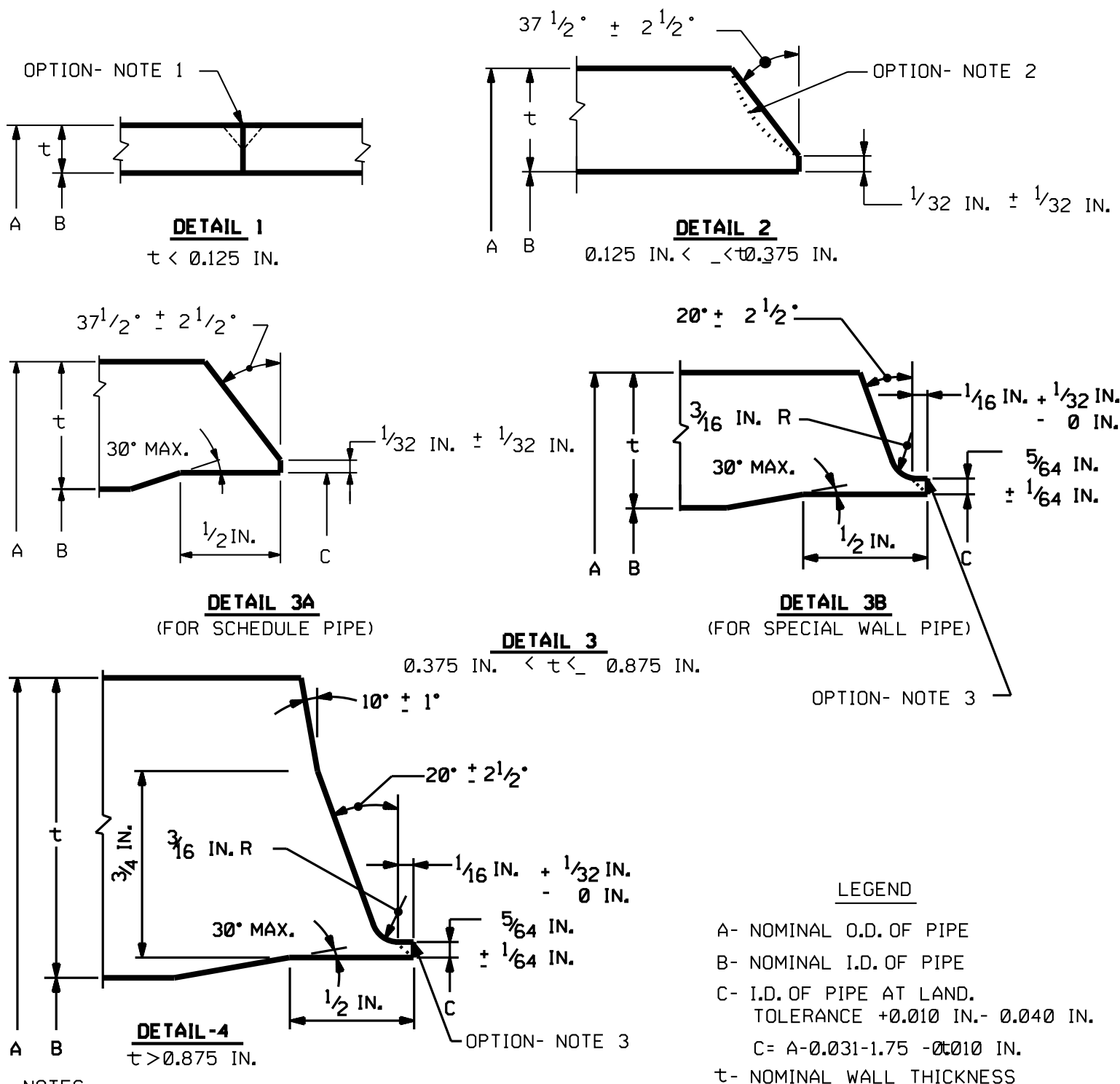
- A - NOMINAL O.D. OF PIPE
- B - NOMINAL I.D. OF PIPE
- C - I.D. OF PIPE AT LAND.
TOLERANCE +0.010 IN. - 0.040 IN.
- t - NOMINAL WALL THICKNESS

NOTE:

1. REFER TO MSDE-2.1.8.1 FOR GENERAL NOTES.

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WELDING END DETAILS: OPEN ROOT GTAW WELDING (NOTE 5)



NOTES:

1. AS AN OPTION, JOINT MAY BE SLIGHTLY CHAMFERED OR GROUND IN V-SHAPE.
2. AS AN OPTION, BEVEL MAY BE GROUND TO A ROUNDED PROFILE ON ONE OR BOTH SIDES OF JOINT AS REQUIRED.
3. AS AN OPTION, ROOT WELD FACE MAY BE GROUND TO A FEATHEREDGE.
4. REFER TO MSDE-2.1.8.1 FOR GENERAL NOTES.
5. BUTT WELDING END PREPARATION DIMENSIONS CONTAINED IN ASME B16.25 OR ANY OTHER END PREPARATION WHICH MEETS THE WPS ARE ACCEPTABLE.



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

ATTACHMENT 2
REFERENCE DOCUMENTS

MES-2.6 / PDT: **CI-1525**Revision: **A** Date: 11/17/2020

Approved By: Wear, Jason D

Piping Code: B31.1 NBEP

Temperature Limits

Minimum: -20 F Maximum: 1055 F

Status: **Approved**

Mechanical Engineering Standard Piping Design Table

Service: General

Primary Material: 2 1/4 CR - 1 MO Alloy Steel

Liner Material: None

Nominal Rating: ASME Class 1500

Type of Joints

NPS (Nominal Pipe Size)		End Type	Joint Detail	Welding Requirements
Min Size NPS	Max Size NPS			
0.125	2	SW	None	GTAW or SMAW.
2.5	24	BW	MSDE-2.1.8.5	Open root weld using GTAW for the root and second pass with the balance of weld completed by an approved process.

Pipe, Fittings, and Flanges

Item	Min Size NPS	Max Size NPS	Rating, Schedule or Gauge	Dimensional Standard	Manufacturing Specification	General Description	Flg Hub Type	Flg Face Type	Note References
Pipe	0.125	3	SCH 160	ASME B36.10M	ASTM A 335 GRADE P22	Seamless Ferritic Alloy Steel Pipe			
	4	6	SCH 120	ASME B36.10M	ASTM A 335 GRADE P22	Seamless Ferritic Alloy Steel Pipe			
	8	24	SCH 100	ASME B36.10M	ASTM A 335 GRADE P22	Seamless Ferritic Alloy Steel Pipe			
Fitting	0.125	2	CLASS 6000	ASME B16.11	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel SW Fitting			
	2.5	3	SCH 160	ASME B16.9	ASTM A234 GRADE WP22 CLASS 1	Seamless Wrought Ferritic Alloy Steel BW Fitting			s-20
	4	6	SCH 120	ASME B16.9	ASTM A234 GRADE WP22 CLASS 1	Seamless Wrought Ferritic Alloy Steel BW Fitting			s-20
	8	24	SCH 100	ASME B16.9	ASTM A 234 GRADE WP22 CLASS 1	Seamless Wrought Ferritic Alloy Steel BW Fitting			s-20
Branch Outlet Fitting (SW)	0.125	24	CLASS 6000	MSS SP-97	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel S-O-L Fitting			s-22
Branch Outlet Fitting (BW)	2.5	6	SCH 160	MSS SP-97	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel W-O-L Fitting			s-24
Branch Outlet Fitting (Bw (Br>6))	8	24	SPECIAL	MSS SP-97	ASTM A182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel W-O-L Fitting			s-24, s-185
Branch Outlet Fitting (Bw (Br<=6))	8	24	SCH 160	MSS SP-97	ASTM A182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel W-O-L Fitting			s-24, s-186
Flange	0.5	2	CLASS 1500	ASME B16.5	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Pipe Flange	SW	1/4 R.F.	s-30, s-174

PDT: **CI-1525**Rev: **A**Piping Code: **B31.1 NBEP**

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MES-2.6 / PDT: **CI-1525**Revision: **A** Date: 11/17/2020

Approved By: Wear, Jason D

Piping Code: B31.1 NBEP

Temperature Limits

Minimum: -20 F Maximum: 1055 F

Status: **Approved**

Mechanical Engineering Standard Piping Design Table

Item	Min Size NPS	Max Size NPS	Rating, Schedule or Gauge	Dimensional Standard	Manufacturing Specification	General Description	Flg Hub Type	Flg Face Type	Note References
Flange	2.5	2.5	CLASS 1500	ASME B16.5	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Pipe Flange	WN	1/4 R.F.	s-174
	3	24	CLASS 1500	ASME B16.5	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Pipe Flange	WN	1/4 R.F.	s-174
Flanged Fitting	0.5	2	CLASS 1500	ASME B16.5	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Flanged Fitting	NOT USED	1/4 R.F.	
	2.5	2.5	CLASS 1500	ASME B16.5	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Flanged Fitting	NOT USED	1/4 R.F.	s-103
	3	24	CLASS 1500	ASME B16.5	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Flanged Fitting	NOT USED	1/4 R.F.	s-103
Orifice Flange	1	2.5	CLASS 1500	ASME B16.36	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Orifice Flange	WN	R.J.	s-63, s-70, s-175
	3	24	CLASS 1500	ASME B16.36	ASTM A 182 GRADE F22 CLASS 1	Forged Ferritic Alloy Steel Orifice Flange	WN	R.J.	s-63, s-70, s-175

