City of Pasadena
Department of Water and Power

ADDENDUM NO. 4
to

Specifications LD-13-14
for
PROVIDING LABOR AND MATERIALS FOR
GLENARM REPOWERING BALANCE OF PLANT DESIGN AND CONSTRUCTION

This addendum is issued to correct and clarify the above Specifications. All addenda will be issued electronically. This addendum shall be considered in the bid proposal and become a part of any contract made pursuant thereto:

1. Add the Q & A Table Rev 2 as part of the Specifications. The Q&A Table Rev 1 in Enclosure 1 of Addendum 3 is deemed deleted. See Enclosure 1.

2. Replace the Bidder's Proposal Form in its entirety with the revised sheets marked "Addendum 4" in Enclosure 2. It has been revised to include 1) pricing and unit rate for asbestos removal from the circulating water tunnel, 2) pricing for the BOP Contractor to provide the Builder's All Risk Policy, and 3) to provide Sales and Use Taxes as a separate line item. Refer to Bidder Q&A #170.

3. Add the following new Section 10.1.4 to Page 27 of the Specification:

   "10.1.4 Damages Due to Excessive Steam Line Pressure Drop. BOP Contractor will pay to the City $7,500/psi for each psi of pressure drop in excess of 25 psi between the Once Through Steam Generator outlet PIE/BOP Contractor interface and the steam turbine inlet BOP/PIE Contractor interface; and the BOP Contractor agrees to pay said liquidated damages herein agreed upon, and further agrees that the General Manager may deduct the amount thereof from any money due or that may become due to the BOP Contractor under the Contract."

4. Add the following new Section 10.1.5 to Page 27 of the Specification:

“10.1.5 Damages Due to Excessive Steam Line Temperature Drop. This is a "BOP Contractor will pay to the City $15,000/ºF for each degree Fahrenheit of temperature drop in excess of 2 ºF between the Once Through Steam Generator outlet PIE/BOP Contractor interface and the steam turbine inlet BOP/PIE Contractor interface; and the BOP Contractor agrees to pay said liquidated damages herein agreed upon, and further agrees that the General Manager may deduct the amount thereof from any money due or that may become due to the BOP Contractor under the Contract.”

5. Add the following new Section 10.1.6 to Page 27 of the Specification:

“10.1.6 Damages Due to Excessive Auxiliary Load. BOP Contractor will pay to the City $1,700/kW for each kW in excess of 250 kW attributable to the BOP Contractor scope of supply. The value of 250 kW does not include any of the 550 kW auxiliary load attributable to the Power Island Equipment Contractor’s equipment. It does include equipment and losses within the BOP Contractor’s scope of supply; and the BOP Contractor agrees to pay said liquidated damages herein agreed upon, and further agrees that the General Manager may deduct the amount thereof from any money due or that may become due to the BOP Contractor under the Contract.”

6. Add the following new Section 10.1.7 to Page 27 of the Specification:

“10.1.7 10 Minute Start. This is a “Must Fix” item and the BOP Contractor will pay to the City the damages described in Section 10.1.2 until such time that the BOP Contractor can demonstrate the ability for the plant to start and achieve full gas turbine load within 10 minutes; and the BOP Contractor agrees to pay said liquidated damages herein agreed upon, and further agrees that the General Manager may deduct the amount thereof from any money due or that may become due to the BOP Contractor under the Contract.” This provision will not apply if the failure to achieve the 10 Minute Start is solely attributable to the PIE Contractor.

7. Add the following paragraph before the last paragraph on Page 35 of the BOP Scope of Work, Attachment A.1 Section G.2:

“The BOP Contractor shall comply with SCAQMD Rule 1166 during soil excavation. This means that the BOP Contractor shall have a Volatile Organic Analyzer (VOC) at all times to monitor VOC. If level exceeds 1,000 ppmv, the soil should be sprayed with water. This requirement and action should also be added to the Soil Remediation Plan. Note this does not relieve the BOP Contractor from moistening the soil to control airborne dust.

8. Add the following words to Page 78 of the BOP Scope of Work, Attachment A.1 Section I.7.8:

"The pressure drop in the main steam piping between the Once Through Steam Generator outlet PIE/BOP Contractor interface and the steam turbine inlet BOP/PIE Contractor interface shall not exceed 25 psi."

9. Add the following words to Page 80 of the BOP Scope of Work, Attachment A.1 Section I.7.14:

"The temperature drop in the main steam piping between the Once Through Steam Generator outlet PIE/BOP Contractor interface and the steam turbine inlet BOP/PIE Contractor interface shall not exceed 2 ^{o}F."

10. Add the following words to Page 90 of the BOP Scope of Work, Attachment A.1 Section J.9:

"The auxiliary power load attributable to the BOP Contractor's scope of supply shall not exceed 250 kW. This value of 250 kW does not include any of the 550 kW auxiliary load attributable to the Power Island Equipment Contractor's equipment. The BOP Contractors maximum auxiliary load shall consist of the following contractor supplied items identified in of the BOP Scope of Work, Attachment A.1 Section A.5:

- *Plant Control System*
- *Power Distribution Center including HVAC*
- *Losses for the BOP supplied transformers*
- *One running Condensate Makeup Pump*
- *One running Auxiliary Cooling Water Pump*
- *One running Bearing Cooling Water Pump*
- *One running Demin Water Forwarding Pump"*

11. Add Section J.26 on Page 103 of the BOP Scope of Work, Attachment A.1 Section J, describing the Security and Camera Monitoring Requirements. See Enclosure 4.

"The BOP Contractor will provide conduit and pull boxes (appropriately located for ease of cable pulling operation) for a security camera system. The City will provide and install wiring for the system. The systems will use cameras that are remotely aimed (2-axis) with zoom capability. All of the camera feeds will be brought back to the Control Room for display on a dedicated monitor with the ability to select different camera views. The City will furnish and install the cameras themselves on a mounting to be provided by the BOP Contractor (6"x6"x1/2" steel plate). A total of seventeen cameras are to be installed:

1. *Perimeter Cameras (5 total)*
    a. *South gate (1)*
    b. *West gate (1)*
    c. *Fountain (1)*
    d. *North side of Glenarm Building (2)*
2. *Control Building (2 total)*
    a. *Southwest corner of the roof*
    b. *Northeast corner of the roof*
3. *Fuel Gas Compressors (1 total)*
    a. *West side with view of both compressors within the noise enclosure*
4. *Chiller Package (1 total)*
    a. *Northeast corner*
5. *Once Through Steam Generator (1 total)*
    a. *CEMS Sample Port Platform southeast quadrant*
6. *Steam Turbine Enclosure (2 total)*
    a. *Southeast interior corner*
    b. *Northwest interior corner*
7. *Cooling Tower (2 total)*
    a. *West side*
    b. *Northeast corner*
8. *Generator Step-Up Transformer (1 total)*
    a. *Northwest corner with view of the GSU*
9. *Power Distribution Center (2 total)*
    a. *Southwest interior corner*
    b. *Northeast interior corner*

12. Modify the 11th bullet on Page 140 of the BOP Scope of Work, Attachment A.1 Section N.3, describing construction utilities, to read that construction water is provided at cost:

    "Construction Utilities including Power (construction power source provided by General Manager at no cost), Water (construction potable, raw, and treated water sources provided by General Manager at cost), Sanitary, Voice and Data Communication." The BOP Contractor will need to apply to the Water Department for a "meter hydrant" to obtain a metered flow of water.

13. Add the following text on Page 143 of the BOP Scope of Work, Attachment A.1, Section N.8 describing Temporary Utilities:

    "There is a 4 kV overhead line that is located at the west end of the site that will provide the source of power for the BOP Contractor's temporary construction power. A bank of two transformers and a secondary riser to a backboard having distribution panels, whose panels will be provided by the BOP Contractor, will be installed by PWP to provide the BOP Contractor a

source of 480 V construction power at the utility pole at the northeast corner of the old Pacific Electric building.

This 4 kV line also currently provides the source for the fountain at the corner of South Fair Oaks and Glenarm adjacent to the Glenarm Building. Except for brief interruptions to allow for transferring the fountain from one source of power to another, the fountain must always stay in operation. The permanent feed for the fountain will be from the new Power Distribution Center being provided by the BOP Contractor.

PWP will "roll back" this 4 kV line to the pole nearest the Pacific Electric building at the southwest corner of the project site. However prior to doing so, the BOP Contractor must first establish an alternate underground power feed to the fountain. Once mobilized the BOP Contractor will provide the necessary labor and materials to install a direct burial feed to the fountain to allow removal of the 4kV overhead and secondary's, allow continued operation using the 4 kV source at the pole near the Pacific Electric building, and eventually allow powering the fountain from the Power Distribution Center.

14. Add Section Q on Page 148 of the BOP Scope of Work, Attachment A.1, describing the Training Requirements. See Enclosure 5.

15. Add Section R on Page 148 of the BOP Scope of Work, Attachment A.1, describing the Plant Procedure Requirements. See Enclosure 6

16. Add a new Section 1.5.D with the following words to Page 8 of the BOP Scope of Work, Attachment A.2.A PCS Control System Specification (037-4780):

"The BOP Contractor shall include in the control integration the requirement for the 10-minute startup capability of the gas turbine generator (GTG) of Power Island Equipment (PIE) and all supporting auxiliaries supplied by the PIE Contractor and BOP Contractor. 10- minute startup capability is defined as capability of dispatching the GTG to the grid at its guaranteed maximum power output in 10 or less minutes after a start signal without any pause or decrement in the megawatts at any point during the ramp, and the capability of maintaining maximum power for at least thirty (30) minutes from the time maximum power output is achieved. The 10-minute startup capability shall be achievable irrespective of the unit condition i.e. cold, warm or hot.

The BOP Contractor shall also implement within the Plant Control System the requirement for the 120-minute start-up and 60-minute shutdown of the unit as described in the SCAQMD Permit to Construct (attached in Attachment A.3 of the Specification). The BOP Contractor shall institute the PIE Contractor's start-up and operability sequential description of gas turbine, OTSG, and steam turbine start-up:

1. *Start-up time commencing at initial fire of the GTG until the Full Load operation of the combined cycle unit shall not exceed 120 minutes (limited by a start-up fuel consumption control limit regulator as needed), and*

2. *The mass emission limits (determined using CEMS minute by minute data) of the following pollutants for the initial 120 minutes shall not exceed – 28.68 lbs for NOx and 23.61 for CO, and*

3. *The fuel usage during the initial 120 minutes start-up shall not exceed 922.02 MMBtu (LHV) and 1023.1 MMBtu (HHV), when unit is operated in the following operating modes*

    a. *In combined cycle mode, after the GTG has achieved full load, the unit output shall not decrease for the remaining time during the first 120 minute start-up.*
    b. *In simple cycle mode, after the GTG has achieved full load, the GTG shall maintain that full load for the remaining time during the first 120 minute start-up.*

The BOP Contractor shall also institute the PIE Contractor's shutdown and operability sequential description of the gas turbine, OTSG, and steam turbine shut-down:

1. *Shutdown shall begin at the initiation of the shutdown sequence, with a GTG ramp down to approximately 20% load, over a period of 15-minutes. Then the GT shall resume the standard ramp down schedule to idle and fuel shutoff, and*

2. *The mass emissions (determined using CEMS minute by minute data) of the following pollutants for the 60 minutes shall not exceed – 11.7 lbs for NOx and 9.9 lbs for CO, and*

3. *The fuel usage during the 60 minute shutdown period shall be no more than 431.41 MMBtu (LHV)and 478.7 MMBtu (HHV)"*

17. Two Noise Control Performance specifications were included in the Specification.
    a. Section 480031 Rev.1 (Combined Cycle Power Island Noise Control Performance) is for the Power Island Equipment Contractor. It was incorrectly included in Attachment A.2.A BOP Supplied Equipment Mechanical Specifications and correctly included in Attachment A.3.
    b. Section 480033 Rev. B (Combined Cycle Balance of Plant Noise Control Performance) is for the BOP Contractor. It was included in Attachment A.2.B Construction Specifications.

The BOP Contractor should adhere to the requirements of Section 480033.

18. As discussed in the response to Bidder Q&A #166, electrical drawing E6-10 Revision C is provided in Enclosure 7 and replaces drawing E6-10 Revision B contained in Attachment A.2.D Preliminary Drawings.

19. Addendum 3 Item #7 is rescinded. The plant will continue to use the plate and frame heat exchanger for anti-icing. Replace P&IDs M3-3-2, M3-11-1, M3-11-2, M3-25-1 and M3-25-2 in Attachment A.2.D Preliminary Drawings. See Enclosure 8.

20. The following General Electric drawings are added to Attachment A.3.A City Supplied Power Island Equipment Info. See Enclosures 9, 10, 11, and 12.

    Gas Turbine

Drawing Number		*Title*
7253049-969201	*Rev. A*	*General Arrangement Main Unit – LH (14 sheets)*
7253049-969031	*Rev. A*	*One Line (3 sheets)*

    OTSG

Drawing Number		*Title*
11303-0001	*Rev. E*	*General Arrangement LM6000 PG OTSG*
C12079-PCP	*Rev. 00*	*OTSG Pre-Construction Plan*

21. The response to Bidder Q&A #5 has been revised to state that it is acceptable for the BOP Contractor to utilize a licensed California civil engineer for the design of the structural design.

22. The response to Bidder Q&A #21 and #37 have been revised regarding the application of the California Building Code for the project and that site specific seismic data will be developed for the project.

23. The GE supplied information referred to in the response to Bidder Q&A #40 is contained in Enclosure 13.

24. As discussed in the response to Bidder Q&A #151, GE Packaged Power, Inc.'s Work Order No. 20001, "Area 1 Civil Plan Paving/Grading & U.G. Sewer", Dwg. No. 20001-C-002-02 ("Issued for Construction 1/24/03") is provided in Enclosure 14.

25. As discussed in the response to Bidder Q&A #160, add the following new Section 2.5 to Page 7 of the Specification:

The BOP Contractor must provide pricing to provide Builder's All Risk coverage. The City, at its sole discretion, may choose to provide this coverage itself, and if *it does so, will deduct the Bidder's cost for the Builder's All Risk coverage from the Bidder's price. The basis for selecting the lowest bidder will be the total bid price including the cost of the Builder's All Risk coverage.*

BOP Contractor shall provide at its own expense Builder's All Risk Insurance through the end of the Warranty Period. The insurance shall insure the BOP Contractor, PIE Contractor, and the City against all risks of damage to buildings, structures, equipment, and materials that are part of the Work, as well as damage to the Broadway and Glenarm power plant attributed to performance of the Work. The Builder's All Risk policy shall insure against all risks, including without limitation risks of:

a) any direct physical loss or damage to the Work, the Broadway and Glenarm power plant, or any portion thereof from any cause, including without limitation flood, earthquake or tidal wave;
b) any mechanical or electrical breakdown that occurs during any performance testing or other testing or operation of any component associated with the Work;

The amount of such Builder's All Risk Insurance shall not be less than the replacement value of the Work at completion. Such insurance shall provide for losses to be payable to the City. The BOP Contractor shall be responsible for the full costs of any deductible under the Builder's All Risk Insurance in all events.

The policy shall waive right of recovery or subrogation against the City, the PIE Contractor, its Affiliates, Suppliers and Subcontractors. The policy shall not be canceled or materially changed without thirty (30) Days' advance written notice to the City and PIE Contractor, or in the case of nonpayment, ten (10) Days' advance written notice.

The City and PIE Contractor shall not be responsible for any insurance exclusions or deductibles or any uninsured or uninsurable loss or damage to the facility or other loss or damage to the facility under construction.

The Builder's All Risk Insurance policy shall at a minimum meet the following requirements:

a) the BOP Contractor shall provide the City and PIE Contractor a copy of the policy prior to the Notice to Proceed;
b) the policy shall be in effect from the planned start of any on-site activity through the completion of the Work and the end of the BOP Contractor's obligations;
c) the policy shall include extended maintenance coverage through the end of the Warranty Period, as required;

d) *the policy shall be provided by responsible insurers properly authorized to provide insurance in the State of California and rated at least A-VII by the AM Best Insurance Report or rated at similar levels by other internationally recognized insurance rating experts;*

e) *the policy shall include as named insureds the City, the PIE Contractor, their Affiliates, Suppliers and Subcontractors that is performing work in connection with the Work;*

f) *the policy shall also include a waiver of subrogation in favor of all insureds;*

g) *the policy shall cover all risks of physical loss or damage to the Facility, including mechanical and electrical breakdown in the course of construction, start-up, testing and commissioning, including materials, equipment and furnishings, up to the replacement value of the Work at full completion;*

h) *the City and the PIE Contractor shall be permitted to examine the original insurance policies or summaries, which shall include sums insured, loss limits, deductible details of cover, exclusions or conditions, and a list of security (each insurance company's participation in the insurance policy required for this Project only);*

i) *the minimum design/defects coverage shall equal LEG 2 or DE 4;*

j) *the City and the PIE Contractor shall have the right to submit claims directly to the insurers and receive payment directly from the insurers for any amounts that are their responsibility.*

26. As a result of our clarification discussions with General Electric, the City has agreed to change the classification of the CTs used for the GSU transformer from C800 to C400. General Electric has been requested to change the CTs on the LM6000 used for the generator protection relay from C200 to C400 to be consistent with the C400 CTs already being supplied with the steam turbine generator and the GSU transformer. There are two protection relays per generator. As a result of these changes, we will also need all of the BOP CT's to be class C400 as well.

27. The BOP Scope of Work Attachment A.2 Document List Revision 4 remains as the current revision. See Enclosure 15.

28. The BOP Scope of Work Attachment A.3 Reference Document List Revision 3 remains as the current revision. See Enclosure 16.

29. There is a meeting on May 13, 2014 with the Municipal Services Committee of the City Council to discuss the selected BOP Contractor. The selected BOP Contractor should plan on attending.

30. There is a meeting on May 19, 2014 with the City Council to approve the contract with the selected BOP Contractor. The selected BOP Contractor

should plan on attending. Execution of the contract is expected to take place within the following two weeks.

31. There is a one day design review meeting with General Electric and IST regarding the OTSG planned May 21 or 22, 2014 in Alpharetta, GA. The selected BOP Contractor is desired to attend.

32. There is an Opportunity Fair scheduled for May 28, 2014 with local residents and unions as part of the Local Participation plan. The selected BOP Contractor should plan on attending.

Dan Angeles

Date: 2/27/14

Dan Angeles
Principal Engineer
City of Pasadena Water and Power Department

Enclosures:

RECEIPT OF ADDENDUM NO. 4

Specifications LD-13-14

for
PROVIDING LABOR AND MATERIALS FOR
GLENARM REPOWERING BALANCE OF PLANT DESIGN AND CONSTRUCTION
FOR
PASADENA WATER & POWER
PASADENA, CALIFORNIA

<u>This Receipt must be signed and returned with your bid.</u> Failure to include signed acknowledgements of all addenda will cause the bid to be deemed incomplete and nonresponsive.

I hereby acknowledge receipt of Addendum No. 4 for Specifications LD-13-14 for Providing Labor and Materials for Glenarm Repowering Balance of Plant Design and Construction.

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Date

____
Company Name

____
Authorized Signature

Enclosure 1

City of Pasadena - Glenarm GT5
Pre-Bid Meeting Questions
Revision 2

Question #	Question	Answer	Status	Responsible Party
1	Drawing E6-10 shows a vault identified under note 4 and located at the east end of the Glenarm building. The scope document indicates that this vault is for the 17.2 kV feed form the dispatch center. Given it's location it would appear that it is intended to be inserted in the existing 17.2kV trench on the east of the building as shown on sketch 6-1. Please clarify the intended use and location of this vault.	Location to be determined by the BOP with the intention of feeding through this vault for 17.2Kv feed to the PDC.	CLOSED	
2	The fire marshal (FM) has dictated that the auxiliary lube oil skids/containers be misted/sprinkled. We heard this at the bid meeting on 1/8/14. What does PW&P expect for containment of the oil & water. Depending on the spray volume, this could be a significant quantity and flow of oil & water.	For indoors, the containment would be expected to hold the contents of the largest single container of material, plus 20 minutes of fire flow. For outdoors, the containment would be expected to contain the same, plus the volume of 24 hours of rainfall from a 25 year storm unless it's protected from rainfall. Drainage from the containment area should be sized for the amount of fire flow and rainfall, as applicable.	CLOSED	
3	The scope requires a soil resistivity test after soil removal & recompaction. Presumably this is for grounding design. Is the engineer required to wait to complete a grounding design until after this is complete?	Resistivity values provided can be used to initiate design. Post-backfilling tests should be performed to confirm values.	CLOSED	
4	The containment area fill for future lay down appears to be at a different elevation than the surrounding roads/asphalt. Please confirm elevations to determine if we need to dedicate space in the area for ramping.	The lay down area is approximately 12" higher than the surrounding asphalt. The BOP Contractor will need to plan how to deal with the change in elevation.	CLOSED	
5	Confirm whether a licensed structural engineer is required for the project. i.e. is a licensed civil engineer is acceptable for design of structures for this project.	It is acceptable for the BOP Contractor to utilize a licensed California civil engineer for the design of the structural design.	CLOSED	
6	Clarify how ADA requirements apply for the site. i.e. what buildings are required to be ADA?	ADA requirements apply to the control building.	CLOSED	
7	Does the new fence/wall along Fair Oaks need to be built first, or can it be built near the end of the project?	The decision lies with the BOP contractor.	CLOSED	
8	Clarify if a firewall or blast wall is required between gas compressors and control building.	It is a protection wall and yes it is required.	CLOSED	
9	Section 262600 (Power Distribution Center) Section 2.9-B-1 requires a 5' clearance under the PDC and Section 5.5 states 8' clearance; please clarify	Actual clearance is to be 6' to bottom of steel.	CLOSED	
10	Specification LD-13-14, 7.2 states water use cost by contractor and scope of work page 140 states water use cost by City of Pasadena; please clarify.	Point of water connection provided by city; cost of water usage by BOP	CLOSED	

City of Pasadena - Glenarm GT5
Pre-Bid Meeting Questions
Revision 2

Question #	Question	Answer	Status	Responsible Party
11	Is any epoxy grout required for the GE supplied equipment?	Assume none for bid purposes. Grout specifications (in accordance with project design specifications) grout shall be non-shrinkable, at all ages, when tested in accordance with American Society for Testing and Materials (ASTM) C-827. Effective bearing area shall not be less than 95% in hardened state when tested in accordance with ASTM C-827. If using an epoxy grout for use around turbine and generator skid and anchor bolt, grout must meet requirements of Corps of Engineers CRD C-621 and ASTM C-1107. Peak exotherm of a cylinder of grout material 2 inches in diameter and 4 inches high shall not exceed 95 °F (35 °C), when tested at material and laboratory temperatures of 75 °F (24 °C). Working life of grout shall be 60 minutes minimum at 75 °F (24 °C).	CLOSED	
12	Can testing water be supplied?	Yes at metered cost to the BOP Contractor	CLOSED	
13	Can 70F testing water be supplied for Section 1 hydros?	Assume a package boiler may be required.	CLOSED	
14	Is the onsite resident engineer requirement of scope of work Section C.4.1.2 for a full time requirement?	It is the responsibility of the BOP Contractor to provide engineers as needed.	CLOSED	
15	Attachment 4 of GE document (schedule major component, RTS and delivery dates) based on GE provided NTP of September 27, 2013. Was NTP provided on September 27, 2013?	NTP was provided on September 27. However since that time the delivery dates have been re-negotiated to obtain a better delivery sequence to support expected construction needs as well provide more time for preparation of the site and foundations. These are the current Ready to Ship (RTS) and Guaranteed Delivery (GD) dates as contained in the draft of GE's Change Order #1: Inlet Chiller - RTS 12/17/14 GD 1/28/15 Gas Turbine - RTS 1/23/15 GD 3/2/15 CEMS - RTS 1/30/15 GD 3/13/15 Fuel Gas Compressor -RTS 2/9/15 GD 3/23/15 OTSG - RTS 2/20/15 GD 3/30/15 GSU Transformer - RTS 2/13/15 GD 4/3/15 Steam Turbine - RTS 2/27/15 GD 4/6/15 Auxiliary Boiler - RTS 2/25/15 GD 4/8/15 Auxiliary Boiler Superheater - RTS 2/27/15 GD 4/10/15 Condensate Polisher - RTS 2/27/15 GD 4/10/15 Circulating Water, Condensate, and Feedwater Pumps - RTS 3/4/15 GD 4/15/15 STG Bypass Valve - RTS 3/4/15 GD 4/15/15 Cooling Tower - RTS 3/6/15 GD 4/17/15 Condenser - RTS 3/9/15 GD 4/20/15 Compressed Air Skid - RTS 3/27/15 GD 5/8/15	CLOSED	
16	Section 485312 (circulating water pumps) section 1.2-A-2 states one speed drive motors and Section 1.7-A-8 states two speed motors; please clarify.	The circulating water pump motors are single speed	CLOSED	
17	Section 480031-2 (noise control performance) section 2.2 refers to attachment 6 - performance guarantees and part 3 refers to contract liquidated damages. Can not located liquidated damages in contract.	The BOP contractor does not need the GE Liquidated Damages as they do not apply to the BOP	CLOSED	

Question #	Question	Answer	Status	Responsible Party
18	When will design information be received for the PIE equipment?	These are the current initial drawing delivery dates for major groups of drawings. A more detailed listing can be made available if needed. Following the initial release by General Electric, there is a 3 week period for the City to review and comment on the drawings. General Electric will then issue final drawings seven to eight weeks thereafter depending on the drawing set. These dates do not include erection manuals, procedures, O&M manuals, etc. ; just the design drawings. Gas Turbine Foundation Drawings - 2/7/14 Gas Turbine Electrical and Balance of Drawings - 3/7/14 OTSG Foundation Drawings - 3/21/14 OTSG Balance of Drawings - 5/9/14 STG Foundation Drawings - 5/2/14 STG Electrical Drawings - 7/25/14 STG Enclosure Drawings - 6/6/14 STG Balance of Drawings - 10/17/14 Condenser Drawings - 5/9/14 Cooling Tower EXCEPT Electrical Drawings - 6/27/14 Cooling Tower Electrical Drawings - 7/25/14 Pump EXCEPT Electrical Drawings - 7/25/14 Pump Electrical Drawings - 8/8/14 Fuel Gas Compressor Foundation Drawings - 4/4/14 Fuel Gas Compressor Balance of Drawings - 5/16/14 Chiller EXCEPT Electrical Drawings - 4/4/14 Chiller Electrical Drawings - 5/2/14 Condensate Polisher Drawings - 6/6/14 GSU Transformer Drawings - 7/25/14	CLOSED	
19	Are there permit requirements tied to construction of the wall along Fair Oaks?	There are permit requirements tied to the construction of the wall, the Planning Department for Design Review and Building Department for structural review.	CLOSED	
20	IST is a mandatory subcontractor that is not local. The welding could be self-performed. How will the IST subcontract be considered towards the local content criteria?	The orbital welding on the IST equipment is proprietary in both equipment and procedure and the BOP Contractor must subcontract with IST. As IST is not local to Pasadena, this subcontract does not count towards the 15% goal.	CLOSED	
21	In the RFP documents, there are two references mentioned for seismic design criteria. One is based on 2013 CA Building Code (CBC), the other is based on ASCE 7-05 which is 2010 CBC. Which version of CBC is to be used for project design?	This is an update of our prior response due to further information becoming available. Also see the response to question #21. The BOP Contractor is required to work to CBC-2013. In addition the Building Department has required that site specific seismic data is required. For bidding purposes the bidder should proceed on the basis of using the information in the Specification. The PIE Contractor and their suppliers are working to CBC-2010. The City is in discussion with the PIE Contractor to addtress provision of foundation loads calculated in accordance with CBC-2013 for use by the BOP Contractor.	CLOSED	
22	Have you had conversations with the building trades on how they could support the 25% local hire requirements considering their collective bargaining provisions?	Yes and the building trades feel confident that the 25% requirement can be achieved.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
23	GE BOP equipment lists 'preferred suppliers' as opposed to chosen suppliers. Are these suppliers fixed or subject to change?	General Electric is finalizing its suppliers. The current list i as follows; Fuel Gas Compressor - Kobelco Chiller - Stellar Gas Turbine - General Electric Heat Recovery Steam Generator - OTSG by IST CEMS - CEMTEK Steam Turbine - Shin Nippon GSU Transformer - GE Prolec Additional information will be provided as it become available.	OPEN	Diane Donovan
24	Will a water analysis data sheet be provided for the BOP to design and procure the chemical feed system?	Yes. Refer to condensate polisher spec. A3	CLOSED	
25	Are start up and commissioning chemicals to be provided by BOP as well as initial 'fills'	Yes. See Section 480032.1 Item 1.3.A.8 in Attachment A.1 of the Specifications.	CLOSED	
26	Does the BOP contractor work with GE and/or ATCO (the steam turbine enclosure provider) directly during proposal development for load requirement of piping and cable trays?	The steam turbine enclosure will only be used to support the fire sprinkler piping.	CLOSED	
27	For what equipment will GE supply 3D models? GTG? STG? OTSG?	3D models will not be available during the bidding period. A 3D model of the LM6000 will not be available. A 3D model of IST's Once Through Steam Generator will be available. A 3D model for the STG will be available. The 3D model will be a surface type model showing terminal point connections. A few clarifications: 1) the 3D model is not a contract deliverable and is provided as a matter of convenience for the BOP engineer, 2) the 2D drawings take precedence over the 3D model - the BOP engineer will need to check for dimensional differences between 2D drawings and the 3D model. 3) The 2D drawings (contract deliverables) will accurately reflect changes in equipment that might not be updated in the model. 4) The 3D model will be issued after the 2D drawings are issued and after Shin Nippon receives 3D models from their sub-suppliers. GE does not have contract dates with Shin Nippon for a 3D model and will provide it after these activities are complete. GE will provide other 3D models of their power island equipment if and as they become available.	CLOSED	
28	The BOP contractor is required to contract with the cooling tower manufacturer for field erection; provide cooling tower vendor information.	GE expects to finalize their cooling tower selection by the end of February. This response will be updated once the selection is made.	OPEN	Diane Donovan
29	Please confirm material requirement for feed water & condensate piping, or if carbon steel A106 is suitable	Please refer to P&IDs. Given the need for high purity water for the OTSG, all condensate & BFW piping is stainless steel.	CLOSED	
30	Is hazard assessment surrey reports on all asbestos containing areas available?	Yes, and will be provided in Addendum 3	CLOSED	
31	Is a list of hazardous waste sites available?	No, the Bidder will have to propose and include in the haz waste plan submittal	CLOSED	

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32	What permits and inspections are required for historical structures?	Building Permit for the sealing of tunnel openings of the Glenarm Building.	CLOSED	
33	Should fire protection system for control be water mist or FM200?	The control room will have water mist pre-action system.	CLOSED	
34	Please specifically state that the STG fire protection by the BOP Contractor shall be pre-action fire water and deluge if required for STG bearings and lube/hydraulic oil systems. No clean agent gasses are planned.	The STG fire protection requirements are defined in the Specification. No clean agent is required. STG roof preaction, STG bearings preaction with rate of rise detections, and STG lube oil deluge are all required.	CLOSED	
35	Please confirm aircraft warning lights are supplied if required by local codes for the exhaust stack.	No aircraft warning lights are required	CLOSED	
36	Please confirm all IST pressure/temperature instruments are provided and rack mounted and that the BOP Contractor is responsible only for junction boxes, tubing, and wiring.	Refer to M195 in A.3 owner supplied equipment. Items shown with an asterisk are supplied by IST. TEs will be supplied by IST. All other instruments by BOP.	CLOSED	
37	In the RFP documents seismic design values based on CBC 2010 have been provided. During pre-bid meeting, it has been cleared that 2013 version of CBC will be used. Can you provide us with the new seismic design values based on CBC, 2013 version	Since providing our initial response additional information has become avauilable. Also see the response to question #21. The seismic design methodology did not change from 2010 to 2013, however the response spectrra from the USGS hazard maps has increased. The City Building Department is also requiring a site specific seismic evaluation due to the proximity of the Raymond Hill fault which runs east-west south of the site. The results of that study are expected in ~2 weeks time and will be provided in Addendum #5. However it is up to the Bidder to select the proper values as they will be the responsible engineer for the project. The values provided in the Specification are to be used as general guidance only.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
38	Clarify/confirm/identify what drawings/calculations are required to be submitted to city for review	The project will be reviewed under one building permit. The Building Department will be happy to sit down with the BOP Contractor to discuss plan requirements and submission after award. To operate under one permit, the BOP Contractor will need to submit a Foundation Key Plan for all of the equipment foundation drawings. This will serve as a placeholder for the permit. Once the first equipment foundation is finalized, it will be submitted as a revision to the original permit and the Building Department will then review it. The same process will take place for the succeeding foundation drawings as they are ready for submission. The Building Department will perform the review internally (they do not plan to hire an outside consultant). At a minimum the following will be reviewed: * Soil design, rebar, concrete, bolting, seismic design * Grading and drainage plans * All foundation designs and calculations will be reviewed * All systems containing hazardous materials will be reviewed * The fire protection systems will be reviewed (detection and suppression) * Access for fire and emergency vehicles * The Control Room building will be subject to a complete review * The pre-cast wall along Fair Oaks * The Glenarm Building tunnel seals An NPDES SWPPP for construction is required to be complied with by the BOP Contractor.	CLOSED	
39	Hyrdologue Inc. representative stated during the pre-bid meeting that additional soil samples have been taken for soil contamination determination. Hyrdologue also stated that no critical contamination levels are anticipated for the project site. Will it be possible for us to get the new soil contamination results as they are available?	Initial test results show that the Dioxin levels on-site at 6" and 12" below grade are below the off-site background levels. DTSC's initial review was to accept the City's recommendation that no further action was needed.	CLOSED	
40	Please define all GE loads & utilities after an emergency shutdown as well as duration, voltage phase, etc. Relevant to safe & proper shutdown of GT & STG & other BOP equipment within GE/IST scope of supply.	Refer to Addendum #4 for information on the LM6000 that GE has provided. They do not expect to have information for the other equipment within their scope of supply until the end of March.	OPEN	Diane Donovan
41	Please define length and diameter of P91/P11/P21 alloy piping materials for interconnecting piping to silencer and/or any other known equipment interconnects to IST/GE equipment	Based on preliminary sizing information, IST expects the interconnecting piping between the start-up vent to the silencer to be 6 NPS Sch 80 SA335 P22. The silencer will have a flanged connection while the control valve and start-up vent isolation valve have butt weld ends. The length of piping between the start-up vent and silencer will depend on the location of the take-off relative to the silencer position. Line diameter sizing information will be confirmed upon completion of valve sizing around March 14th. For the steam piping, IST expects this to be a 10 NPS Sch80 SA335 P22 pipe. The IST supplied portion of the pipe spool will be approximately 15 ft in length. This will be confirmed by the next release of the General Arrangement drawing.	CLOSED	

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42	Please confirm if SS liner is required by GE/IS for any de-superheater or bypass piping interconnections or if P91/P11/P21 is required.	1. SS liner is required immediately downstream of the de-super heater. This is a GE standard. 2. SS liner is not required on bypass piping connections. 3. Based on maximum temperature of the steam (914oF), it is expected that P11 piping will be required for the HP steam and bypass piping. BOP contractor will be responsible for final confirmation and selection of piping materials based on the GE data blocks which are scheduled to be issued no later than April 4, 2014.	CLOSED	
43	Equipment doors on west side open into firewall behind GSU XFMR. What is concept for truck access for equipment removal?	The platforms provided by BOP will need to allow for equipment removal	CLOSED	
44	Are the GE provided panels that are shown on E1-2 shown correctly? TCP Mark VIE panels for CTG and STG often are 6-10 units. Including GPP for 2 units, exciter/AVR for STG, etc., is the allocated space sufficient?	We believe we there is adequate room in the PDC for the referenced panels.	CLOSED	
45	Is battery room required for QEL-CEL battery stacks? If required, is space shown sufficient for 125v battery and 24v battery?	Battery room is basis of bid and is required.	CLOSED	
46	In regards to local business participation obtaining 15% local procurement and subcontracting; do team members count as self-perform?	People performing work that are employees of the BOP Contractor count for self-performed work. Work performed by the any of the BOP Contractor's sub-contractors does not count as self-performed.	CLOSED	
47	In regards to local business participation obtaining 15% local procurement and subcontracting; how do you satisfy 15% requirement at bid time if 7% is material procurement from local Pasadena business?	In order to give the prime credit for the purchases, prior to them actually making the purchases, the Prime has to list the local supplier as a subcontractor.	CLOSED	
48	Will the prime receive credit towards the 15% local business, for transactions generated by our subcontractor?	Yes, the goal is that 15% of the BOP Contractor's subcontracted work be spent with local Pasadena businesses.	CLOSED	
49	Local participation of 15% is required. It is understood this requirement pertains to subcontractor and procuring content combined. In other words if our price for subcontracted work is $10,000,000 and our price for procurement is $10,000,000 the aggregate is $20,000,000 therefore we would need to spend 15% of $20,000,000 ($3,000,000) on local Pasadena subcontractors and/or vendors. Please confirm this is correct	That is correct.	CLOSED	