Item	Min Size	Max Size	Dimensional Standard	Manufacturing Specification	General Description	Properties	Note References
Bolt	0.75	1	ASME B16.5	ASTM A 193 GRADE B16	1Cr-1/2Mo-V Alloy Steel Stud Bolt	STUD BOLT, Thread STD.: ASME B1.1 CL. 2A COARSE UNC, Coating: PLAIN	
	1.125	3.5	ASME B16.5	ASTM A 193 GRADE B16	1Cr-1/2Mo-V Alloy Steel Stud Bolt	STUD BOLT, Thread STD.: ASME B1.1 CL. 2A COARSE 8UN, Coating: PLAIN	
Nut	0.75	1	ASME B18.2.2	ASTM A 194 GRADE 7	Cr-Mo Alloy Steel Nut	HEAVY HEX, Thread STD.: ASME B1.1 CL. 2B COARSE UNC, Coating: PLAIN	
	1.125	3.5	ASME B18.2.2	ASTM A 194 GRADE 7	Cr-Mo Alloy Steel Nut	HEAVY HEX, Thread STD.: ASME B1.1 CL. 2B COARSE 8UN, Coating: PLAIN	
Washer	0.75	3.5	ASME PCC-1, APP. M	ASTM A240 (UNS S41000) - TYPE 5	Hardened Martensitic Stainless Steel	THROUGH HARDENED, Coating: PLAIN	s-183

PDT: **CI-1525**Rev: **A**Piping Code: **B31.1 NBEP**

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MES-2.6 / PDT: **CI-1525**Revision: **A** Date: 11/17/2020

Approved By: Wear, Jason D

Piping Code: B31.1 NBEP

Temperature Limits

Minimum: -20 F Maximum: 1055 F

Status: **Approved**

Sargent & Lundy

**Mechanical Engineering Standard
Piping Design Table**

Item	Min Size NPS	Max Size NPS	Rating, Schedule or Gauge	Dimensional Standard	General Description	Properties	Note Refs
Gasket (Spiral Wound)	0.5	24	CLASS 1500	ASME B16.20	Spiral-Wound Metallic Gasket	SPIRAL WOUND GASKET, MATERIAL:SS 304, FILLER:VERMICULITE, INNER RING:SS 304, OUTER RING:SS 304, INIT. THICKNESS:0.175	

Valves

Item	Min Size NPS	Max Size NPS	End Type	Rating	Material	VDT Number
Check	0.5	2	SW	CLASS 1500	2 1/4 CR - 1 MO Alloy Steel	CHECK20
	2.5	24	BW	CLASS 1500	2 1/4 CR - 1 MO Alloy Steel	CHECK20
Gate	0.5	2	SW	CLASS 1500	2 1/4 CR - 1 MO Alloy Steel	GATE20
	2.5	24	BW	CLASS 1500	2 1/4 CR - 1 MO Alloy Steel	GATE20
Globe	0.5	2	SW	CLASS 1500	2 1/4 CR - 1 MO Alloy Steel	GLOBE20
	2.5	14	BW	CLASS 1500	2 1/4 CR - 1 MO Alloy Steel	GLOBE20

General Notes

- s-n Standard Abbreviations: SCH - Schedule; STD - Standard Weight; XS - Extra-Strong; XXS - Double Extra-Strong; SO - Slip-On Flange; SW - Socket Welding Flange; WN - Welding Neck Flange; FF - Flat Face; RJ - Ring Joint; RF - Raised Face; AB - Adhesive Bonded; BF - Butt Fusion Joint; BJ - Braze Joint; BS - Bell & Spigot Joint; BW - Butt Weld; CJ - Compression Joint; CP - Coupler joint; FJ - Flared Joint; FL - Flanged Joint; HS - Hub and Spigot; MJ - Mechanical Joint; PO - Push-On Joint; PS - See Project Specification; SC - Socket Solvent Cement Joint; SF - Socket Fusion Joint; SJ - Solder Joint; SO - Slip-On Joint (Flange to Pipe); SW - Socket Welding Joint; WJ - Butt and Wrap Joint; TG - Tongue and Groove joint; TH - Threaded joint; S-O-L - Sockolet or approved equal; T-O-L - Thredolet or approved equal; W-O-L - Weldolet or approved equal
- s-o The size of all pipe is identified by the nominal pipe size (NPS) (or DN) as indicated in ASME B36.10M or ASME B36.19M.
- s-p All butt joints shall be complete penetration welds. Refer to Standard Drawing MSDE-2.1.8.1 for welding end details general notes.
- s-q Refer to the Project Specification for detailed welding requirements.
- s-r Flanged joints shall only be used if specifically designated on the Design Drawings.
- s-s Pipe flanges mating with flanged components such as fittings, piping specialties, valves, and equipment shall be matched in outside diameter and drilling.
- s-t Only asbestos free materials suitable for the operating conditions shall be utilized for pipe flange gaskets.
- s-y Refer to the Valve Design Table (VDT) indicated for detailed valve specifications and requirements.

PDT: **CI-1525**Rev: **A**Piping Code: **B31.1 NBEP**

MES-2.6 / PDT: **CI-1525**

Service: General
Primary Material: 2 1/4 CR - 1 MO Alloy Steel
Liner Material: None
Nominal Rating: ASME Class 1500

Revision: **A** Date: 11/17/2020
Approved By: Wear, Jason D
Piping Code: B31.1 NBEP
Temperature Limits
Minimum: -20 F Maximum: 1055 F
Status: **Approved**



Mechanical Engineering Standard Piping Design Table

Notes

- s-20 Short radius elbow and return fittings shall not be used unless specifically indicated on the Design Drawings.
- s-22 Branch outlet fittings for outlet sizes NPS 2 (DN 50) and smaller shall be Bonney Forge Sockolet or approved equal.
- s-24 Branch outlet fittings for outlet sizes NPS 2 1/2 (DN 65) and larger shall be Bonney Forge Weldolet or approved equal.
- s-30 Socket welding flanges shall NOT be used when the system Design Temperature exceeds 500 deg F (260 C) unless indicated on the S&L piping isometric drawing, or without S&L's prior approval. Welding neck pipe flanges shall be used.
- s-63 Refer to Project Specific Drawing Class 600 and greater orifice flange and plate installation details.
- s-70 Orifice flange pressure sensing pipe connections shall be NPS 1/2 (DN 15) - socket welding type per ASME B16.11 unless otherwise indicated in the Project Specification.
- s-103 Cast flanged fittings may be substituted for the forged flanged fittings specified in this PDT with prior Sargent & Lundy approval.
- s-174 As required by ASME B16.5 and B16.47, purchaser shall specify the flange bore. The flange bore shall match the bore shown in the project specifications for the given pressure class, NPS and schedule of the adjoining pipe.
- s-175 As required by ASME B16.36, purchaser shall specify the orifice flange bore. The orifice flange bore shall match the bore specified in the project specification documents for the given pressure class, NPS and schedule of the adjoining pipe.
- s-183 Washers shall be made to the dimensions of ASME PCC-1, Appendix M, for the corresponding bolt size. Washers shall be made from material conforming to ASTM A240, Type 410 (UNS 41000). Washers shall be through hardened to a hardness of 38 HRC to 45 HRC. Washer materials shall meet the requirements of ASME PCC-1, Appendix M.
- s-185 The size range indicated for branch outlet fittings refers to the main run pipe size on which the branch outlet fitting will be used. Integrally reinforced forged branch outlet fittings are outside the range of fittings defined in the MSS-SP-97 standard. Special designed proprietary fittings are required and shall meet the requirements of ASME B31.1 paragraph 104.3 or paragraph 104.7.2. Calculations and documentation demonstrating that the special fittings provide adequate pressure reinforcement shall be available for the owner's and / or the Authorized Inspector's review.
- s-186 The size range indicated for branch outlet fittings refers to the main run pipe size on which the branch outlet fitting will be used. Integrally reinforced forged branch outlet fittings are within the range of fittings defined in the MSS-SP-97 standard.

MES-2.6 / VDT: **CI-GATE20**Revision: **A** Date: 4/21/2006

Pressure Class Standard: ASME B16.34

Dimensional Standard: ASME B16.10

Primary Valve Material: 2 1/4 CR - 1 MO Alloy Steel

Max Temperature: 1055 F

Valve Body: **GATE**Configurations: Double Wedge, Parallel, Slide,
Solid Wedge, Split Wedge

Mechanical Engineering Standard Valve Design Table

Approved By: Signature on file

Status: **Approved**

Rating	Min Size NPS	Max Size NPS	Body/Bonnet Type Of Attachment	Bonnet Stud Material	Bonnet Nut Material	Body/Bonnet Material	Stem Type	Stem Material	Disk/Plug Material	Seat / Backseat	Seat Material	Packing	Manual Operator Type	Note References
CLASS 600	0.5	2	BOLTED OR WELDED	ASTM A 193 GRADE B16	ASTM A 194 GRADE 7	ASTM A 182 GRADE F22	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Integral	Stainless Steel hard facing	Graphite	Handwheel	s-1, s-2, s-3, s-8, s-9, s-14, Iron or Steels-19
CLASS 1500	0.5	2	WELDED OR INTEGRAL	Not Applicable	Not Applicable	ASTM A 182 GRADE F22	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Integral	Stainless Steel hard facing	Graphite	Handwheel	s-1, s-2, s-3, s-8, s-9, s-14, Iron or Steels-19
CLASS 150	2.5	36	BOLTED	ASTM A 193 GRADE B16	ASTM A 194 GRADE 7	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Renewable	Stainless Steel hard facing	Graphite	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-14
CLASS 300	2.5	36	BOLTED	ASTM A 193 GRADE B16	ASTM A 194 GRADE 7	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Renewable	Stainless Steel hard facing	Graphite	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-14
CLASS 600	2.5	24	PRESSURE SEAL	Not Applicable	Not Applicable	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Renewable	Stainless Steel hard facing	Graphite Live Loaded	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-14, s-52
CLASS 900	2.5	24	PRESSURE SEAL	Not Applicable	Not Applicable	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Integral	Stainless Steel hard facing	Graphite Live Loaded	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-14, s-52
CLASS 1500	2.5	24	PRESSURE SEAL	Not Applicable	Not Applicable	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Integral	Stainless Steel hard facing	Graphite Live Loaded	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-14, s-52
CLASS 2500	2.5	24	PRESSURE SEAL	Not Applicable	Not Applicable	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Integral	Stainless Steel hard facing	Graphite Live Loaded	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-10, s-12, s-13, s-14, 52
CLASS 4500	2.5	8	PRESSURE SEAL	Not Applicable	Not Applicable	ASTM A 182 GRADE F22 or ASTM A 217 GRADE WC9	OS&Y	11 -13% Chrome	Stainless Steel	Welded-in or Integral	Stainless Steel hard facing	Graphite Live Loaded	Handwheel	s-1, s-2, s-3, s-4, s-5, s-8, Iron or Steels-9, s-10, s-12, s-13, s-14, 52

MES-2.6 / VDT: **CI-GATE20**

Revision: **A** Date: 4/21/2006

Pressure Class Standard: ASME B16.34

Dimensional Standard: ASME B16.10

Primary Valve Material: 2 1/4 CR - 1 MO Alloy Steel

Max Temperature: 1055 F

Valve Body: **GATE**

Configurations: Double Wedge, Parallel, Slide,
Solid Wedge, Split Wedge

Approved By: Signature on file

Status: **Approved**



Mechanical Engineering Standard Valve Design Table

General Notes

- s-a The valve size shall be designated by the actual body size.
- s-b All valves shall be full ported as defined by the table in B16.34; the use of reduced ported valves is not acceptable unless noted in the Project Specification.
- s-c The valve end connections shall be in accordance with the Project Specification.
- s-d The valves shall be capable of being mounted in any direction.
- s-e All valves shall be hydrostatically tested and proven tight at the manufacturer's plant. The test shall be in accordance with ASME B16.34, except that the gas seat (closure) test is not acceptable in lieu of a hydrostatic test.
- s-f Where applicable for ASME BPVC Section III, NB, NC, ND or ASME BPVC Section I applications, the material designation shall be considered as having the prefix "SA-". The ASME SA- materials specification applies to piping and valves within the jurisdiction of the ASME Boiler and Pressure Vessel Code.
- s-g For ASME BPVC Section III, NB, NC and ND applications, the use of any Cobalt containing material such as Stellite in seat, backseats and other valve components is subject to review by Sargent & Lundy.
- s-h The application of the materials listed is solely the dependent on the project specification, system designation, pipe class, and the governing codes.

Notes

- s-1 Gate and globe valves shall be designed so that the stem cannot be removed from the valve while under pressure by the removal of the stem seal alone.
- s-2 Gate and globe valves shall have a backseat to allow for packing adjustments to the valve while under full pressure and while the valve is in the wide open position. The backseat shall also be designed to protect the packing while the valve is in service.
- s-3 Gear operators shall be supplied for all manually operated valves NPS 8 and larger and on smaller valves when the lever pull of the valve is greater than 50 pounds at the maximum operating torque requirement.
- s-4 Valves in steam service shall have before and after seat drain plugs. Drain outlets on Class 600 valves and higher shall be provided with pipe nipples socket welded into the valve body. Drain nipples shall be a minimum Schedule 80 seamless steel pipe or as otherwise noted in the Project Specification.
- s-5 Bypasses and bypass valves shall be provided for all stop valves 8 inch and larger in steam service and for all stop valves 8 inch larger in Class 900 and higher in feedwater service. The bypass material shall be comparable to that of the valve and shall have one socket welded globe valve. The bypass shall be a minimum Schedule 80 seamless steel pipe or as otherwise noted in the Project Specification.
- s-8 Certification and Data Reports for all components furnished by Contractor shall be submitted in accordance with the requirement of the applicable codes.
- s-9 All ASME Code valves and other ASME components furnished by the contractor shall have a nameplate and /or be marked and stamped in accordance with the applicable requirements of the appropriate section of the ASME Code.
- s-10 Where special wall piping is indicated for butt weld end valve connections, Contractor shall verify with Sargent & Lundy the actual dimensions of the pipe and weld end preparation prior to machining the ends of such valves.
- s-12 The testing clamp ring on butt weld end valves shall not be placed to damage, mar or distort the weld end bevel.
- s-13 In addition to the requirements of the specific codes, special class butt weld valves and valves in the critical systems (Main Steam, Hot Reheat, Cold Reheat, other high pressure steam systems and Feedwater) shall be examined and tested in accordance with the Project Specification.
- s-14 In addition to the requirements of the specific codes, valves specified for ASME Section III applications shall be examined and tested in accordance with the Project Specification.
- s-19 In general, all stop or isolation valves NPS 2 and smaller shall be globe or angle valves unless specifically noted in the project documents.

MES-2.6 / VDT: **CI-GATE20**

Revision: **A** Date: 4/21/2006

Pressure Class Standard: ASME B16.34

Dimensional Standard: ASME B16.10

Primary Valve Material: 2 1/4 CR - 1 MO Alloy Steel

Max Temperature: 1055 F

Valve Body: **GATE**

Configurations: Double Wedge, Parallel, Slide,
Solid Wedge, Split Wedge

Approved By: Signature on file

Status:

Approved



Mechanical Engineering Standard Valve Design Table

Notes

- s-52 All double-seated valves Class 600 and higher and 2 1/2 inch and larger shall have over-pressurization protection in accordance with ASME B16.34. For valves in pressure class 600 and larger bolted bonnets are acceptable for modulating valves (control valves) and manufacturer's standard product for valves at a pressure class of 600

MES-2.6 / PDT: **CI-1559**Revision: **A** Date: 6/10/2014

Approved By: Signature on file

Piping Code: B31.1 NBEP

Temperature Limits

Minimum: -20 F Maximum: 1200 F

Status: **Approved**

Mechanical Engineering Standard Piping Design Table

Tube Outside Diameter			Type of Joints	
Min Size in.	Max Size in.	End Type	Joint Detail	Welding Requirements
0.375	1	SW	None	GTAW or SMAW.

Tubing and Fittings

Item	Min Size in.	Max Size in.	Rating or Thickness	Dimensional Standard	Manufacturing Specification	General Description	Flg Hub Type	Flg Face Type	Note References
Tubing (OD)	0.375	0.75	16 BWG (0.065)	ASTM A1016	ASTM A 213 GRADE TP316	Seamless Austenitic Stainless Steel Tube			s-29, s-107
	1	1	13BWG(095)	ASTM A1016	ASTM A 213 GRADE TP316	Seamless Austenitic Stainless Steel Tube			s-29, s-107
Fitting (Welded)	0.375	1	NONE	NONE	ASTM A 182 GRADE F316	Forged Austenitic Stainless Steel SW Tube Fitting			s-112, s-233
Fitting (Compression)	0.375	1	NONE	NONE	ASTM A 182 GRADE F316	Forged Austenitic Stainless Steel Compression Tube Fitting			s-106, s-118, s-233

General Notes

- s-m This table shall NOT be used for systems with Design Temperatures over 1200 deg F (650 C)
- s-n Standard Abbreviations: SCH - Schedule; STD - Standard Weight; XS - Extra-Strong; XXS - Double Extra-Strong; SO - Slip-On Flange; SW - Socket Welding Flange; WN - Welding Neck Flange; FF - Flat Face; RJ - Ring Joint; RF - Raised Face; AB - Adhesive Bonded; BF - Butt Fusion Joint; BJ - Brazed Joint; BS - Bell & Spigot Joint; BW - Butt Weld; CJ - Compression Joint; CP - Coupler joint; FJ - Flared Joint; FL - Flanged Joint; HS - Hub and Spigot; MJ - Mechanical Joint; PO - Push-On Joint; PS - See Project Specification; SC - Socket Solvent Cement Joint; SF - Socket Fusion Joint; SJ - Solder Joint; SO - Slip-On Joint (Flange to Pipe); SW - Socket Welding Joint; WJ - Butt and Wrap Joint; TG - Tongue and Groove joint; TH - Threaded joint; S-O-L - Sockolet or approved equal; T-O-L - Thredolet or approved equal; W-O-L - Weldolet or approved equal
- s-q Refer to the Project Specification for detailed welding requirements.
- s-x The size of all tubing and tube fittings specified in this PDT is given by the Tube Outside Diameter. Refer to the individual Product Note for the relationship between tube outside diameter and tube standard or nominal size.
- s-jr For applications that have design temperatures over 1000 F (540 C) the stainless steel materials must have a carbon content of 0.04% or higher. This may require the use of special order materials.
- s-pr The published vendor pressure rating data for fittings, must meet or exceed the system design conditions (i.e., Pressure and temperature).