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Question #	Question	Answer	Status	Responsible Party
50	When calculating total subcontractor and procurement dollars are we to include other costs such as sales tax, bonds, markup in the calculation? Example: If procuring dollars are $10,000,000 exclusive of sales taxes and say sales taxes are 9% total procurement cost would be $10,900,000. If subcontractor content is $10,000,000 exclusive of bonds and bond cost are an additional 1% sub-value would then be $10,100,000. In summary, do we shoot for 15% of $20,000,000 or do we shoot for 15% of $10,900,000 plus $10,100,000 which totals $21,000,000?	The City considers the value of the contract.	CLOSED	
51	Does procuring for project apply only to permanent plant materials or could it include items such as small tools and consumables as well?	Small tools, equipment, and consumables count towards the 15%.	CLOSED	
52	Clarify the 15% local requirement. I.E. 15% applies to total subcontracted plus total procurement. Confirm if this includes taxes/fees, etc.	See responses to items 49 and 50.	CLOSED	
53	What is the evaluation criteria for the local preference point system? I.E., advertising is worth 5 points. What determines if the bidder receives full points at 5/5 versus partial points?	As you cannot partially advertise or solicit bids, there are no partial points.	CLOSED	
54	GE is supplying the STG enclosure (building). Is GE responsible for building official/building permit requirements? If BOP contractor is responsible, who is responsible if the building official requires changes/additions?	General Electric is responsible for providing the design of the steam turbine enclosure. The BOP Contractor is responsible for working with the City's Building Department. If changes to GE supplied equipment are needed, those will be worked through the City's GT5 Project Team.	CLOSED	
55	On page 12 of scope of work, it is stated that "SWPPP and SUSMP permits will need to be obtained by the BOP contractor". On page 49 of the same document, under section G.11 it is mentioned "... development of SWPPP meeting all state and EPA regulators and supporting PWP in updating their SUSMP permit." Please clarify the scope of this SUSMP (standard urban storm water mitigation plan) on the BOP contractor side.	The BOP Contractor shall only prepare SWPPP. A SUSMP is not required.	CLOSED	

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Question #	Question	Answer	Status	Responsible Party
56	What are the options of locations for hazardous material disposal?	The BOP Contractor will have to retain and pay for the services of an environmental consultant to prepare , submit, and obtain fire department approval of hazardous waste work plan as well as manage the remediation, waste characterization, waste profiling, transportation, & disposal of hazardous waste in accordance with local, state, and federal environmental regulation. Depending on how it's sub-contracted out, this could be one work plan for everything or several separate ones. The BOP Contractor shall submit work plans for the following: - Lead/asbestos abatement on structures - Electrical transformer removal (assuming they are not just being sent as hazardous waste) - Cleaning and removal of fuel oil piping (assuming they are not just being sent as hazardous waste) - Soil remediation The work plans will need to demonstrate that the proposed contractor is suitably qualified and licensed for the work, document the procedures used to remove and manage the hazardous materials from generation through disposal, and propose cleanup levels and sampling criteria based upon current regulatory standards. Pasadena Fire Department review of submittals and reports, as well as required inspections, The current billing rate for reviews is $202/hr for the time required. Lead and asbestos work are also likely regulated by CalOSHA and/or AQMD and may require additional submittals and/or permits for those agencies.	CLOSED	
57	What are the technical specs for flowable fill; if used?	This is the responsibility of the BOP Contractor since they are performing the construction. Flowable fill mixtures are usually specified to meet either a compressive strength or unit weight requirement. The compressive strength is typically measured by testing a 4 x 8 inch cylindrical test specimen in compression. The National Ready Mixed Concrete Association defines an "excavatable" flowable fill mixture as one with a compressive strength not exceeding 150 pounds per square inch. We do not have a formal technical spec for flowable fill. Standard criteria are: * Unit weight: 20#/CF to 145#/CF * Compressive Strength: 150psi max (any more than this will not allow for future ease of excavation) A typical mix uses approx. 100# cement, 250-300# fly ash, and the rest clean sand, water and selected admixtures...on a per cubic yard basis.	CLOSED	
58	On page 34 of scope of work there is a statement, "organics removed from the site will most likely be reduced this soil, if cleared organic material, can be used for fill on site per the geotech report." For proposal preparation, should we assume 1.3000cy is accurate and price accordingly?	You should base your bid upon the quantities provided.	CLOSED	
59	What are the safety training requirements for workers at the site? (how many hours?)	No specific requirements but it will be discussed on the pre-construction meeting. BOP Contractor is responsible for the haz mat training required under local, state, & federal environmental regulations.	CLOSED	
60	Are drawings of maintenance shop available?	The Maintenance Building has been removed from the scope of the project.	CLOSED	

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61	Are extended hours allowed for monolithic pours on the center-line foundation?	You should assume that the monolithic pours must be completed within the standard allowed work hours.	CLOSED	
62	Are there any extended time curing requirements?	Per ACI mass concrete requirements	CLOSED	
63	Will plant operations be allowed on Sunday?	Operations: yes Construction: no	CLOSED	
64	Will any historic building inspections be required?	Building Department on sealing of tunnel openings.	CLOSED	
65	Will we utilize the plant's EPA processes for hazardous material?	Yes	CLOSED	
66	Will there be any CBO involvement?	There will not be a CBO in the sense of a California Energy Commission jurisdictional project. However the Pasadena Building Department does expect to review the project design as well as field inspections.	CLOSED	
67	Does the 15% requirement apply to the aggregate of subcontracting and procurement?	See responses to items 49 and 50.	CLOSED	
68	If we use a company that the city of Pasadena uses, but is not located within the city of Pasadena, does it count towards the 15%?	No	CLOSED	
69	Is the list of Pasadena firms classified by business type?	No, business type is not the criteria, location within the City of Pasadena is the critical criterion.	CLOSED	
70	Are there extraction points for the gear box?	There is a removable panel on the GTG per the GE presentation. The STG gear box should be accessible through the roof.	CLOSED	
71	Is the generator rotor located out of the back?	The generator rotor for both the STG and the GTG will be to the west. Removable panels will be provided by GE for both.	CLOSED	
72	Does the steam turbine include a removable roof?	Sections of the roof are removable.	CLOSED	
73	Will GE define the requirements for the chemical feed systems?	They are included in the issued specifications	CLOSED	
74	Will GE be treating the boiler feed pumps for acoustics?	Yes, If necessary to meet their noise guarantee.	CLOSED	
75	Will the slides from GE's presentation be included in the addendum?	They are being distributed as part of Addendum #2.	CLOSED	
76	Is GE's equipment data current?	Yes	CLOSED	
77	Are the GE preferred vendors confirmed or yet to be determined?	See response to item 23.	CLOSED	
78	When will the bidders know GE's final equipment selections?	See response to item 23.	CLOSED	
79	It was noted that the steam turbine included shims, but are they also included with the gas turbine?	Shear lugs only for gas turbine	CLOSED	
80	Are the generator protective panels included with all devices?	Yes; the BOP is to have them installed in the PDC furnished by the BOP Contractor.	CLOSED	
81	Are the power requirements after shutdown defined?	See response to Item 40.	CLOSED	
82	Is the steam turbine grout or epoxy?	See response to Item 11.	CLOSED	
83	Are the erection plates designed for seismic activity?	Yes	CLOSED	
84	Will the erection plates be bolted and welded?	Yes	CLOSED	
85	Do the modules come prime or painted?	They will be delivered in a primed condition. It is the BOP contractor's responsibility to do touch ups	CLOSED	
86	Is there a recommended traffic-rated cover to protect pipes onsite?	It is the BOP Contractor's responsibility to provide adequate protection.	CLOSED	

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87	Are the soil resistivity levels defined?	See response to Item 3.	CLOSED	
88	Are there any requirements for soil remediation in the lay-down yard following use?	The BOP Contractor must restore the laydown area to its as found condition	CLOSED	
89	Are there any architectural details for the 10' protection wall?	There are no architectural requirements.	CLOSED	
90	Is the PDC considered a habitable structure with ADA requirements?	No, there are no ADA requirements for the PDC.	CLOSED	
91	Can additional site visits be requested?	Yes, if scheduled in advance with at least one week's notice.	CLOSED	
92	Which version of the building code will be used on the project?	See response to Item 21.	CLOSED	
93	Are there any requirements to have external condensate storage during drain down of IST's equipment?	The plant design includes a 5,000 gal. Condensate Storage Tank	CLOSED	
94	Are gas blows allowed on the project?	No, natural gas blows are not allowed.	CLOSED	
95	Will the erection procedures for the LM6000 and OTSG be included in the bid package?	Yes, to the extent shown at the pre-bid meeting.	CLOSED	
96	Will the sign-in sheet be made available?	They are being distributed as part of Addendum #2.	CLOSED	
97	Does the CEMS package include the umbilical?	Yes	CLOSED	
98	Will the project primarily be using Donaldson filter houses?	Yes	CLOSED	
99	Does the existing 6' x 4' storm drain culvert lie within an easement? If so, please provide the recorded easement document with legal description and any encroachment restrictions.	No	CLOSED	
100	Since the boilers and burners in the Glenarm Building are not being removed and there is no "seismic retrofitting" of the Glenarm Building, are "demolition" & "protection" plans and a "Historic American Building Survey (HABS) Level III recordation" required prior to any demolition within the Glenarm Building (see Mitigation Monitoring and Reporting Program (MMRP) Mitigation Measures CULT 1, -2 & -3), or for any other existing structure? And is an "interpretive architectural exhibit" required per MMRP Mitigation Measure CULT-2?	There is no demolition within the confines of the Glenarm Building. Therefore a plan is not required.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
101	Has PWP submitted “comprehensive pre-demolition asbestos” and “lead-based paint” surveys “for all existing buildings located on the project site” and a “soils management plan” for “excavation and grading activities on the project site” to the City of Pasadena Fire Department per MMRP Mitigation Measures HAZ-1, -2 & -5? If so, please provide the surveys and plan. If not, please let us know when they will be submitted and their expected approval.	The GT5 Repower EIR Mitigation Measure indicated that an asbestos/lead survey and soil management plan shall be submitted to Pasadena Fire prior to demo. The Mitigation Measure and reporting Program (MMRP) from the EIR is in the BOP Contractor Specification. As the City will not be occupying the Glenarm Building as part of this project, the asbestos and lead abatement will be limited to the structures that will be removed on the south side of the building (i.e., smoke stack, air compressor building, restroom, and piping in the tunnels outside the building that will be removed). There will be organic & lead contaminated dirt remediation. There are electrical transformers that contain < 2 ppm PCB based on PWP’s latest sampling and analysis and there are old fuel oil lines in the tunnels that will be removed. The BOP Contractor could handle this as one work plan for everything or several separate ones. They’ll need work plans for the following: - Lead/asbestos abatement on structures - Electrical transformer removal (assuming they are not just being sent as hazardous waste) - Cleaning and removal of fuel oil piping (assuming they are not just being sent as hazardous waste) - Soil remediation The work plans will need to demonstrate that the proposed contractor(s) is suitably qualified and licensed for the work, document the procedures used to remove and manage the hazardous materials from generation through disposal, and propose cleanup levels and sampling criteria based upon current regulatory standards. Pasadena Fire will charge $202/hour for review of submittals and reports, as well as required inspections. This rate is subject to escalation each fiscal year. Lead and asbestos work may also require additional submittals and/or permits from CalOSHA and/or AQMD.	CLOSED	
102	Can we design flexible & rigid pavement sections per the Soils Engineering Investigation’s R-value tests of “60 and 67” (page 22) instead of per the paving thickness designs “outlined in section 9.0 Paving of the Soils Investigation Report” based on “an assumed R value of 35” (section 9.2, page 43)	The BOP Contractor will be responsible for the pavement design and layer thickness for surface and base courses. The BOP Contractor may use either CALTRANS or AASHTO methods of flexible and rigid pavement design and will need to select the input values for either method based on information provided in the geotechnical investigation and the Contractors design experience and expertise. The road layer thickness provided in Section 9.2 are based on an R value of 35 as noted and provides expected layer thickness based on that value. The actual R values from lab results for two boreholes are 60 and 67, respectively as noted. The BOP Contractor may use these or other R values based on experience.	CLOSED	
103	Is the reinforced concrete paving covering the “operating areas” to be designed for “heavy truck drives” (2nd to last paragraph in SOW, page 46)?	The intent is to have all concrete H-20 rated, with thickened areas for crane loading on the west side of the GTG and then also south of the cooling tower.	CLOSED	
104	Please clarify the conflicting statements in the 3rd paragraph of SOW, page 49, regarding spill containment areas: “The containments shall be provided with sumps to pump out rain water or contaminated water.” and “All spill containment areas shall be set to gravity drain to grade . . .”	Sump pumps are needed to pump out rain water or contaminated water if the containment is located below grade and will not have the proper slope towards the oily water separator.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
105	Is the existing on-site AC roadway running N. – S. between East State St. and the new plant proper to be removed and replaced, or can it be left in place to connect with the proposed new roadways on its west and north ends?	The existing AC paving can be left in place. However, the BOP Contractor is responsible to bring it back to its pre-construction condition before final acceptance of the City of the project.	CLOSED	
106	What volume of "residual fuel oil" in the "asbestos insulated fuel oil piping" and "asbestos containing materials (ACM)" needs to be removed, remediated, and properly disposed (SOW sections A.7.1.i., page 6, and G.2, page 39)?	BOP Contractor shall include in his bid the price for the removal of oil in the fuel oil piping and assume that pipe is full of fuel oil and shall include in his bid the price for removal of all insulation based on the assumption that the insulation is ACM. BOP Contractor is responsible for determining the quantity of the material to be removed.	CLOSED	
107	Per SOW, paragraph 2, pages 5 & 6, of Addendum No. 1, can Hyrdologue serve as both the "geotechnical firm . . . present for all excavation and backfill activities on site" and the "third party geotechnical firm . . . required to be on site for all inspections, testing and reporting including compaction, soil testing, etc.?	Yes, the City does not have any restrictions insofar as the Bidder using Hydrologue as a 3rd party geotechnical firm. It is solely the Bidder's determination as to what firm to use for this role.	CLOSED	
108	Please confirm that the contractor-provided "unit rates" for the "Quantities of soil to be excavated and recompacted, organic materials and lead contaminated soils to be removed from the site and concrete volumes to be demolished" will be used as both an extra to "account for additional material to be handled/removed" and as a "credit for materials not handled and removed" (SOW, section G.1, 3rd paragraph).	Yes, the unit rates that were requested are to be used to adjust up or down the BOP Contractor's cost based on actual volumes.	CLOSED	
109	Where is the Ground Penetrating Radar report in the RFP bid documents? If missing, please provide.	The GPR report is in the document 3626-03 Geophysical Investigation found in A.3.C/Reference & Preliminary Design Scoping/ Geotech Report and GPR / Geotech	CLOSED	
110	Does the 10 minute start requirement apply to the BOP Contractor?	Yes, the plant must meet a 10 minute start. The plant control system, plant design, and any equipment supplied by the BOP Contractor must work with the GE supplied equipment to achieve the 10 minute start. Addendum 4 will contain additional definition.	CLOSED	
111	Can the payment of the Contract Price be by Milestone Payments according to mutually agreed milestones and percentages of the Contract Price (Appendix D 4.1)	Appendix D 4.1 contains the successful Bidder's Not to Exceed price to perform the project. Section 9.0 of Specification describes how payments will be handled. In order to submit a responsive bid, the Bidder must accept Section 9.0 in its entirety.	CLOSED	

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112	Typical contract would permit change orders for change in laws; unknown and unexpected underground conditions (obstructions, hazardous materials, artifacts); delays or costs caused by owner or owners other contractors; suspension by the City; grid connection not available by the schedule date; delays in customs not attributable to Contractor; Failure in the acquisition of licenses, permits and approvals due to governmental authority delays and or Statute rules, regulations issued by any governmental authority (in addition to force majeure and changes in scope). Will the BOP Contract include such? (Appendix D 4.2)	This is addressed in Sections 11 and 13 of the Specification.	CLOSED	
113	Contractor interprets this clause to mean that intellectual property of Contractor and Equipment suppliers shall remain their intellectual property. City will own the documents and have the right to use the documents with respect to the operation, maintenance and repair of the Plant. Please confirm. (Appendix D 6.3)	All work product prepared by the BOP Contractor that is a required deliverable under the contract becomes the property of the City of Pasadena.	CLOSED	
114	Contractor requests clarification that this clause does not prevent Contractor's ability to assign payment receivables to a financial entity. (Appendix D 6.7)	The City agrees this clause does not prevent the BOP Contractor from assigning payment receivables. The City, in the past, has allowed contractors to open an escrow account for special handling of invoices and retention payments.	CLOSED	
115	Can you add clarity that in the case of termination other than due to Contractor's default, City shall pay Contractor any and all payments due owing to Contractor on or prior to the date of termination, any prorated payments amount based on the services performed as per contractual requirements and timely performed prior to the service of the notice of termination, refund Contractor the Surety Bond/s and pay all reasonable, actual and direct costs including without limitation the cost of cancellation of subcontracts. (Appendix D 7.15)	This is addressed in Section 3.7 of the Specification.	CLOSED	
116	Contractor interprets that the period time to cure the material breach are 10 Business Days and request that the City confirm this interpretation (Appendix D 7.16)	Section 7.16 of the Contract speaks for itself. If a party sends a notice of default and termination, “the Contract shall terminate unless such default is cured before the effective date of termination stated in such notice, which date shall be no sooner than ten (10) days after the date of the notice.”	CLOSED	

Question #	Question	Answer	Status	Responsible Party
117	Typically there would be a clause excluding incidental and consequential damages. Please confirm whether such will be included. (Appendix D)	Bidder's shall submit proposal as they deem competitive. If the bidder has clarifications or exceptions to the commercial terms only, they may submit them with their bids. The City is not inclined to exclude categories of damages for this project, but may be able to capitate certain types of losses to $20 million (i.e. for business loss coupled with debt service, the contractor may have a limited exposure City's capitated damages of $20 million per occurrence only)	CLOSED	
118	Typically there would be a clause limiting the Contractors liability. (Appendix D)	See response to item 117.	CLOSED	
119	What is the length of time for the material and workmanship warranty? (Appendix D)	The BOP Contractor will warrant materials and workmanship for a period of 12 months or the vendors warranty, whichever is longer, following the Acceptance of Work by the City per Part II (City Standard Spec), Section 10 (Completion of Work and Acceptance) of the Specifications.	CLOSED	
120	We note that City Council approval is required if change orders cause Contractors total compensation to exceed a certain amount. Approximately how much above the contract price is this expected to be? (Appendix D)	Section 4.2 of Appendix D will contain an amount that is greater than the Bidder's price as bid to perform the work which is contained in Section 4.1 of Appendix D. The standard change order for City contract is 10% of the contract amount. The City Manager has the authority to approve change orders up to this 10% amount. Change orders that are more than 10% of contract amount will need City Council approval.	CLOSED	
121	Please provide confirmation/clarification that "specialty" contractors (e.g.: insulation, painting, etc...) do not need to be identified in the bid	In accordance with Section 3.4 of the Specification, subcontractors that represent more than one-half of one percent (0.5%) of the Bidders bid price must be identified on Attachment 1 to the Specification.	CLOSED	
122	PLA agreement: Attachment E is blank. It is the document that is designed to list the unions signatory to this agreement. Please provide this list. (Appendix D)	The Project Labor Agreement is located in Appendix I (the letter "I") of the Specification.	CLOSED	
123	We are requesting a 3 week bid extension to April 8, 2014.	The bid due date is extended to April 8. The last day to submit questions is extended by the same amount to March 21.	CLOSED	
124	Please advise on the project tax exempt status for materials and equipment incorporated into the project.	There is no special tax exempt status for materials for this project.	CLOSED	
125	With the Maintenance Building removed from the scope of the project, per Pre-Bid Meeting Question 60, Rev. 0, is the Welding Shop also removed?	Yes	CLOSED	
126	Can the area around the Maintenance Building still be used for "parking and proposed laydown/staging area"?	Yes	CLOSED	
127	Is it acceptable to distribute material in the bid specification to third parties for the purposes of obtaining bids from suppliers and vendors.	Yes, however GE proprietary material may not be distributed beyond the Bidder.	CLOSED	
128	Attachment A.1 Scope of Work states in item 6 at the top of page 6 "...subject to the 50% self-performance requirement." Is there still a 50% self-performance requirement?	No, there is not a 50% self-performance requirement.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
129	Please clarify the meaning of items 53010 and 53020 in the Division of Responsibility.	53010 - The PIE Contractor is responsible for delivering their equipment to the site. Any equipment that the PIE Contractor ships to the site via rail, will be delivered to the site by the PIE Contractor. The BOP Contractor assumes care, custody, and control of the PIE Contractor equipment when they off-load it from the PIE Contractor's truck/transporter. The BOP Contractor is responsible for the PIE from the time they off-load it from the truck/transporter until placement onto the foundation. 53020 - The BOP Contractor is responsible for movement from the rail siding to the site for equipment that the BOP Contractor procures and ships by rail.	CLOSED	
130	Part ID of the "Bidder's Proposal" in Specifications LD-13-14 appears to have some typos. Shouldn't the referenced attachments refer to section "G" vs. "F" of the Scope of Work, Attachment A.1? In addition, please confirm that Part ID only covers the bid items described in the "Demolition Requirements" portion of Attachment A.1.G. (i.e. – demolition of existing improvements), while Part IE covers the bid items described in the "Civil Requirements" portion of Attachment A.1.G. (i.e. – construction of new improvements)?	Yes, in Specification LD-13-14, Section D of the Bidder's Proposal Form should have referred to Attachment A.1.G instead of A.1.F. Yes, Part ID of the Bidder's Proposal Form only covers the bid items described in the "Demolition Requirements" portion of Attachment A.1.G. (i.e. – demolition of existing improvements), while Part IE of the Bidder's Proposal Form covers the new GT5 construction items described in the "Civil Requirements" portion of Attachment A.1.G.	CLOSED	
131	In Part ID of the "Bidder's Proposal" in Specifications LD-13-14, what is "Attachment A.1X"?	Attachment A.1.X is a placeholder for the Glenarm Building Mothballing Requirements which are being issued via Addendum. The Glenarm Building requirements are included within Addendum 3.	CLOSED	
132	In Part ID of the "Bidder's Proposal" in Specifications LD-13-14, shouldn't the unit process for Item Nos. D.2 – D.6 be in "CY" vs. "Ton" to maintain consistent units?	Yes, we will change these to cubic yards to maintain consistency.	CLOSED	
133	In Part ID of the "Bidder's Proposal" in Specifications LD-13-14, shouldn't there also be separate items with unit prices for the provided allowances for "Remove old house concrete foundations, bricks & asphalt near new tanks (100 CY)", and "Removal and recompaction of 2' – 3' of fill soil below AC roadways (3,380 CY)"?	This was provided in Addendum #3 Item #5 Enclosure #4.	CLOSED	
134	Can the cooling tower be moved to the south by 5-10 feet?	There is no latitude to move the cooling tower.	CLOSED	
135	What are the STG auxiliary heat loads?	The steam turbine auxiliary equipment cooling loads from GE/Shin Nippon are as follows: Lube oil cooler = 300 kW Generator cooler = 450 kW	CLOSED	

Question #	Question	Answer	Status	Responsible Party
136	Section 2.3.A.18 of the Shop Fabricated Tanks specification (Section 485173) indicates "All longitudinal and girth welds shall be 100% x-rayed." Can applicable requirements of API 650 and/or ASME be used instead?	The BOP Contractor should use the applicable code requirement for girth weld inspection.	CLOSED	
137	Will the design engineer be responsible for determining the Design Pressure and Design Temperature for the systems or are we to use what is listed in the Service Index?	Yes, the BOP contractor's engineer is responsible for determining design temperature and pressure.	CLOSED	
138	Are different pipe materials allowed to be substituted if deemed acceptable by the design engineer and if they will provide equivalent or superior long-term performance?	Use the pipe materials listed for the BOP Contractor's bid. Alternative materials may be considered after award of contract.	CLOSED	
139	Are Electrical Load lists for the following PIE supplied equipment available? We need these to adequately size and price the 480 V MCCs located in the PDC. · Chiller Electrical Load List · Shin Nippon STG Electrical Load List · IST OTSG Electrical Load List	We can provide estimates of the electrical loads, but the final power requirements are not available from the Power Island Equipment Contractor as yet. Here are estimates based on POWER Engineer's preliminary design and compared against GE's proposal: GT fuel compressor 1,095 kW GT electric chiller 370 kW GT chiller/heater water pump 330 kW HRSG feed pump 145 kW Cooling water pump 170 kW Cooling tower fans 180 kW Lights 10 kW Aux. from PEACE running motor/load list 485 kW Miscellaneous gas turbine auxiliaries 105 kW Miscellaneous steam cycle auxiliaries 35 kW Miscellaneous plant auxiliaries 40 kW Transformer losses 355 kW	CLOSED	
140	Is there an MCC located in the PIE supplied Chiller Package or are the Chiller 480 V loads being fed from the PIE MCC? A chiller MCC is not called out in the PDC layout plan.	The Chiller package is to be fed from the PIE MCC with two (2) 4160V feeds and two (2) 480 Feeds.	CLOSED	
141	Bid Form - Can the City of Pasadena provide the bid form in native Excel format?	No. The Bidder shall submit the Bidder's Proposal Form (Addendum #3 Item #5 Enclosure #4) completed in handwriting with their bids.	CLOSED	
142	Addendum #2 - Page #37 of Part 1 shows an elevation of the condenser. Can you please provide more complete information - plans, loads etc.	This is the best information we have from General Electric at this time. General Electric expects to finalize the condenser vendor selection at the end of February.	OPEN	Diane Donovan
143	Addendum #2 - Page #38 shows information for the foundation of the STG. Please provide the drawing that is referenced on this sheet: 5065A0-C23. There is also a conflict in the top of concrete elevation shown on this sheet with the top of concrete shown on Page 1700 of Attachment #3. Please clarify what the top of concrete elevation is for the STG.	This is the best information we have from General Electric at this time. The elevation of the steam turbine has not been set as yet.	OPEN	Diane Donovan

Question #	Question	Answer	Status	Responsible Party
144	Attachment #2 - BOI 037-5056 - Architectural Scope of Work Page 13 - Part 7: This calls for required activities in the Existing Glenarm Building and makes reference to details on drawing XXXXXX. Please provide this drawing so that we can comply with the required scope of work.	This information was provided in Addendum #3 Item 16 and Enclosure #7.	CLOSED	
145	Bid Form - Item #27 - Air Compressor & Receiver - What is the size of the enclosure for this equipment?	It is up to GE as to whether they will be supplying an enclosure or a shelter in order to meet their noise requirements. If GE does not provide an enclosure, then they will be providing a shelter (roof with open sides).	CLOSED	
146	Appendix G - In the "Local Subcontractor Solicitation Process for Contractors bidding on the Project:" section, it states in the second paragraph that "Forms shall be provided to the contractors to assist them in documenting the following steps." Please provide these forms.	The forms are provided in Appendix H.	CLOSED	
147	During the 1/8/14 project site visit, we overheard a PWP rep. state that the two existing on-site power poles, located on the west and south sides of the site, and their overhead utility lines would be removed by the City. Please confirm.	The overhead power line to the southwest of the Glenarm Building will be modified as follows: 1) the end pole to the southwest of the Glenarm Building will be removed 2) the next pole to the south, closer to the Pacific Electric building will remain. At that pole PWP will provide a 480V service drop. From there it is the BOP Contractor's responsibility receive and distribute the temporary construction power on-site.	CLOSED	
148	Due to the unknown hydraulic characteristics of the 6' x 4' storm drain box culvert, are backflow prevention valves required on any storm drain line connection to the 6' x 4' storm drain box culvert to prevent potential flooding of the site should the culvert become surcharged?	We are not aware of any surcharge conditions associated with the 6' x 4' storm drain box culvert. Recommend not including backflow preventers at this time. Contractor will go through a permitting process with the City for relocation of the storm drain and also for the grading permit and if new information is obtained at that time that the culvert can indeed see pressure conditions, the Contractor will need to address it.	CLOSED	
149	We assume that PWP wants the BOP Contractor to preserve and adjust as needed the existing catch basin at the west end of the 6' x 4' storm drain box culvert, while the two existing manholes (identified as "4' & 5' Dia. Lid Unknown" on Topo Survey), which lie in the middle of the plant proper, are to be removed. Please confirm.	Correct.	CLOSED	
150	We assume that the existing south plant entrance gate off State St. is to be removed and the bare ground around the PWP-removed backflow preventer is to be paved to match the existing roadway pavement elevations. Please confirm.	The gate at the south entrance shall be removed and replaced by the BOP Contractor with a wider gate with a similar mesh design as the one removed. The BOP Contractor shall install the necessary post and other appurtenances necessary to make the new gate operate properly. The area where the backflow preventer is removed will need to be paved. The paving should extend to the south and end at the existing gate, matching the existing sidewalk.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
151	Please provide missing GE Packaged Power, Inc.'s Work Order No. 20001, "Area 1 Civil Plan Paving/Grading & U.G. Sewer", Dwg. No. 20001-C-002-02 ("Issued for Construction 1/24/03"), on the Pasadena Powerplant Upgrade Project. The four associated Dwg. Nos. 20001-C-002-01 & -03 thru -05 were provided as part of A.3, but Dwg. No. 20001-C-002-02 is missing.	The referenced drawing will be issued in Addendum #4.	CLOSED	
152	What is the extent of the existing gate and fence removal/replacement at the SE corner of the Glenarm Building where "New Asphalt Pavement" is shown on Dwg. No. C3-1?	This fencing will remain in place.	CLOSED	
153	The ammonia system shows 3x100% capacity pumps whereas the specification discusses 2x100% pumps. Which is correct?	The project requirement is for 3x100% pumps as shown on the P&ID.	CLOSED	
154	Can the City provide the GE guarantee sheet? If this is not available, can the City provide the amount of hours GE allows before PM10 compliance is void?	GE prefers to release the guarantees only to the successful BOP Contractor. With regards to PM10 testing, GE requires that the combustion turbine must run for a minimum of 300 total-fired hours prior to any PM testing, and must operate at base load for a minimum of 3 to 4 hours prior to any PM test run to achieve steady-state wheelspace temperatures (gas turbine nozzle final stage temperature). GE does not have a maximum number of fired hours before which the PM-10 test must occur to be valid, nor is there a degradation-type factor applied to PM-10 based on hours.	CLOSED	
155	After our review of the General Contract for the above subject project, we have identified a few typical reference clauses missing in an EPC contract. Appendix D of the request for bid does not reference any of the following clauses; namely, Price and Payment Terms, Warranty, Confidential Information, Consequential Damages, Contractor Liability, Environmental , Changes, Force Majeure, Owners Insurance/ Builders Risk Insurance. Please advise how the City plans to address these contract clauses.	Price and Payment Terms - Refer to Section 3.2 and the Bidder's Proposal Form of the Specification for pricing. Refer to Section 9.0 of the Specification for payment terms . Warranty - Refer to question #119 for the response. Confidential Information - The Bidder will be required to execute a Non-Disclosure Agreement with General Electric. Consequential Damages - Refer to question #117 for the response. Contractor Liability - Refer to question #117~~118~~ for the response. Environmental - Refer to question #117 for the response Changes - Refer to question #112 for the response. Force Majeure - Refer to Sections 11.1 and 22.7. Owners Insurance/ Builders Risk Insurance - Refer to question #160.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
156	Attachment A-1, paragraph J.21.6.j has this statement: The underground duct bank systems shall have at least 20% spare conduits. We anticipate that the underground power cable bus from the CTG and STG to the 13.8kV switchgear will require a large number of parallel power cables, and as a result will have a very large duct bank. The same situation will apply to the low side connections for the auxiliary transformers T1 and T3. Please clarify if the 20% spare capacity requirement applies to these duct banks.	20% spare conduits are required for the duct banks as described in the Specification. The CTG to GSU Xfmr circuits are overhead and thus this requirement does not apply. For the following circuits the City will accept as an alternative sufficient spare conduit to accommodate the cables associated with one of the three phases: 1) STG to GSU Xfmr 2) Aux Xfmr T1 to PDC 3) Aux Xfmr T3 to PDC	CLOSED	
157	Please clarify if the “goal of at least 25% local hiring” in the Project Labor Agreement is a firm requirement or a true goal which we are to attempt/make best efforts to meet during the course of the project.	The 25% local hiring is the goal set under the PLA for the project. Contractor shall perform all outreach effort prescribed in the PFBL and described in Section 6 (Union Recognition, Referral & Employment of Pasadena Residents) of the PLA to meet this goal.	CLOSED	
158	Referring to Section 7.11.2 of the Sample Contract in Appendix D of the Specification, does the City intend to modify the Indemnity provision in the contract to comply with California law? The word “sole” should be replaced with the word “active” pursuant to California Civil Code Section 2782 (b) which provides as follows: Except as provided in Sections 2782.1, 2782.2, and 2782.5, provisions, clauses, covenants, or agreements contained in, collateral to, or affecting any construction contract with a public agency that purport to impose on the contractor, or relieve the public agency from, liability for the active negligence of the public agency are void and unenforceable.	The City is not attempting to be relieved from "active" negligence and nor does the existing contract language purport to do so. The contract is not in contravention of the California Civil Code as written.	CLOSED	
159	Referring to Section E in Appendix E of the Specification, if the Contractor reduces or eliminates the self-insured retentions, it will result in additional cost. Does the City intend to issue guidance about the amount of self-insured retention that will be acceptable to the City prior to the proposal date?	Bidders should sumbit proposal as they deem appropriate, to be competitive. Since each company has differing rates for each of its insurance coverages, each company has differeing risk tolerance, and risk appetite for self-insured retentions or dedutibles. Each proposer will have to determine on its own its financial capabilities.	CLOSED	
160	Does the City intend to provide Builder’s Risk insurance for the full replacement value of the Work. If so does the City intend to disclose the terms of such coverage? If the City intends to provide Builder’s Risk insurance, will the	The BOP Contractor must provide Builder's Risk coverage as an option within their bid. Please refer to Addendum #4 for further details.	CLOSED	
161	17.2 kV is not a typical substation voltage. Is the new T3 Aux Transformer connected directly to a generator?	17.2 kV is the correct value. The T3 Aux Transformer is not connected to a generator.	CLOSED	

Question #	Question	Answer	Status	Responsible Party
162	Enclosure 10 of addendum 3 provides us with dates for owner furnished equipment deliveries. It provides both RTS (ready to ship) dates and guaranteed delivery dates. My question pertains to the guaranteed delivery date. Does the guaranteed delivery date provided pertain to the beginning of deliveries to the site or is it the date that we will receive the final delivery for that particular item?	The Guaranteed Delivery Date is the last day that GE may deliver the equipment to the site and not be liable for liquidated damages for late delivery. GE must provide not less than 5 day's notice prior to delivery to the site. Deliveries must occur on a business day before 2:00 PM local time, or as otherwise agreed with the City in writing. GE may issue a RTS notice up to 30 days prior to the RTS dates in the contract. Additionally they are required to use reasonable efforts to provide 10 days advance notice of issuing a RTS notice. GE may deliver the equipment up to 30 days prior to the Guaranteed Delivery Date.	CLOSED	
163	In many of the mechanical specifications, e.g. Section 485172 Field Fabricated Tanks - Steel, refer to Section 481200, Combined Cycle Balance of Plant. Where is Section 481200 located?	Section 481200 was originally going to be what is now Attachment A.1, the BOP Scope of Work. The references to Section 481200 should be back to Attachment A.1 and were inadvertently missed.	CLOSED	
164	Please clarify the incomplete sentence in the answer to Question #56, as underlined below: “Pasadena Fire Department review of submittals and reports, as well as required inspections, The current billing rate for reviews is $202/hr for the time required."	The sentence should have read as follows: Pasadena Fire Department review of submittals and reports, as well as required inspections, is required. The current billing rate for reviews is $202/hr for the time required.	CLOSED	
165	We have another question in response to your answer to Question #105: If the “existing AC paving can be left in place” (i.e. running N– S between east State St. and the new plant proper), shouldn’t the quantity of “Bidder’s Proposal” Bid Item D.8 “Remove and recompaction of 2’ – 3’ of fill soil below AC roadways” be reduced accordingly?	It may be possible to execute the project in the way described, in which case the unit rates will be used to reduce the Bidder's price.	CLOSED	
166	Enclosure 6 of Addendum #2 lists drawing E6-10 as revision C, 7-Jan-14, released in Addendum #2. However, Enclosure 4 in Addendum #2 for Civil Scope/Storm Drain Reroute has E6-10 listed as revision B. Is there in fact a revision C to drawing E6-10?	Revision C is the correct revison and is included in Addendum #4.	CLOSED	
167	Are there OTSG and STG P&ID’s for the Glenarm Repowering Project available at this time?	Not at this time, as soon as they are available we will issue them in a future Addendum.	OPEN	Diane Donovan

City of Pasadena - Glenarm GT5
Pre-Bid Meeting Questions
Revision 2

Last Updated February 26, 2014

Question #	Question	Answer	Status	Responsible Party
168	The proposed storm drainage system, as detailed on the 'Preliminary Grading & Drainage Plan' (dwg C3-1), does not appear to be sufficient for proper drainage of the site. Should additional catch basins and piping be considered for bidding purposes	We have taken a second look at the proposed storm drainage system as shown on Drawing C 3-1 and find it to be adequate. The BOP Contractor should consider that this arrangement is based on the preliminary information available at this time and they are responsible for the final drainage system design once all equipment sizes and locations are determined and integrated into the final general arrangement. If the bidder thinks that additional catch basin and piping are necessary, then they should consider it in their design and include it in the bid price. City Public works will review and approve the final design before start of construction.	CLOSED	
169	While reviewing the Bidder's Checklist we saw that one of the requirements under Bid Security, Item (a) Bid Bond, was that the Attorney-in-Fact be on file with the L.A. County Clerk or the Pasadena City Clerk. Our Attorney-in-Fact tried to file with Pasadena and was told that they will not file unless it is for 'Real Property.' We wanted to confirm if our Attorney-in-Fact must actually be on file for this project?	The bid security shall be signed & sealed (emboss seal) by the Attorney-in-fact. A Power of attorney for the Attorney-in-fact shall be attached with the bid security. With the Power of attorney attached to the bid document, this addresses the requirement that the Attorney-in-fact is on file with the City Clerk.	CLOSED	
170	The hazard reports provided in Addendum #3 do not provide the lengths/volume of asbestos to be removed in the the tunnels outside the boundary of the Glenarm Building	Assume 10 cubic yards. Also provide a unit rate to be used to adjust the bid price based on the actual volume of asbestos. An updated bid form is provided in Addendum #4.	CLOSED	

Enclosure 2

ADDENDUM 4

SPECIFICATIONS LD-13-14

BIDDER'S PROPOSAL

FOR
PROVIDING LABOR AND MATERIALS

FOR

GLENARM REPOWERING BALANCE OF PLANT DESIGN AND CONSTRUCTION

To the Honorable City Council
of the City of Pasadena, California

Gentlemen:

In response to the Notice Inviting Bids for the Glenarm Repowering Balance of Plant Design and Construction for the City of Pasadena, Water and Power Department, the undersigned hereby proposes and agrees to provide all necessary and incidental labor, supervision, transportation, materials, construction equipment, tools, engineering, testing, sampling, and analysis , to satisfactorily complete the Work in strict conformity with the Specifications all approved Addenda for the firm prices hereinafter indicated.