PDT: **CI-1559**Rev: **A**Piping Code: **B31.1 NBEP**

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MES-2.6 / PDT: **CI-1559**

Revision: **A** Date: 6/10/2014

Approved By: Signature on file

Piping Code: B31.1 NBEP

Temperature Limits

Minimum: -20 F Maximum: 1200 F

Status: **Approved**



Mechanical Engineering Standard Piping Design Table

Notes

- s-29 Tube type "OD" is the designation for seamless ferritic or austenitic alloy steel tube manufactured in accordance with ASTM A 213 or ASME SA-213 or seamless copper alloy tube manufactured in accordance with ASTM B 75. Its size is designated by the tube's outside diameter and minimum wall thickness (MWT). The terms standard size or nominal size do not apply to this type of tubing.
- s-106 Compression fittings may be used in place of weld fittings at instruments, instrument valves and instrument specialties only where the heat resulting from welding would be detrimental to the component, or where break joints are required, or where specifically indicated on the project drawings, and where the Design Temperature does NOT exceed 800 deg. F (425 C). Any threaded joints that are required shall be seal welded.
- s-107 Tube bending is allowed. All bends shall have a minimum radius of 3 times the tubing outside diameter, unless otherwise specified in the Project Specification. All bends shall meet the requirements of ASME B31.1 paragraph 102.4.5 on bends. This may be met by using tubing that is 25% thicker than that specified in this PDT, or by verification of the final thickness of the bend after the bend is completed. This verification can be met if the intrados of the bend is measured to be at least 10% thicker than the minimum straight pipe thickness, and the extrados of the bend is measured to be no thinner than 4.5% less than the straight pipe thickness and the sidewall thickness of the completed bend must be no less than that required for straight pipe. Detailed calculations may be used to justify lesser intrados thickening and greater extrados thinning.
- s-112 SW tube fittings that are manufactured from stainless steel bar stock (ASTM A 479 Grade TP316) are also acceptable for use with this PDT.
- s-118 Compression tube fittings that are manufactured from stainless steel bar stock (ASTM A 479 Grade TP316) are also acceptable for use with this PDT where allowed by note 106.
- s-233 Vendor proprietary fittings (not made to a standard listed in ASME B31.1 Table 126.1) must meet the requirements of ASME B31.1 paragraph 104.7.2 for Specially Designed Components.

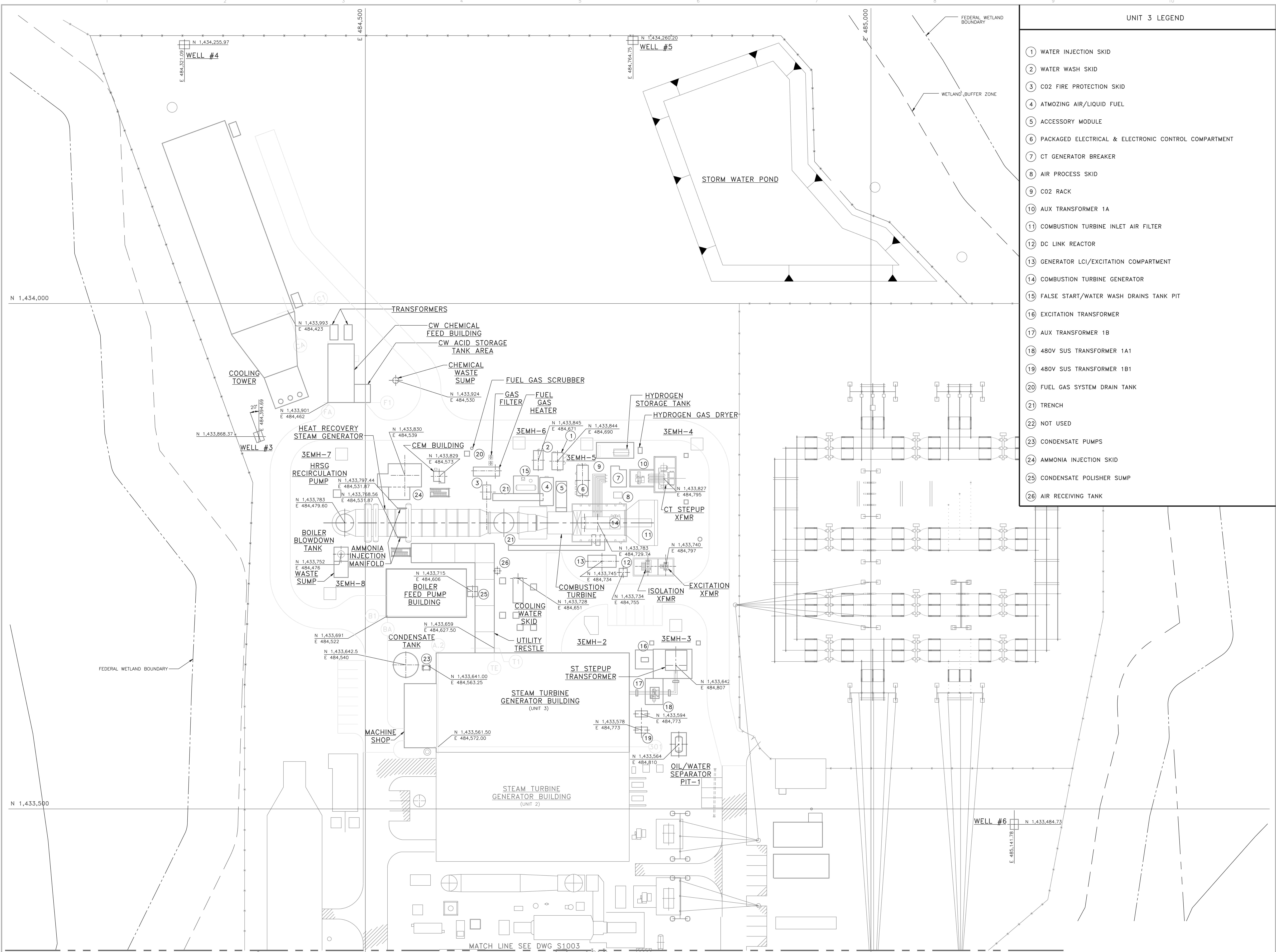


Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

ATTACHMENT 3
OWNERS DOCUMENTS



- UNIT 3 LEGEND
- ① WATER INJECTION SKID
 - ② WATER WASH SKID
 - ③ CO2 FIRE PROTECTION SKID
 - ④ ATMOZING AIR/LIQUID FUEL
 - ⑤ ACCESSORY MODULE
 - ⑥ PACKAGED ELECTRICAL & ELECTRONIC CONTROL COMPARTMENT
 - ⑦ CT GENERATOR BREAKER
 - ⑧ AIR PROCESS SKID
 - ⑨ CO2 RACK
 - ⑩ AUX TRANSFORMER 1A
 - ⑪ COMBUSTION TURBINE INLET AIR FILTER
 - ⑫ DC LINK REACTOR
 - ⑬ GENERATOR LCI/EXCITATION COMPARTMENT
 - ⑭ COMBUSTION TURBINE GENERATOR
 - ⑮ FALSE START/WATER WASH DRAINS TANK PIT
 - ⑯ EXCITATION TRANSFORMER
 - ⑰ AUX TRANSFORMER 1B
 - ⑱ 480V SUS TRANSFORMER 1A1
 - ⑲ 480V SUS TRANSFORMER 1B1
 - ⑳ FUEL GAS SYSTEM DRAIN TANK
 - ㉑ TRENCH
 - ㉒ NOT USED
 - ㉓ CONDENSATE PUMPS
 - ㉔ AMMONIA INJECTION SKID
 - ㉕ CONDENSATE POLISHER SUMP
 - ㉖ AIR RECEIVING TANK

9		7/11/2000	REVISED H2 STORAGE SHED; REVISED AMMONIA INJECTION SKID - CONTRACT 71.0205	KAWLLFPGPGGRTU	6	2/29/2000	APPROVED FOR CONSTRUCTION-CONTRACT 71.0205	ARBLLFPGPGGSMG	12	10/01/2001	CONFORMED TO CONSTRUCTION RECORDS	KAWCDJLLFRTURU
8		5/12/2000	REVISED AS INDICATED-CONTRACT 71.0205	KFHLLFPGPGGSMG	5	2/25/2000	REVISED AS INDICATED; ISSUED FOR REFERENCE - CONTRACT 72.0201	APMAPMLLFPGGSMG	10	8/14/2000	ADDED AIR REC. FND, AMMONIA INJ MANIFOLD-CONTRACT 71.0205	KAWLLFPGPGGRTU
7		4/28/2000	REVISED STORM POND, WELL PUMPS & FENCE	KFHLLFPGPGGSMG	4	12/15/1999	REVISED AS INDICATED	APMAPMLLFPGGSMG	NO	DATE	REVISIONS AND RECORD OF ISSUE	DRNDSCHKPDEAPP

ENGINEER	PLN	DRAWN	LLF
CHECKED	LUK	DATE	10/29/1999

PROJECT	DRAWING NUMBER	REV
KISSIMMEE UTILITY AUTHORITY CANE ISLAND PLANT - UNIT 3	60818-3STA-S1002	12

SITE ARRANGEMENT AREA 1	CODE	AREA
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KAW 15.05
A-50
01/24/02 13:43:27



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

ATTACHMENT 4
PROJECT LISTS

Line Number	Size	System Code	Max Temp	Max Press	Design Temp	Design Press	Fld Tst Pres	PDT	PDT Rev	Piping Code	Instr. PDT	Instr. Piping Code	Schedule	Manufacturing Spec
22JDA10-1601	22	RH - HOT REHEAT STEAM	1069	585	1080	600	N/A	CI 1525	A	B31.1 NBEP	CI 1529	B31.1 NBEP	100	ASTM A 335 GRADE P22
18JDA10-1602	18	RH - HOT REHEAT STEAM	1069	585	1080	600	N/A	CI 1525	A	B31.1 NBEP	CI 1529	B31.1 NBEP	100	ASTM A 335 GRADE P22
8JDA10-1603	8	RH - HOT REHEAT STEAM	1069	585	1080	600	N/A	CI 1525	A	B31.1 NBEP	CI 1529	B31.1 NBEP	100	ASTM A 335 GRADE P22
2JDA10-1604	2	RH - HOT REHEAT STEAM	1069	585	1080	600	N/A	CI 1525	A	B31.1 NBEP	CI 1529	B31.1 NBEP	160	ASTM A 335 GRADE P22
1JDA10-1605	1	RH - HOT REHEAT STEAM	1069	585	1080	600	N/A	CI 1525	A	B31.1 NBEP	CI 1529	B31.1 NBEP	160	ASTM A 335 GRADE P22

Valve Number	Body Type	Configuration	Oper Type	Valve Size	PDT	Piping Code	PDT Revision	Press Class	Pipe Line Tag	VDT	Primary Valve Material	Dimensional Std	End Type	Design Temperature	Max Temperature	Design Pressure	Max Pressure
VA-1605-01	Gate	SPLIT/FLEXIBLE WEDGE	N/A	1	CI 1525	B31.1 NBEP	A	CLASS 1500	2JDA10-1605	GATE20	ASTM A 182 GRADE F22	ASME B16.10	Socket Welded	1080	1069	600	585



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract



Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

ATTACHMENT 5

PRICING PAGES



Cane Island Power Park Unit 3
Hot Reheat Pipe Replacement
General Work Contract

Specification C-6251
Issue: Bid, Rev. 0
Date: 03-23-2021
Project No.: 13840-007

NAME OF SELLER: _____

TOTAL	
1. TOTAL FIRM LUMP SUM PRICE for demolition, procurement, fabrication and delivery, freight on board (F.O.B.) at the Cane Island Power Park, for the General Work Contract as identified in Specification C-6251 based on meeting all of the conditions of the Owner's Contract documents, unless exceptions are specifically listed and identified as such in the Proposal. Without limitation, it is understood that this price is firm and includes all activities (i.e., demolition, furnishing, fabricating, installing, shipping protection, delivery, overhead, profit and any travel and living expenses for technical field assistance) required by the Contractor to supply the indicated component, and is not subject to increase due to changes in the cost of labor or material or to any other factor, except changes in the Scope of Work or causes specifically stated in the Contract Documents.	\$0.00

1.2

1.1 SCOPE	\$0.00
1.1.1 Demolition	\$
1.1.2 Installation & Construction Activities	\$
1.1.3 Material Supply	\$
1.1.4 Testing	\$

Sum of Items
1.1.1 to 1.1.4

2. CONFORMITY WITH SPECIFICATION	
2.1 Bidder hereby certifies that it agrees with all provisions of the Specification unless exceptions or clarifications are specifically and clearly identified as exceptions and/or clarifications in a special section in its proposal. (Yes/No)	
2.2 Any exceptions or clarifications which the Bidder has taken with reference to specific specification sections and articles are listed on proposal page number(s):	

3. RECEIPT OF ADDENDA	
Bidder acknowledges receipt of the following Addenda: __, __, __, __, __. If no Addenda were issued, Seller shall state "NONE".	

4. PAYMENT MILESTONE SCHEDULE	
Seller shall provide a payment milestone schedule for review and approval by Owner. Seller to use Project Milestones in Attachment G for major payment milestones. Payment milestone schedule is included on Seller's proposal page	

Dated this ____ day of _____, 20__.

Name of Firm: _____
Signature: _____
Typed or Printed Name: _____
Title: _____
Business Address of Seller: _____

APPENDIX B

SAMPLE AGREEMENT

FLORIDA MUNICIPAL POWER AGENCY
TERMS AND CONDITIONS FOR THE PURCHASE OF GOODS AND SERVICES
(Form PO-101AR Rev 2.)

Notice: FMPA's purchase of goods and services from the Supplier is expressly conditioned on Supplier's assent to these Form PO-101AR terms and conditions (the "*Terms and Conditions*") which are binding on the Supplier. Any acceptance of FMPA's offer to purchase goods and services is expressly limited to acceptance of these Terms and Conditions, and FMPA expressly objects to any additional or different terms and conditions offered by the Supplier. Any order for goods and services fulfilled by the Supplier or the performance of work by Supplier shall constitute the Supplier's assent to these Terms and Conditions. These Terms and Conditions, however, do not apply to FMPA's purchase of engineering and other professional services; such purchase of engineering and other professional services shall be governed by terms and conditions separately set forth and agreed to between FMPA and the Supplier. This notice is a material part of these Terms and Conditions.

1. **Definitions.** As used in these Terms and Conditions, the terms below have the following definitions:

"**FMPA**" means the Florida Municipal Power Agency, a governmental separate legal entity created and existing under Florida Law.

"**Good(s)**" means the materials, supplies, items, and equipment covered by the purchase order and any pre-existing master agreement between FMPA and the Supplier.

"**Goods and Services**" means the Supplier's provisions of Good(s) or Services, or both, individually or together, and the Supplier's performance of the totality of its obligations as set forth in the Purchase Order.

"**Purchase Order**" means purchase order or agreement between FMPA and Supplier for the provision of Goods and Services and includes all exhibits, specifications, attachments, and these Terms and Conditions which are hereby deemed by the parties to be a material and essential part of the Purchase Order.

"**Supplier**" means a vendor, seller, supplier, materialman, outfitter, contractor, or other provider designated in the Purchase Order and includes the Supplier's employees, subcontractors, independent contractors and all other persons performing any type of work, directly or indirectly under the Supplier's direction or control, in contribution to the provision of the Goods and Services subject to the Purchase Order.

"**Services**" means the work to be performed or the services to be provided by the Supplier, or both, as described in the Purchase Order, including any technical description or proposal submitted to or issued by FMPA and related to the Purchase Order.

2. **Applicability.** The Supplier hereby agrees to sell and provide the Good(s) and perform the Services described in the Purchase Order in accordance with these Terms and Conditions and the requirements of the Purchase Order, including any specified scope of work or technical specification included in the Purchase Order.

3. **Acceptance.** The Supplier shall accept the Purchase Order in writing. If Supplier fails to accept the Purchase Order in writing, the Purchase Order and these Terms and Conditions are nonetheless applicable and binding upon the Supplier if the Supplier engages in any conduct which recognizes the existence of a contract pertaining to the subject matter hereof, including, without limitation, the shipment of Goods or commencing the performance of Services, which is deemed by the Supplier to constitute its acceptance of the Purchase Order. Any terms proposed in Supplier's acceptance of FMPA's offer that add to, vary from, or conflict with the Purchase Order and these Terms and Conditions is hereby objected to by FMPA and shall not apply. To the extent that the Purchase order might be treated as an acceptance of Supplier's prior offer, and if any of the terms of the Purchase Order are additional to or different from any terms of such offer, then the issuance of the Purchase Order by FMPA shall constitute an acceptance of such offer subject to the express condition that Supplier assent to these additional and different Terms and Conditions, which in all cases of conflict are controlling, and Supplier shall be deemed to have so assented. Any other preprinted terms and conditions affixed to any Goods or forms provided by the Supplier are hereby acknowledged and agreed to be void and of no effect.

4. **Entire Agreement.** (a) The Purchase Order sets forth the complete and final agreement between the parties with respect to the subject matter hereof, and supersedes any and all prior or contemporaneous oral or written communications relating thereto.

(b) Only if the Purchase Order is used as a release for Goods or Services under a pre-existing master agreement, then

these Terms and Conditions are deemed to supplement the provisions of such master agreement to the extent they are not inconsistent and such master agreement is hereby deemed to be appended to and form a part of the Purchase Order. In the event of any inconsistency between the terms of any pre-existing Master agreement, and these Terms and Conditions and those additionally set forth in the Purchase Order, the following order of precedence is hereby agreed: (1) the terms of the master agreement, (2) the terms on the face of the Purchase Order, and (3) these Terms and Conditions.

(c) Any reference to a proposal, quotation, or other communication given by the Supplier, unless expressly provided for in the Purchase Order to the contrary, is limited only to the description of the Goods or Services and by the terms set forth or incorporated by reference in the Purchase Order.

5. **Prices.** (a) The price(s) set forth in the Purchase Order are firm, and are not subject to increase.

(b) The Supplier represents that the price(s) charged for the Goods and Services covered by the Purchase Order are the lowest prices charged by the Supplier to buyers of a class similar to FMPA under conditions similar to those specified in the Purchase Order and the price(s) comply with the applicable government regulations in effect at the time of quotation, sale, or delivery. The Supplier agrees that any price reduction made in the Goods or Services covered by the Purchase Order within the 12 months subsequent to the placement of the Purchase Order will be applicable to the Purchase Order and FMPA. In such case, the Supplier shall issue a payment to FMPA to credit to FMPA the reduction in price from the price that FMPA has paid. If FMPA has not completed payment for the Goods and Services, the Supplier shall issue to FMPA a credit against future amounts owed under the Purchase Order.

(c) FMPA may require the Supplier to provide a performance and payment bond as an option. The bonds must be priced separately.

6. **Taxes.** FMPA is tax-exempt for most purchases. FMPA's Florida Consumer's Certificate of Exemption Number is 85-8012559814C-2. A copy of this Certificate is available upon request. However, should any federal, state, or local taxes be imposed upon or on account of such sale, the prices for the Goods and Services are hereby deemed to include all such amounts, unless otherwise expressly set forth in the Purchase Order.