PART I - ITEMIZED COST PROPOSAL					
	Bid Item	**Quantity**	**Description**	**Unit Price**	**Total Amount**
A	**GENERAL CONDITIONS**				
	A.1	LS	Insurances, Bonds, Mobilization, Offices, Overheads	Lump Sum	$____________
	A.2	LS	Building Permits	Lump Sum	$____________
	A.3	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	A.4		Part IA SUBTOTAL		$____________

ADDENDUM 4

B	**ENGINEERING**				
	B.1	LS	Detailed Engineering, Studies and Submittals	Lump Sum	$____________
	B.2	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	B.3		Part IB SUBTOTAL		$____________
C	**EQUIPMENT SUPPLY**				
	C.1	LS	Furnish Plant Control System software, programming, cabinets and all necessary hardware per Attachment A.2 PCS/Control System Specification (037-4780).	Lump Sum	$____________
	C.2	LS	Furnish, Power Distribution Center, including switchgear, breakers and all other associated equipment per Attachment A.2 Section 262600 Power Distribution (PDC)	Lump Sum	$____________
	C.3	LS	Furnish auxiliary transformers per Attachment A.2 Section 261200-2 (Medium Voltage Auxiliary Transformers)	Lump Sum	$____________
	C.4	LS	Balance of Engineered Equipment	Lump Sum	$____________
	C.5	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	C.6		Part IC SUBTOTAL		$____________

ADDENDUM 4

D	DEMOLITION, REMEDIATION, EARTHWORK, PAVING				
	D.1	LS	Exclusive of D.2 through D.8 which are provided separately below: Demolition of Existing Above Grade Site Infrastructure; Storm Drain Relocation, including demolition and haul-off of existing storm drain culvert; Stockpiling, Backfilling, Dirt Importation, Topo & Site Survey; Site fences and gates; Site Preparation, Grading & Drainage, Roads & Paving, Sidewalks & Landscaping; State Street Improvements; Erosion & Sediment Controls; Sanitary Sewer Connections; & Making of all Facility Interfaces per BOP Scope of Work in Attachment A.1 Section G of the Specifications as well as all applicable and approved Addenda.	Lump Sum	$____________
	D.2	700 CY (Cubic Yards)	Concrete demolition for tunnels, stack foundations, train tracks, gantry crane per the BOP Scope of Work in Attachment A.1 Section G.2 and any approved Addenda. Provide lump sum price for the transportation and disposal of 700 CY, and a $/CY for adjustments up and down from 700 CY.	$____/CY	$____________

ADDENDUM 4

D	DEMOLITION, REMEDIATION, EARTHWORK, PAVING				
	D.3	2,500 CY	Import fill to fill tunnel voids per the BOP Scope of Work in Attachment A.1 Section G.2 and any approve Addenda. Provide lump sum price for the transportation and disposal of 2,500 CY and a $/CY for adjustments up and down from 2,500 CY.	$____/CY	$____________
	D.4	1,300 CY	Organics removed from site per the BOP Scope of Work in Attachment A.1 Section G.2 and any approved Addenda. Provide lump sum price for the transportation and disposal of 1,300 CY and a $/CY for adjustments up and down from 1,300 CY.	$____/CY	$____________
	D.5	13,000 CY	Over-excavate and re-compact soils, but not removed from site per the BOP Scope of Work in Attachment A.1 Section G.2 and any approved Addenda. Provide lump sum price for the 13,000 CY and a $/CY for adjustments up and down from 13,000 CY.	$____/CY	$____________
	D.6	25 CY	Lead contaminated soil, removed from site and disposed per the BOP Scope of Work in Attachment A.1 Section G.2 and any approved Addenda. Provide lump sum price for the 25 CY and a $/CY for adjustments up and down from 25 CY.	$____/CY	$____________

ADDENDUM 4

D	DEMOLITION, REMEDIATION, EARTHWORK, PAVING				
	D.7	100 CY	Remove old house concrete foundations, bricks, and asphalt near new tanks from the project site and dispose of them per the BOP Scope of Work in Attachment A.1 Section G.2 and any approved Addenda. Provide lump sum price for the 100 CY and a $/CY for adjustments up and down from 100 CY.	$____/CY	$____________
	D.8	3,000 CY	Remove and recompaction of 2' – 3' of fill soil below AC roadways per the BOP Scope of Work in Attachment A.1 Section G.2 and any approved Addenda. Provide lump sum price for the 3,000 CY and a $/CY for adjustments up and down from 3,000 CY.	$____/CY	$____________
	D.9	10 CY	Remove asbestos from within the circulating water tunnels underlying the site and outside of the Glenarm Building	$____/CY	$____________
	D.10	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	D.11		Part ID SUBTOTAL		$____________

ADDENDUM 4

E	GT5 CONSTRUCTION EXCLUSIVE OF DEMOLITION CONTAINED IN PART D				
	E.1	LS	Civil Construction as described in Attachments A.1, A.2, and A.3 of the Specifications and any approved Addenda.	Lump Sum	$___________
	E.2	LS	Structural Construction as described in Attachments A.1, A.2, and A.3 of the Specifications and any approved addenda	Lump Sum	$___________
	E.3	LS	Mechanical Construction as described in Attachments A.1, A.2, and A.3 of the Specifications and any approved Addenda.	Lump Sum	$___________
	E.4	LS	Electrical Construction as described in Attachments A.1, A.2, and A.3 of the Specifications and any approved Addenda.	Lump Sum	$___________
	E.5	LS	I&C Construction as described in Attachments A.1, A.2, and A.3 of the Specifications and any approved Addenda.	Lump Sum	$___________
	E.6	LS	Furnish all materials and labor for the erection of the new Water Lab per the BOP Scope of Work in Attachment A.1 Section F, Attachment A.2 Architectural Scope of Work, and any approved Addenda	Lump Sum	$___________
	E.7	LS	34.5kV work between GSU and on-site 34.5kV vault per the BOP Scope of Work in Attachment A.1 Section J and any approved Addenda.	Lump Sum	$___________

ADDENDUM 4

E	**GT5 CONSTRUCTION EXCLUSIVE OF DEMOLITION CONTAINED IN PART D**				
	E.8	LS	17kV work between Aux Transformer Bank and on-site 17kV vault per the BOP Scope of Work in Attachment A.1 Section J and any approved Addenda.	Lump Sum	$____________
	E.9	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	E.10		Part IE SUBTOTAL		$____________
F	**STARTUP, COMMISSIONING AND TRAINING**				
	F.1	LS	Startup and Commissioning per the BOP Scope of Work Attachment A.1 Section P and any approved Addenda.	Lump Sum	$____________
	F.2	LS	Allowance for craft support for power island contractor based on two pipe fitters and two electricians for a period of 3 months working a 6-10 schedule. Time will be billed on a T&M basis.	Lump Sum	$____________
	F.3	LS	Training, and O&M Manual Assembly per the BOP Scope of Work in Attachment A.1 Section Q and any approved Addenda.	Lump Sum	$____________
	F.4	LS	O & M Manuals per Section R in BOP Scope of Work in Attachment A.1 and any approved addenda.	Lump Sum	$____________
	F.5	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	F.6		Part IF SUB TOTAL		$____________

ADDENDUM 4

G	**CONTROL ROOM**				
	G.1	LS	Furnish all materials and labor for the erection of the new Operations and Control Building per the BOP Scope of Work in Attachment A.1 Section F and Attachment A.2, Architectural Scope of Work and any approved Addenda	Lump Sum	$____________
	G.2	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	G.3		Part IG SUB TOTAL		$____________
H	**OTHER CONSTRUCTION REQUIREMENTS**				
	H.1	LS	Provide all materials and labor for Spare Parts, tools, & Storage requirements of Section M, as well as the construction requirements in Section N of the BOP Scope of Work in Attachment A.1 and any approved Addenda.	Lump Sum	$____________
	H.2	LS	Sales and Use Tax (if any)	Lump Sum	$____________
	H.3		Part IG SUB TOTAL		$____________
I	**BUILDER'S ALL RISK INSURANCE**				
	I.1	LS	Provide Builder's All Risk Insurance per Addenda #4 and any approved Addenda	Lump Sum	$____________

PART II - GRAND TOTAL PRICING		
Grand Total = A.4 + B.3 + C.6 + D.11 + E.10 + F.6 + G.3 + H.3+I1	Lump Sum	$____________

Each bidder must bid on all of the above items. If any bidder makes any alteration, interlineation or deviation in any of the printed matter of the proposal or if the signature of the bidder is incomplete, the bid will be considered informal and may be rejected.

ADDENDUM 4

Refer to section 3.2 in case of a discrepancy between the Item Prices and the Total Price.

The prices quoted herein include all applicable federal, state, local, and other taxes.

The undersigned bidder agrees to commence work on the start date indicated in the Notice to Proceed and proposes and agrees to have the Work completed by the date specified in Section 8.1.

The undersigned bidder acknowledges receipt of the following addenda issued for the above project. If no addenda have been received, write "none". FAILURE TO ACKNOWLEDGE RECEIPT OF ANY ADDENDA ISSUED WILL RENDER THE CONTRACTOR'S BID NON-RESPONSIVE.

List of Addenda Received:

Addendum No.	Bidder's Initials
1. ________________	________________
2. ________________	________________
3. ________________	________________
4. ________________	________________

The bidder declares that neither he nor any member of his firm or corporation is an officer or an employee of the City of Pasadena.

California State Contractor's License Number ______________________

The undersigned certifies that he is an official legally authorized to bind their firm and to enter into a contract should the City accept this proposal.

Bid proposal by

____

(Name of Firm)

Legal status of bidder: (Please check the appropriate box)

A. Corporation ____ State of Incorporation ________________________________

B. Partnership ____ List Names ____

____

____

C. DBA ____ State Full Name ________________________________ DBA

____

____

ADDENDUM 4

D. Other _____ Explain ____
____
____

Signature of Bidder ______________________________ Title __________________________
(Authorized Signature)

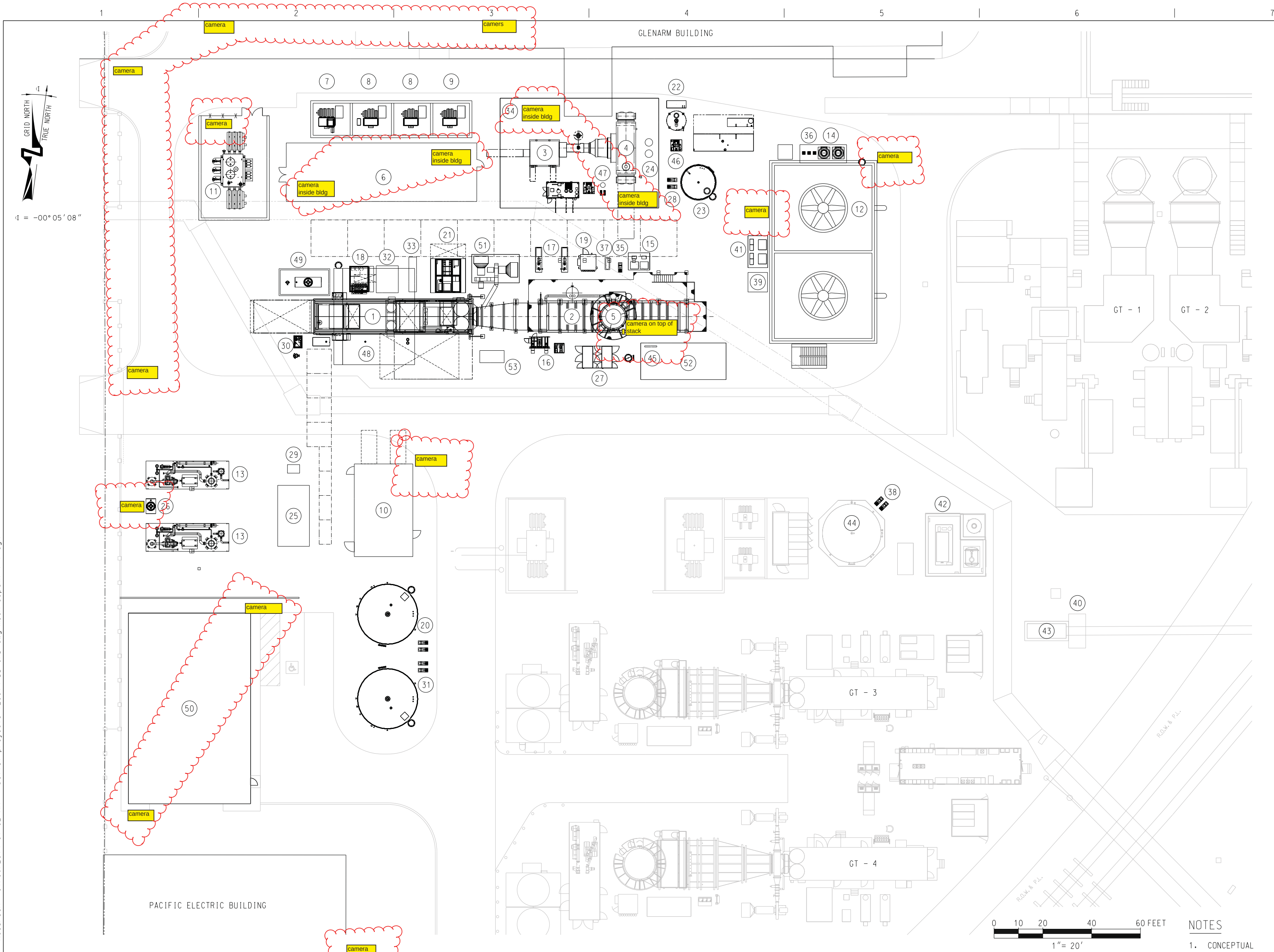
Print Name ____________________________________

Address ______________________________ City ____________________ Zip __________

Telephone No. ___________________________

Signed this _____________________ day of ____________________ 2014

Enclosure 3



LEGEND

1. - GAS TURBINE GENERATOR (GTG)
2. - ONCE THROUGH STEAM GENERATOR (OTSG)
3. - STEAM TURBINE GENERATOR (STG)
4. - SURFACE CONDENSER
5. - OTSG STACK
6. - POWER DISTRIBUTION CENTER (PDC) / CONTROL ROOM
7. - 13.8KV -4.16KV AUX. TRANSFORMER
8. - 4160V -480V AUX. TRANSFORMER
9. - 17.2KV -4.16KV AUX. TRANSFORMER
10. - INLET AIR CHILLER
11. - GSU TRANSFORMER
12. - COOLING TOWER
13. - FUEL GAS COMPRESSOR SKID
14. - CIRCULATING WATER PUMPS
15. - OTSG CHEMICAL FEED SKID
16. - AMMONIA FLOW CONTROL UNIT
17. - BOILER FEEDWATER PUMPS
18. - GTG CO2 BOTTLES
19. - CEMS SKID
20. - DEMINERALIZED WATER TANK/PUMPS
21. - GTG AUXILIARY SKID
22. - CONDENSATE POLISHER
23. - CONDENSATE STORAGE TANK
24. - CONDENSATE PUMPS
25. - INLET AIR HEAT EXCHANGER
26. - FUEL GAS COMPRESSOR DRAINS TANK
27. - AIR COMPRESSOR AND RECEIVER
28. - CONDENSATE MAKE-UP PUMPS
29. - INLET AIR PRE-COOLER
30. - GTG FUEL GAS FINAL FILTER SKID
31. - WASTE WATER TANK/PUMPS
32. - GENERATOR/GEARBOX LUBE OIL SKID
33. - GTG LUBE OIL COOLER SKID
34. - STEAM TURBINE ENCLOSURE
35. - BEARING COOLING WATER PUMPS
36. - AUXILIARY COOLING WATER PUMPS
37. - AUXILIARY COOLING WATER HEAT EXCHANGER
38. - DEMINERALIZED WATER FORWARDING PUMPS
39. - WASTE WATER LIFT STATION
40. - GLENARM WEIR (EXISTING)
41. - COOLING TOWER CHEMICAL TREATMENT
42. - GT 3 & 4 OILY WATER SEPARATOR (EXISTING)
43. - GLENARM BROADWAY TUNNEL (EXISTING)
44. - GT 3 & 4 DEMIN TANK (EXISTING)
45. - STEAM & WATER SAMPLING PANEL
46. - POTABLE WATER RECIRCULATION SKID
47. - ATMOSPHERIC FLASH TANK/TRANSFER PUMPS
48. - COIL CONDENSATE SUMP
49. - GTG WATER WASH DRAINS TANK (IN OPEN VAULT)
50. - CONTROL BUILDING
51. - PURGE/TEMPERING AIR FANS
52. - WATER LAB BUILDING
53. - SPRINT SKID

NOTES

1. CONCEPTUAL

INTER-DISCIPLINE REVIEW

DISC	ARCH	CIVIL	ELECT	HVAC	I&C	MECH	STRUCT
DATE							
INIT							

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
L	RE-ISSUED FOR BID	01/06/2014	KAC	KAC	TRC	GTH
K	RE-ISSUED FOR BID	12/06/2013	VBD	KAC	TRC	GTH
J	RE-ISSUED FOR BID	10/15/2013	VBD	KAC	TRC	GTH
I	RE-ISSUED FOR BID	09/27/2013	VBD	KAC	ADD	SLH
H	RE-ISSUED FOR REVIEW	07/18/2013	VBD	KAC	ADD	SLH

DSGN	DPB	04/12/2011
DRN	DPB	04/12/2011
CKD	RVK	04/12/2011

SCALE: 1″ = 20′-0″

FOR 22x34 DWG ONLY

POWER ENGINEERS www.powereng.com

PASADENA WATER & POWER

GLENARM REPOWERING PROJECT (GT-5 COMBINED CYCLE INSTALLATION)

GENERAL ARRANGEMENT GAS TURBINE/AXIAL EXHAUST

JOB NUMBER 123374

REV L

DRAWING NUMBER M1-1-1

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Enclosure 4

Q. TRAINING

Q.1 Scope of Services

The services shall include the design, layout, and development of Operator Training Manuals for the power block and all ancillary systems and equipment, and all material handling systems to interface with the OEM vendors to incorporate the OEM training as part of the overall training program.

There are approximately thirty-five (35) members of the plant staff to be trained. All of them will not be available at the same time due to shift staffing requirements, and will need to be trained in two groups.

Q.2 Systems and Equipment

BOP Contractor shall develop training modules and plant operating procedures (see Section R) to cover all systems and equipment within the plant. The PIE Contractor will provide training on the equipment within their scope of supply.

The scope of systems and equipment covered includes the following:

- Fuel Gas System
- Condensate System
- Boiler Feed Water System
- High Pressure Steam System
- Auxiliary Steam System
- Gland Steam System
- Steam Drains System
- Condenser Air Extraction System
- Circulating Water System
- Auxiliary Cooling Water System
- Component Cooling Water System
- Service Water System
- Demineralized Water System
- Chilled Water System
- Potable Water System
- Waste Water Collection System
- Service Air System
- Instrument Air System
- Compressed Nitrogen System
- Steam and Water Sampling Systems
- Aqueous Ammonia System
- Fire Protection Systems
- Chemical Feed Systems
- 34.5 kV System
- 17.2 kV System
- 4160 V System
- 480 V System
- 120 V AC System
- 125 V DC System
- Plant Control System

Q.3 Organization/Content of Operator Training Manual

The Training Manual structure shall consist of system modules. Each system module is subdivided with information that progresses through each system's function and operation.

- Simplified Diagram
- System Purpose
- System Components
- System Description
- Normal System Operation
- Precautions and Limitations

Text shall be straightforward and to the point. The text shall be supplemented with illustrated systems drawings and will include applicable design/performance data.

Q.4 Training Process

Training activities shall include the following elements:

- Overview of combined cycle plant operation geared towards an OTSG plant (GT5 is PWP's first combined cycle unit)
- Training discussing the PIE Contractor supplied equipment (to be provided by the PIE Contractor in coordination with the BOP Contractor)
- Training discussing the BOP Contractor supplied equipment and systems
- System Walkdown (consistent with construction progress and equipment availability)
- Lesson Plans
- Session Quiz
- Operator OJT Qualification Checklist

The instructor shall perform pre-training site familiarization, site specific digital images, and daily activities associated with text or diagram revision to reflect as-built conditions or additional design criteria not available during initial text development.

Classroom subject matter discussions are targeted at six (6) hours per day with the remaining two (2) hours dedicated to daily walkdown and review sessions. Daily schedules shall be coordinated with project management to best utilize the student's time in conjunction with their plant operations.

Q.5 Training Schedule

The BOP Contractor, working with the PIE Contractor and the City shall mutually agree on a training schedule and shall develop a training that accomplishes the following goals:

- Allows the City to maintain ongoing operations of the other Broadway and Glenarm units
- Training on power island equipment is delivered before the same equipment is covered in the BOP Contractor supplied training
- All training is completed prior to start of plant commissioning

Q.6 Deliverables

The deliverables include submittals of draft training modules for review cycle, and final delivery of items:

- Initial submittal of all training module drafts
- Final Deliverables for Classroom Training, one week prior to the start of training
    - Twenty (20) hard copies for Operator handouts
- Two (2) CDs with editable files in MS Word

Enclosure 5

R. OPERATING PROCEDURES

R.1 Scope of Services

The Plant Operating Procedures consolidate the operating procedures from all of the major PIE Contractor equipment manuals and the system procedures into a comprehensive plant operating procedures manual. The procedures with this manual address the different plant operational scenarios.

R.2 Organization/Content of Operating Procedures:

The Plant Operating Procedures will contain two primary sections:

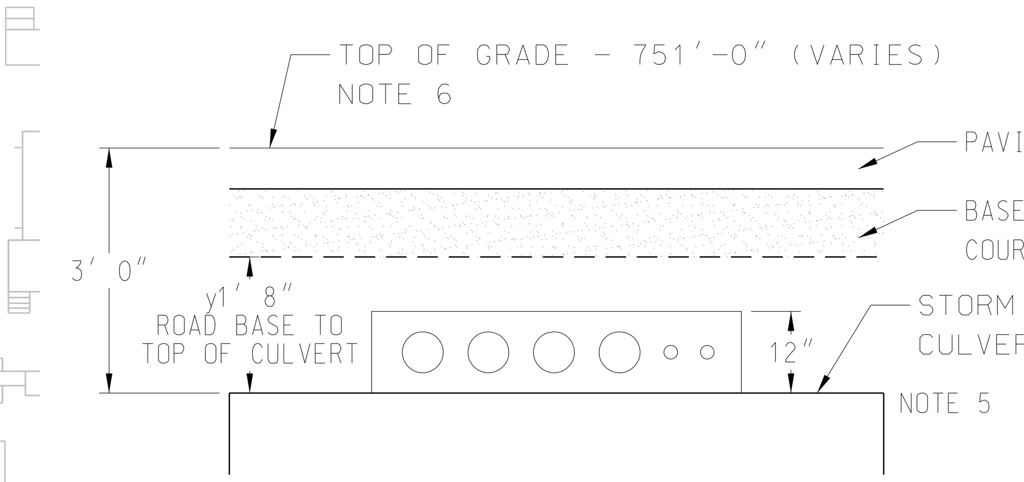
- System Operating Procedures will address individual systems and contain the following procedures:
  - Normal System Startup
  - Normal System Operation
  - Normal System Shutdown
  - Emergency Shutdown
  - System Alarms
- Integrated Operating Procedures will address plant evolutions and include procedures for:
  - Plant Startup – Operation in Simple Cycle
  - Plant Startup – Operation in Combined Cycle
  - Transition from Simple Cycle to Combined Cycle
  - Transition from Combined Cycle to Simple Cycle
  - Plant Shutdown – Simple Cycle
  - Plant Shutdown – Combined Cycle
  - Dispatch
  - Emergency shutdown – Combined Cycle
  - Recovery from steam turbine trip
  - Recovery from gas turbine trip

R.3 Deliverables

The deliverables include submittals of drafts for one review cycle, and final delivery of items:

- Draft copy, in MS Word® and Visio® format, submitted for review six weeks prior to the start of plant staff training
- Initial procedures, in MS Word® and Visio® format, to support initial plant operations submitted two weeks prior to the start of plant staff training
- Two (2) CDs with editable Final (Rev 0) procedures incorporating commissioning lessons learned, in MS Word® and Visio® format, for record two weeks after Commercial Operation

Enclosure 6



SECTION A
SCALE: NTS

NOTES

1. SEE DRAWING E6-1 FOR GENERAL NOTES, LEGEND AND DETAILS.
2. THIS DRAWING REPRESENTS PROPOSED UNDERGROUND ROUTING FOR 17.2kV AND 34.5kV FEEDS. CABLE SIZING AND QUANTITIES TO BE DETERMINED DURING DETAILED DESIGN.
3. PROPOSED ROUTING IS NEW UNLESS OTHERWISE NOTED.
4. 8' X 14' TUNNEL VAULT TO BE INSTALLED. FINAL LOCATION AND DEPTH TO BE DETERMINED BY CONTRACTOR AND COORDINATED WITH PWP.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY FIELD CONDITIONS. ELEVATIONS AND DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY.
6. SEE DRAWING C3-1 FOR APPROXIMATE ELEVATIONS.
7. CORE DRILL THROUGH EXISTING VAULT 4275 TO INSTALL CONDUITS. PENETRATIONS SHALL BE SEALED TO MAKE WATER TIGHT.
8. CABLES TO EXIT VAULT 4275 ON THE SOUTH UTILIZING SPARE DUCT BANK CONDUITS ON THE EAST SIDE OF VAULT.
9. REFER TO EXISTING PWP DRAWINGS 20001-E-004-13, 8-2-547 AND 2-2-1562 FOR DUCTBANK DETAILS AND ROUTING.
10. 4160kV FEED TO ALSO BE ROUTED OVER STORM DRAIN, IN PARALLEL TO THE 34.5kV LINE.

INTER-DISCIPLINE REVIEW

DISC	ARCH	CIVIL	ELECT	HVAC	I&C	MECH	STRUCT
DATE							
INIT							

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
C	RE-ISSUED FOR BID	01/07/2014	TLM	FTD	RL	GH
B	ISSUED FOR BID	12/10/2013	TLM	FTD	RL	GH
A	ISSUED FOR REVIEW	09/30/2013	TLM	FTD	RL	GH

DSGN	FTD	07/31/2013
DRN	TLM	07/31/2013
CKD	RL	09/18/2013
SCALE:	1" = 20'-0"	

FOR 22x34 DWG ONLY

CITY OF PASADENA INCORPORATED JUNE 1886

POWER ENGINEERS www.powereng.com

PASADENA WATER & POWER

GLENARM REPOWERING PROJECT (GT-5 COMBINED CYCLE INSTALLATION)

PROPOSED ELECTRICAL UNDERGROUND ROUTING

JOB NUMBER 123374

REV C

DRAWING NUMBER E6-10

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Enclosure 7

NOTES

1. GENERAL NOTES ARE SHOWN ON DRAWING M3-1-0. SYMBOLS AND LEGEND ARE SHOWN ON DRAWINGS M3-1-1 THRU M3-1-3.
2. ALL VALVE, PIPING SPECIALTIES AND INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED WITH "5XXX" UNLESS OTHERWISE NOTED.

INTER-DISCIPLINE REVIEW

DISC	ARCH	CIVIL	ELECT	I&C	MECH	STRUCT
DATE						
INIT						

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
H	ISSUED FOR REVIEW	01/30/14	VBD	ADD	SEG	TRC
G	ISSUED FOR REVIEW	12/06/13	VBD	ADD	SEG	TRC
F	ISSUED FOR REVIEW	11/22/13	VBD	ADD	SEG	TRC
E	ISSUED FOR REVIEW	10/15/13	AJG	ADD	SEG	TRC
D	ISSUED FOR REVIEW	09/13/13	VBD	ADD	SEG	TRC

DSGN	ADD	09/13/12
DRN	VBD	09/13/12
CKD	SEG	09/13/12
SCALE:	NONE	

CITY OF PASADENA INCORPORATED JUNE 1886

POWER ENGINEERS

PASADENA WATER AND POWER
GLENARM REPOWERING PROJECT
(GT-5 COMBINED CYCLE INSTALLATION)
PIPING & INSTRUMENTATION DIAGRAM
OTSG INTERCONNECTIONS (STEAM)

JOB NUMBER: 123374
REV: H
DRAWING NUMBER: M3-3-2

NOTES

1. GENERAL NOTES ARE SHOWN ON DRAWING M3-1-0. SYMBOLS AND LEGEND ARE SHOWN ON DRAWINGS M3-1-1 THRU M3-1-3.
2. ALL VALVE, PIPING SPECIALTIES AND INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED WITH "5XXX" UNLESS OTHERWISE NOTED.
3. REFER TO GE DRAWING M106 SHEET 1 & 2 FOR ADDITIONAL HOTWELL AND WATER BOX LEVEL INDICATING INSTRUMENTATION.

INTER-DISCIPLINE REVIEW

DISC	ARCH	CIVIL	ELECT	I&C	MECH	STRUCT
DATE						
INIT						

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
H	ISSUED FOR REVIEW	01/30/14	VBD	ADD	SEG	TRC
G	ISSUED FOR REVIEW	12/06/13	VBD	ADD	SEG	TRC
F	ISSUED FOR REVIEW	11/22/13	VBD	ADD	SEG	TRC
E	ISSUED FOR REVIEW	10/15/13	VBD	ADD	SEG	TRC
D	ISSUED FOR REVIEW	09/13/13	VBD	ADD	SEG	TRC

DSGN	ADD	09/17/12
DRN	VBD	09/17/12
CKD	SEG	09/17/12
SCALE:	NONE	

CITY OF PASADENA INCORPORATED JUNE 1886

POWER ENGINEERS

PASADENA WATER AND POWER
GLENARM REPOWERING PROJECT
(GT-5 COMBINED CYCLE INSTALLATION)
PIPING & INSTRUMENTATION DIAGRAM
CONDENSATE SYSTEM

JOB NUMBER 123374
REV H
DRAWING NUMBER M3-11-1

5CDS-TNK-010
CONDENSATE STORAGE TANK
Opr Cap: Proc Cap:
Opr Press: Vol Cap: 5000.0 gallon
Opr Temp: 117.00 F Spec: 485173

5CDS-PMP-020A
CONDENSATE MAKE-UP PUMP A
Opr Cap: 22.0 gallon/min Proc Cap:
Opr TDH Press: 40.00 psi Drv Rtg:
Opr Temp: 97.00 F Spec: 485311.11

5CDS-PMP-020B
CONDENSATE MAKE-UP PUMP B
Opr Cap: 22.0 gallon/min Proc Cap:
Opr TDH Press: 40.00 psi Drv Rtg:
Opr Temp: 97.00 F Spec: 485311.11

NOTES

1. GENERAL NOTES ARE SHOWN ON DRAWING M3-1-0. SYMBOLS AND LEGEND ARE SHOWN ON DRAWINGS M3-1-1 THRU M3-1-3.
2. ALL VALVE, PIPING SPECIALTIES AND INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED WITH "5XXX" UNLESS OTHERWISE NOTED.
3. ALL CONDENSATE TANK CONNECTIONS SHALL BE SUPPLIED WITH ISOLATION VALVES.

INTER-DISCIPLINE REVIEW

DISC	ARCH	CIVIL	ELECT	I&C	MECH	STRUCT
DATE						
INIT						

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
H	ISSUED FOR REVIEW	01/30/14	VBD	ADD	SEG	TRC
G	ISSUED FOR REVIEW	12/06/13	VBD	ADD	SEG	TRC
F	ISSUED FOR REVIEW	11/22/13	VBD	ADD	SEG	TRC
E	ISSUED FOR REVIEW	10/15/13	VBD	ADD	SEG	TRC
D	ISSUED FOR REVIEW	09/13/13	VBD	ADD	SEG	TRC

DSGN	ADD	09/17/12
DRN	VBD	09/17/12
CKD	SEG	09/17/12
SCALE:	NONE	

POWER ENGINEERS

PASADENA WATER AND POWER
GLENARM REPOWERING PROJECT
(GT-5 COMBINED CYCLE INSTALLATION)
PIPING & INSTRUMENTATION DIAGRAM
CONDENSATE SYSTEM

JOB NUMBER 123374
REV H
DRAWING NUMBER M3-11-2

NOTES

1. GENERAL NOTES ARE SHOWN ON DRAWING M3-1-0. SYMBOLS AND LEGEND ARE SHOWN ON DRAWINGS M3-1-1 THRU M3-1-3.
2. ALL VALVE, PIPING SPECIALTIES AND INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED WITH "5XXX" UNLESS OTHERWISE NOTED.
3. PERFORMANCE TEST FLOW CONNECTIONS.
4. SERVICE WATER FLUSHING CONNECTIONS TO ALL SEALS ON PUMPS IN COOLING TOWER PIT.
5. FLANGE AT GRADE FOR ACCESS.

INTER-DISCIPLINE REVIEW						
DISC	ARCH	CIVIL	ELECT	I&C	MECH	STRUCT
DATE						
INIT						

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
H	ISSUED FOR REVIEW	01/30/14	VBD	ADD	SEG	TRC
G	ISSUED FOR REVIEW	12/06/13	VBD	ADD	SEG	TRC
F	ISSUED FOR REVIEW	11/22/13	VBD	ADD	SEG	TRC
E	ISSUED FOR REVIEW	10/15/13	VBD	ADD	SEG	TRC
D	ISSUED FOR REVIEW	09/13/13	VBD	ADD	SEG	TRC

DSGN	ADD	09/18/12
DRN	VBD	09/18/12
CKD	SEG	09/18/12
SCALE:	NONE	

CITY OF PASADENA INCORPORATED JUNE 1886

POWER ENGINEERS

PASADENA WATER AND POWER
GLENARM REPOWERING PROJECT
(GT-5 COMBINED CYCLE INSTALLATION)
PIPING & INSTRUMENTATION DIAGRAM
CIRCULATING WATER SYSTEM

JOB NUMBER 123374
REV H
DRAWING NUMBER M3-13-1

NOTES

1. GENERAL NOTES ARE SHOWN ON DRAWING M3-1-0. SYMBOLS AND LEGEND ARE SHOWN ON DRAWINGS M3-1-1 THRU M3-1-3.
2. ALL VALVE, PIPING SPECIALTIES AND INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED WITH "5XXX" UNLESS OTHERWISE NOTED.
3. CHILLER PACKAGE MAY HAVE MORE THAN 1 MODULE.
4. WEATHER STATION LOCATED ON TOP OF CONTROL ROOM.
5. BOP CONTRACTOR TO VERIFY CHEMICAL TREATMENT REQUIREMENTS WITH PWP'S WATER TREATMENT CHEMICAL SUPPLIER, CHEMTREAT.
6. CONDENSER AND EVAPORATOR TO BE PROVIDED WITH INDICATING DIFFERENTIAL PRESSURE GAUGES BETWEEN INLET AND OUTLET OF COOLING WATER SECTION.
7. PLATE AND FRAME COOLER WILL BE SHIPPED LOOSE AND MOUNTED ON SEPARATE FOUNDATION.