7. **Invoices.** (a) All invoices shall be submitted to FMPA in duplicate and shall contain the following information: (1) Purchase Order number; (2) Purchase Order line item number, as applicable; (3) Purchase Order part number, as applicable; (4) part serial number (if serialized); (5) brief description of the Goods and Services that are the subject of the invoice; (6) unit of measure; (7) unit price; (8) item quantity; (9) extended item price; (10) total invoice value; (11) Supplier's contact information and remit-to address; (12) invoice number; (13) date prepared; and (14) payment due date. Each invoice must also be accompanied by the Supplier's waiver, in a form reasonably acceptable to FMPA, of all liens and lien rights associated with amounts set forth in the invoice, conditioned only upon FMPA's payment of such invoice, as required to keep all Good(s) free from liens and claims of lien arising out of the provisions of the Goods and Services.

(b) FMPA may invoice or set off against amounts owed to the Supplier under the Purchase Order, in its discretion, any amounts FMPA determines are owed to FMPA by the Supplier pursuant to the Purchase Order, including these Terms and Conditions.

8. **Payment.** (a) Unless otherwise expressly set forth in the Purchase Order, FMPA shall pay 100% of the uncontested Purchase Order price upon the completion of the provision of all Goods and Services within 30 days after receipt of the Supplier's invoice following the delivery and FMPA's acceptance of the Goods and Services. Payment of an invoice does not constitute acceptance of the Goods and Services and shall be subject to adjustment for errors, shortages, defects in the Goods and Services, damage to FMPA for which Supplier is partially or wholly responsible, or other failure of Supplier to meet the requirements of the Purchase Order, including any of these Terms and Conditions.

(b) If applicable, in addition to Supplier's hourly rate, FMPA shall reimburse Supplier for certain reasonable business related expenses supported by original receipt, which may include reasonable travel expenses, business mileage (paid at no more than the IRS approved rate), postage, copying, and other similar business related expenses. All requests for reimbursement of expenses will be subject to audit and approval by FMPA.

9. **Delivery and Performance.** (a) Time is of the essence, and the Goods must be received or Services performed on the date(s) and at the destination(s) set forth in the Purchase Order. If the Supplier fails to meet any such delivery or performance date, FMPA may, without limiting its other rights and remedies, direct expedited routing, charge excess costs incurred thereby to the Supplier, purchase substitute goods or services elsewhere and charge Supplier for any additional expense incurred, or cancel all or part of the Purchase Order, without further liability of FMPA.

(b) Any Services required to be performed under the Purchase Order will be performed with the skill and care which would be exercised by comparable highly qualified persons performing similar Services and exercising all diligence to perform the Services in a first class manner. If the failure to meet these standards results in deficiencies in the Services, the Supplier shall re- perform such non-conforming Services necessary to correct such deficiencies at no extra cost to FMFA. Such re-performance by the Supplier shall be done in a manner and on a schedule that is established by FMFA.

(c) If applicable, the Supplier shall provide to FMFA upon delivery of Goods all material safety datasheets and other materials reasonably required by FMFA, including without limitations, factory test reports, inspections and certifications documentation, instructions and procedures for operation and maintenance, technical specifications, shipping documentation, and other similar or FMFA-designated materials.

10. Freight; Title and Risk of Loss. (a) Unless otherwise specifically provided for, Supplier shall be responsible for all freight and delivery costs, including unloading costs, to the destination specified in the Purchase Order. All freight and delivery charges will be paid by Supplier. Notwithstanding anything else herein, Supplier shall bear all risks of loss and damage to the Goods until final acceptance by FMFA at the destination specified in the Purchase Order. Further, Supplier shall bear the same risks with respect to any Goods rejected by FMFA or as to which FMFA has revoked its acceptance, from the time of such rejection or revocation.

(b) Risk of loss, title, and ownership of the Goods and Services shall pass to FMFA upon FMFA's acceptance of the Goods and Services meeting the quantity, quality, and other requirements set forth in the Purchase Order, except that nothing prohibits FMFA from revoking such acceptance is subsequently FMFA determines any of the Goods and Services, despite the initial acceptance thereof, did not meet all requirements of the Purchase Order.

11. Inspection and Acceptance. (a) Notwithstanding any prior inspections or payments hereunder, all Goods and Services shall be subject to final inspection, which may include measurement, testing and examination, at FMFA's facility within a reasonable time (but not less than 90 days) after receipt at destination. Any inspection by FMFA does not relieve the Supplier of any obligations or liabilities under the Purchase Order.

(b) If FMFA determines that any Goods and Services delivered or performed do not meet all of the requirements of the Purchase order, FMFA shall have the right to reject such Goods and Services and return such rejected Goods to Supplier at Supplier's expense. FMFA may elect to reject the entire Goods and Services tendered even if only a portion thereof is nonconforming. If FMFA elects to accept nonconforming Goods or Services, FMFA, in addition to its other remedies, shall be entitled to an appropriate reduction in price, as reasonably determined by FMFA based upon the total Purchase Order price. Payment for any Goods or Services shall not be deemed an acceptance thereof. All Goods that fail to meet the requirements of the Purchase Order are subject to Supplier's payment of any "in and out" costs incurred by FMFA due to such failure.

(c) Acceptance of any part or portion of the Goods and Services subject to the Purchase Order does not bind FMFA to accept any future shipments nor deprive FMFA of its right to return nonconforming Goods that were previously accepted.

(d) If Services under the Purchase Order are performed on FMFA property, the Services are deemed to not be complete until all rubbish, trash, debris, and unused material due to or connected with the performance of the Services is removed and the premises are left in a safe, neat, and reasonably clean condition.

12. Warranty. (a) Supplier warrants that all Goods and Services furnished under the Purchase Order are: (1) be free from known, apparent, latent and inherent defects in workmanship, material, manufacture, and design (where design is the Supplier's responsibility); (2) comply with the requirements of the Purchase Order in all respects and any samples and warranties furnished by the Supplier; (3) be merchantable and safe for use, and fit and sufficient for the use intended by FMFA; (4) be free and clear of any lien, security interest, or other adverse claim against title; and (5) not infringe, including without limitation their sale or use alone or in combination, any United States or foreign patents, trademarks, trade secrets, copyrights, or proprietary rights of any third party.

(b) The foregoing warranties are in addition to all other warranties, expressed or implied, and shall survive any delivery, inspection, acceptance, and payment by FMFA.

(c) Supplier's warranties shall be effective for the period of time either (1) as set forth in the Purchase Order expressly, or (2) two years from the date of FMFA's final acceptance, whichever is greater plus an additional two (2) years from any warranty repair with the total period not to exceed four (4) years from the date of FMFA's final acceptance.

(d) If any of the Goods and Services furnished under the Purchase Order do not meet the warranties described in these Terms and Conditions or otherwise, FMPA may, at its option: (1) require the Supplier to correct, at no cost to FMPA, any defective or nonconforming Goods and Services by repair or replacement; or (2) return such defective or nonconforming Goods at the Supplier's expense to the Supplier and recover from the Supplier the price for such defective or nonconforming Goods and FMPA's related costs to determine such defect or nonconformance, for FMPA's return shipping costs to the Supplier, and for FMPA's acquisition and installation of replacement Goods meeting FMPA's requirements; (3) correct the defective or nonconforming Goods and Services itself and charge the Supplier for all costs and expenses incurred by FMPA related to such correction; or (4) accept the defective or nonconforming Goods and Services at a reduced price, as reasonably determined by FMPA based upon the total Purchase Order price. In all cases, for Goods and Services that do not meet the warranties described in these Terms and Conditions or otherwise, the Supplier shall be responsible for the costs of removal and reinstallation. Also, since the Goods and Services may be part of and operating power plant – the timing of repairs will in all cases be at FMPA's convenience.

13. **Changes.** FMPA reserves the right at any time to change the requirements of the Purchase Order and these Terms and Conditions in writing, and if such change causes an increase or decrease in price or delivery of the Goods or Services, an equitable written adjustment shall be made. Any price changes must be agreed to in writing at least 60 days prior to becoming effective. Any such change, modification, change order, or constructive change must be reasonable for the completion of the Services.

14. **License.** To the extent that the Supplier or third parties retain ownership rights in materials delivered with the Goods, or upon which any work product is based, the Supplier hereby grants to FMPA an irrevocable, worldwide, non-exclusive, royalty-free right and license to make, have made, modify, use, distribute, publicly perform or display, sell, offer to sell, and import such materials. Supplier hereby warrants that it owns or has acquired rights in all such intellectual property necessary to grant the licenses and intellectual property rights set forth in this provision.

15. **Liens.** As a governmental legal entity subject to Florida law, FMPA's property (real and personal) is not subject to lien or other security interests. The Supplier hereby acknowledges the foregoing and covenants to not attempt to nor permit the attempt to impose or attach a lien on FMPA's property by the Supplier associated with the Goods and Services purchased by FMPA under the Purchase Order.

16. **Indemnity.** (a) The Supplier shall defend, indemnify, and hold FMPA and its members, officers, directors, employees, agents, successors, and assigns harmless from and against any and all claims, suits, actions, liabilities, losses, costs, reasonable attorneys' fees and costs, expenses, judgments or damages, whether ordinary, special, or consequential arising directly or indirectly from or in connection with (1) the acts, negligence, omissions, or willful misconduct of Supplier; (2) the Goods or Services supplied; (3) a breach of any of Supplier's warranties or any other term or condition of the Purchase Order, including these Terms and Conditions; (4) the Supplier's negligent, unauthorized, or wrongful acts or omissions with regard to the transportation, use, handling, disposal, processing, or installation of hazardous materials; (5) a claim that any of the Goods and Services furnished by the Supplier infringe upon or misappropriate any patent, copyright, trademark, trade secret, or other intellectual property interest of another; (6) a claim of any lien, security interest, or other encumbrance made by a third party that is related to the Purchase Order; and (7) Supplier's violation of federal or state law, regulation, rule, permit, statute, or ordinance.