INTER-DISCIPLINE REVIEW

DISC	ARCH	CIVIL	ELECT	I&C	MECH	STRUCT
DATE						
INIT						

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
H	ISSUED FOR REVIEW	02/20/14	VBD	TRC	SLH	GTH
G	ISSUED FOR REVIEW	01/30/14	VBD	ADD	SEG	TRC
F	ISSUED FOR REVIEW	12/06/13	VBD	ADD	SEG	TRC
E	ISSUED FOR REVIEW	11/22/13	VBD	ADD	SEG	TRC
D	ISSUED FOR REVIEW	10/15/13	VBD	ADD	SEG	TRC

DSGN	ADD	09/18/12
DRN	VBD	09/18/12
CKD	SEG	09/18/12
SCALE:	NONE	

CITY OF PASADENA · INCORPORATED JUNE 1886

POWER ENGINEERS

PASADENA WATER AND POWER
GLENARM REPOWERING PROJECT
(GT-5 COMBINED CYCLE INSTALLATION)
PIPING & INSTRUMENTATION DIAGRAM
CHILLED WATER SYSTEM

JOB NUMBER: 123374
REV: H
DRAWING NUMBER: M3-25-1

5GTS-ZXX-510
GAS TURBINE GENERATOR

Opr Cap:	Proc Cap:
Opr Press:	Drv Rtg:
Opr Temp:	Spec: 485222

5CHW-PMP-010
COIL CONDENSATE SUMP PUMP

Opr Cap: 20.0 gallon/min	Proc Cap:
Opr Press:	Drv Rtg:
Opr Temp: 97.00 F	Spec: 485951.63

5CHW-SMP-030
COIL CONDENSATE SUMP

Opr Cap:	Proc Cap:
Opr Press:	Drv Rtg:
Opr Temp: 97.00 F	Spec: 485951.63

NOTES

1. GENERAL NOTES ARE SHOWN ON DRAWING M3-1-0. SYMBOLS AND LEGEND ARE SHOWN ON DRAWINGS M3-1-1 THRU M3-1-3.
2. ALL VALVE, PIPING SPECIALTIES AND INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED WITH "5XXX" UNLESS OTHERWISE NOTED.
3. INLET AIR TEMPERATURE T2 REQUIRED FROM TURBINE CONTROL SYSTEM FOR FLOW CONTROL LOOP. OTHERWISE TEMPERATURE ELEMENTS IN TURBINE INLET REQUIRED.

INTER-DISCIPLINE REVIEW						
DISC	ARCH	CIVIL	ELECT	I&C	MECH	STRUCT
DATE						
INIT						

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
G	ISSUED FOR REVIEW	01/30/14	VBD	ADD	SEG	TRC
F	ISSUED FOR REVIEW	11/22/13	VBD	ADD	SEG	TRC
E	ISSUED FOR REVIEW	10/15/13	AJG	ADD	SEG	TRC
D	ISSUED FOR REVIEW	09/13/13	VBD	ADD	SEG	TRC
C	ISSUED FOR REVIEW	07/16/13	VBD	ADD	SEG	TRC

DSGN	ADD	09/18/12
DRN	VBD	09/18/12
CKD	SEG	09/18/12
SCALE:	NONE	

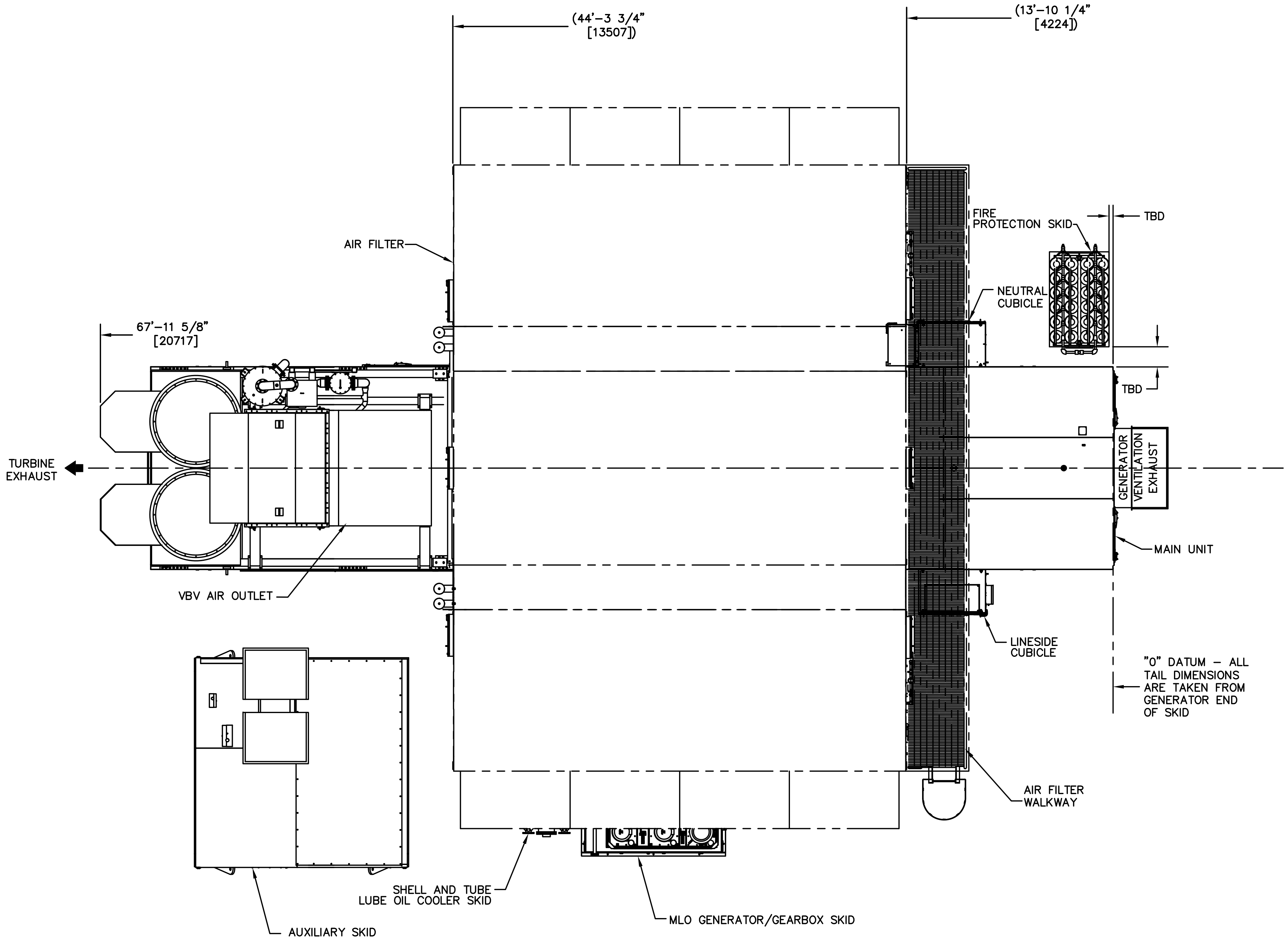
CITY OF PASADENA INCORPORATED JUNE 1886

POWER ENGINEERS

PASADENA WATER AND POWER
GLENARM REPOWERING PROJECT
(GT-5 COMBINED CYCLE INSTALLATION)
PIPING & INSTRUMENTATION DIAGRAM
CHILLED WATER SYSTEM

JOB NUMBER: 123374
REV: G
DRAWING NUMBER: M3-25-2

Enclosure 8



PLAN VIEW

NOTES:

1. TOLERANCE ON FLANGE CONNECTIONS ±1/8" [3]
   TOLERANCE ON ELECTRICAL CONNECTIONS ±1/8" [3]
   TOLERANCE ON BOLT HOLES ±1/16" [2] TRUE POSITION
2. DIMENSIONS AND VALUES IN [ ] ARE SI UNITS AND ARE GIVEN FOR REFERENCE ONLY. EQUIPMENT SHALL BE DESIGNED AND MANUFACTURED USING U.S. CUSTOMARY UNITS.
3. ADDITIONAL EXTERIOR LIGHTING TO BE SUPPLIED BY CUSTOMER.
4. MAXIMUM LOAD ON EACH ENGINE REMOVAL FOOT PAD IS 10,000 LBS [4536 kg], (20,000 LBS [9072 kg] TOTAL ENGINE REMOVAL LOAD). MAXIMUM LOAD ON EACH GEARBOX REMOVAL PAD IS 28,000 LBS [12700 kg]
5. AUXILIARY SKID, SPRINT SKID & FIRE PROTECTION SKID FOUNDATIONS MUST BE AT THE SAME ELEVATION AS THE MAIN SKID FOUNDATION. MLO SKID FOUNDATION MUST BE 1'-6 1/2" [471] LOWER.
6. CUSTOMER DRAWING NUMBERS CONSIST OF: (ORDER NUMBER)-(STANDARD DRAWING NUMBER), AND ARE REFERENCED AS X-(STANDARD DRAWING NUMBER), WHERE X = ORDER NUMBER.
7. TOLERANCES:
   LINEAR DIMENSION: ±1/8" [3]
   ANGULAR: ±0.5°
8. PIPING AND/OR TUBING MATERIAL SPECIFICATION LISTED IN CONNECTION LEGEND SHALL BE USED BY CUSTOMER AS A RECOMMENDATION IN DESIGN OF THEIR PLANT INTERCONNECT PIPING SYSTEM.

SAFETY NOTE: CAUTION

1. GEPPLP SHALL NOT BE LIABLE FOR DAMAGE CAUSED BY EXCESSIVE FLANGE LOADS OR INADEQUATE EXPANSION JOINT DESIGN. FAILURE TO PROVIDE FOR ADEQUATE THERMAL EXPANSION OR EXCEEDING ALLOWABLE FLANGE LOADS MAY RESULT IN DAMAGE TO OR DESTRUCTION OF FASTENERS AND ENGINE/EXHAUST SYSTEM RELATED HARDWARE RESULTING IN EXHAUST LEAKS AND ACCELERATED WEAR ON THE EXHAUST DIFFUSER ASSEMBLY. IT IS THE CUSTOMER'S RESPONSIBILITY TO ALLOW A CONSERVATIVE AMOUNT OF EXPANSION CAPABILITY TO ACCOMMODATE INSTALLATION ERRORS AND TOLERANCE STACK-UPS FOR THE COMPLETE EXHAUST SYSTEM.
2. IN THE REMOTE CHANCE OF A HP ROTOR FAILURE THE ENGINE CASING MAY NOT CONTAIN THE ENTIRE FAILURE. IT IS HIGHLY RECOMMENDED THAT NO PERMANENTLY MANNED SPACES BE LOCATED IN THE PLANE OF THE HP TURBINE. IT IS ALSO HIGHLY RECOMMENDED THAT ALL POTENTIALLY HAZARDOUS LINES (i.e. FUEL) OR EQUIPMENT (i.e. SHUTOFF VALVES, CONTROL VALVES) ALSO BE LOCATED OUTSIDE THE PLANE OF THE HP TURBINE.

REFERENCE DRAWINGS:

X-969204 GENERAL ARRANGEMENT, AIR FILTER
X-969219 GENERAL ARRANGEMENT, AUXILIARY SKID, LH
X-969221 GENERAL ARRANGEMENT, GENERATOR/GEARBOX MINERAL LUBE OIL SKID

RESERVED

REVISIONS

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

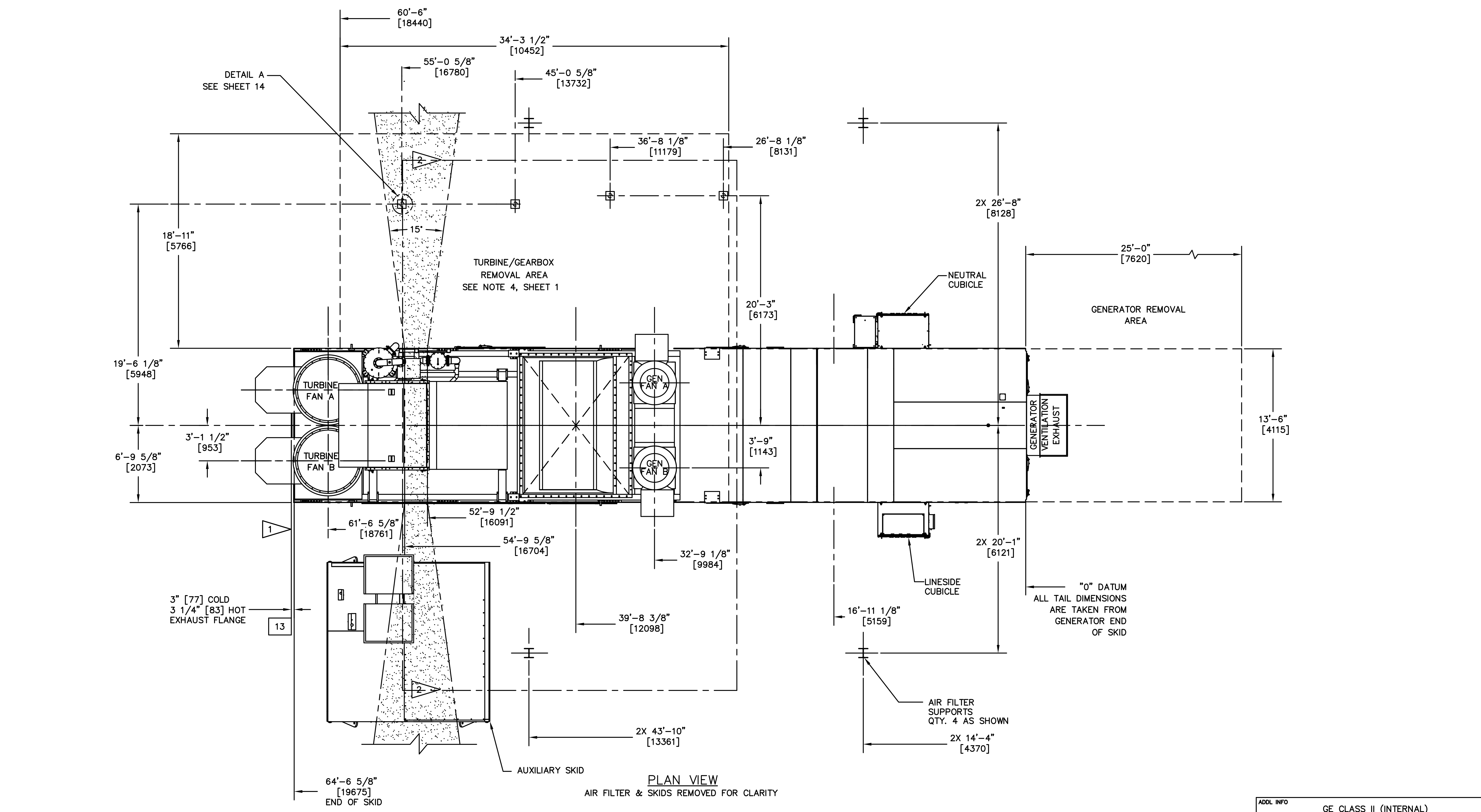
ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201 REV. A

SCALE 1/4" = 1'-0" SHEET 1 OF 14



PLAN VIEW
AIR FILTER & SKIDS REMOVED FOR CLARITY

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES
DECIMALS .XX ± .03 .XXX ± .010 FRACTIONAL ±1/16" ANGULAR ±1°

NEXT ASSY.

UNIT TYPE LM6000

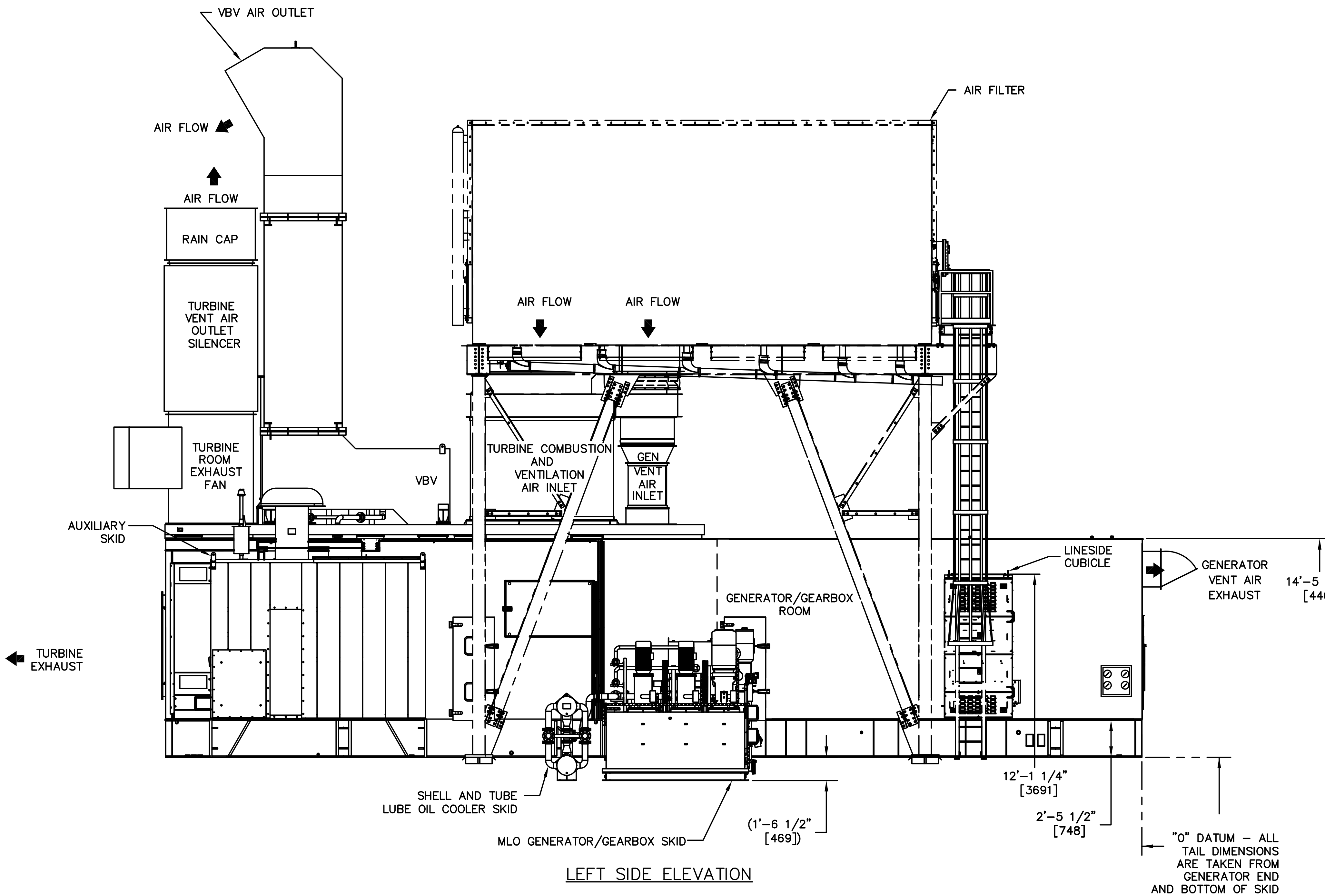
ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201 REV. A

SCALE 1/4" = 1'–0" SHEET 2 OF 14



LEFT SIDE ELEVATION

RESERVED

REVISIONS

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

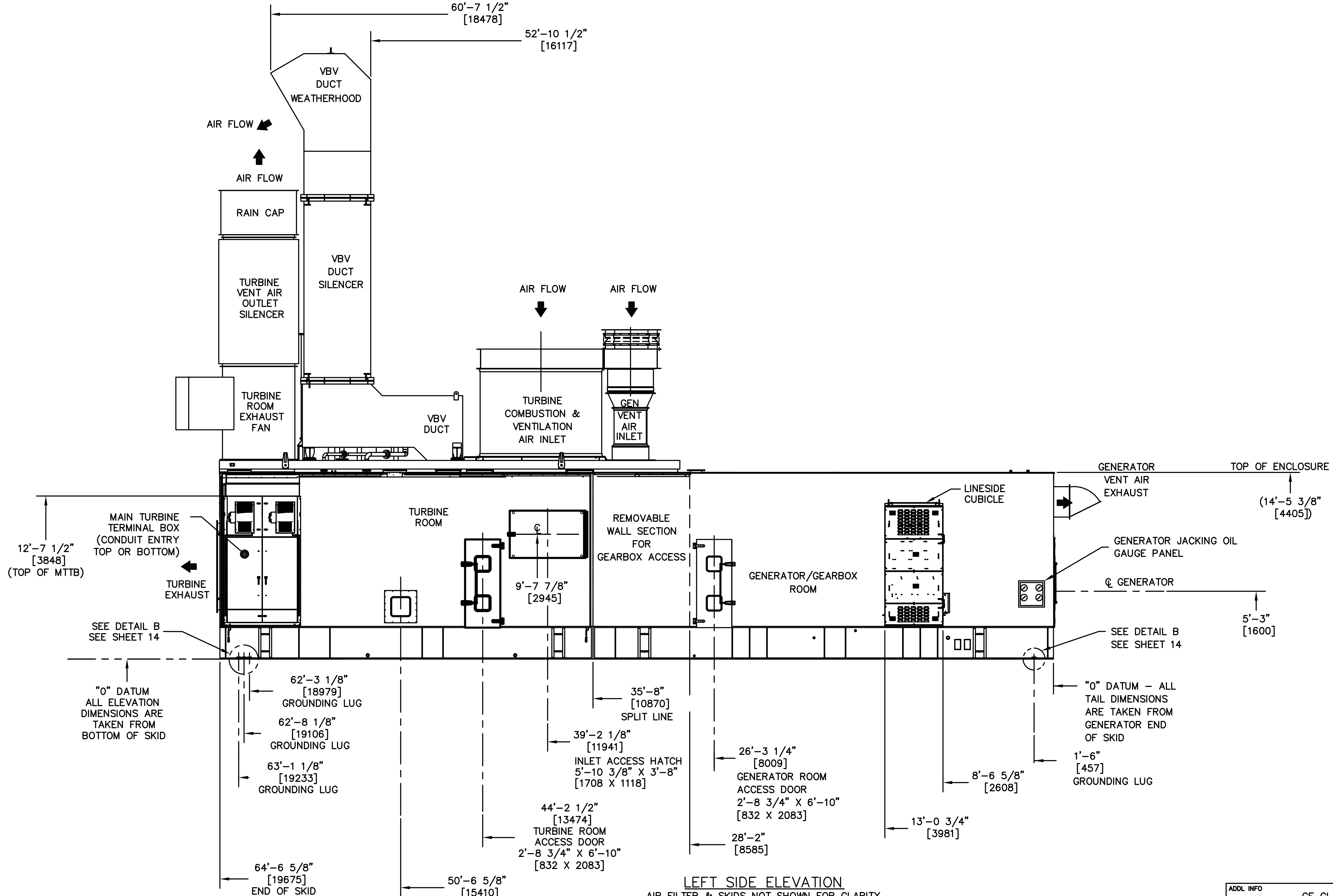
ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201 REV. A

SCALE 1/4" = 1'–0" SHEET 3 OF 14



LEFT SIDE ELEVATION
AIR FILTER & SKIDS NOT SHOWN FOR CLARITY

ADDL INFO: GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE: GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201 REV. A

SCALE 1/4" = 1'-0" SHEET 4 OF 14

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

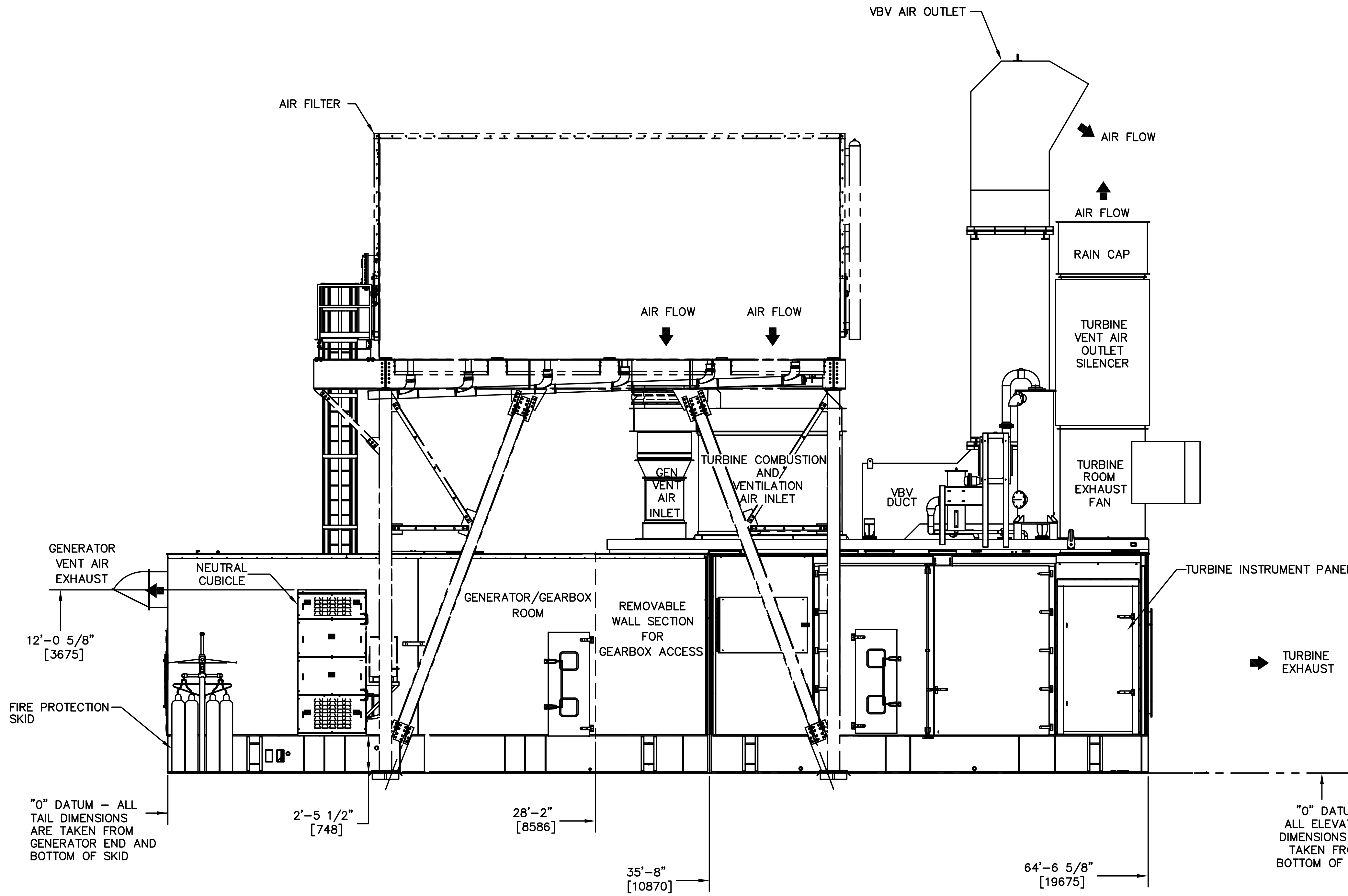
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000



RIGHT SIDE ELEVATION

RESERVED

REVISIONS

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000®

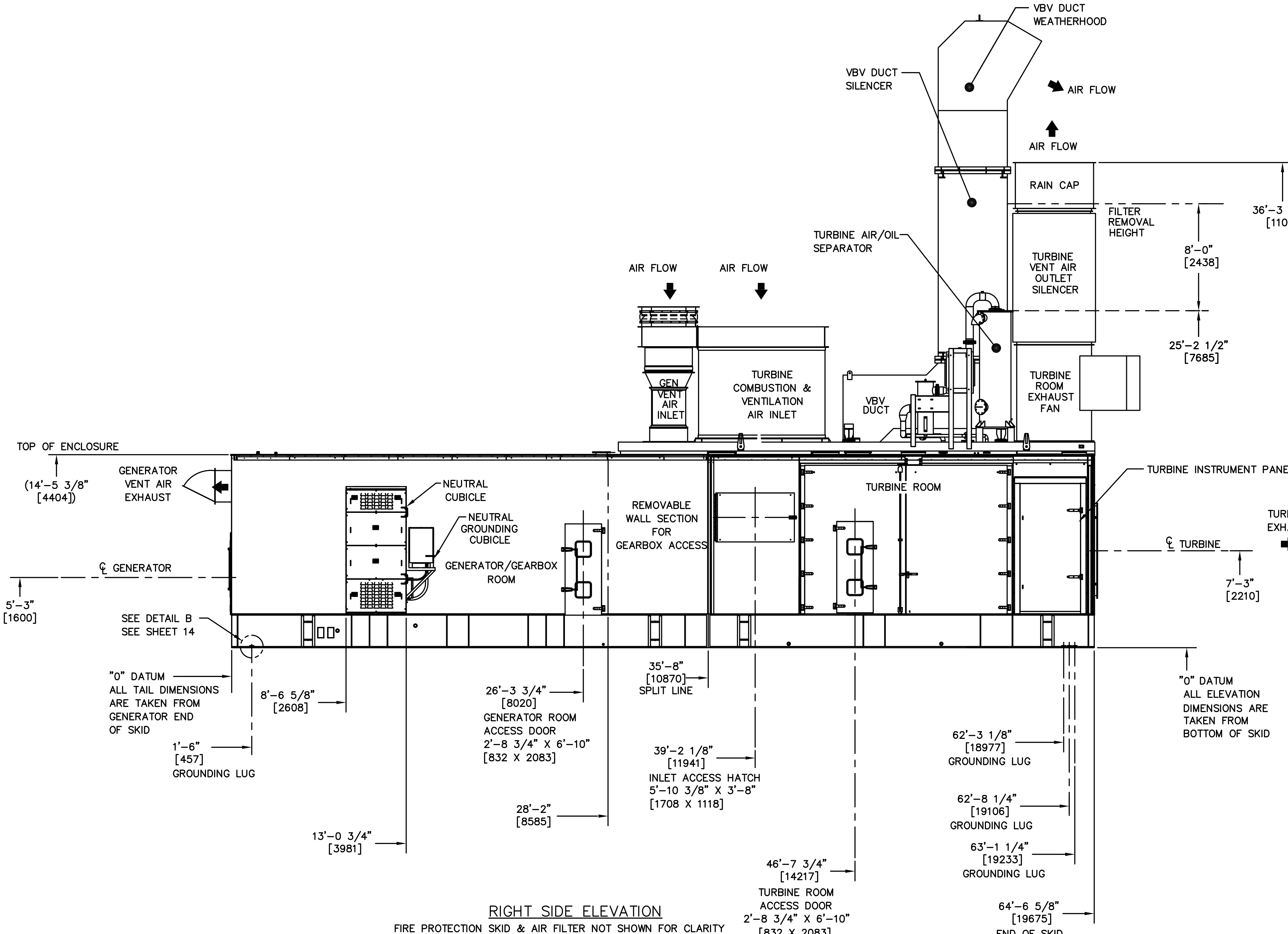
ADDL INFO: GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE: GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049-969201 REV. A

SCALE 1/4" = 1'-0" SHEET 5 OF 14



RIGHT SIDE ELEVATION

FIRE PROTECTION SKID & AIR FILTER NOT SHOWN FOR CLARITY

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

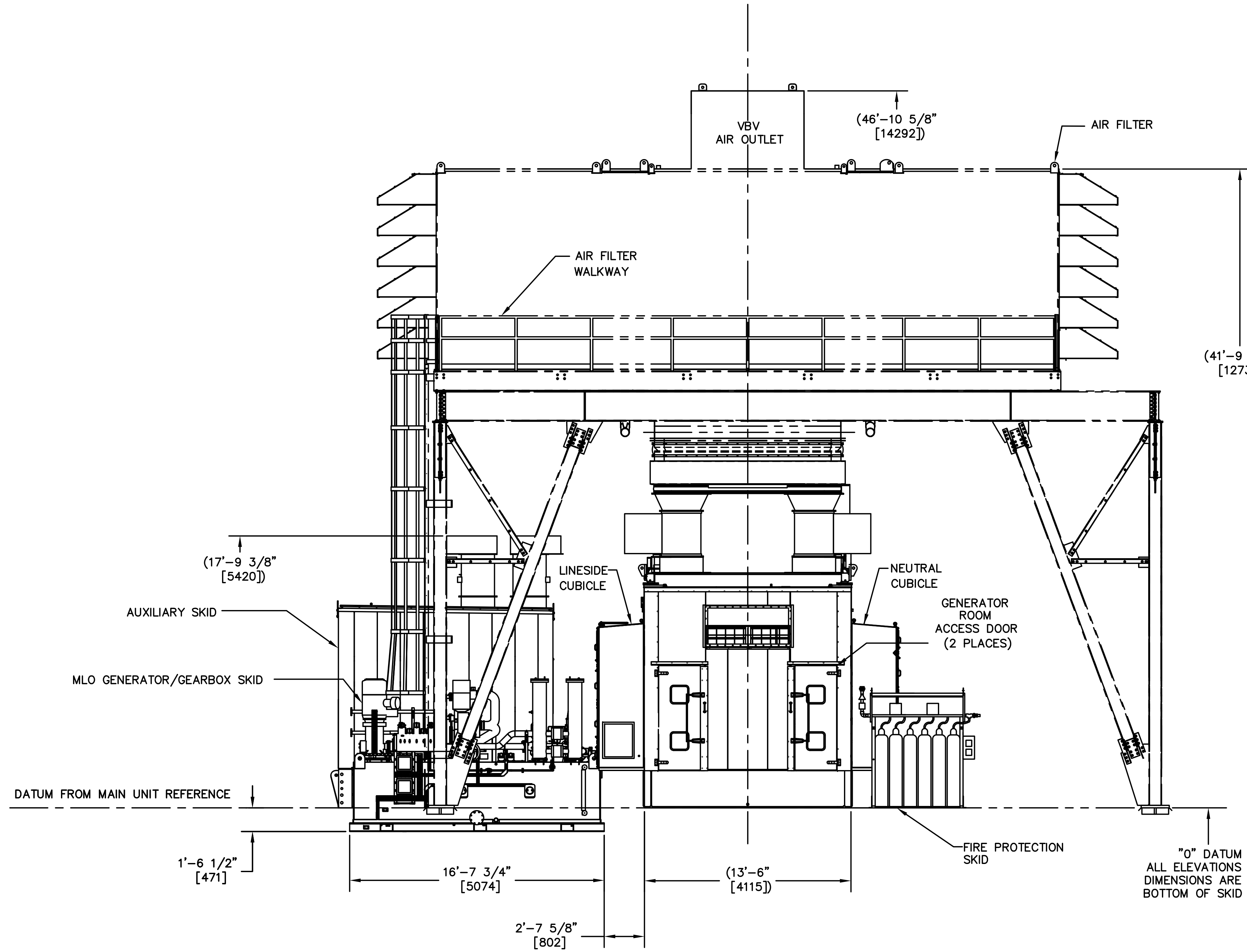
ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201 REV. A

SCALE 1/4" = 1'-0" SHEET 6 OF 14



GENERATOR END VIEW

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

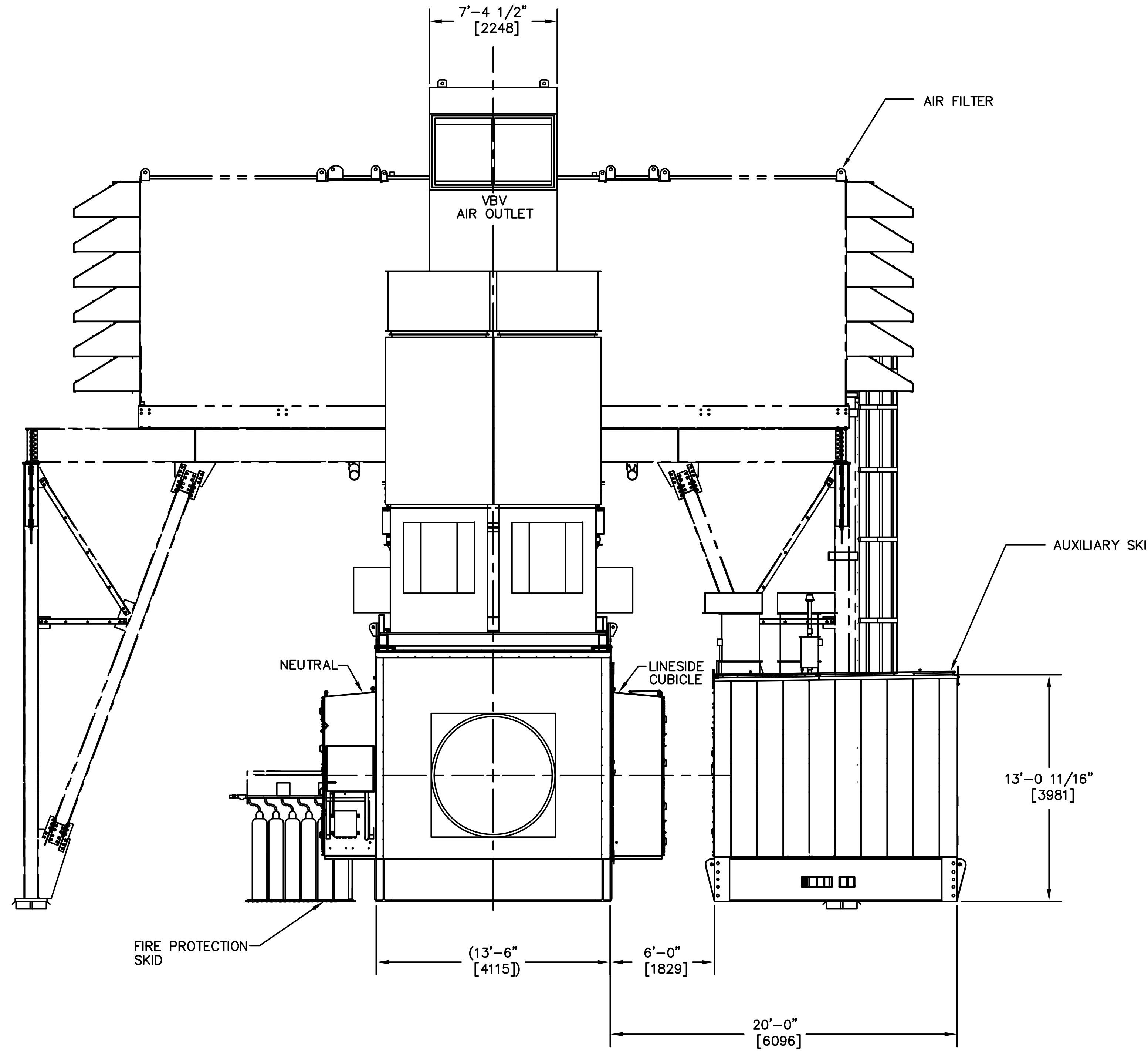
TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201

REV. A

SCALE 1/4" = 1'-0"

SHEET 7 OF 14



EXHAUST END VIEW

ADDL INFO: GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE: GENERAL ARRANGEMENT
MAIN UNIT – LH

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

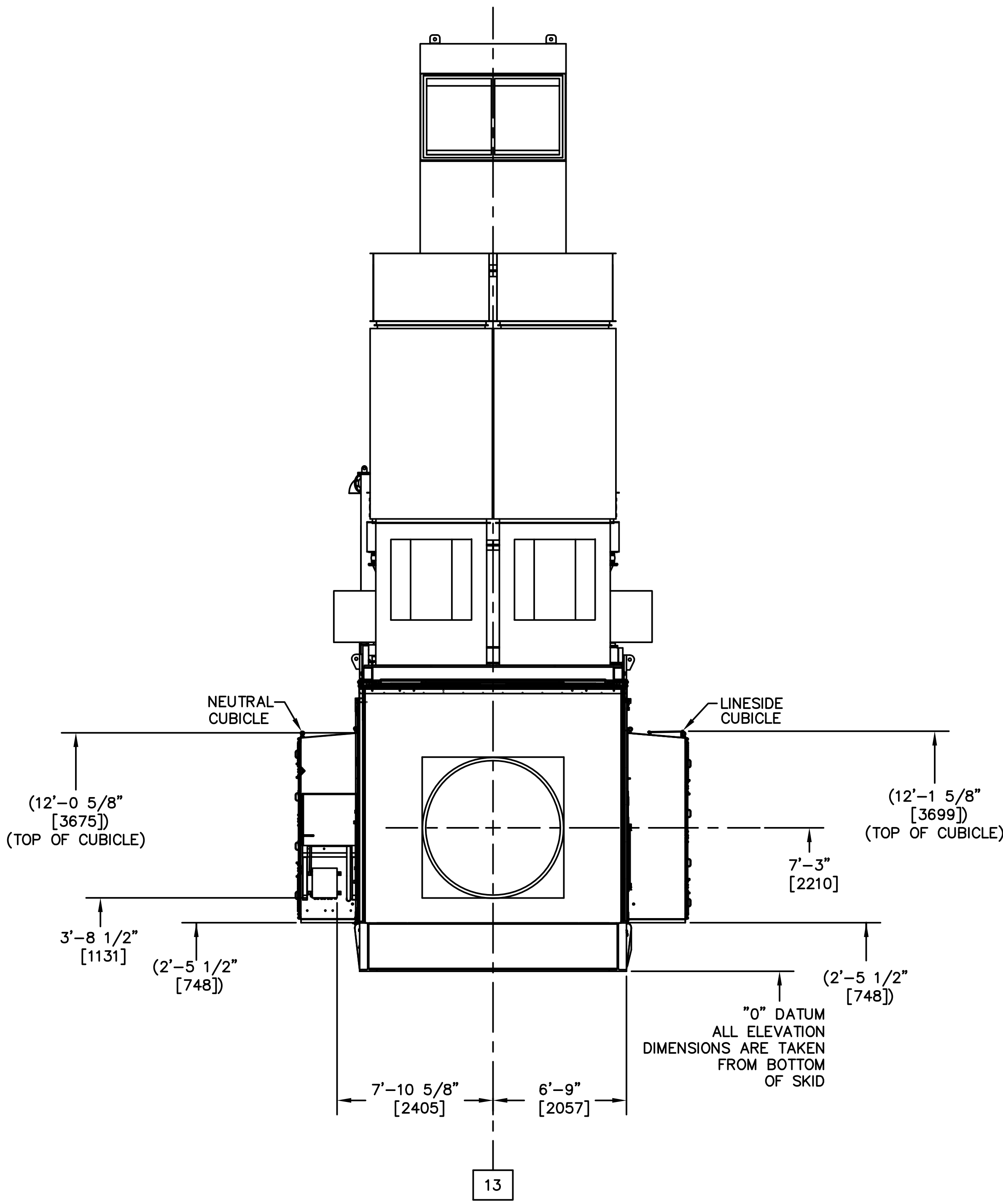
UNIT TYPE: LM6000

DWG NO. 7253049–969201

REV. A

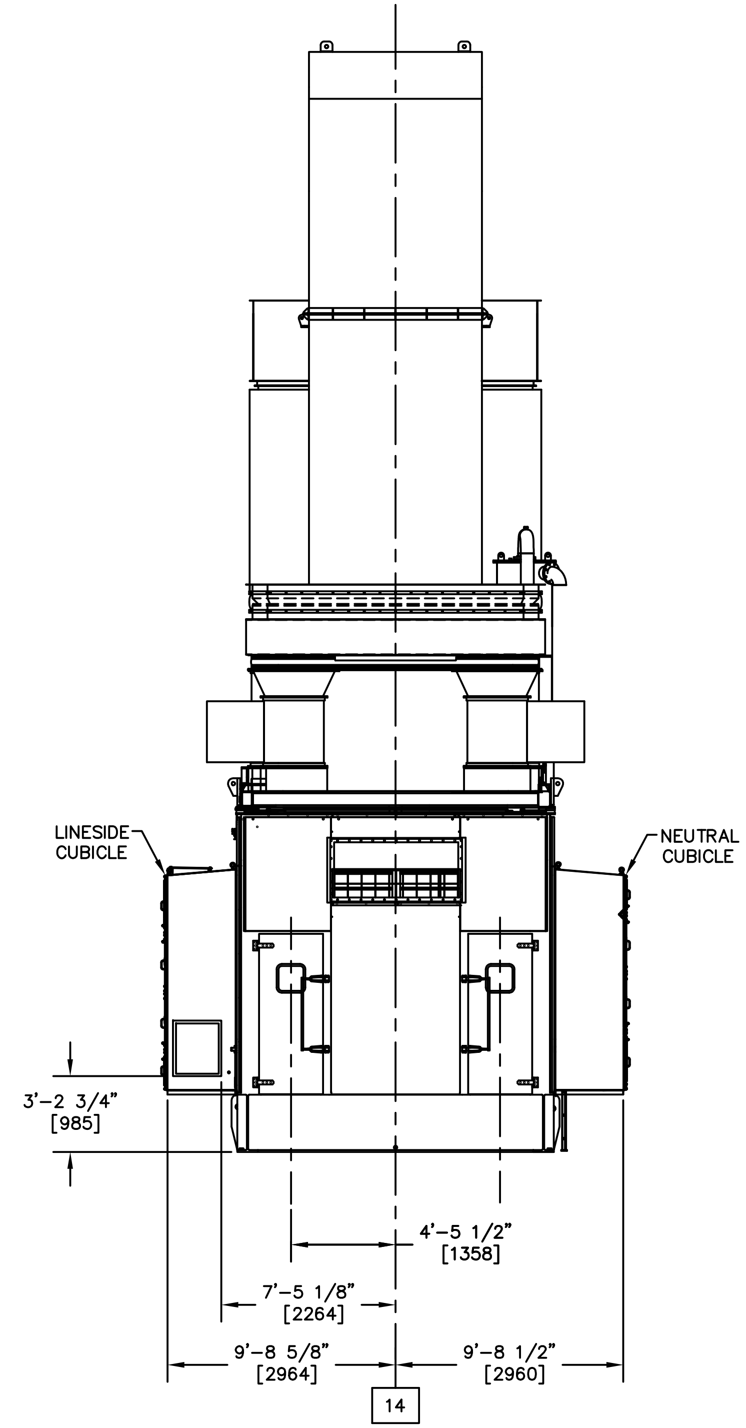
SCALE 1/4" = 1'-0"

SHEET 8 OF 14



VIEW FROM EXHAUST END

AIR FILTER AND SKIDS NOT SHOWN FOR CLARITY



VIEW FROM GENERATOR END

AIR FILTER AND SKIDS NOT SHOWN FOR CLARITY

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201

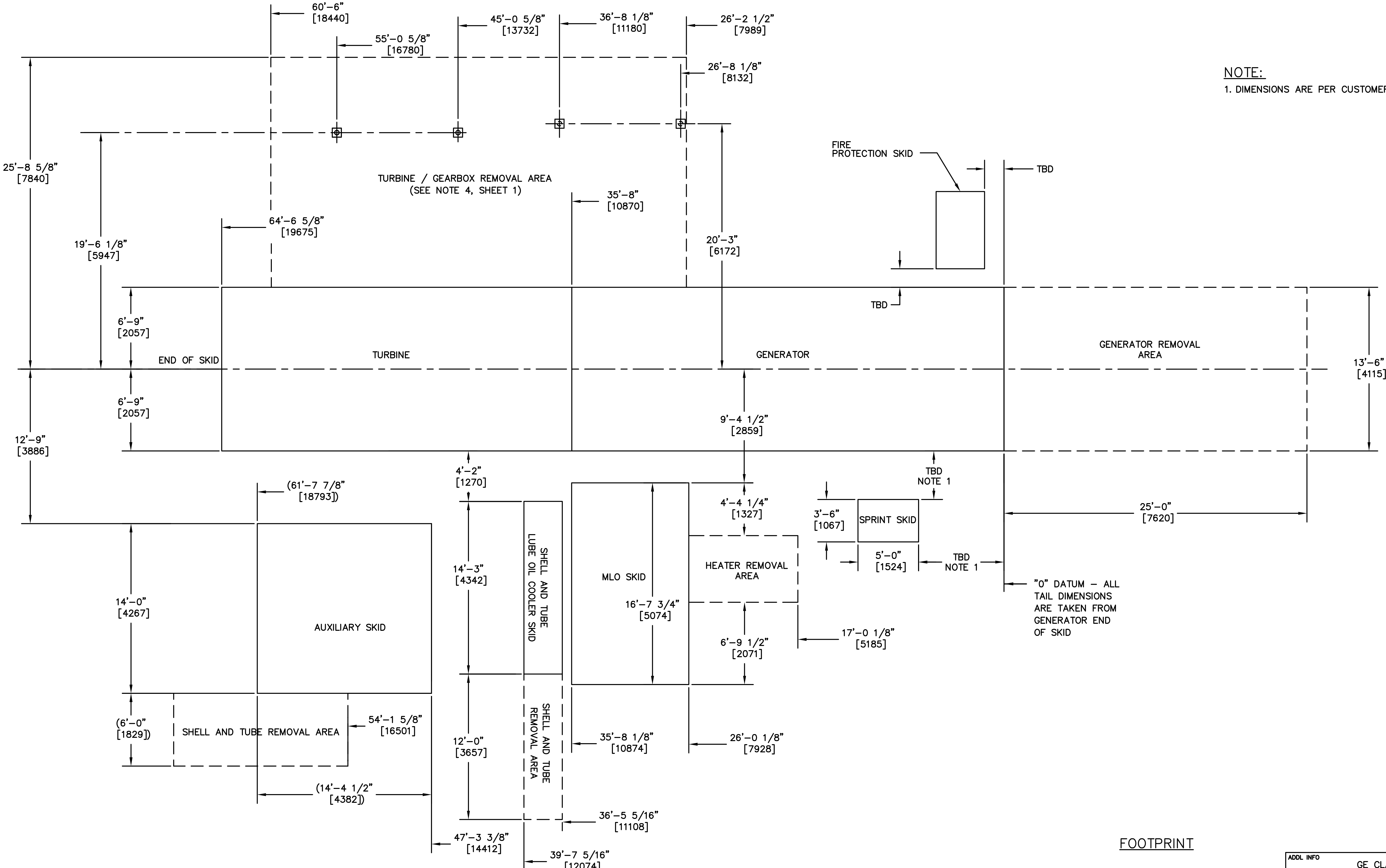
REV. A

SCALE 1/4" = 1'-0"

SHEET 9 OF 14

NOTE:

1. DIMENSIONS ARE PER CUSTOMER PREFERENCE



FOOTPRINT

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS .XX ± .03 .XXX ± .010 FRACTIONAL ±1/16" ANGULAR ±1°

NEXT ASSY.

UNIT TYPE LM6000

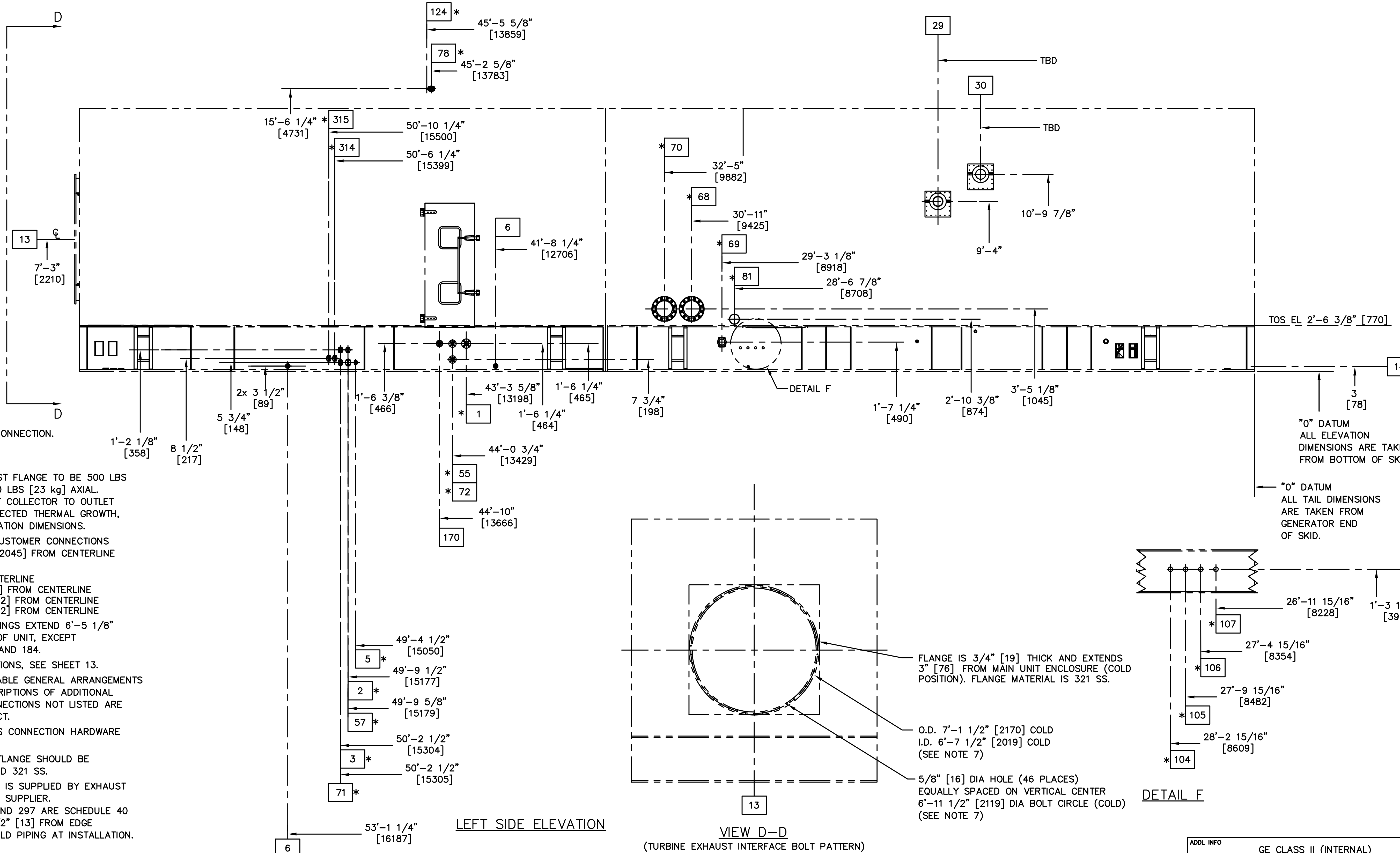
ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049-969201 REV. A

SCALE 1/4" = 1'-0" SHEET 10 OF 14



LEGEND

☐ INDICATES CUSTOMER CONNECTION.

NOTES:

1. MAXIMUM LOAD ON EXHAUST FLANGE TO BE 500 LBS [227 kg] VERTICAL AND 50 LBS [23 kg] AXIAL. TRANSITION FROM EXHAUST COLLECTOR TO OUTLET FLANGE IS SOLID. FOR EXPECTED THERMAL GROWTH, SEE EXHAUST OUTLET LOCATION DIMENSIONS.
2. ALL MAIN UNIT FLANGED CUSTOMER CONNECTIONS ARE LOCATED 6'-8 1/2" [2045] FROM CENTERLINE OF UNIT, EXCEPT:
   - 14: ALIGNED WITH CENTERLINE
   - 149: 7'-0 1/4" [2140] FROM CENTERLINE
   - 228: 6'-10 3/8" [2092] FROM CENTERLINE
   - 229: 6'-10 3/8" [2092] FROM CENTERLINE
3. ALL MAIN UNIT NPT COUPLINGS EXTEND 6'-5 1/8" [1959] FROM CENTERLINE OF UNIT, EXCEPT CONNECTION 14, 161, 183 AND 184.
4. FOR CONNECTION DESCRIPTIONS, SEE SHEET 13.
5. REFERENCE OTHER APPLICABLE GENERAL ARRANGEMENTS FOR LOCATIONS AND DESCRIPTIONS OF ADDITIONAL CONNECTIONS. THOSE CONNECTIONS NOT LISTED ARE NOT USED ON THIS PROJECT.
6. AN ASTERISK (*) INDICATES CONNECTION HARDWARE BY GEPPLP.
7. "HOT" INTERFACE MATING FLANGE SHOULD BE EXTERNALLY INSULATED AND 321 SS.
8. HARDWARE CONNECTION 13 IS SUPPLIED BY EXHAUST STACK / EXPANSION JOINT SUPPLIER.
9. CONNECTIONS 10, 11, 24 AND 297 ARE SCHEDULE 40 304 SS PIPE RECESSED 1/2" [13] FROM EDGE OF SKID. CUSTOMER TO WELD PIPING AT INSTALLATION.

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000®

ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

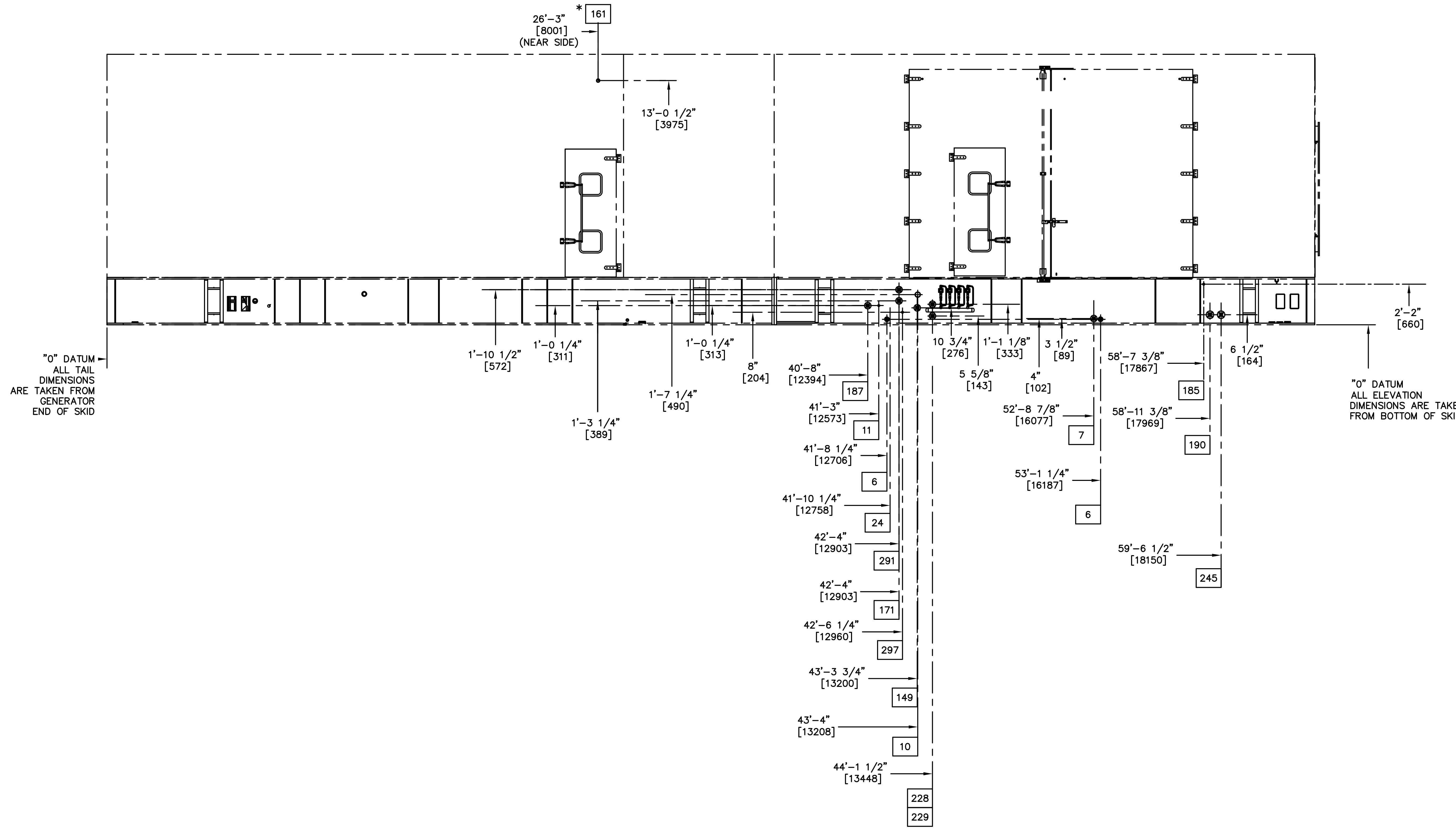
TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049-969201

REV. A

SCALE 3/8" = 1'-0"

SHEET 11 OF 14



RIGHT SIDE ELEVATION

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DO NOT SCALE DRAWING

TOLERANCES

DECIMALS	FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT
MAIN UNIT – LH

DWG NO. 7253049-969201

REV. A

SCALE 3/8" = 1'-0"

SHEET 12 OF 14

CUSTOMER CONNECTION LEGEND:

*	1	DEMINERALIZED WATER SUPPLY FOR WATER INJECTION – 1 1/2"–600# RF, TP316 PIPE SCH 40S
*	2	HYDRAULIC STARTER SUPPLY – 1 1/2"–6000# FF, SAE CODE 62, TP304 PIPE SCH XXS
*	3	HYDRAULIC STARTER RETURN – 1 1/2"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S
*	5	HYDRAULIC STARTER CASE DRAIN – 1"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S
	6	TURBINE SUMP DRAIN – 2" FNPT 3000#, CPLG, 304SS
	7	EXHAUST DRAIN – 1"–150# RF, TP304 PIPE SCH 40S
	10	GAS FUEL INLET – 3" PIPE, TP304 SCH 40S
	11	GAS FUEL VENT – 1" PIPE, TP304 SCH 40S
	13	TURBINE EXHAUST DUCT CONNECTION – N/A
	14	GENERATOR/GEARBOX SUMP DRAIN – 1" FNPT 3000#, CPLG, 304SS
	24	GAS FUEL VENT – 1" PIPE, TP304 SCH 40S
	29	TEWAC INLET – 6" 150# RF,TP304 PIPE SCH10S
	30	TEWAC OUTLET – 6" 150# RF,TP304 PIPE SCH10S
*	55	INSTRUMENT AIR SUPPLY – 1"–600# RF, TP304 PIPE SCH 40S
*	57	SCAVENGE LUBE OIL FILTER/COOLER SUPPLY – 1 1/2"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S
*	68	GEARBOX LUBE OIL RETURN LINE – 10" PIPE, TP304 SCH 10S
*	69	GENERATOR LUBE OIL SUPPLY – 4"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S
*	70	GEARBOX LUBE OIL RETURN LINE – 10" PIPE, TP304 SCH 10S
*	71	TURBINE LUBE OIL PUMP SUPPLY – 1 1/2"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S
*	72	WATER WASH SUPPLY – 1"–600# RF, TP304 PIPE SCH 40S
*	78	TURBINE LUBE OIL AIR/OIL PRE–SEPARATOR RETURN – 1 1/2"–3000# FF, SAE CODE 61, TP304 SCH 40S
*	81	GENERATOR LUBE OIL DRAIN LINE – 6" PIPE, TP304 SCH 10S
*	104	JACKING OIL RETURN – 3/4" COMPRESSION TUBE FITTING, TP304 TUBING 0.065" WT MINIMUM
*	105	JACKING OIL RETURN – 3/4" COMPRESSION TUBE FITTING, TP304 TUBING 0.065" WT MINIMUM
*	106	JACKING OIL RETURN – 3/4" COMPRESSION TUBE FITTING, TP304 TUBING 0.065" WT MINIMUM
*	107	JACKING OIL RETURN – 3/4" COMPRESSION TUBE FITTING, TP304 TUBING 0.065" WT MINIMUM
*	124	TURBINE LUBE OIL AIR/OIL SEPARATOR RETURN – 1/2" JIC, TP304 TUBING 0.049" WT MINIMUM
	149	INLET VOLUTE DRAIN – 2"–150# RF, TP304 PIPE SCH 40S
*	161	CO2 – 1 1/4" FNPT 3000#, CPLG, 304SS
	170	SPRINT WATER SUPPLY – 1"–150# RF, TP316 PIPE SCH 40S
	171	SPRINT DRAIN – 1"–150# RF, TP316 PIPE SCH 40S
	185	INSTRUMENT AIR FOR DAMPER RESET – 1/4" FNPT, 304SS
	187	VBV DUCT DRAIN – 1"–150# RF, TP304 PIPE SCH 40S
	190	WATER INJECTION BYPASS – 1"–600# RF, TP304 PIPE SCH 40S
	228	TURBINE LUBE OIL OVERBOARD DRAIN VENT – 1"–150# RF, TP304 PIPE SCH 40S
	229	TURBINE LUBE OIL OVERBOARD DRAIN – 1"–150# RF, TP304 PIPE SCH 40S
	245	WATER INJECTION OVERBOARD DRAIN – 1"–150# RF, TP316 PIPE SCH 40S
	291	STARTER CLUTCH SEAL TELL–TALE DRAIN – 1"–150# RF, TP304 PIPE SCH 40S
	297	GAS FUEL VENT – 1" PIPE, TP304 SCH 40S
*	314	TURBINE LUBE OIL DISCHARGE TO COOLER – 1 1/2"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S
*	315	TURBINE LUBE OIL RETURN FROM COOLER – 1 1/2"–3000# FF, SAE CODE 61, TP304 PIPE SCH 40S

NOTE:

1. AN ASTERISK (*) INDICATES CONNECTION HARDWARE BY GEPPLP.

RESERVED

REVISIONS

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES

DECIMALS .XX ± .03 .XXX ± .010 | FRACTIONAL ±1/16" | ANGULAR ±1°

NEXT ASSY.

UNIT TYPE LM6000

ADDL INFO: GE CLASS II (INTERNAL)

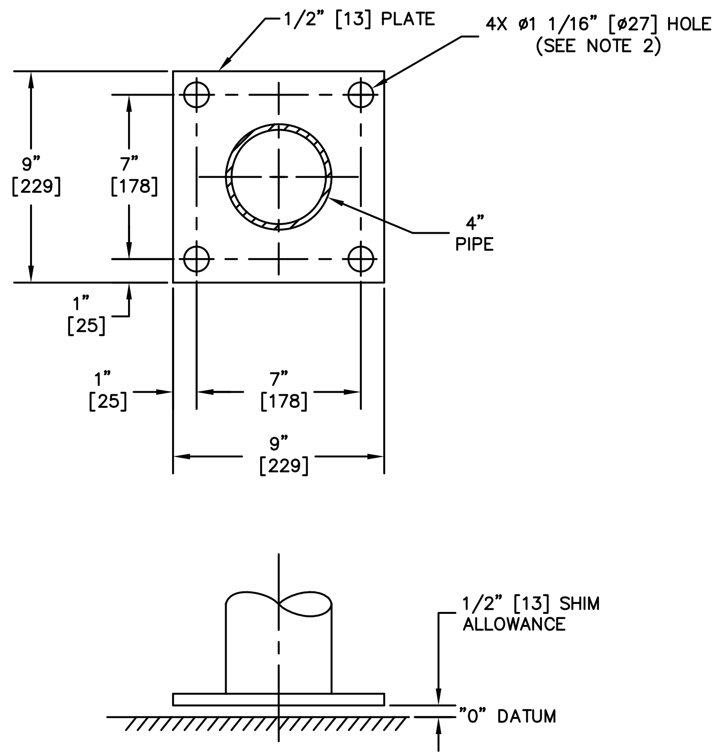
GE PACKAGED POWER, L.P.

TITLE: GENERAL ARRANGEMENT MAIN UNIT – LH

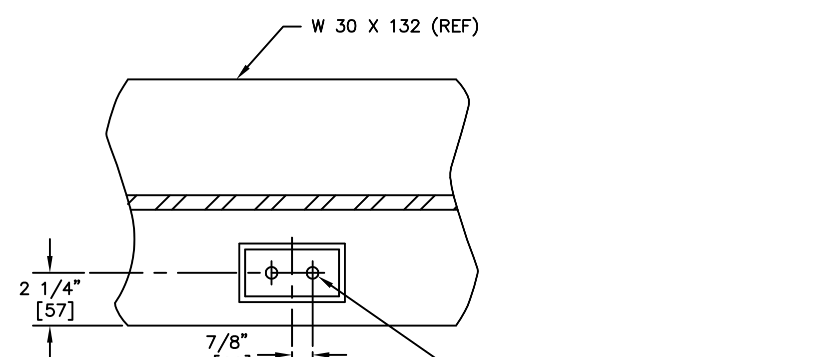
DWG NO. 7253049–969201 REV. A

SCALE NONE SHEET 13 OF 14

NOTES:
1. ALL ANCHORING HARDWARE TO BE SUPPLIED BY CUSTOMER.
2. BOLT HOLE TOLERANCE ± 1/8" [3], TRUE POSITION.



DETAIL A
ENGINE & GEARBOX REMOVAL FOOT PAD
SEE SHEET 2
(SEE NOTE 4, SHEET 1)



DETAIL B
GROUNDING LUG
SEE SHEETS 4 & 6

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11914	DLC	11/12/13	DT

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES
DECIMALS .XX ± .03 .XXX ± .010
FRACTIONAL ±1/16"
ANGULAR ±1°

NEXT ASSY.

UNIT TYPE LM6000

ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE GENERAL ARRANGEMENT MAIN UNIT – LH

DWG NO. 7253049–969201

REV. A

SCALE 3" = 1'–0"

SHEET 14 OF 14

Enclosure 9

NOTES:

1. * ASTERISK INDICATES FURNISHED BY OTHERS. ITEMS SHOWN AS "BY OTHERS" MAY VARY BUT ARE SHOWN TO ATTEMPT CLARITY OF PERSPECTIVE ON THIS DRAWING.
2. APPLICABLE STANDARD/SPECIFICATION: IEEE 315–1975 GRAPHIC SYMBOLS FOR ELECTRICAL AND ELECTRONIC DIAGRAMS.
3. CUSTOMER DRAWING NUMBERS CONSIST OF: (ORDER NUMBER)–(STANDARD DRAWING NUMBER), AND ARE REFERENCED AS X–(STANDARD DRAWING NUMBER), WHERE X = ORDER NUMBER.
4. ALL COMPONENTS SHOWN DE–ENERGIZED (SHELF STATE).
5. GENERATOR PHASE SEQUENCE IS T1–T2–T3 FOR LEFT HAND LINESIDE CUBICLE OR T4–T5–T6 FOR RIGHT HAND LINESIDE CUBICLE. SEE MAIN UNIT GENERAL ARRANGEMENT FOR LINESIDE PLACEMENT.
6. VOLTAGE TRANSFORMER FUSE LOSS DETECTION HAS BEEN PROGRAMMED IN THE IGPS.
7. DMMF INCLUDES THE FOLLOWING: VOLTS, AMPS, POWER FACTOR, kW, kVA, kvar, FREQ, kVAh & kWh.
8. REFERENCE X–969964 FOR INTEGRATED GENERATOR PROTECTION SYSTEM (IGPS) SETTINGS.
9. TEST SWITCHES SHOWN WITH PLUG REMOVED.
10. CUSTOMER TO ENSURE PROPER PHASE ANGLE AND VOLTAGE FOR SYNCHRONIZER OPERATION.
11. AVR INCLUDES POWER SYSTEM STABILIZER FUNCTION.

LEGEND:

SEE X–969005

REFERENCE DRAWINGS:

X–969005 ELECTRICAL SYMBOLS, ABBREVIATIONS, AND REFERENCE DATA

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11809	MR	10/09/13	ARA

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

TOLERANCES
DECIMALS .XX ± .03 .XXX ± .010 FRACTIONAL ±1/16" ANGULAR ±1°

NEXT ASSY.