(b) It is understood and agreed that each party has an affirmative duty to promptly notify the other party in writing of any claims, demands, or suits brought or made against such notifying party with respect to its performance pursuant to the Purchase Order. FMPA may permit the Supplier, in FMPA's discretion, to settle any claim or suite indemnified by the Supplier hereunder, with the written approval of FMPA and agrees, to the extent permissible by law, that it may permit the complete control of such defense by the Supplier. Any settlement offer negotiated by the Supplier pursuant to this indemnity provision shall, prior to being submitted to an adverse third party, be (1) a *bona fide* offer of settlement that releases with prejudice all claims and liabilities against FMPA, its members, directors, officers, agents, representatives, consultants, independent contractors, and employees, arising out of the claim or suit for which indemnity is sought; (2) made in good faith by the Supplier; (3) discussed, reviewed, and approved in writing by FMPA; and (4) not include any terms or conditions which impose on FMPA, its members, directors, officers, agents, representatives, consultants, independent contractors, and employees any obligation, legal or otherwise, to perform or refrain from any act which would have a legal, financial, or operational impact to FMPA and which would not be reimbursed by the Supplier as part of the proposed settlement.

(c) To the extent permissible by law, and deemed appropriate in the sole discretion of FMPA, FMPA its members, directors, officers, agents, representatives, consultants, independent contractors, and employees shall cooperate fully with the Supplier and its legal representatives in the investigation and defense of any claims or suits covered by this indemnity provision.

17. **Insurance.** (a) If required by FMPA and expressly stated in the Purchase Order, Supplier shall carry and maintain insurance coverage satisfactory to FMPA to cover its obligations in the Purchase Order, including without limitation, the following insurance with the respective minimum limits per occurrence:

- (1) Commercial General Liability - \$2,000,000;
- (2) Workers' Compensation - statutory;
- (3) Business Automobile Liability - \$500,000;
- (4) Product Liability Coverage - as set forth in the Purchase Order, if any; and
- (5) Pollution Insurance and Builder's All Risk - as set forth in the Purchase Order, if any.

(b) Supplier shall provide FMPA with a certificate evidencing compliance with the above requirements of subsection (a) and naming FMPA and the other entities specified in the Purchase Order (which in any event shall include the owner or any FMPA joint- owner(s) of the facility for or at which the Supplier is providing the Goods and Services) as an additional insured, except on the worker's compensation policy. Supplier shall provide FMPA with no less than 10 days prior notice of cancellation of any such insurance. At no time shall Supplier be without insurance in the above amounts during any performance related to the Purchase Order, which is deemed to be a material default under these Terms and Conditions.

18. **Termination.** (a) FMPA may, at any time, terminate the Purchase Order, in whole or in part, without cause, upon written notice to the Supplier. Upon any such termination the Supplier shall, to the extent specified by FMPA, stop all work on the Purchase order, and cause its suppliers and subcontractors to stop work. The Supplier's charges for any such termination of the Purchase Order are limited to actual non-recoverable costs incurred by the Supplier that the Supplier can demonstrate were properly incurred prior to the date of termination. In no event shall FMPA be obligated to reimburse Supplier for Good(s), inventory, or Services in excess of those required to meet FMPA's delivery schedule for binding forecasts. In no event shall such reimbursement include anticipated profits or revenue or other economic loss for undelivered Good(s) or unperformed Services.

(b) FMPA may delay the Supplier's performance for any reason upon written notice to the Supplier. If FMPA delays performance for more than three months and either FMPA or the Supplier elects to terminate the Purchase Order because of such delay, the Supplier's sole remedy shall be reimbursement for actual non-recoverable costs incurred by the Supplier that the Supplier can demonstrate were properly incurred prior to the date of termination. In no event will FMPA reimburse Supplier for Good(s), inventory, or Services in excess of those required to meet FMPA's delivery schedule for binding forecasts. In no event shall such reimbursement include anticipated profits or revenue or other economic loss for undelivered Good(s) or unperformed Services.

(c) FMPA may terminate this PO, in whole or in part, if Supplier: (1) is in material default of the Purchase Order; (2) fails to make delivery of the Good(s) or perform the Services within the time specified in the Purchase Order; (3) fails to replace or correct defective Goods and Services in accordance with the provisions of the Purchase Order, including these Terms and Conditions; (4) fails to perform any other provision of the Purchase Order or so fails to make progress as to endanger performance in accordance with its terms; or (5) becomes insolvent, files or has filed against it a petition in bankruptcy, or makes an assignment for the benefit of creditors. In the event of cancellation pursuant to this clause, FMPA may procure similar Goods or Services elsewhere by purchase order or otherwise and the Supplier shall be liable to FMPA for all of its excess costs.

(d) Any such termination shall not relieve the Supplier from any liability under the Purchase Order.

19. **Limitation of FMPA's Liability.** In no event shall FMPA be liable for special, incidental, or consequential damages or lost profits of the Supplier. Any action resulting from any breach on the part of FMPA as to the Good(s) delivered or Services performed under the Purchase Order must be commenced within one (1) year after such breach.

20. **Remedies.** FMPA's remedies are cumulative, and remedies herein specified do not exclude any remedies allowed by law or in equity. Waiver of any breach shall not constitute waiver of any other breach of the same or any other provision.

21. **Compliance with Laws.** Supplier warrants that all Goods and Services will be produced or performed in compliance with all applicable federal, state, and local laws, rules, and regulations, including without limitation:

- (1) the Environmental Protection Agency Toxic Substances Control Act's reporting regulation and any and all pre-manufacturing reporting required with regard to the Good(s), or any of the Good(s)' constituent ingredients, covered by the Purchase Order;

- (2) applicable state hazardous materials regulations in shipping the Good(s) covered by the Purchase Order;
- (3) the Occupational Safety and Health Act of 1970;
- (4) the Resource Conservation and Recovery Act, and the Immigration Reform and Control Act of 1986 (“IRCA”) and the IRCA’s implementing regulations as they pertain to any and all employees employed by Supplier in connection with performance hereunder.

Any provisions required thereby to be included herein shall be deemed to be incorporated by reference.

22. **Governing Law.** The validity and interpretation of the Purchase Order and the rights and obligations of the parties shall be governed and construed in accordance with the laws of the State of Florida without regard for any conflicts of law provisions that might cause the law of other jurisdictions to apply. All controversies, claims, or disputes arising out of or related to the Purchase Order or any agreement, instrument, or document contemplated by the Purchase Order must be brought exclusively in the County or Circuit Court for Leon County, Florida, or the United States District Court sitting in Tallahassee, Florida, as appropriate. The parties consent to and agree to submit to the personal jurisdiction of such courts. Each of the parties hereby waives, and agrees not to assert in any such controversy, claim, or dispute, to the fullest extent permitted by applicable law, any argument or claim that: (1) such party is not personally subject to the jurisdiction of such courts, (2) such party and such party’s property is immune from any legal process issued by such courts, or (3) any litigation or other process commenced in such courts is brought in an inconvenient forum.

23. **Independent Contractor.** In all matters relating to the Purchase Order, the Supplier is and will be deemed to be acting as an independent contractor of FMFA. The Supplier is not an employee, agent, partner, or representative of FMFA. The Supplier shall conduct its business under its own name as an independent contractor, and is hereby expressly prohibited from holding itself out as an employee, agent, partner, or representative of FMFA. It is agreed that any person employed by the Supplier to perform its obligations under the Purchase order is not and will not be deemed to be an employee of FMFA, and Supplier and Supplier’s employees, suppliers, subcontractors, agents, or representatives shall not be, nor represent themselves to be, officers, employees, agents, or representatives of FMFA and shall not bind, nor attempt to bind, FMFA to any agreement, liability, or obligation of any nature. Supplier agrees to pay, and hereby accepts full and exclusive liability for the payment of, any and all contributions and taxes for unemployment compensation or disability insurance or old age pension or annuities, and all similar provisions now or hereafter imposed by any federal or state governmental authority, which are imposed with respect to or measured by wages, salaries, or other compensation paid by the Supplier to persons employed by the Supplier; and the Supplier further agrees to indemnify and save FMFA harmless against any and all such liability or claims thereof.

24. **Force Majeure.** Neither party shall be liable for failure to perform under the Purchase Order if such failure to perform arises out of causes beyond the reasonable control and without the fault or negligence of the non- performing party (“**Force Majeure**”). Such causes may include, but are not limited to, acts of God or public enemy, wars, riots, fires, floods, explosions, epidemics, quarantine restrictions, freight embargoes, water shortages, and unusually severe weather. However, “Force Majeure” SHALL NOT MEAN NOR INCLUDE the negligence, gross negligence, or willful malfeasance of a party or any of its directors, officers, agents, representatives, independent contractors, or employees during the performance of the Purchase Order. This provision shall become effective only if the party failing to perform notifies the other party orally within 24 hours and provides written confirmation within two business days of the extent and nature of the problem, limits delay in performance to that required by the event, and takes all reasonable steps to minimize delays. This provision shall not be effective unless the failure to perform is beyond the reasonable control of the non-performing party. It is understood and agreed that FMFA shall not be liable to any other party for any damage occasioned by Force Majeure.