UNIT TYPE LM6000

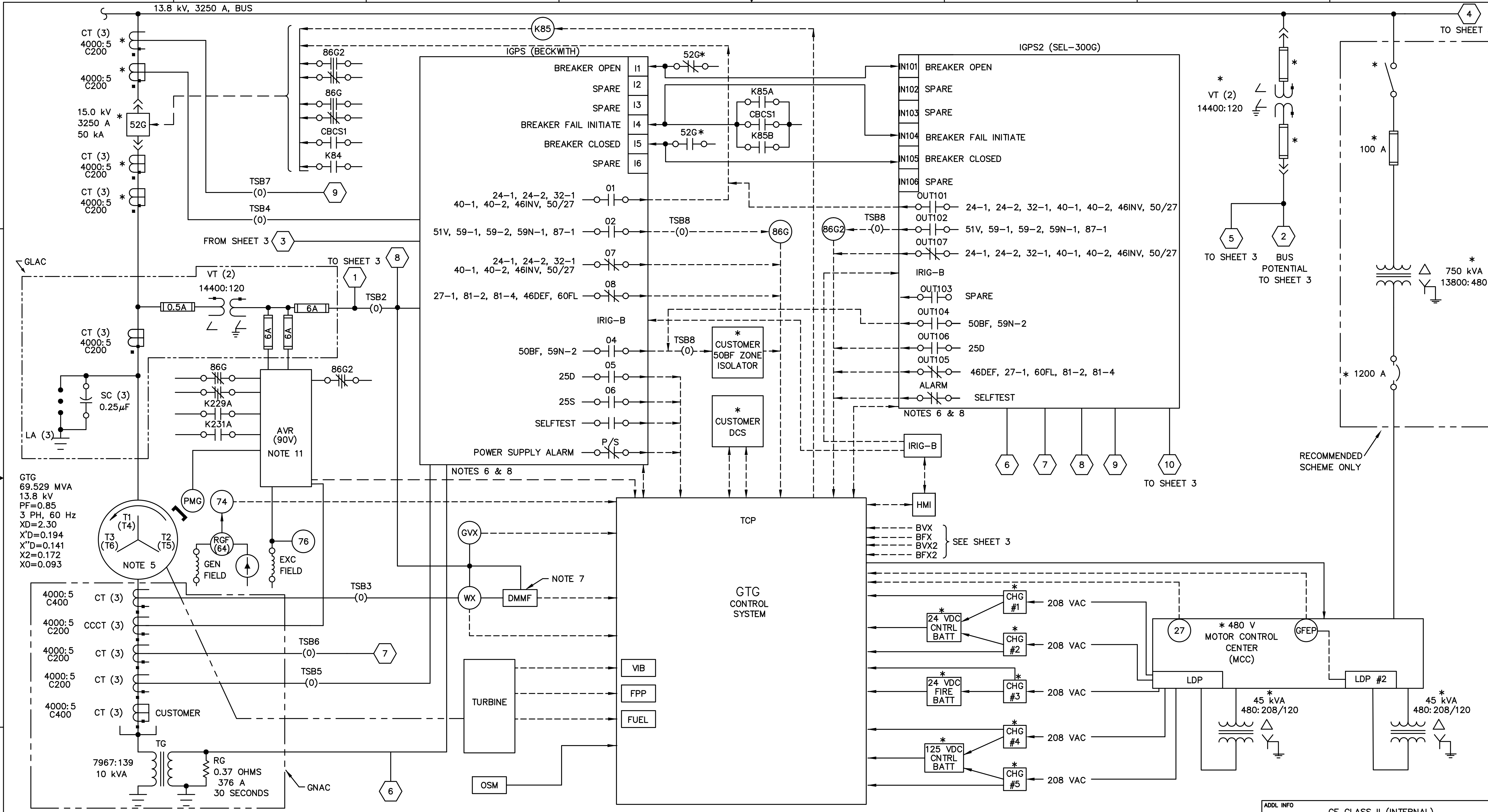
ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE ONE LINE DIAGRAM

DWG NO. 7253049–969031 REV. A

SCALE NONE SHEET 1 OF 3



ADDL INFO: GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

TITLE: ONE LINE DIAGRAM

RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11809	MR	10/09/13	ARA

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

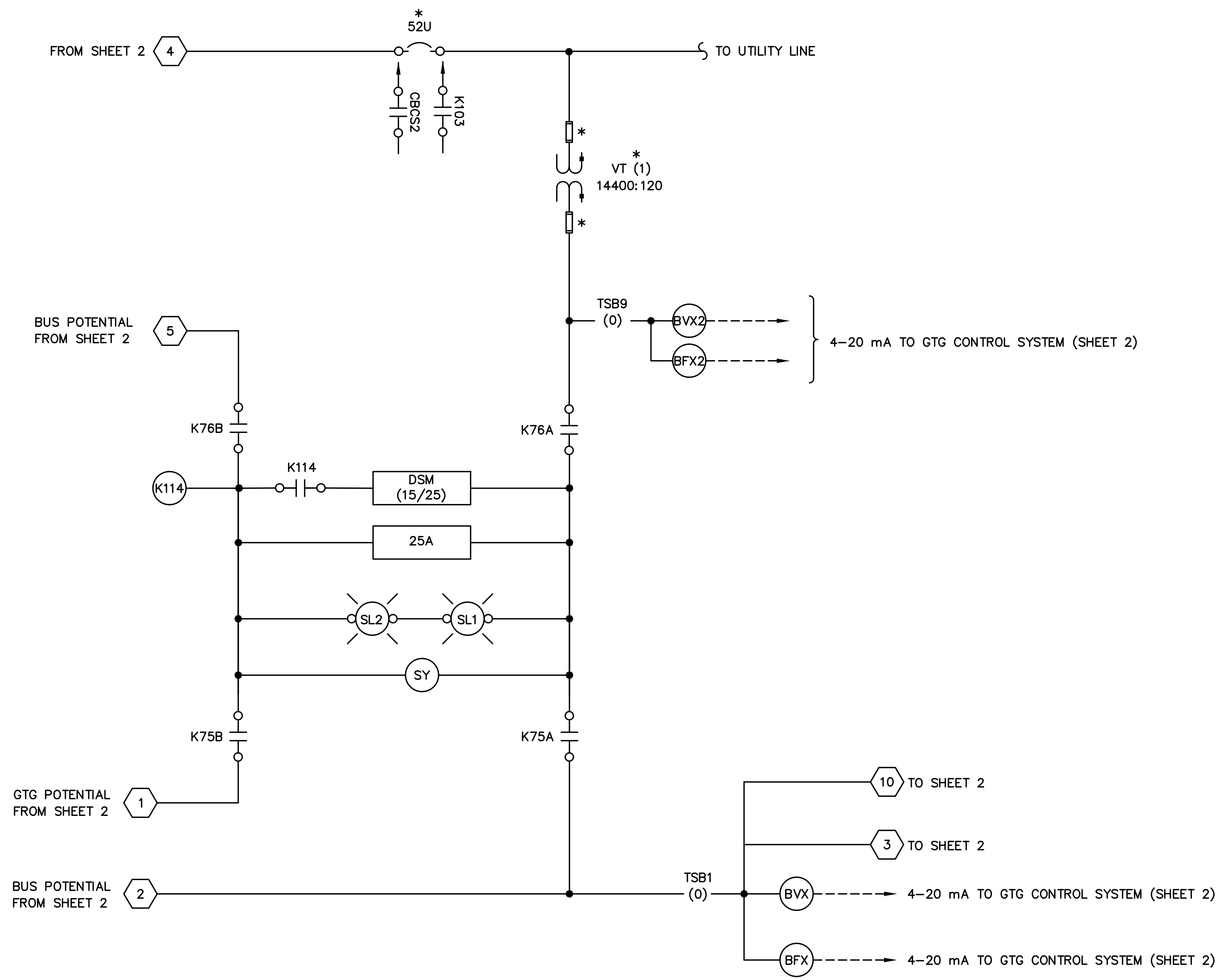
TOLERANCES: DECIMALS .XX ± .03 .XXX ± .010; FRACTIONAL ±1/16"; ANGULAR ±1°

NEXT ASSY.

UNIT TYPE: LM6000

DWG NO. 7253049-969031 REV. A

SCALE NONE SHEET 2 OF 3



RESERVED

REV	DESCRIPTION	ECO	DRAWN	DATE	DESIGN
A	ORIGINAL ISSUE	11809	MR	10/09/13	ARA

REVISIONS

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING

DECIMALS	TOLERANCES FRACTIONAL	ANGULAR
.XX ± .03 .XXX ± .010	±1/16"	±1°

NEXT ASSY.

UNIT TYPE LM6000

ADDL INFO GE CLASS II (INTERNAL)

GE PACKAGED POWER, L.P.

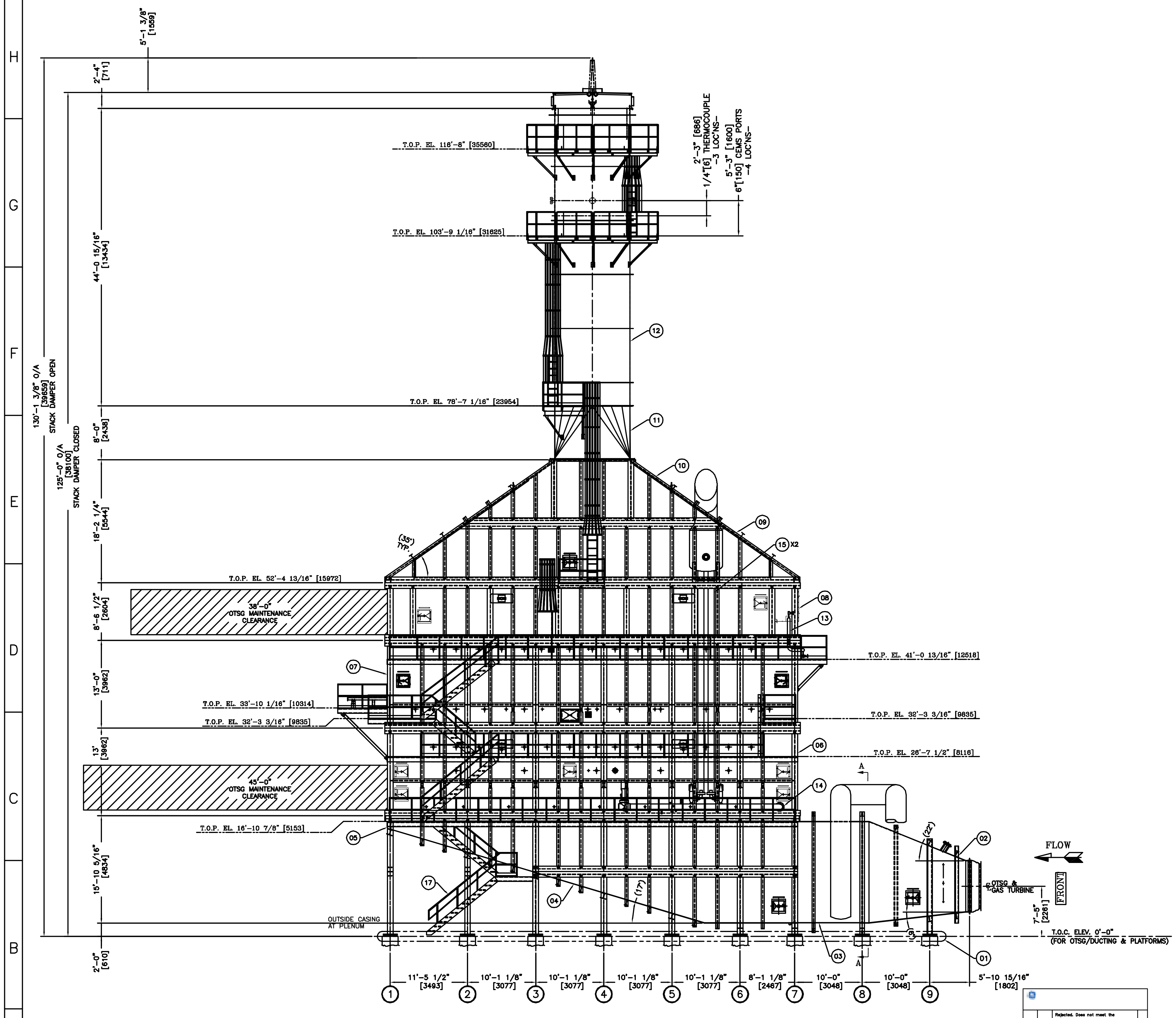
TITLE ONE LINE DIAGRAM

DWG NO.	REV.
7253049–969031	A

SCALE NONE

SHEET 3 OF 3

Enclosure 10



LEFT SIDE ELEVATION

REFERENCE DRAWINGS
FOUNDATION LOADINGS......................11303-0002
BASEPLATE LAYOUT ASSEMBLY.........11303-0003
FEEDWATER & STEAM FLOWSHEET....11303-0004

NOTES:

1. HEADERS LOCATED ON SAME END AS GAS INLET.
2. STEAM OUTLET WILL BE ON THE LEFT WHEN FACING HEADER END OF UNIT.
3. TYP. 24.00[610] CLEARANCE FOR EXTERNAL STIFFENING MUST BE NOTED AND ADHERED TO BY OTHERS.
4. ALL PRIMARY DIMENSIONS & ELEVATIONS ARE IN FEET & INCHES. ALL SECONDARY DIMENSIONS ARE IN mm.
5. IST T.P. DESIGNATES IST TERMINAL POINT, F/S=FAR SIDE, N/S=NEAR SIDE, I/S=INSIDE, O/S=OUTSIDE.
6. ALL EXTERNAL PIPING WELDS TO BE IN ACCORDANCE WITH ASME B31.1 2007 EDITION.
7. A 28.00[712] SWING CLEARANCE IS REQUIRED AT ALL ACCESS DOORS.
8. STRUCTURAL STEEL DESIGN TO COMPLY WITH IBC 2010, AISC 13TH ED, AND CALIFORNIA BUILDING STANDARDS CODE 2010 EDITION (CCR TITLE 24).
9. PLATFORM GRATINGS TO HAVE FULL EDGE BANDING, INCLUDING CUT-OUTS. GRATING SERRATED TYPE.
10. ALL PLATFORM GRATING AND STAIR TREADS ARE TO BE GALVANIZED.
11. ALL LADDERS AND PLATFORMS TO CONFORM TO US OSHA AND CAL/OSHA STANDARDS (CCR TITLE 8).
12. SEE PIPING ASSEMBLY DRAWINGS FOR TERMINAL POINT DETAILS, MAXIMUM THERMAL DISPLACEMENTS AND ALLOWABLE LOADS ON PIPING.
13. ALL PAINTING TO COMPLY WITH IST STANDARD 11303-0450.
14. MINIMUM 36.00 [914] CLEARANCE TO BE MAINTAINED AROUND SKID MOUNTED EQUIPMENT FOR MAINTENANCE ACCESS.

QUANTITIES SHOWN ARE FOR (1) ONE UNIT ONLY.

REVISIONS

REV	ECR	DESCRIPTION	BY	APP	DATE

QTY.	U/M	ITEM	PART NO.	PART NAME	DESCRIPTION	MATERIAL	ZONE
1	EA	20	11303-0300	EQUIPMENT	EQUIPMENT LIST		
1	EA	19	11303-0200	VALVES	VALVE ASSEMBLY LIST		
1	EA	18	11303-0100	INSTRUMENTS	INSTRUMENT ASSEMBLY LIST		
1	EA	17	11303-0024	PLATFORM ERECTION	PLATFORM ERECTION ASEMBLY AND DETAILS		
1	EA	16	11303-0023	OTSG/DUCTING ERECTION	OTSG/DUCTING ERECTION DIAGRAM AND DETAILS		
1	EA	15	11303-0022	PIPING ASSEMBLY	HP VENT STACK PIPING ASSY		
1	EA	14	11303-0021	PIPING ASSEMBLY	HP STEAM PIPING ASSEMBLY		
1	EA	13	11303-0020	PIPING ASSEMBLY	HP FEEDWATER PIPING ASSEMBLY		
1	EA	12	11303-0019	EXHAUST STACK	EXHAUST STACK ASSEMBLY		
1	EA	11	11303-0018	STACK ADAPTER	EXHAUST STACK ADAPTER		
1	EA	10	11303-0017	U. EXHAUST HOOD	UPPER EXHAUST HOOD ASSEMBLY		
1	EA	09	11303-0016	L. EXHAUST HOOD	LOWER EXHAUST HOOD ASSEMBLY		
1	EA	08	11303-0009	UPPER MODULE	UPPER MODULE ASSEMBLY		
1	EA	07	11303-0044	SCR MODULE	SCR MODULE ASSEMBLY		
1	EA	06	11303-0006	LOWER MODULE	LOWER/CO/AIG MODULE ASSEMBLY		
1	EA	05	11303-0015	UPPER INLET PLENUM	UPPER INLET PLENUM ASSEMBLY		
1	EA	04	11303-0014	LOWER INLET PLENUM	LOWER INLET PLENUM ASSEMBLY		
1	EA	03	11303-0013	AIR DILUTION DUCT	AIR DILUTION DUCT ASSEMBLY		
1	EA	02	11303-0012	INLET TRANS. DUCT	INLET TRANSITION DUCT ASSEMBLY		
1	EA	01	11303-0003	BASE PLATE LAYOUT	BASE PLATE LAYOUT/ASSEMBLY		

BILL OF MATERIAL AND PARTS LIST

REJ	Rejected. Does not meet the Specification Requirements. Revise and Resubmit as "For Review".	0
RNC	Reviewed: No Comments. Revise and Resubmit as "Approved for Construction".	1
RCN	Reviewed: Comments as Noted. Revise and Resubmit as "Approved for Construction".	2
RR	Reviewed: Comments as Noted. Revise and Resubmit as "For Review".	3
RNR	Reviewed not Required.	4
Reviewed By:	Date	

TOLERANCES
UNLESS OTHERWISE SPECIFIED
LINEAR DIMENSIONS ARE IN INCHES
METRIC LINEAR TOL.+/- 1.5mm
TOL. ON 1 PLACE DECIMALS +/- 0.120"
TOL. ON 2 PLACE DECIMALS +/- 0.060"
TOL. ON 3 PLACE DECIMALS +/- 0.030"
ANGULAR TOLERANCE +/- 0.5°

THIRD ANGLE PROJECTION

THIS IS A PROPRIETARY DESIGN OF INNOVATIVE STEAM TECHNOLOGIES. REPRODUCTION, MANUFACTURE OR USE OF ANY ASSEMBLY, SUBASSEMBLY OR PART INDICATED HEREIN OR THE USE OF THE DESIGN OF ANY SUCH ASSEMBLY, SUBASSEMBLY OR PART IS NOT PERMISSIBLE UNLESS EXPRESSLY AUTHORIZED IN WRITING BY INNOVATIVE STEAM TECHNOLOGIES.

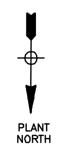
IST
An Aecon Company

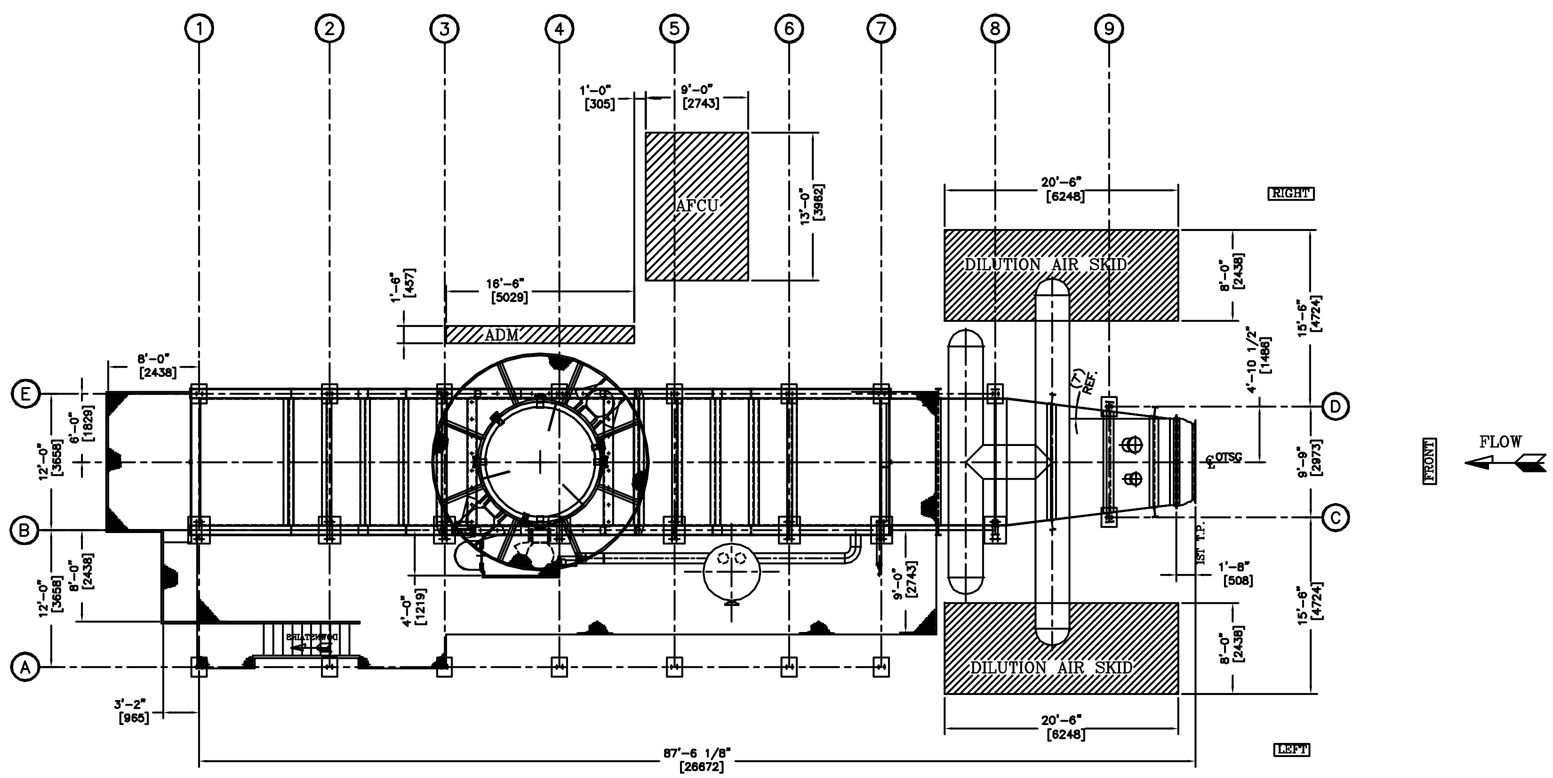
QUALITY: N/A	DATE: N/A	CUSTOMER: GENERAL ELECTRIC ENERGY, CITY OF PASADENA, GLENARM REPOWERING PROJECT
MFG.: N/A	DATE: N/A	
PROJ.ENG.: J.TONG	DATE: 01/24/2014	TITLE: GENERAL ARRANGEMENT LM6000 PG OTSG
CHK.: J.TONG	DATE: 01/24/2014	
DRN.: R.GU	DATE: 01/24/2014	
N.H.A.: N/A	EQUIP.MODEL: LM6000PG	PROJ.NO.: C12079

DWG. NO.	SIZE	REV.
11303-0001	E	P2

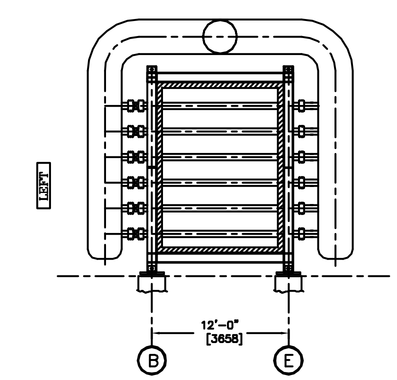
CADDS I.D.: P:\C12079\11303-0001-S1
SCALE: 1:64
SHEET NO. 01 OF 02

REVISIONS					
REV	ECR	DESCRIPTION	BY	APP	DATE





PLAN VIEW



SECTION A–A
SOME ITEMS REMOVED FOR CLARITY

	REJ	Rejected. Does not meet the Specification Requirements. Revise and Resubmit as "For Review".	0
	RNC	Reviewed: No Comments. Revise and Resubmit as "Approved for Construction"	1
	RCN	Reviewed: Comments as Noted. Revise and Resubmit as "Approved for Construction".	2
	RR	Reviewed: Comments as Noted. Revise and Resubmit as "For Review".	3
	RNR	Reviewed not Required.	4
Reviewed By:		Date	

This drawing has been reviewed only for general conformance with the contract documents. The foregoing shall in no way relieve the Supplier from entire responsibility for engineering design, workmanship, material, and all other liabilities under the contract.

Note: Revise means the revision level of the drawing shall be incremented.

THIRD ANGLE PROJECTION

TOLERANCES UNLESS OTHERWISE SPECIFIED
LINEAR DIMENSIONS ARE IN INCHES
METRIC LINEAR TOL.+/- 1.5mm
TOL. ON 1 PLACE DECIMALS +/- 0.120"
TOL. ON 2 PLACE DECIMALS +/- 0.060"
TOL. ON 3 PLACE DECIMALS +/- 0.030"
ANGULAR TOLERANCE +/- 0.5°

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IST An Aecon Company

QUALITY: N/A	DATE: N/A	CUSTOMER: GENERAL ELECTRIC ENERGY CITY OF PASADENA GLENARM REPOWERING PROJECT		
MFG.: N/A	DATE: N/A			
PROJ.ENG.: J.TONG	DATE: 01/24/2014	TITLE: GENERAL ARRANGEMENT LM6000 PG OTSG		
CHK.: J.TONG	DATE: 01/24/2014			
DRN.: R.GU	DATE: 01/24/2014			
N.H.A.: N/A	EQUIP.MODEL: LM6000PG	PROJ.NO.: C12079	DWG. NO.: 11303-0001	SIZE: E / REV.: P2
CADDS I.D.: P:\C12079\11303-0001-S2			SCALE: 1:64	SHEET NO.: 02 OF 02

Enclosure 11

Rev	Date	Description	Author	Checked
00	24 Jan 2014	Preliminary Issue	JT	

General Electric International, Inc.
Energy
Power Plant Engineering

	REJ	Rejected. Does not meet the Specification Requirements. Revise and Resubmit as "For Review".	0
	RNC	Reviewed: No Comments. Revise and Resubmit as "Approved for Construction".	1
	RCN	Reviewed: Comments as Noted. Revise and Resubmit as "Approved for Construction".	2
	RR	Reviewed: Comments as Noted. Revise and Resubmit as "For Review".	3
	RNR	Review not Required.	4

Reviewed By:	Date

This drawing has been reviewed only for general conformance with the contract documents. The foregoing shall in no way relieve the Supplier from entire responsibility for engineering design, workmanship, material, and all other liabilities under the contract.

Note: Revise means the revision level of the drawing shall be incremented.

Customer: **General Electric Energy**

Project: **City of Pasadena - Glenarm Repowering Project**

Contract: **C12079**

MDL# **N/A**

IST An Aecon Company

Innovative Steam Technologies
549 Conestoga Boulevard
Cambridge, Ontario
Canada N1R 7P4
An AECON Company

Title:

ONCE THROUGH STEAM GENERATOR PRE-CONSTRUCTION PLAN

No. of Boilers:	Author:	Date:	IST Document Number:
One (1)	J Tong	Jan 24, 2013	**C12079-PCP**

REVISION SUMMARY

Revision Number	Description of Revision	Prepared By	Approved By	Approval Date
00	Preliminary Issue – For Information Only	JT		24 Jan 2014

TABLE OF CONTENTS

INTRODUCTION

The following document contains installation and erection instructions for the Once Through Steam Generator (OTSG). It must be understood that an OTSG can be supplied in multiple configurations and incorporate various associated equipment. This document will specifically address the OTSGs supplied for the Southcentral Power Project and also outline installation instructions for the associated equipment supplied.

This procedure for erecting a conventional Once-Through Steam Generator (OTSG) and auxiliary equipment was prepared as an overview of the basic steps that should be followed to achieve a successful installation. This procedure is not intended to be a substitute for proper and thorough planning on the part of the erecting agency. However, it will attempt to familiarize the Erectors with the basic procedure for assembling this system in the manner in which it was designed to be assembled.

Contact Innovative Steam Technologies if further information is required:

Main Line: (519) 740-0757	Direct: (519) 740-0757	Fax: (519) 740-2051
Peter Hecimovic – Project Manager		Ext. 222
James Tong – Project Engineering		Ext. 283
Peter Finlin - Customer Service Supervisor		Ext. 270

<u>The Erector should be familiar with these instructions so as to understand the system, and the manner by which it was designed to be assembled.</u>

IMPORTANT
Please be aware that the procedures outlined in this document are not intended to be a substitute for proper and thorough planning. The safe handling and correct placement of the equipment outlined herein is ultimately the responsibility of the customer and their Erector.

All Figures can be found in Appendix A

1 ERECTION PACKAGE DRAWING LIST

The following list identifies the complete set of drawings associated with this project that will be required to successfully complete the OTSG installation. Review the list and ensure that hard copies are available at the construction site. Please contact IST if any of the following drawings are required.

Drawing Number	Description
11303-0001	General Arrangement
11303-0004	Feedwater Steam and Exhaust Flow Sheet

Drawing Number	Description

2 RECOMMENDED CONSTRUCTION PRACTICES

2.1 LIFTING OF EQUIPMENT

It is recommended that the lifting procedure of all components utilize conventional hoisting methods. Recommended lifting arrangements are illustrated in Figure 6 to 21.

The final decision as to what lifting method is used remains the full responsibility of the Erector. IST recommends that the lifting arrangements shown in the attached figures be followed. General construction equipment such as spreader beams, choker cables, and shackles are not considered specialized and therefore are the responsibility of the contractor to provide.

2.2 ACCESSING CONNECTION POINTS

There are various methods that can be utilized to provide high elevation access for installing modules, erection plates and welding. Some of which is a man basket, mobile man lift (Genie Boom) or scaffolding (built from the ground up). The most commonly used method is the mobile man lift. Another option is to install temporary tank brackets to the component walls prior to the lift. Tank brackets can be temporarily installed on the vertical structural members and in turn support scaffolding planks and handrails. Brackets are to be installed approximately 3 ft (1 m) below the upper horizontal joint on each of the major components. These include the OTSG module, inlet plenum, and exhaust hood. These brackets will allow construction personnel fast and easy access to erection plates at all field joints, for both bolting and welding. The downside is that it takes time to install these in advance of the lift, and then all need to be removed once equipment installation is complete and any grinding removal will require touch-up painting.

2.3 CHECKING THE OTSG COMPONENTS FOR LEVEL

To ensure proper fit, and to eliminate excessive gap on the horizontal joints, it is very important to measure the interface points of the each component (all OTSG modules, inlet plenums and exhaust hoods) for level. The number of measuring points should be at least four (4) for small units and six (6) for larger ones. A maximum difference of ¼" (6mm) between measured points on each component is acceptable. For that reason, the measuring method should provide at least 1/8" (3mm) accuracy. The use of water gauges or measuring tapes, measuring from ground elevations, would not provide an accurate measurement, especially for higher elevations. Acceptable measuring practices include utilizing laser type measuring instruments or positioning optical instruments on top of the measured component.
The plenum shall be leveled prior to placing any of the modules in position. The deviation from straightness of the top and bottom surface of the component sidewalls should be checked by running a line from endwall to endwall. Deviation of more than ¼" (6mm) must be reported prior to placing the next component as the modules are very rigid and will not flex to fill the gap.

3 PRE-CONSTRUCTION ACTIVITIES

3.1 SHIPPING DAMAGE

All components should be inspected for shipping damage prior to installation. Ducting components should be inspected for casing, liner, or structural damage. The OTSG modules should have a more thorough inspection that should also include tubing, end restraints and top support beams. Any damage should be reported to IST prior to lifting the component into place.

3.2 OFFLOADING AND SHIPPING BEAMS

In order to protect the OTSG components during shipment, and to facilitate transport, temporary shipping beams have been installed. When an OTSG component is off-loaded from the transport vehicle and placed to rest on the ground, it is necessary that the sidewalls be supported at the jacking points (as a minimum). The jacking points are clearly identified on the module sidewalls and cribbing should be used to spread the load to the vertical wall columns.

Consideration must be given to the placement of the cribbing / blocking so as to not interfere with the removal of the shipping beams. Block points are to be level to ensure no torsion forces are generated in the component.

To remove a shipping beam, unfasten the bolts holding the beam in position to the sidewalls (refer to Figure 1). Once the beam is removed, re-install the bolts in the holes (with the bolt heads on the outside) and seal weld them in position, this will create a gas tight seal.

All temporary structural components and shipping beams are painted yellow prior to shipment. IST must be contacted immediately if there are any doubts as to what items are to be removed.

3.3 OTSG MODULE SHIPPING BEAMS

All shipping beams in the bottom of OTSG lower module are to remain in position throughout the transporting of the module and offloading at site. Before the module is lifted into its final position, the Erector may elect to remove some of the module shipping beams (refer to Figures 2 and 4). A number of shipping beams must remain in place and are only to be removed after the module is in its final position, outer erection plates are installed and the internal seal welding is underway.

3.4 DUCTING COMPONENT SHIPPING BEAMS

Ducting components which include the inlet transition ducts, burner ducts, inlet plenum, SCR module, exhaust hoods, and stack, may also come equipped with shipping beams. All shipping beams within these components are to remain during any transportation of the component to site. Typically, ducting components are large in nature and are not designed with any permanent internal stiffening members. Unless otherwise instructed, IST recommends that all shipping beams remain installed during any placement or lifting of these components. The contractor may find it necessary to remove the odd shipping beam to assist with minor alignment adjustments. This is acceptable to IST but should be first reviewed with the IST site representative. Shipping beams can be removed after the component is in its final position and seal welding is under way.

4 BASE PLATES

Although the OTSG outside casing is a “cold casing” (i.e. insulated inside), provisions have been made to allow expansion of the OTSG unit in both the side-to-side and fore-and-aft directions. The instructions on the Base Plate Layout drawing 11303-0003 should be carefully followed.

The principle of the base plate design is to hold one corner of the OTSG fixed (usually the steam outlet piping corner). The corner base plate on the side opposite the “fixed” corner will allow expansion from side-to-side only and prevent any fore-and-aft movement. Base plates on the same side as the “fixed” base plate, which are parallel to the side of the OTSG, are installed in a manner that allows only fore-and-aft movement and not any side-to-side movement.

In order to allow thermal movements, all base plates, except the “fixed” base plates are to be installed with a Fabreeka pad. The Teflon side of this pad should face up and interface with the stainless plate welded to the bottom of the base plate. In order to prevent any dust or contamination from damaging the Teflon surface, the slotted hole in the base plate is to be covered with an oversized washer.

At all locations where base plates are designed to move, anchor bolts are to be installed and secured with nuts. Nuts are to be installed “snug” tight then loosened ¼ turn and fixed in position with a tack weld or locked in position with a second nut (jam nut).

Anchor bolts at the “fixed” base plate location are to be installed with nuts. These nuts are to be installed “snug” tight then tightened an additional ¼ turn. The base plate is then required to be welded to the adjacent soleplate, per the Base Plate Layout drawing. All base plate and sole plate components shown on the Base Plate Layout drawing are designed and supplied by IST. All anchor bolts, foundation design, and grouting are designed and supplied by Erector.

The base plate layout drawing indicates all anchor bolt sizes used in the design of the base plate hole and slot sizes. If actual anchor bolts sizes are different than that shown, notify IST immediately.

During the final placement of the soleplates and base plates, survey personnel should ensure that elevations and centrelines are located per design. Centrelines should be scribed on the base plates to act as reference datum lines for the placement of the inlet plenum columns.

After installation of anchor bolts and welding of the inlet plenum columns to the base plates, the Erector is to perform touch-up painting over the welded areas in accordance with Appendix D. The Erector is responsible for the supply of all primer for touch-up required throughout the construction process.

5 ERECTION PLATES

During erection, ducting components are stacked on top of each other and bolted together with erection plates. The erection plates are subsequently welded to the ducting structural beams and internal seal welding is completed in accordance with IST Erection Diagram 11303-0027. At assembly, it is not necessary to perform all welding, however if time permitting, erection plate welding should be completed as the duct components are installed. The exception to this procedure being the lower inlet plenum to upper inlet plenum joint where all erection plate welding and structural welding must be completed prior to any further lifts.

Where ducting erection is completed without immediately welding out the joints, the erection plates and internal seal welding must be completed after the placement of the lower exhaust hood. Erection plate welding and internal seal welding should commence with the lowest joint – upper inlet plenum to lower OTSG module – and progressing upward.

Due to the potential for high winds that can occur during erection, it is necessary to erect the platform steel after the installation of the lower exhaust hood. The platform steel will provide bracing to the overall structure. The platform columns at locations [A1 through A7] on IST Platform Erection Plan and Details 11303-0021, cross beams, and ties will be erected with bolting only to the OTSG ducting prior to installing the upper exhaust hood and exhaust stack assemblies. The following requirements are to be met:

1) The lower inlet plenum and upper inlet plenum must first be aligned and levelled on their respective base plates. The columns must be securely welded to base plates and all erection plates joining the two assemblies must be securely welded before the balance of ducting and OTSG modules can be stacked on top.

2) The lower OTSG module, SCR module, upper OTSG module, and lower exhaust hood can be stacked on top and secured with erection plates by bolting properly tightened to AISC requirements (see Section 5.1). Due to the exhaust stack height, erection plate welding and some internal seal welding must be complete before the upper exhaust hood and exhaust stack can be installed. Refer to Section 7.5 for complete stack erection prerequisites.

3) The connection of the upper exhaust hood to exhaust stack shall be bolted together and immediately welded into position at the corners while the crane is supporting the stack adapter and exhaust hood respectively. Follow the welding instructions given on IST Erection Diagram 11303-0027.

The erection contractor should note that all erection plates are not always the same size, thickness, and the attachment hardware and welding may vary for each location. Please pay strict attention to the Erection Diagram 261027 for the location of applicable erection plates and securing specifics. If you are unsure please contact the on-site IST supervisor or IST head office.

5.1 ERECTION PLATE BOLT TIGHTENING PROCEDURE

Hex bolts are to be installed with the heads on the exterior of the erection plates in accordance with AISC requirements. Bolts shall be installed in all holes of the connection, and brought to a “snug” tight condition. “Snug” tight is defined as the tightness that exists when the plies of the joint are in firm contact. This may be attained by a few impacts of an impact wrench or from the full effort of a man using an ordinary spud wrench. The tightening process shall progress systematically from the most rigid part of the connection to the free edges, and then the bolts of the connection shall be re-tightened in a similar systematic manner until all bolts are simultaneously “snug” tight and the connection is fully compacted. Following this initial operation, all bolts in the connection shall be tightened further by 1/3 turn. During the tightening operation, there shall be no rotation of the part not turned by the wrench.

6 LIFTING INSTRUCTIONS

Refer to the attached Figures 6 to 21 for recommended lifting arrangements. Ensure proper spreader beams, rigging cables and shackles (supplied by others) are used at all times.

Lifts should be smooth and any form of load shock should be avoided. Take precaution to avoid weak axis lug bending.

7 DUCTING & MODULE INSTALLATION

7.1 ERECTION OF INLET PLENUM – General Procedure

a. The inlet plenum comprises of two (2) major components – a Lower Inlet Plenum, an Upper Inlet Plenum, four (4) loose columns, and a cross brace.

b. Installation of the Lower Inlet Plenum and four (4) loose columns should not be initiated until base plate installation is complete and grouting has taken place and given time to cure before imposing loads.

c. Remove tarps from the top framing of the Lower Inlet Plenum and Upper Inlet Plenum.

d. The Lower Inlet Plenum assembly is to be lifted and positioned such that each column rests centrally on its respective base plate, which were previously positioned and scribed during the initial layout (See "Base Plates" in Section 4). For the recommended lifting arrangement of the lower inlet plenum refer to Figure 12. Upon setting the lower inlet plenum assembly, ensure that the main columns are vertical and centered on the centerline of the base plates. At this time, check that the inlet opening centerline is aligned with the centerline of the gas turbine discharge. The most critical position is the "fixed" column, having this correctly located will ensure proper tie-in points to piping and ducting. The elevation height from the top of the lower inlet plenum to the base plate should be measured and confirmed with IST drawings. With a transit, check the top four (4) corners of the plenum for level before proceeding to weld columns to base plates.

e. Weld the column beams to the relevant base plates per IST Base Plate Layout Assembly drawing 11303-0003.

f. Stand in position and temporarily brace the four (4) loose vertical columns at grid lines 1 and 2. Loosely install the erection splice plates with the hardware provided. Ensure the columns are centered on their respective base plates.

g. The upper inlet plenum assembly is then lifted and placed on top of the lower inlet plenum assembly. Guide plates are installed on the perimeter horizontal beams to assist while lowering it into position. For the recommended lifting arrangement of the upper inlet plenum refer to Figure 13. Keep the upper inlet plenum on the crane hook as the four (4) columns at grid lines 1 and 2 are aligned and mechanically connected with erection splice plates and hardware provided. Once alignment of the columns with the upper inlet plenum is complete, weld the four (4) column beams to the relevant base plates per IST Base Plate Layout Assembly drawing 11303-0003.

h. Once the overall inlet plenum assembly is properly aligned and mechanically secured, weld all of the erection plates per IST Erection Diagram 11303-0027 and use full penetration welds at all required locations along the plenum joint. Closely follow the welding instructions on the IST Erection Diagram as various types and sizes of weld are required at different locations.

i. Weld the splice plates that attach the upper inlet plenum to the loose columns per IST Erection Diagram. Weld the column beams together where they meet and finally weld the columns to their respective base plate per IST Base Plate Layout Assembly drawing 11303-0003.

j. Once the erection plate welding is complete, internal seal welding at the casing interface can commence. Refer to IST Erection Diagram 11303-0027 for welding instructions.

k. Ensure that all upper inlet plenum to lower inlet plenum internal seal welding is complete. All temporary shipping beams can now be removed. Shipping beam bolts should be reinserted back into the open holes and seal welded around the bolt shoulder.

l. The Joint Assembly Kit (JAK) 11303-0506 between upper and lower inlet plenums can be installed immediately after internal seal welding is complete or at a later time at the discretion of the Erector.

m. Scaffolding should now be installed inside the upper inlet plenum to access the joint between the upper inlet plenum and lower OTSG module. A working platform should be created at an elevation that will accommodate internal seal welding and joint assembly kit installation.

n. If required, scaffolding external to the boiler can also be constructed to reach the joint assembly kit elevation. Alternatively, tank brackets can now be installed to the exterior columns as detailed Section 2.2.

o. Welding of all inlet plenum structural components must be complete before the OTSG module is installed to the Inlet Plenum assembly.

7.2 ERECTION OF LOWER OTSG MODULE – General Procedure

NOTE

The arrival of the IST site representative is coordinated with this point of the installation process. IST recommends that our representative be on site prior to continuing forward with the installation procedure.

a. Installation of the Lower OTSG Module should commence only after the inlet plenum is installed and all the required welding is complete. This will ensure proper structural integrity exists as the load on the inlet plenum is increased. Prior to lifting the module, ensure that all required scaffolding inside the inlet plenum is complete.

b. Ensure that only the identified shipping beams as specified in Figure 2 are removed. Once the beams are removed, re-install the bolts in the holes (with the bolt heads on the outside) and seal weld them in position to create a gas tight seal. A cross-section of the Lower OTSG Module is found in Figure 3.

c. Remove tarps from top of the module framing. Plywood is to be placed on the top surface of the fin tubes between the top support beams to prevent damage to finned tubes from falling debris and by distributing any weight placed on top of the tubes. Plywood is also to be placed on the top surface of the installed Ammonia Injection Grid (AIG) lances to prevent debris from plugging the injection holes and to distribute weight placed on top of the lances. Any weight placed on the AIG must be distributed over a minimum of four lances.

d. The joint assembly kit (JAK) 11303-0506 and lower module closure kit 11303-01601 may be placed on top of the CO catalyst frame prior to the lift or immediately after the lift. These components must be stored in the Lower OTSG Module prior to placing the SCR Module.

e. Scaffolding should now be installed inside the Lower OTSG Module to access the joint with the SCR Module. A working platform should be created at an elevation that will accommodate internal seal welding and joint assembly kit installation.

f. If required, scaffolding external to the boiler can also be constructed to reach the Lower OTSG Module and SCR Module joint elevation. Alternatively, tank brackets can now be installed to the exterior columns as detailed Section 2.2.

g. Lift the Lower OTSG Module vertically using spreader beams as per the lifting arrangement shown in Figure 14.

h. Carefully place the Lower OTSG Module on top of the Upper Inlet Plenum. Guide plates have been installed during fabrication to assist in the alignment during this installation process. Ensure that columns and stiffeners are aligned properly and that the top of the module is level. Mechanically secure erection plates at all connections using the supplied bolting hardware. Refer to Section 5.0 and IST Erection Diagram 11303-0027 for details.

i. It is recommended that erection plate welding and seam welding between the Upper Inlet Plenum and Lower OTSG Module be completed at this point. Only after all erection plates have been welded and seam welding between the Upper Inlet Plenum and Lower OTSG Module are complete can the remaining shipping beams at the base of the Lower OTSG Module and at the top of the Upper Inlet Plenum be removed. Shipping beams at the top of the Lower OTSG Module can be removed only after seal welding with the SCR Module has been completed. Remove the remaining shipping beams by unfastening the bolts holding the beam in position to the sidewalls. Once the beam is removed, re-install the bolts in the holes and seal weld them in position to create a gas tight seal. All temporary structural components and shipping beams are painted yellow prior to shipment. IST must be contacted immediately if there are any doubts as to what items are to be removed and/or when they are to be removed.

j. Top support beam end clip angles and studs should not be removed until the SCR Module is in position and the majority of the internal seal welding between the Lower OTSG Module and SCR Module is completed in order to prevent any sidewall deflection.

k. Due to the proximity with the main lifting points on the Lower OTSG Module, two (2) Ammonia Injection Grid (AIG) lance assemblies are shipped loose for assembly at site. The two AIG lances should be placed on the CO catalyst frame once the Lower OTSG Module is mechanically secured in place. The Erector has the option of continuing with the placement of the SCR module at this point or completing the AIG lance installation.

l. The 2” NPS Sch. 40 inlet nozzle of the lance assemblies are located directly behind the module lifting lugs on the non-platform side of the module. The lance assembly with an internal manifold from which four HSS 2” x 2” lances project towards the opposite wall. The four lances will be inserted into receptacles in the sidewalls while the inlet nozzle will protrude outside beyond the Lower OTSG Module casing. A stainless steel patch ring will be welded over the sidewall opening and be used to level and center the AIG lance assembly.

m. Internal insulation and the lower module closure kit 11303-0601 may be installed upon completion of the AIG lance assemblies. Internal insulation and the Upper Inlet Plenum to Lower OTSG Module JAK 261508 may also be installed at this time.

n.

NOTE

Prior to working on top of OTSG module, tubes and AIG lance assemblies shall be covered with plywood and fire blankets. Failure to do so will result in possible warranty invalidation. Extreme care must always be exercised to prevent any possible damage to the pressure tubes and AIG lances. Do not support heavy equipment or liner panels (greater than 200 lb [90 kg]) on the tubes and AIG lances and ensure that loads are spread over multiple tube surfaces.

7.3 ERECTION OF SCR MODULE – General Procedure

a. Installation of the SCR Module should commence only after installation of the Lower OTSG Module is complete. This will ensure proper structural integrity exists as the load on the inlet plenum is increased. Prior to lifting the module, ensure that all required scaffolding inside Lower OTSG Module is complete and that the Lower OTSG Module to SCR Module joint assembly kit 11303-0508 is placed inside. Ensure erection plates and hardware are placed in the lower sidewall beam gutters for easy access.

b. Remove tarp from top of the SCR Module framing

c. Ensure that all temporary shipping beams and bracing remain in the assembly until the SCR Module is mechanically secured.

d. The JAK 11303-0509 may be placed on top of SCR frame in the module prior to the lift or immediately after the lift. These components must be stored in the SCR Module prior to placing the Upper OTSG Module.

e. Lift the SCR Module vertically using spreader beams as per the lifting arrangement shown in Figure 15.

f. Carefully place the SCR Module on top of the Lower OTSG Module. Guide plates have been installed during fabrication to assist in the alignment during this installation process. Ensure that columns and stiffeners are aligned properly and that the top of the module is level. Mechanically secure erection plates at all connections using the supplied bolting hardware. Refer to Section 5.0 and IST Erection Diagram 11303-0027 for details.

g. It is recommended that erection plate welding and seam welding between the Lower OTSG Module and SCR Module be completed at this point. Only after all erection plates have been welded and seam welding between the Lower OTSG Module and SCR Module are complete can the remaining shipping beams and braces at the top of the Lower OTSG Module and at the base of the SCR Module be removed. Shipping beams at the top of the SCR Module can be removed once seal welding between the SCR Module and Upper OTSG Module have been completed. Remove the remaining shipping beams by unfastening the bolts holding the beam in position to the sidewalls. Once the beam is removed, re-install the bolts in the holes and seal weld them in position to create a gas tight seal. All temporary structural components and shipping beams are painted yellow prior to shipment. IST must be contacted immediately if there are any doubts as to what items are to be removed and/or when they are to be removed.

h. SCR support beam end clip angles and studs should not be removed until the Upper OTSG Module is in position and the majority of the internal seal welding between the SCR Module and Upper OTSG Module is completed in order to prevent any sidewall deflection.

i. The support beam clip angles are temporary shipping restraints that are removed during the erection process. All support beam clip angles that are painted yellow must be removed. Once the angles are removed, the bolts are to be reinserted into their respective holes in the sidewall, their heads cut off with a grinder, and seal welded. Care must be taken to ensure that the remaining bolt body be either ground flush with the beam flange or be left in a position that allows sufficient clearance to the side of the support beam. Minimum clearance from the end of the support beam to any bolting inserted into the wall is 1" [25 mm]. For the support beam located closest to the head end, the beam is allowed to grow axially but prevented from moving laterally in the unit. The restraint angles are therefore not to be removed (hence they are not painted yellow). Only the stud restraining the support beam to the restraint angles is to be removed at both ends (refer to Figure 22).

j. Internal insulation and the Lower OTSG Module to SCR Module JAK 11303-0508 can be installed upon completion of the internal seal welding of the two assemblies.

7.4 ERECTION OF UPPER OTSG MODULE – General Procedure

a. Installation of the Upper OTSG Module should commence only after installation of the SCR Module is complete. This will ensure proper structural integrity exists as the load on the SCR Module is increased. Prior to lifting the module, ensure that all required scaffolding inside the SCR Module is complete.

b. Ensure that only the identified shipping beams as specified in Figure 4 are removed. Once the beams are removed, re-install the bolts in the holes (with the bolt heads on the outside) and seal weld them in position to create a gas tight seal. A cross section of the Upper OTSG Module is found in Figure 5.

c. Remove tarp from top of the module framing. Plywood is to be placed on the top surface of the fin tubes between the top support beams to prevent damage to finned tubes from falling debris and by distributing any weight placed on top of the tubes.

d. The JAK 11303-0510 may be placed on top of Upper OTSG Module prior to the lift or immediately after the lift. These components must be stored on top of the Upper OTSG Module prior to placing the Lower Exhaust Hood.

e. If required, scaffolding external to the boiler can also be constructed to reach the Upper OTSG Module and Lower Exhaust Hood joint elevation. Alternatively, tank brackets can now be installed to the exterior columns as detailed Section 2.2.

f. Lift the Upper OTSG Module vertically using spreader beams as per the lifting arrangement shown in Figure 16.

g. Carefully place the Upper OTSG Module on top of the SCR Module. Guide plates have been installed during fabrication to assist in the alignment during this installation process. Ensure that columns and stiffeners are aligned properly and that the top of the module is level. Mechanically secure erection plates at all connections using the supplied bolting hardware. Refer to Section 5.0 and IST Erection Diagram 11303-0027 for details.

h. It is recommended that erection plate welding and seam welding between the SCR Module and Upper OTSG Module be completed at this point. Only after all erection plates have been welded and seam welding between the SCR Module and Upper OTSG Module are complete can the remaining shipping beams and braces of the Upper OTSG Module and at the top of the SCR Module be removed. Remove the remaining shipping beams by unfastening the bolts holding the beam in position to the sidewalls. Once the beam is removed, re-install the bolts in the holes and seal weld them in position to create a gas tight seal. All temporary structural components and shipping beams are painted yellow prior to shipment. IST must be contacted immediately if there are any doubts as to what items are to be removed and/or when they are to be removed.

i. Upon completion of internal seal welding, internal insulation and installation of the Upper OTSG Module to SCR Module JAK 11303-0509 can be installed.

j. Top support beam end clip angles and studs should not be removed until the Lower Exhaust Hood is in position and the majority of the internal seal welding between the Upper OTSG Module and Lower Exhaust Hood is completed in order to prevent any sidewall deflection.

7.5 ERECTION OF LOWER EXHAUST HOOD – General Procedure

a. Installation of the Lower Exhaust Hood should commence only after installation of the Upper OTSG Module is complete. This will ensure proper structural integrity exists as the load on the Upper OTSG Module is increased.

b. Remove tarp from top of the Lower Exhaust Hood framing. Plywood is to be placed on the top surface of the silencer baffles to prevent damage to internal structure from falling debris and by distributing any weight placed on top of the baffle assembly.

c. Place the Lower Exhaust Hood to Upper Exhaust Hood JAK 11303-0511, the Upper Exhaust Hood to Stack Adaptor JAK 11303-0512, and the Stack Adaptor to Exhaust Stack JAK 11303-0513 on top of the silencer baffles prior to lifting the Lower Exhaust Hood. Otherwise, place these JAKs on the silencer baffles prior to placing the Upper Exhaust Hood assembly.

d. Temporary shipping beams are to be removed only after the internal seal welding is underway and erection plates are securely bolted and welded. They are only to be removed prior to the lift if there is interference with the top support beams. After removal of temporary shipping beams, the bolts are to be placed back into the holes and seal welded into position.

e. The Lower Exhaust Hood assembly is to be lifted vertically using spreader beams as designated in Figure 17. Guide plates have been installed during the fabrication to assist with alignment during erection. Ensure that columns and stiffeners are aligned properly and that the top of the Lower Exhaust Hood is level. Mechanically secure erection plates at all connections using the supplied bolting hardware. Refer to Section 5.0 and IST Erection Diagram 11303-0027 for details.

f. If gaps are evident at end joints between the Lower Exhaust Hood and the Upper OTSG Module as a result of the fit up, the outer most erection plates may be required to be left off until internal welding is complete. Some pressure jacking may be required to force gaps closed and minimize closure welds.

g. It is recommended that erection plate welding and seam welding between the Upper OTSG Module and Lower Exhaust Hood be completed at this point. Only after all erection plates have been welded and seam welding between the Upper OTSG Module and Lower Exhaust Hood are complete can the remaining shipping beams and braces at the bottom of the Lower Exhaust Hood be removed. Remove the remaining shipping beams by unfastening the bolts holding the beam in position to the sidewalls. Once the beam is removed, re-install the bolts in the holes and seal weld them in position to create a gas tight seal. All temporary structural components and shipping beams are painted yellow prior to shipment. IST must be contacted immediately if there are any doubts as to what items are to be removed and/or when they are to be removed.

h. Internal insulation and installation of the Upper OTSG Module to Lower Exhaust Hood JAK may commence after completion of the internal seal weld between the two assemblies.

i. Due to the potential for high winds that can occur during erection, it is necessary to erect the platform steel after the installation of the lower exhaust hood. The platform steel will provide bracing to the overall structure. See Section 10 for complete installation procedures for the platform steel.

7.6 ERECTION OF UPPER EXHAUST HOOD – General Procedure

a. Installation of the Upper Exhaust Hood should commence only after installation of the Lower OTSG Module and all platform steel is complete. This will ensure proper structural integrity exists as the load on the Lower Exhaust Hood is increased.

b. Remove tarps from top of the Upper Exhaust Hood framing.

c. Ensure erection plates and hardware are placed in the lower sidewall beam gutters for easy access. Safety handrailing should also be placed at the upper ends of exhaust hood for the benefit of the welders who will eventually be working in that region making the final bolting and welding of the stack adapter.

d. Temporary shipping beams are to be removed only after the internal seal welding is underway and erection plates are securely bolted and welded. After removal of temporary shipping beams, the bolts are to be placed back into the holes and seal welded into position.

e. The Upper Exhaust Hood assembly is to be lifted vertically using spreader beams as designated in Figure 18. Guide plates have been installed during the fabrication to assist with alignment during erection. Ensure that columns and stiffeners are aligned properly and that the top of the Upper Exhaust Hood is level. Mechanically secure erection plates at all connections using the supplied bolting hardware. Refer to Section 5.0 and IST Erection Diagram 11303-0027 for details.

f. A closure plate is installed to cover the gap in the front and rear wall casing between the Lower Exhaust Hood and Upper Exhaust Hood. The closure plate will be seal welded to the duct casing on the exterior and stitch welded on the inside. Refer to IST Erection Diagram 11303-0027 for details.

g. Internal insulation and installation of the Upper Lower Exhaust Hood to Upper Exhaust Hood JAK 11303-0512 may commence after completion of the internal seal weld between the two assemblies.

7.7 ERECTION OF STACK ADAPTER – General Procedure

a. Installation of the Stack Adapter should commence only after installation of the Upper Exhaust Hood is complete. This will ensure proper structural integrity exists as the load on the Upper Exhaust Hood is increased.

b. Remove tarps from top of the Stack Adapter assembly.

c. The adapter assembly should be shored up on the ground in the vertical position. Any temporary bracing inside the adapter assembly can be removed at this time.

d. Ensure erection plates and hardware are placed in the lower sidewall beam gutters for easy access. Safety handrailing should also be placed at the top of the stack adapter for the benefit of the welders who will eventually be working in that region making the final bolting and welding of the exhaust stack.

e. Once the overall adapter assembly has been made ready, it should be taken directly to the top of the upper exhaust hood for placement. The Stack Adapter assembly is to be lifted vertically using spreader beams as designated in Figure 19. **Note orientation of the adapter.**

f. The adapter assembly section will rest on the upper exhaust hood channel frame and holes on the mating faces must be aligned and secured with erection hardware provided. Ensure that the top of the stack adapter is level. Once secured atop the exhaust hood, welding of the internal and external seam at the upper exhaust hood to stack adapter joint will begin. It is recommended that a minimum of 12” (300 mm) of internal/external casing seam weld be completed at each corner before removing rigging from the top of the adapter. Refer to IST Erection Diagram 11303-0027 for details.

g. Full penetration continuous seal welding must be performed on the inside and outside perimeter of the exhaust hood to adapter joint as soon as possible.

h. Internal insulation and installation of the Upper Exhaust Hood to Stack Adapter JAK 11303-0513 may commence after completion of the internal seal weld between the two assemblies.

7.8 ERECTION OF EXHAUST STACK – General Procedure

a. Erection of the exhaust stack can only proceed after the following steps have been completed:

- All inlet plenum columns to base plate welds are complete and all base plates are secured to the anchor bolts.
- Inlet plenum diagonal bracing is installed and completely welded.
- All erection plates are completely welded at all ducting assembly joints.
- External and internal seal welding is complete for a length of at least 12” (305 mm) on either side of every column and at least 25% of the entire lengths of all seal welds are complete at all ducting assembly joints.
- Platform columns are erected and welded to their base plates which are secured to the anchor bolts.
- Beams between all platform columns and between the platform and the OTSG are installed and completely fastened.
- Cross bracing between the platform columns and the OTSG are installed and completely welded.

b. The Exhaust Stack assembly is designed to be lifted in a single section, although it may have its respective platform assembly installed on the ground prior to the lift. This requires that the stack section be offloaded on the ground in a horizontal position on solid temporary cribbing. Refer to horizontal and vertical rigging sketches Figures 20 and 21. Once the platform sections are attached, assembly can be lifted vertically into position.

c. Care should be taken when assembling the platforms to the stack. The Exhaust Stack should be shored up on the ground using temporary cribbing and having the orientation such that the top lifting lugs are on the strong axis for the subsequent vertical lift. Certain sections of the stack platform may have to be left off and installed once the stack is erected.

d. As soon as the platform assembly to the Exhaust Stack is completed, it can be simultaneously rotated and lifted. This can be accomplished using 2 lifting cranes – a main lift crane with rolling sheave blocks at the top of the stack to distribute loading equally to the lifting lugs and a tailing crane near the bottom of the stack to lift the end off the ground and prevent stack damage. Comprehensive planning is necessary on the part of the Erector to negotiate this complex lift from the horizontal to vertical position.

e. Once the stack / platform assembly is in the vertical position, it should be taken directly to the top of the exhaust hood for installation. Do not set the stack assembly back on the ground once it is lifted. This will avoid damaging the bottom casing of the Exhaust Stack.

f. The interface of the Exhaust Stack casing into the Stack Adapter has been designed as a clearance fit. If required, additional slitting of the stack casing lower corners will give additional flexibility to fit into the Stack Adapter opening.

g. The Exhaust Stack casing will insert into the Stack Adapter opening by approximately 2” (50 mm). Note the orientation of the stack before carefully lowering the Exhaust Stack onto the Stack Adapter. The four Stack Adapter to Exhaust Stack erection plates are installed and secured with the erection hardware provided, leaving a 3/8” (10 mm) gap at the four vertical columns. Refer to the IST Erection Diagram 11303-0027 for details. The load is not to be released from the crane hook until the stitch and external seal welds between the Exhaust Stack and Upper Exhaust Hood are completed.

h. The stack shall be true and plumb to within 2” (50 mm) in 100 ft (30 m) based on ASME STS-1-2000 Steel Stacks.

i. Internal insulation and installation of the Stack Adapter to Exhaust Stack JAK 11303-0513 can commence once internal seam welding at the joint is completed.

j. The obstruction lights should be installed and made operational as soon as possible the exhaust stack assembly is erected.

7.9 ERECTION OF DILUTION AIR DUCT – General Procedure

a. The dilution air duct section is located upstream of the inlet plenum. The dilution air duct is designed to slip fit into the inlet plenum ductwork opening. It is up to the Erector to decide whether to build the ducting towards the gas turbine or upwards to the exhaust stack following the completion of the Inlet Plenum installation. This decision typically rests on the most effective use of available crane time on site.

b. Prior to obstructing all sizeable openings, ensure that the dilution air duct JAK 11303-0505 is inside the ducting. Otherwise some components will not fit through the access doors.

c. The Dilution Air Duct assembly is to be lifted vertically utilizing spreader beams and rigging as shown in Figure 13. This ductwork is to be lowered directly in front of the inlet plenum opening. Keeping the ductwork on the hook, pull the duct section into the frame of the Inlet Plenum. Ensure the alignment of the burner duct centerline with the gas turbine discharge centerline. The height from the top of the burner duct to top of concrete should be measured and confirmed with IST drawings. With a transit, check the top four (4) corners of the burner duct for level.

d. Once alignment of the duct is confirmed, the columns will be welded to the base plates in accordance with the instructions shown on Base Plate Layout Assembly drawing 11303-0003. Tack weld the dilution air duct to the inlet plenum before removing the lifting equipment.

e. Seal welding of the casing perimeter between Dilution Air Duct and Inlet Plenums can commence. Two gusset plates will be welded to the underside of Dilution Air Duct at columns B7 and E7 as shown on the IST Erection Diagram 11303-0027 once seal welding of the casing perimeter is complete.

f. Any temporary bracing installed in the interior of the duct can be removed after all casing welds are complete. Internal insulation and JAK installation can commence after the completion of internal casing welds.

7.10 ERECTION OF INLET TRANSITION DUCT – General Procedure

a. The Inlet Transition Duct comprises of two (2) major assemblies – Inlet Transition Duct #1 and Inlet Transition Duct #2. Installation of Inlet Transition Duct #2 commences only after installation of the Dilution Air Duct is complete. Prior to obstructing all sizeable openings, ensure that all the appropriate joint assembly kits 11303-0503 and 11303-0504 are inside the ducting, otherwise some components will not fit through the access doors.

b. Inlet Transition Duct #2 is to be lifted vertically with a rigging arrangement as shown in Figure 9. This ductwork section is to be lowered directly in front of the dilution air duct opening. Keeping the duct on the hook, pull the duct section inside the opening of the burner duct. Ensure the alignment of the burner duct centerline with the gas turbine discharge centerline. The elevation height from the top of the inlet transition duct to the top of concrete should be measured and confirmed with IST drawings.

c. As Inlet Transition Duct #2 is not self-supported by columns, cribbing must be placed under the duct to support its weight until the installation of Inlet Transition Duct #2. Tack weld the duct to the dilution air duct before removing the lifting equipment.

d. Seal welding of the casing perimeter between Inlet Transition Duct #2 and Dilution Air Duct can commence.

e. Any temporary bracing installed in the interior of the duct can be removed after all casing welds are complete. Internal insulation and JAK installation can commence after the completion of internal casing welds.

f. Installation of Inlet Transition Duct #1 should commence only after the complete installation of Inlet Transition Duct #2. The duct assembly is to be lifted vertically utilizing spreader beams and rigging as shown in Figure 7. This ductwork is to be lowered directly in front of the Inlet Transition Duct #2 opening. Keeping the ductwork on the hook, pull the duct section such that the outlet frame fits over the Burner Duct #2 inlet opening. Center the columns of Burner Duct #1 over their respective base plates and rest the duct securely on the base plates. Ensure the alignment of the burner duct centerline with the gas turbine discharge centerline. The height from the top of the burner duct to top of concrete should be measured and confirmed with IST drawings.

g. Ensure the inlet flange is aligned with the gas turbine discharge centerline. The dimensional position of the Inlet Transition Duct should be checked and that it is centered accordingly and that a 20" [510 mm] gap from the Inlet Transition Duct flange to the GT flange is maintained for insertion of the expansion joint.

h. Weld columns to base plates as specified on IST Base Plate Layout Assembly drawing 11303-0003.

i. Seal welding of the casing perimeter between Inlet Transition Duct #2 and Inlet Transition Duct #1 can commence.

j. Any temporary bracing installed in the interior of the duct can be removed after completion of column to base plate welding.

k. The next piece to be installed to this group is the expansion joint. Break the tack welds on the inlet transition duct flange and adjust it back (if required). This will provide a larger opening for insertion of the expansion joint if needed and also allow for adjustment during the final fit up. Prior to lowering the expansion joint into position, gasket tape must first be applied to the inlet and outlet flange faces of the expansion joint assembly. The expansion joint is to be installed in its preset compressed condition by first attaching to the Inlet Transition Duct flange with the hardware provided.

l. Loosen designated bolts on the expansion joint preset bars as illustrated on the expansion joint drawing and expand the joint to its required cold operational setting. Bolt upstream expansion joint flange securely to gas turbine exhaust flange.

m. Once the expansion joint is installed and positioned properly, the angle flange on the inlet transition duct can be seal welded around the entire casing perimeter. Refer to IST Erection Diagram 11303-0027.

n. After the expansion joint is installed, internal installation of the joint assembly kit can commence.

7.11 ERECTION PLATE WELDING

NOTE

If any gaps exist at the interface of two components, it is recommended that the internal seal welding be performed prior to any erection plate welding. See Section 8.7 *Internal Seal Welding* for instructions. Slight adjustment to the erection plate holes may be necessary at site. It is at this time of the OTSG installation process that erection plates are welded to the structural beams that they are bolted to. Depending on which construction option was chosen in Section 8.0 *Ducting & Module Installation*, most erection plates may already be welded at this point. If not, continue erection plate welding until complete. Welding requirements are outlined on the IST Erection drawing.

During the OTSG installation process, erection plates are welded to the structural beams that they are bolted to. Depending on which construction option is chosen, erection plates may be welded while individual assemblies are erected or may be completed immediately after the installation of the Lower Exhaust Hood. Welding requirements are outlined on the IST Erection Diagram.

Erection plate welding shall be commenced as quickly as possible after the components have been assembled. The Erector shall minimize the amount of time the structure stands without full structural welding completed.

7.12 INTERNAL SEAL WELDING

After the installation of a component and once the associated erection plates are welded, internal seam welding should commence. Specific requirements for these welds are outlined on the IST Erection drawings. Seal welding is required at each interface of two components to form a gas tight enclosure.

During the fabrication of the large OTSG module and ductwork components, it is possible that any variance in straightness will result in gaps at either end. This is noticeable when two components are stacked upon each other. In order to compensate for these gaps it is best, during seal welding, to have two (2) welders inside the unit. Both welders should start welding at the middle point of the unit, one on the left wall and one on the right wall. They should weld simultaneously towards the end with the gap. The continuous welding in the one direction will effectively reduce a large portion of the existing gap. This will help to eliminate multiple closure weld passes at the end wall. The Erector may find that the erection plates on the end walls may need to be left off until this internal seal welding is complete. Hydraulic jacks may also be used to force gaps closed and minimize the closure welds.

Inspect all seal welds for adequate size and completeness. Once seal welding is complete, all temporary shipping beams and/or braces can be removed. Ensure that any bolt holes from these beams are covered by having the bolt re-installed and seal welded in place.

8 SUPPORTS AND RESTRAINTS

8.1 TUBESHEET TOP SUPPORT BEAMS

The tube bundles in the OTSG Modules are supported from tubesheets hung vertically from top support beams (refer to Figure 3 and 5) tubesheet support beams are end-supported on expansion pads that allow axial growth towards the sidewalls and to the rear (refer to Figure 22). In addition, all tubesheet support beams, except for the one farthest from the header end, are interconnected along the length of the unit via the use of "push" pipes. To accommodate thermal expansion, the ends of the support beams must not be restrained. During shipping, the ends of the beams are restrained with shipping angles. These angles, which are painted yellow, must be removed (refer to Figure 22). Once the shipping angles are removed, the bolts are to be reinserted into their respective holes in the sidewall, their heads cut off with a grinder, and seal welded. Care must be taken to ensure that the remaining bolt body be either ground flush with the beam flange or be left in a position that allows sufficient clearance to the side of the top support beam. Minimum clearance from the end of the top support beam to any bolting inserted into the wall is 1" [25 mm].

The shipping angles shall be removed only after the majority of the peripheral internal seal weld has been completed between all support beams. Once the angles are moved, the remaining seal welding can be completed.

For the top support beam located farthest from the header end, the beam is allowed to grow laterally (side to side) but prevented from moving longitudinally (fore and aft) within the module. The restraint angles are therefore not to be removed (hence they are not painted yellow). Only the studs restraining the support beam to the restraint angles is to be removed at both ends (refer to Figure 22).

When all required top support beam shipping angles have been removed and the inside periphery of the lower module to SCR module joint and the upper module to lower exhaust hood joint have been welded, the joint assembly kit may be installed. Refer to Section 9.0. Ensure that the joint assembly kit liner panels are installed such that tubesheet top support beam growth is not hindered.

8.2 PRESSURE PART RESTRAINT

The tube bundle is restrained in position with rods that extend from the end casing to the return bend restraint assemblies (refer to Figures 23 to 26). To prevent damage during shipping, rubber strips have been inserted between the return bend inner restraints and the inside surface of the return bends. All rubber strips must be removed prior to operation.

The return bend end pattern design of the internal pressure boundary matrix is a hybrid arrangement containing a zigzag arrangement in the economizer and evaporator sections and an inline arrangement in the superheater section. The zigzag return bend restraints use a ‘double bar’ restraint located at the inside of the return bends. The inline return bend restraints use a “pipe” restraint located at the inside of the return bends. These restraints will be used to hold the tube bundle in position during operation.

Please note that throughout this document, reference will be made to the ‘front’ end. This end of the module will be at the feedwater box or header end.

At all restraint levels, the gap between the inside of the return bend and the double bar restraint is to be adjusted to have a gap of 0” to 1/16” [0 to 2 mm] maximum after the protective rubber is removed. Care must be taken not to damage the return bends. Note that it may be possible to remove the shipping rubber without having to readjust the restraints, provided the clearance after the rubber is removed is 0” to 1/16” [0 to 2 mm]. It is allowable to have minimal clearance between restraints at some of the return bends, but the majority should just touch.

For restraint positions 1, 3, 5, and 6 as shown on Figures 23 and 25, a gap of no more than ¼” [6 mm] must be maintained between the outside of the return bend and the push pipe restraint.

Once installed, all restraints at all levels must be checked at the wall bracket location to ensure that each is securely fastened.

CAUTION

The proper adjustment of the return bend restraints is critical to the reliable operation of the OTSG. Improperly adjusted restraints can lead to pressure part and restraint failure. It is highly recommended that an IST Service Representative be on site during this stage of the construction.

8.3 FEEDWATER BOX SHIPPING RESTRAINT

Temporary restraints consisting of lumber and zip ties are installed inside the feedwater box for shipping purposes. Completely remove these restraints prior to commissioning the OTSG.

9 JOINT ASSEMBLY KIT (JAK) INSTALLATION

Once the internal seam welding is completed, shipping beams removed, and all bolt holes plugged, the joint assembly kits can be installed. These kits comprise of insulation, stainless steel liner panels, retaining channels, washers, and nuts.

Proper planning by the Erector will ensure that all required joint assembly kit components are placed in their proper location, inside the unit, during installation of each OTSG assembly.

Concentrated loading of joint assembly kit components directly onto finned tubes is strictly prohibited. JAK liner panels should straddle top support beams or be distributed over the tube surface in several areas. Insulation bundles can be set directly on tubes between top support beams.

JAK installation is required at the following component interfaces:

1. Expansion Joint to Inlet Transition Duct #1
2. Inlet Transition Duct #1 to Inlet Transition Duct #2
3. Inlet Transition Duct #2 to Dilution Air Duct
4. Dilution Air Duct to Upper/Lower Inlet Plenum
5. Lower Inlet Plenum to Upper Inlet Plenum
6. Upper Inlet Plenum to Lower OTSG Module
7. Lower OTSG Module to SCR Module
8. SCR Module to Upper OTSG Module
9. Upper OTSG Module to Lower Exhaust Hood
10. Lower Exhaust Hood to Upper Exhaust Hood
11. Upper Exhaust Hood to Stack Adapter
12. Stack Adapter to Exhaust Stack

Prior to joint assembly kit installation, inspect all liner plates. They should be flat or have distortion less than a ½" [12 mm].

The installed insulation should be tight fitting and joints should be staggered to prevent hot spots, refer to the individual JAK drawings for details. All insulation being installed in JAK locations is clearly indicated in the JAK drawing. In the case of insulated joints with liners to achieve the required 6" [150 mm] thickness, insulation is to be installed in layers. The insulation is then compressed to 5½" [140 mm] when the liner panels are secured in place. The insulation density is provided in the individual joint assembly kit drawings.

Ensure that liner panels are installed in the correct, overlapping sequence. Once the joint assembly kit liner panels are placed in position, retaining channels, washers and then nuts can be installed.

The liner sections immediately adjacent to the top support beams are floating, as they must allow the beams to expand along the length of the unit, as well as side-to-side. These floating panels are to be installed directly after the placement of insulation and are to be placed local to the ends of the top support beam.

IMPORTANT

The nuts installed on the studs, at all JAK locations, should be "snug" tight, then backed off ¼ turn and then tack welded. This will ensure that the liner panel is not secured too tightly as to prohibit liner plate movement during thermal expansion.

10 PLATFORMS

Check that platforms are in conformance with IST supplied drawings and that the platforms and other OTSG attachments do not place any restraint on the OTSG thermal growth. The platform is an integral part of the OTSG structure and will have to be erected in sequence with the boiler. Due to the potential for high winds during construction, the platform steel must be installed prior to the placement of the Upper Exhaust Hood assembly. See Section 7.0. Refer to the IST Platform Arrangement drawing 11303-0021, installation detail drawings [TBD], and fabrication detail drawings [TBD] for all erection details.

At the start of platform installation, the major columns along gridline A are to be centred over their respective base plates and welded into place. Gusset plates for cross bracing along the base of gridline B must be welded to the duct columns and base plates at four locations prior to erecting the balance of the platform steel. The platform steel is designed to be bolted together during the erection phase. Bolt holes are drilled into the duct columns and platform columns for quick assembly of connecting beams in the field.

The connecting beams at column lines B1, B3, B5, and B7 have gusset plates that require field welding to the duct columns. It is permissible to bypass these field welds during the erection of the platforms as these bolted joints are designed to withstand wind loading on the OTSG during the construction phase. The connecting beam field welds must be completed immediately after the installation of the Exhaust Stack.

The platform steel is shipped with a coating of Carbozinc 11 primer. Coating removal and preparation for welding is the responsibility of the Erector. The Erector is responsible for cleaning and coating of welded joints and other surface imperfections. The Erector is responsible for the supply and application of all primer touch-up required throughout the construction process.

Grating penetration holes, for piping and conduit, are to be cut in the field by the Erector. The Erector will fabricate and install collars at all grating penetrations.

11 EXTERIOR SURFACE

Once the OTSG installation is complete, inspect all field welds made between the major components. Check the welds for adequate size, quality and completeness. Check all bolts for tightness, including all erection plate bolts and header restraint bolts. All ducting flange bolts (e.g. at expansion joint location) should be checked for tightness and seal welded if required.

External surfaces, where temporary shipping components have been removed, and any areas of grinding and welding, should be touched up with paint equivalent to that on the supplied equipment. All external joint seam welding and other surface imperfections are to be cleaned and coated following the instructions outlined in IST Paint Specification 11303-0450 attached in Appendix D for reference. The Erector is responsible for the supply and application of all primer touch-up required throughout the construction process.