25. **Assignability and Subcontracting.** The Purchase Order is binding upon and inures to the benefit of the parties and their respective successors and permitted assigns. Notwithstanding the foregoing, neither the Purchase Order nor any interest in the Purchase Order may be assigned, delegated, or otherwise transferred by the Supplier except upon the prior written consent of FMFA, and any assignment or transfer without such consent shall be void and of no effect. The Supplier shall not appoint any subcontractor or non-employee to carry out its obligations under the Purchase Order without the prior written consent of FMFA. In any event, even with FMFA’s consent, the Supplier shall remain liable for the performance of all such obligations and shall ensure that any permitted subcontractor or non-employee reads and understands the terms of the Purchase Order and that the Goods and Services are provided in accordance with all requirements. FMFA may assign its rights or obligations under the Purchase Order to any FMFA affiliate or successor without Supplier’s consent.

26. **Survivorship.** All provisions, representations, and warranties contained in the Purchase Order, including in these Terms and Conditions, which by their nature are required or intended to be observed or performed after termination or completion of

the Purchase Order are hereby intended by the parties to survive its termination or completion.

27. **Notices.** (a) Each party giving or making any notice, request, demand, or other communication (each, a “notice”) pursuant to this agreement shall give the notice in writing, unless otherwise expressly permitted in this agreement, and shall use one of the following methods of delivery, each of which for purposes of this agreement is a writing: (1) personal delivery; (2) registered or certified mail, in each case, return receipt requested and postage prepaid; (3) nationally recognized overnight courier, with all fees prepaid; (4) electronic mail with electronic confirmation of the addressee opening the electronic mail (*i.e.*, read receipt) or (5) facsimile.

(b) Each party giving a notice shall address the notice to the appropriate person at the receiving party (the “Addressee”) at the address listed below or to another Addressee or at another address designated by a party in a notice pursuant to this section 27:

If to FMPA: Florida Municipal Power Agency
8553 Commodity Circle
Orlando, Florida 32819-9002
Attention: Chief Operating Officer
Facsimile No.: (407) 355-5794
Email: ken.rutter@fmpa.com
david.schumann@fmpa.com
Telephone No. (for verification purposes only): (407) 355-7767

With a required copy to: Florida Municipal Power Agency
Office of the General Counsel
2061-2 Delta Way (32303-4240)
Post Office Box 3209
Tallahassee, Florida 32315-3209
Attention: Purchase Order Terms and Conditions
Facsimile No.: (850) 297-2014
Email: jody.lamar.finklea@fmpa.com
Telephone No. (for verification purposes only): (850) 297-2011

If to the Supplier: As provided in the Purchase order.

(c) Except as provided else-where in this agreement, a notice is effective only if the party giving or making the notice has complied with subsections (a) and (b) and if the Addressee has received the notice. A notice is deemed to have been received as follows:

- (1) If a notice is delivered in person, or sent by registered or certified mail, or nationally recognized overnight courier, upon receipt as indicated by the date on the signed receipt.
- (2) If a notice is sent by facsimile, upon receipt by the party giving or making the notice of an acknowledgment or transmission report generated by the machine from which the facsimile was sent indicating that the facsimile was sent in its entirety to the Addressee’s facsimile number.
- (3) If the Addressee rejects or otherwise refuses to accept the notice, or if the notice cannot be delivered because of a change of address for which no notice was given, then upon the rejection, refusal, or inability to deliver.
- (4) Despite the other clauses in this subsection (c), if any notice is received after 5:00 p.m. on a business day where the Addressee is located, or on a day that is not a business day where the addressee is located, then the notice is deemed received at 9:00 a.m. on the next business day where the Addressee is located.

28. **Public Records.** All documents submitted and received by FMPA may become public records and FMPA shall treat them as subject to the Florida Public Records Law, including chapter 119, Florida Statutes.

29. **Enforcement.** In the event that either party is required to enforce the Purchase Order by court proceedings or otherwise, the prevailing party shall be entitled to recover all fees and costs incurred, including reasonable attorney's fees and costs, for cost of investigation, trial, alternative dispute resolution, cost of settlement, and/or appellate proceedings.

30. **Interpretation.** Each reference to the Purchase Order in these Terms and Conditions always includes these Terms and Conditions as a material part of the Purchase Order, whether or not the language "including these Terms and Conditions" or similar language is provided.

31. **General Provisions.** (a) In the event that any of the terms, covenants or conditions of the Purchase Order, or the application of any such term, covenant or condition, shall be held invalid as to any person or circumstance by any court having jurisdiction under the circumstances, the remainder of the Purchase Order and the application of its terms, covenants or conditions to such persons or circumstances shall not be affected by that invalidity.

(b) Except as provided in section 13, no amendment to the Purchase Order is valid unless mutually agreed and signed by both parties.

(c) The Purchase Order reflects the negotiated agreement of the parties. Accordingly, the Purchase Order, including these Terms and Conditions, is to be construed as if both parties jointly prepared it, and no presumption shall be made as to whether one party or the other prepared the Purchase Order for purposes of interpreting or construing any of the provisions of the Purchase Order or otherwise.

(d) The headings provided in the Purchase Order, including these Terms and Conditions, are for convenience only and do not affect its meaning.

(e) The Purchase Order may be executed in counterparts, each of which is deemed to be an original, but all of which together shall constitute one and the same instrument.

CONTRACTOR

FLORIDA MUNICIPAL POWER AGENCY

Signature: _____

Signature: _____

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

APPENDIX C

BID FORMS

**PROPOSAL TO FURNISH AND DELIVER
GENERAL WORK FOR HOT REHEAT PIPE REPLACEMENT
AT CANE ISLAND POWER PLANT
FOR THE FLORIDA MUNICIPAL POWER AGENCY**

I have carefully examined the RFP, Terms and Conditions, Technical Specifications, Bid Forms, and any other documents accompanying or made a part of this RFP. With full knowledge and understanding of the aforesaid, I agree to abide by all conditions of this bid.

I hereby propose to furnish the materials/services specified in the RFP at the prices quoted in my proposal.

I certify that I am duly authorized to submit this proposal; on behalf of the vendor and that the vendor is ready, willing and able to perform if awarded the bid.

Prices quoted shall remain firm and irrevocable for a period of 180 days.

ADDENDA. The undersigned bidder acknowledges receipt of the following addenda, which have been considered in preparing this proposal (if applicable).

Number _____ Dated _____

Number _____ Dated _____

Respectfully submitted:

Company Name: _____

Signature: _____

(Authorized Representative)

(Type or Print Name of Signer)

Address: _____

E-Mail Address: _____

Telephone Number: _____

Toll Free Number: _____

Date: _____

DISPUTE DISCLOSURE

Answer the following questions by placing an "X" in the appropriate "YES" or "NO" box. If you answer "YES", please explain in the space provided, or via attachment.

Has your firm, or any of its officers, received a reprimand of any nature or been suspended by the Department of Professional Regulation or any other regulatory agency or professional association within the last five (5) years?

YES ☐ NO ☐

Has your firm, or any member of your firm, been declared in default, terminated or removed from a contract or job related to the services your firm provides in the regular course of business within the last five (5) years?

YES ☐ NO ☐

Has your firm had filed against it or filed any requests for equitable adjustment, contract claims or litigation in the past five (5) years that is related to the services your firm provides in the regular course of business?

YES ☐ NO ☐

If yes, state the nature of the request for equitable adjustment, contract claim or litigation, a brief description of the case, the outcome or status of suit and the monetary amounts or extended contract time involved.

I hereby certify that all statements made are true and agree and understand that any misstatement or misrepresentation or falsification of facts shall be cause for forfeiture of rights for further consideration of this project:

Project: FMPA RFP# 2021-243

Firm

Date

Authorized Signature

Officer Title

Printed or Typed Name

AFFIDAVIT OF COMPLIANCE

FMPA RFP 2021-243

_____ We DO NOT take exception to any items included in the RFP.

_____ We TAKE exception as follows:

Company Name:

By:

(Authorized Person's Signature)

(Print or type name and title of signer)

Company Address: _____

Telephone Number: _____

Toll Free Number: _____

Fax Number: _____

Date: _____

DRUG-FREE WORKPLACE COMPLIANCE FORM

Preference shall be given to businesses with drug-free workplace programs. Pursuant to Section 287.087, Florida Statutes, whenever two or more proposals which are equal with respect to price, quality, and service are received by the State or by any political subdivision for the procurement of commodities or contractual services, a proposal received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process.

The undersigned proposer in conformity with Florida Statute 287.087 hereby certifies that _____ does:

(Name of business)

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.
2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.
3. Give each employee engaged in providing the commodities or contractual services that are under proposal a copy of the statement specified in Subsection 1.
4. In the statement specified in Subsection 1, notify the employees that, as a condition of working on the commodities or contractual services that are under proposal, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.
5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.
6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that the undersigned complies fully with the above requirements.

Signature

Name of Proposer

Date

STATEMENT OF NO PROPOSAL

Sharon Samuels
Florida Municipal Power Agency
8553 Commodity Circle
Orlando, FL 32819

We, the undersigned, have declined to submit a proposal on your Request for Proposals Number 2021-243, Florida Municipal Power Agency, General Work for Hot Reheat Pipe Replacement at Cane Island Power Plant - for the following reasons:

- ☐ We do not offer this service/product.
- ☐ Our schedule would not permit us to perform.
- ☐ Unable to meet specifications.
- ☐ Unable to meet bond requirements.
- ☐ Other

We understand that if the Statement of No Proposal letter is not executed and returned, our name may be deleted from the list of qualified proposers of the Florida Municipal Power Agency.

Company Name: _____

By: _____
(Authorized Person's Signature)

(Print or type name and title of signer)

Company Address: _____

Telephone Number: _____

Toll Free Number: _____

Fax Number: _____

Date: _____