12 ACCESS DOORS

OTSG access doors have a standard opening dimension of 18” x 18” [450 mm x 450 mm]. Install any access doors that may have been shipped loose. Verify that structural steel does not interfere with the door hardware when it is opened. Since the doors have considerable thickness, obstructions must not exist beside the hinge points, otherwise the insulation plug on the inside of the door will not open far enough to allow access into the OTSG.

Inspect all rope gaskets in the door to ensure that a continuous loop exists around the door perimeter. Close the door to check that the rope gasket seals around the entire perimeter of the door frame.

Ensure that the eyebolt has been coated with anti-seize compound.

After all internal inspections have been completed, close the doors and tighten the handle firmly.

13 PIPING AND VALVES

During OTSG installation, do not remove protective end caps from headers or piping until necessary. Install steam and feedwater external piping spools as detailed in the IST Piping drawings. Ensure all necessary post weld heat treatment and non-destructive examination has been completed. Refer to Appendix E for Hydrostatic testing requirements.

Check that the safety valves have been installed correctly, all seals are in tact and have the proper rating. Ensure that plugs and gags have been removed, if the hydrostatic test is complete, and confirm that operational disks have been installed. Check that the drain connections have been properly routed to ensure operator safety.

Safety valve vent stack pipes should be installed firmly supported and restrained. Sufficient clearance should exist between the safety valve discharge elbow and the vent pipe to allow for steam pipe thermal expansion. Refer to the IST Vent Stack Piping drawing for details. Refer to Section 14.2 for installation instructions.

Install all valves that were shipped loose. Take note of the correct flow direction. Motorized and pneumatic valves should be checked for proper operation. Operate the valves to ensure the linkages do not bind. Refer to the IST Flowsheet drawing 11303-0004 for tag number references.

Ensure that the flow nozzle meter run is installed in the direction of flow.

Check that all drains and vents are free of obstructions and that the lines have been properly and safely, routed and supported.

Check all pipe supports to ensure that guides act only as guides and that piping is restrained only at the points indicated on the Customer Engineering drawings. Steam pipe hanger supports are to be installed such that there are no external forces imposed on the OTSG header connection. All spring hanger supports are to be adjusted so that the load indicator is positioned at the desired "cold" setting. If travel stops are installed, have these removed prior to OTSG operation.

NOTE

Due to rapid temperature changes of the external piping during startup and shut down, welding of pipe supports to the steam piping should be avoided whenever possible.

Check that all bolts on flanged connections are tight and that proper gaskets have been installed.

All sampling ports off the OTSG casing and drain connection at the bottom of the inlet plenum should be capped or plugged.

All temporary pipe supports and bracing installed for erection and cleaning purposes must be removed before OTSG operation.

All blanking plates and hydro test plugs used for hydrostatic testing shall be removed once the hydro has passed test.

Ensure that all required feedwater strainers are installed. Their purpose is to safeguard control valves and to prevent damage and/or plugging of downstream flow orifices. They should be installed prior to water flushing and OTSG start up.

14 "JUMPER" TUBE INSTALLATION

As the OTSG pressure part assembly is distributed over three (3) modules – Lower OTSG Module, SCR Module, and Upper OTSG Module – the internal tube circuits have to be connected once all modules have been erected in place. Before the interconnecting tube welding can take place, the internal seam welding and JAK (joint assembly kit) between Lower, SCR and Upper Modules must first be completed. There are forty-one (41) 1"∅ jumper tube sets at the front end, each made up of two (2) sections of field installed tubing. This field installed tubing will require one hundred twenty three (123) field welds to be performed by an automated orbital TIG welding process.

For specific arrangement refer to IST drawing *Field Jumper Tube Arrangement* 11303-0650. The services to perform this activity are available to the customer at IST standard per diem rates. These rates and a tentative schedule are submitted separately to the customer for review. The Erector will be responsible for certain functions related to this activity and are outlined as follows:

- 480 Volt 60 Amp junction uninterrupted power source and hook-up service for IST orbital welding transformer, plus 110 / 220 Volt 100 Amp for tool crib container to provide lighting and use of power tools.
- Designated lay down area local to steam generator unit (preferably) for IST tool crib container.
- Provision of dry compressed air and designated area for air compressor local to steam generator unit.
- Twelve (12) 2,300 psig bottle manifold pack of argon with two (2) manifold connections for backing gas for orbital welding, plus six (6) loose bottles for welding machine shielding gas.
- Internal scaffold inside the ducting for the completion of orbital welds as required.
- Provision of salamander heaters, hoses of which to be fed into the inlet plenum access door. This is a requirement only if work is performed during winter months. These will also be required during the hydrostatic test in order to raise the temperature of the tube material.
- Tarpaulin over access doors in the event of inclement weather.
- Site safety induction lecture of IST personnel prior to commencement of site activities.
- Provision by customer for one (1) site personnel for safety watch while IST welding technicians work inside the ducting and one (1) other support personnel to assist with cutting, prepping and purging of tubes. In the event of two (2) shifts, a set of support personnel will be required for each shift.
- Designated lunch, smoking area, and washroom facilities.
- Provision and arrangement of any onsite permit requirements.
- Supply of ample demineralized water and pressurizing equipment to perform a hydrostatic test of each steam generator unit once jumper tube welding is complete and piping tie-ins are made.

- Coordinate activities with local authorities for approvals and witnessing of hydrostatic tests. All associated costs are the responsibility of the customer.

All associated costs to conduct the hydrotest, which may include the supply of pressurizing equipment, obtaining suitable water and the service fees of the local authorized inspector, are not covered by IST.

15 VENDOR SUPPLIED ITEMS

15.1 FABRIC EXPANSION JOINT (Gas Turbine Discharge)

Please reference the expansion joint manufacturers drawing & installation instructions *B25744-1* for additional details.

Before installing the expansion joint, the gas turbine exhaust diffuser must be located in its final, fixed position.

The fabric expansion joint should be preset compressed for installation into position and must be bolted directly to the gas turbine exhaust flange. The expansion joint preset bars should be intact at this time. The face-to-face distance between the gas turbine exhaust flange and the spool duct flange should be checked to ensure proper installation clearance.

Prior to lifting, identify the “TOP” position on the expansion joint. Be sure to apply the self adhesive, woven fibreglass gasket material to both the inlet and outlet flange faces of the expansion joint. Lift and place the expansion joint within the opening. Once the expansion joint is in position, securely fasten it to the gas turbine exhaust flange. Allow the joint to expand to the end of the slot. (Confirm the joint overall operational flange to flange distance is in accordance with specifications). The inlet transition duct flange (shipped tack welded) can now be repositioned if necessary to properly mate up to the expansion joint flange. The flange can now be seal welded in its final position to the inlet transition duct. Securely bolt the expansion joint outlet flange to the now fixed inlet flange of the inlet transition duct with the hardware provided.

Install insulation in the internal cavity between the inlet transition duct and the expansion joint as shown in the IST Erection Diagram 261027. Lap liner plates will be installed to cover the insulation between the expansion joint and inlet transition duct.

15.2 SAFETY VALVE SILENCER

Please refer to the following installation information for the safety valve silencer provided for this project. Refer to the silencer arrangement drawing *1170016-1* for detailed dimensional information.

IST is providing one (1) steam vent silencer on each OTSG that will facilitate two (2) HP safety relief vent lines, and one (1) HP start-up vent line with 30% capacity,

Upon receipt of the silencer at site, a thorough inspection should be performed. Look for any signs of shipping damage both internally and externally. If damage is found immediately contact IST. Any damaged surfaces on the silencer should be repaired according to IST Paint Specification attached in Appendix D. A zinc-rich primer coat of Carbozinc 11 is applied to the external casing. All touch up coatings to be supplied by the Erector.

The vent silencer will be shipped to site on its side. Use the lifting lugs supplied on the equipment for rotating and lifting. Lifting slings if used shall be properly located so that weight distribution is approximately equal on both slings. Spreader beams should be utilized to reduce minor axis bending of lifting lugs, where appropriate

The Erector must ensure all connecting piping are properly supported prior to connecting with the silencer flanges. Failure to comply can lead to excessive forces and moments applied to the nozzles causing damage to the silencer body.

The vent silencer is to be mounted onto support steel which is outlined on the Platform Arrangement drawing 11303-0021. The securing hardware to fasten the silencers to the support steel is called up on the erection diagram. Align the bolt holes and securely connect the four (4) base plates with the hardware provided.

Do not remove any protective end caps from the inlet and outlet nozzles until necessary during installation. Verify that all vent piping has been installed and supported per the design assembly drawings. The vent silencer is to be positioned with the orientation of the weather hood outlet facing towards the Gas Turbine.

Ensure that no interference exists between the silencer and any surrounding structures or piping. Flanged connections on the bottom of the silencer are designed to connect with the safety valve vent stack piping described Section 13.0. The flanged connections on the side of the silencer are designed to connect with the start-up vent piping provided by others. The Erector must ensure piping is properly supported prior to installation at the silencer connection flanges. Loading the connection flanges beyond the allowable loads and moments provided in silencer arrangement drawing *1170016-1* will cause damage to the silencer.

The vent silencer is constructed with connecting flanges with bolt holes straddling plan view centrelines. Install proper gaskets between the inlet flanges of the silencer and vent stack pipes. Bolt the pipe flanges in place with the hardware provided. Hardware and gaskets provided by IST are listed on the Vent Stack piping Assembly drawing 11303-0026 and will be shipped in a hardware kit associated with this equipment. Vent stack pipe flange connections may require re-tightening of the bolts after the unit reaches operating temperature.

A low point drain, off the silencer main body, is provided for removal of condensation or precipitation. Check that the silencer drain is free of obstructions and that the drain line has been properly routed to a safe location and supported.

Drain lines are to be supplied and installed by the Erector. Under no circumstances should liquids be allowed to accumulate in the upstream vent piping or the silencer prior to operation of the silencer as the resulting forces could result in mechanical failure of the silencer.

15.3 SELECTIVE CATALYST REDUCTION (SCR) SYSTEM

The following provides an overview of installation information for the Selective Catalyst Reduction (SCR) System. Detailed installation instructions for the SCR system can be found in the vendor drawings and manuals and SCR Catalyst Loading Arrangement drawing 11303-0734. A complete SCR system consists of the following components:

- Ammonia storage tanks (by Others)
- Ammonia forwarding pumps, interconnecting piping, and instrumentation (by Others)
- Ammonia Flow Control Unit (by IST)
- Ammonia Distribution Manifold (by IST)
- Aqueous and vaporized ammonia interconnecting piping (by Others)
- Ammonia Inject Grid (by IST)
- SCR catalyst support frame internal to the SCR Module (by IST)
- SCR catalyst blocks (by IST)
- SCR catalyst loading cart (by IST)

The Ammonia Flow Control Unit (AFCU) consists of a vaporizer vessel with immersion heater, dual dilution air blowers, and associated instruments and valves mounted on a steel skid. The equipment will be anchored to the concrete foundation. Anchoring hardware and grounding equipment will be supplied and installed by the Erector. Wiring to the control cabinet terminal points will be supplied and installed by the Erector. The Erector will be responsible for connecting electrical supply, ammonia supply, and instrument air supply to the unit. The AFCU will be controlled by the plant DCS using control logic supplied by Peerless Manufacturing Company.

The Ammonia Distribution Manifold (ADM) is located downstream of the AFCU skid and is mounted at grade close to the OTSG. The manifold branches off into thirteen branches leading to individual Ammonia Injection Grid assemblies. The ADM is to be placed on a concrete pad with anchor bolts supplied and installed by the Erector. Due to the temperature of the vaporized ammonia, the ADM is designed to grow thermally away from the manifold inlet. The Erector must ensure the anchoring hardware will accommodate the thermal growth of the ADM.

The fifteen (15) Ammonia Inject Grid (AIG) assemblies are installed inside the OTSG Lower Module. With the exception of two locations at the module lifting lugs, the AIG assemblies are shop-installed by IST. For field instructions on the installation of the two remaining AIG assemblies, see Section 7.2.

Prior to loading the SCR catalysts into the OTSG, the OTSG internals must be heated by the gas turbine exhaust in order to remove any residual paint, oil, debris, and other chemicals that can contaminate the catalyst. The temperature during this burn-out process should reach the dry running design temperature of the OTSG which will cycle the SCR support frame through the full design thermal growth. An inspection of the frame prior to SCR catalyst installation will confirm the perimeter seals are able to accommodate the frame expansion. The following bur-out procedure shall be followed:

1. Run the gas turbine at synch-idle and hold for a minimum of two (2) hours. At no time should the gas turbine exhaust temperature be lower than 550°F (290°C) during the burn-out process. The gas turbine power level should be set accordingly.

2. After the previous step is completed, increase the gas turbine load such that the exhaust temperature is equal to the design dry running temperature +0/-50°F (+0/-28°C). It is preferred that the exhaust temperature reaches the dry running temperature at this stage. Hold for two (2) hours minimum at this steady state condition. The gas turbine will likely be close to 100% load at this time.

3. Reduce the gas turbine load back to synch-idle with an exhaust temperature not less than 550°F (290°C) and hold for a minimum of 10 hours. The burn-out process may be interrupted during the 10 hour burn-out period provided an additional 30 minutes is added to the heat soak time per restart. If the interim shut down is less than two hours, additional run time is not required.

4. As an alternative to the above burn-out procedure, the gas turbine can be brought up to full load with temperature equal to the design dry running temperature +0/-50°F (+0/-28°C) and maintained for a minimum of 14 hours.

It is required that an SCR vendor representative and an IST representative be present for the installation of the SCR catalyst.

To access the SCR catalyst loading area, three removable casing panels at the rear of the SCR Module must be unbolted and removed. The internal liner channels and seals behind the door will be removed from inside the ducting by entering through the closest access door. Next, the SCR cart rail assemblies will be placed and securely fastened to the support beams inside the ducting. A SCR cart rail extension assembly will be securely fastened to the SCR loading platform. Install scaffolding and planking to permit personnel to walk to the length of the unit between the SCR cart rails. Strips of plywood will be placed on top of the tube bundle in the Lower OTSG Module and on top of the AIG lances to prevent falling debris from damaging the finned tubes, AIG lances, and CO catalyst blocks.

IST has supplied a hydraulic SCR loading cart for the purpose of installing the SCR catalyst blocks. The hydraulic cart will be placed on the SCR loading platform to accept catalyst blocks. The catalyst blocks may be transported by truck, forklift, or hoist using a suitable lifting device. Precautions should be taken during transportation and hoisting to avoid shocks and jolts to the catalyst blocks.

Catalyst module assembly packaging should be removed just before installation into the SCR Module. Precautions must be taken to protect the catalyst from damage caused by tools, sharp objects, welding sparks, and other dangers caused by local work activities. Damaged catalyst blocks should not be placed into the SCR Module. Any damage shall be reported immediately to an IST representative.

Prior to installing the catalyst module assemblies, measure their length and compare it against the distance between the stop bars on the catalyst support frame to ensure there is sufficient room for thermal growth.

Woven fiberglass gasket material shall be applied to the catalyst support frame assembly. This will ensure a gas-tight seal between consecutive catalyst module assemblies.

A catalyst module assembly will be placed on the SCR loading cart with the lip at the bottom of blocks facing the rear of the OTSG. The operator will raise the hydraulic actuator to ensure the catalyst clears the catalyst support frame. Slowly push the catalyst module assembly towards the front of the OTSG. Ensure consecutive catalyst module assemblies fit tightly to ensure all catalyst blocks will fit on the support frame. Gently lower the hydraulic actuator and move the loading cart back once the catalyst module assembly is secured.

After all catalyst blocks are loaded, stitch weld the retaining bracket to the support framework at the rear end. The SCR cart rail assemblies and extensions are removed and the SCR loading door sections replaced. Ensure that gasket material is installed around the entire perimeter and that the door panels are installed in the correct sequence. Replace all internal flexible seals and liner channels. Tighten the bolting around the door panel flanges. If gas leaks are found to exist during gas turbine operation, seal welding door flanges may be required.

15.4 CARBON MONOXIDE (CO) CATALYST SYSTEM

The following provides an overview of installation information for the Carbon Monoxide (CO) Catalyst System. Detailed installation instructions for the SCR system can be found in the vendor drawings and manuals and CO Catalyst Installation drawing 11303-0735.

A complete CO catalyst system consists of the following components:

- CO catalyst support frame internal to the Lower OTSG Module (by IST)
- CO catalyst blocks (by IST)

NOTE

The following contaminants are known catalyst deactivators and contribute to shortened catalyst life – heavy and base metals such as lead, mercury, arsenic, antimony, sodium, potassium, lithium, zinc, copper, tin, iron, nickel, chrome, sulfur, silicon, phosphorous, fluorine, chlorine, bromine, and iodine. Hence the contents of these contaminants in the catalyst are recommended not to singularly or collectively accumulate to levels exceeding 10 mg/ft^3 (350 mg/m^3) of catalyst as determined by ICP-OES (Inductive Couple Plasma-Optical Emissions Spectroscopy) or glow discharge spectrophotometry. The presence of levels of the listed contaminants exceeding the stated limits will void the catalyst warranty unless otherwise expressly agreed in writing by EmeraChem.

Prior to loading the CO catalysts into the OTSG, the OTSG internals must be heated by the gas turbine exhaust in order to remove any residual paint, oil, debris, and other chemicals that can contaminate the catalyst. The temperature during this burn-out process should reach the dry running design temperature of the OTSG which will cycle the CO support frame through the full design thermal growth. An inspection of the frame prior to CO catalyst installation will confirm the perimeter seals are able to accommodate the frame expansion. The following burn-out procedure shall be followed:

1. Run the gas turbine at synch-idle and hold for a minimum of two (2) hours. At no time should the gas turbine exhaust temperature be lower than 550°F (290°C) during the burn-out process. The gas turbine power level should be set accordingly.

2. After the previous step is completed, increase the gas turbine load such that the exhaust temperature is equal to the design dry running temperature +0/-50°F (+0/-28°C). It is preferred that the exhaust temperature reaches the dry running temperature at this stage. Hold for two (2) hours minimum at this steady state condition. The gas turbine will likely be close to 100% load at this time.

3. Reduce the gas turbine load back to synch-idle with an exhaust temperature not less than 550°F (290°C) and hold for a minimum of 10 hours. The burn-out process may be interrupted during the 10 hour burn-out period provided an additional 30 minutes is added to the heat soak time per restart. If the interim shut down is less than two hours, additional run time is not required.

4. As an alternative to the above burn-out procedure, the gas turbine can be brought up to full load with temperature equal to the design dry running temperature +0/-50°F (+0/-28°C) and maintained for a minimum of 14 hours.

It is required that a CO vendor representative and an IST representative be present for the installation of the CO catalyst. It is advisable to complete SCR catalyst installation prior to CO catalyst installation to prevent debris from falling onto the CO catalyst blocks. In the event that

both catalysts are installed together, ensure there is sufficient planking above the CO catalyst installation to prevent debris from falling onto the catalyst blocks.
The CO catalyst blocks are fragile – both physically and chemically – and expensive. It is requested that the individual blocks be handled with extreme care.

A crane or other suitable lifting device will be used to deliver the CO catalyst blocks to the appropriate platform elevation. A removable CO catalyst door is located in the SCR Module above the AIG lances from which the CO catalyst blocks will be brought into the ducting. Plywood must be placed over the AIG lances to protect the lance nozzles and to prevent damage to the lances by distributing weight. The weight of workers and CO catalyst blocks must be distributed over a minimum of four AIG lances.

Gas seal panels at the rear of the ducting between the AIG lances and CO catalyst support frame will be removed to grant personnel access for the installation or removal of the CO catalyst blocks.

Individual CO catalyst blocks will be passed through the AIG lances to the installer positioned on the CO catalyst support frame. A fiberglass gasket is applied between the frame support and the catalyst block. Set the catalyst block onto the frame. Ensure the catalyst sits squarely in the frame and check from the sides, top, and bottom to ensure the gasket remains in place. Any gaps in the gasketing between the frame and catalyst will result exhaust gas bypassing the system and reducing CO catalyst performance.

CAUTION
Do not walk on CO catalyst surface.

After all the CO catalyst blocks have been installed in the support frame, install retaining washers and retaining nuts over the threaded studs as indicated in CO Catalyst Installation drawing 11303-0735. Apply a high temperature anti-seize compound (by IST) sparingly on the studs. Install the retaining washer followed by the first nut ensuring it is tightened to the proper torque. Install the second nut and ensure the first nut does not turn, thus changing its initial torque.

Once all the catalyst blocks have been loaded and the installation is considered adequate, the gas seal panels at the rear of the ducting between the AIG lances and CO catalyst frame will be reinstalled to its original state. Remove all plywood planking used during the installation. Reinstall the CO catalyst loading door ensuring that gaskets are used and bolts tightened to prevent gas leakage. If persistent gas leakage is found after the bolts are tightened, it may be necessary to seal weld the door joint.

15.5 DILUTION AIR SYSTEM

The following provides an overview of installation information for the Fossil Power Systems duct burner. Detailed installation instructions for the duct burner can be found in the Fossil Power Systems drawings and manuals.

A complete duct burner system consists of the following components:

- Six (6) dilution air elements and assembly (by IST)
- One (1) blower skid with inlet silencer (by IST)
- One (1) set of interconnecting ducting between blower skid and injection lances (by Others)
- Noise abatement barriers and ducting insulation (by Others as required)

The dilution air system has six (6) horizontal burner elements that are shipped loose and inserted widthwise into the Diluition Air Duct by the Erector. Each dilution air element is supplied with an end support that is welded to the platform side external casing of the duct during the dilution air element installation. The end support should be tack welded at four corners during initial installation. Prior to installing the dilution air elements, the end support will be lined with 6 lb/ft^3 (96 kg/m^3) soluble fiber insulation to minimize heat transfer to the duct exterior.

The dilution air elements are inserted through the duct casing openings on the non-platform side and supported on the opposite wall by the end supports. The burner elements are to be checked for position, level, elevation, and angular alignment upon installation. Once the correct installation of the individual dilution air elements is verified, the faceplates and end supports can be seal welded to the duct casing. 6 lb/ft^3 (96 kg/m^3) soluble fiber insulation will be installed in all casing cavities prior to the installation of the supplied closure liner plates and bolting hardware. Tack weld nuts on the inner securing studs once closure panels are secured in place.

The faceplates will act as the fixed point of the dilution air elements and thermal growth will be towards the expansion end supports. Ensure the installed elements are free to expand towards the end supports.

The dilution air blower skid is to be located and installed in an appropriate location designated by the Erector. The equipment will be anchored to the concrete foundation. Anchoring hardware and grounding equipment will be supplied and installed by the Erector. Wiring to the control cabinet terminal points will be supplied and installed by the Erector. The Erector will be responsible for connecting electrical supply, and instrument air supply to the skid.

15.6 STACK DAMPER

The following provides an overview of installation information for the stack damper. Detailed installation instructions for the stack damper can be found in the vendor drawing CF-2245-01-01 and manuals.

The stack damper actuator and rain skirts may be may be shipped loose to prevent damage to the components. Assembly of the actuator should be completed prior to installation of the stack damper on the exhaust stack.

The stack damper is not to be installed on the exhaust stack until it is mechanically secured and all internal and external seal welding is complete. A crane will be employed to lift the stack damper using the lifting lugs provided. The damper will be secured onto the exhaust stack lifting plates using the supplied hardware. The load is not to be released from the crane hook until the proper installation of the stack damper hardware is confirmed.

Any rain skirt panels that are shipped loose will be bolted into position after the stack damper is secured in place.

Wiring and power supply to the stack damper terminal points will be supplied and installed by the Erector.

16 INTERNAL COMPONENTS INSTALLATION

16.1 END SEALS

The end restraint adjustment procedure, outlined in Section 8.2, may require the removal of end seal panels (floor panels) to allow access. Once the restraint rod adjustment process is complete, the end seal panels should be replaced and inspected. No significant leakage paths between end seal panels should exist; otherwise adjustments should be made to eliminate any gaps.

The end seal panels have been designed with oversized holes to allow for thermal expansion. To ensure these panels slide freely during operation, all bolts should be installed “snug” tight and backed off ¼ turn.

16.2 LOWER OTSG MODULE TUBESHEET THERMOCOUPLE INSTALLATION

Gas side thermocouples are required to be field installed on the tubesheet reinforcing pipes at three (3) locations across the width of the duct at eight (8) tubesheet locations. All thermocouple leads will be secured firmly to the tubesheet reinforcing pipes as they traverse to the Thermocouple Head Assembly. The junction head is to be installed on site into a pipe nipple provided on the external casing of the Lower OTSG Module on the platform side.

Each set of three (3) gas side thermocouples are to be field installed on the tubesheet reinforcing pipes. All three thermocouple wire leads will extend through the side casing by a pipe nipple provided to a single thermocouple junction head. Thermocouple instrumentation conduit cables (by others) are to be run from the junction head on the side casing back to the DCS in the control room. For detailed installation of the tubesheet thermocouples, refer to the IST Lower/AIG/CO Module Thermocouple Arrangement drawing 11303-0602. Ensure that the installation conforms to all notes shown in the drawing.

16.3 SCR MODULE THERMOCOUPLE INSTALLATION

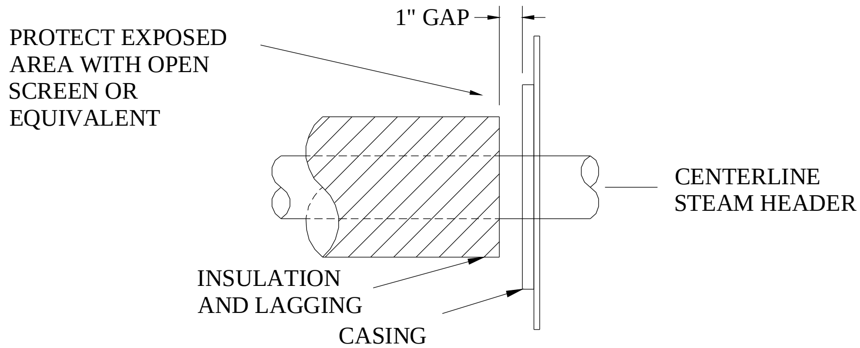
Gas side thermocouples are required to be field installed on the underside of the catalyst block support pipes at three (3) locations across the width of the unit and at two (2) catalyst support pipe locations. All thermocouple leads will also in turn be secured firmly to the underside of the support pipes as they traverse to the Thermocouple Head Assembly. The junction head is to be installed on site into a pipe nipple provided on the external casing of the SCR Module on the platform side. Thermocouple instrumentation conduit cables (by others) are to be run from junction head on Exhaust Hood back to DCS in the control room. For detailed installation of SCR module thermocouples refer to the IST SCR Module Thermocouple Arrangement drawing 11303-0728. Ensure that the installation conforms to all notes shown in the drawing.

16.4 INSPECTION OF TUBES & SIDE SEAL GAS BAFFLES (V SEALS)

Except for the end restraint assemblies and connection to headers, the tubes should be free to expand. All debris must be removed from the top of the module so that no tubes are prevented from moving through the tubesheets. On either side of the tube bundle, the side seal gas baffles or "V-Seals" (refer to Figure 3 and 5) allow the bundle to thermally grow side-to-side while the outside casing remains a fixed size. Any debris that has fallen onto the top of the "V-Seals" must be removed prior to operation. Damage to the "V-Seals" will result during operation if all debris is not removed. Inspect all visible tubes for straightness and immediately report to IST any tubes that show any signs of bowing. Tube finning should be relatively undamaged. If there appears to be major areas of fin damage, the fins can be "combed" out. Leave the fins bent in areas of minor damage.

16.5 PIPING INSULATION AND LAGGING

All required external insulation and lagging for feedwater piping and their branches are to be supplied and installed by the Erector. Any areas requiring insulation or other materials for personnel protection shall be addressed. In general, this should cover all feedwater piping downstream of the heat exchanger including vents, drains, and transmitter connections. All steam piping insulation is the responsibility of the customer and their selected contractor. To prevent casing overheating, the steam pipe insulation shall not be insulated tight against the boiler casing. The insulation shall be stopped short of the casing by a minimum of 1" [25 mm] as shown in the Figure below.


1" GAP
PROTECT EXPOSED
AREA WITH OPEN
SCREEN OR
EQUIVALENT
CENTERLINE
STEAM HEADER
INSULATION
AND LAGGING
CASING

17 PRE-SERVICE INSPECTION AND CHECK LIST

During construction and when the installation is complete, the unit should be completely inspected by an IST representative. This is required prior to the unit being exposed to gas turbine exhaust. If the unit is found not to be in conformance with the supplied drawings or descriptions outlined in this document, or if anything is found that will cause problems during operation, the IST representative will contact the Erector so that an immediate correction or resolution can be conducted.

The construction manager or appointed personnel should review the following checklist to ensure that all activities, associated with the ducting installation, are complete.

- Inspect all ducting components for shipping damage:
  - Gas Turbine Discharge Expansion Joint
  - Inlet Transition Duct #1
  - Inlet Transition Duct #2
  - Dilution Air Duct
  - Lower Inlet Plenum
  - Upper Inlet Plenum
  - Lower OTSG Module
  - SCR Module
  - Upper OTSG Module
  - Lower Exhaust Hood
  - Upper Exhaust Hood
  - Stack Adapter
  - Exhaust Stack

- Inspect all items listed below for shipping damage:
  - Safety Valve Silencer
  - Selective Catalyst Reduction (SCR) System
  - Carbon Monoxide (CO) Catalyst
  - Dilution Air System
  - Stack Damper
  - Valves and Instruments

- All base plates, soleplates and Fabreeka pads installed per drawing, level and in the correct position.
- Anchor bolts installed with nuts fixed in position by welding or jam nut.
- Lower Inlet Plenum installed, positioned properly, and level.
- Lower Inlet Plenum columns welded to base plates.
- Center the four (4) loose columns from the Upper Inlet Plenum onto their respective base plates and brace in place.
- Upper Inlet Plenum is lifted into proper position above the Lower Inlet Plenum.

- With the Upper Inlet Plenum still on the crane hook, the four loose columns are bolted to the Upper Inlet Plenum columns and welded to the base plates.
- Erection plates installed between the Lower Inlet Plenum and Upper Inlet Plenum, both bolted and welded.
- All shipping beams and braces in the Lower Inlet Plenum and along the base of the Upper Inlet Plenum are removed and all bolt holes are sealed.
- Internal and external seal weld between the Lower Inlet Plenum and Upper Inlet Plenum complete.
- Inlet Plenum diagonal brace installed.
- Lower OTSG Module installed, properly positioned, and level.
- Erection plates installed between Lower OTSG Module and Upper Inlet Plenum, both bolted and welded.
- Internal and external seal weld between Lower OTSG Module and Upper Inlet Plenum complete.
- All shipping beams and braces in the Upper Inlet Plenum and along the base of the Lower OTSG Module are removed and all bolt holes in the lower sidewall beams sealed.
- Remove four (4) lifting channels in the Lower OTSG Module sidewall and install the two remaining AIG lance assemblies.
- SCR Module installed, properly positioned, and level.
- Erection plates installed between SCR Module and Lower OTSG Module, both bolted and welded.
- Internal and external seal weld between SCR Module and Lower OTSG Module complete.
- All shipping beams and braces in the Lower OTSG Module and along the base of the SCR Module are removed and all bolt holes in the lower sidewall beams are sealed.
- All top support beam shipping restraint angles on Lower OTSG Module removed (except at the last tubesheet at the rear of the module) and sidewall bolt holes sealed.
- All Lower OTSG Module restraining studs removed at each end of all top support beams including the last support beam where the shipping angle remains.
- Upper OTSG Module installed, properly positioned, and level.
- Erection plates installed between Upper OTSG Module and SCR Module, both bolted and welded.
- Internal and external seal weld between Upper OTSG Module and Lower OTSG Module complete.
- All shipping beams and braces in the SCR Module and the Upper OTSG Module are removed and all bolt holes are sealed.
- All SCR catalyst support beam shipping restraint angles on the SCR Module removed (except at the front support closest to the header) and sidewall bolt holes are sealed.
- All SCR Module restraining studs removed at each end of all support beams including the front support beam where the shipping angle remains.
- Lower Exhaust Hood installed, properly positioned, and level.
- Erection Plates installed between Lower Exhaust Hood and Upper OTSG Module, both bolted and welded.
- All Lower Exhaust Hood shipping beams removed and all bolt holes sealed.

- Internal and external seal weld between Lower Exhaust Hood and Upper OTSG Module complete.
- All top support beam shipping restraint angles on Upper OTSG Module removed (<u>except at the last rear tubesheet</u>) and bolt holes sealed.
- All Upper OTSG Module restraining studs removed at each end of all the top support beams including the last beam (furthest from header end) where the shipping angle remains.
- All platform steel will be fully erected and bracing installed prior to the placement of the Upper Exhaust Hood.
- Upper Exhaust Hood installed, properly positioned, and level.
- Erection Plates installed between Upper Exhaust Hood and Lower Exhaust Hood, both bolted and welded.
- All Upper Exhaust Hood shipping beams removed and all bolt holes sealed.
- Internal and external seal weld between Upper Exhaust Hood and Lower Exhaust Hood complete.
- Closure plates between the Upper Exhaust Hood and Lower Exhaust Hood are seal welded to the casing exterior.
- Stack Adapter installed, properly positioned, and level.
- Erection Plates installed between Upper Exhaust Hood and Stack Adapter, both bolted and welded.
- Shipping braces in the Stack Adapter are removed and all bolt holes sealed.
- Internal and external seal weld between Upper Exhaust Hood and Stack Adapter complete.
- Exhaust Stack installed, properly positioned, and level.
- Erection Plates installed between the Exhaust Stack and Stack Adapter, both bolted and welded.
- Install obstruction lighting (supplied by Erector) and ensure they are operational as soon as erection of exhaust stack is complete.
- Dilution Air Duct installed, positioned properly, and level.
- Internal stitch and external seal weld between Dilution Air Duct and Inlet Plenum complete.
- Gusset plates to the underside of Dilution Air Duct at columns B7 and E7 are seal welded in place.
- Inlet Transition Duct #2 installed, positioned properly, and level.
- Internal stitch and external seal weld between Inlet Transition Duct #2 and Burner Duct #1 complete.
- Inlet Transition Duct #1 installed, positioned properly, and level.
- Internal stitch and external seal weld between Inlet Transition Duct #1 and Inlet Transition Duct #2 complete.
- Expansion joint installed and mechanically connected (bolted) to Inlet Transition Duct #1 support flange and gas turbine outlet flange. Expansion joint preset bars removed.
- All Joint Assembly Kit (JAK) installed accordingly,
    - Insulation used for JAKs on all OTSG duct work joints including expansion joint. Ensure insulation density applied at each joint is in accordance with drawings.
    - Insulation layers installed at a depth of 6” (150mm) and compressed to 5.5” (140mm).
    - Insulation layers are lapped to prevent hot spots.

    - Liner panels overlapped in correct sequence.
    - All nuts are installed correctly (not too tight to prevent thermal movement) and tack welded in position.
    - JAK at Upper OTSG Module-to-Lower Exhaust Hood provides for expansion of top support beams.
- All closure kits are installed accordingly,
    - Insulation used for JAKs on all OTSG duct work joints including expansion joint. Ensure insulation density applied at each joint is in accordance with drawings.
    - Insulation layers installed at a depth of 6" (150mm) and compressed to 5.5" (140mm).
    - Insulation layers are lapped to prevent hot spots.
    - Liner panels overlapped in correct sequence.
    - All nuts are installed correctly (not too tight to prevent thermal movement) and tack welded in position.
- All intermodule field jumper installation installed.
- All debris is cleared from the module side gas baffles ("V seals") locations.
- All end seals and floors are installed and adjusted to prevent gas passage.
- All scaffolding and equipment removed from all OTSG components.
- All temporary shipping bracing removed from ducting components
- All temporary cribbing / supports removed.
- All return bend protective rubbers removed.
- All Pressure part restraint gaps adjusted per instructions.
- All damage to external surfaces has been touched-up with primer as specified which includes all areas of external casing welds, erection plate welding, and base plate welding.
- All access doors can be opened fully and then tightly sealed.
- Safety relief valves installed correctly.
- Safety relief valve vent pipes are properly supported and sufficient clearance exists between the vent pipe and the valve discharge pipe.
- All boiler external piping and valves are installed as required.
- All orifices and strainers are installed as required.
- All vents and drains are piped to safe or designated locations.
- All valves are installed in correct flow direction.
- All valves checked for proper operation (manual or automatic).
- All flanged connections tight and proper gaskets installed.
- All instruments installed (i.e. tubing and wiring).
- All sampling port and drain connections to the ducting are capped.
- Hydrostatic testing conducted according to the required regulations. Water used was demineralized and met IST water quality specification.
- Safety valve silencer installed and secured.
- Safety valve silencer drain line piped.
- Damaged silencer surfaces are primed and painted as required.
- Dilution air elements and end supports are installed and secured.

- Dilution air skid is installed and leveled on foundation per manufacturer's instructions. Ducting connection the dilution air skid and dilution air elements (supplied by Erector) are installed.
- Ammonia Flow Control Unit (AFCU) skid is placed and anchored to the foundation. Grounding cable is installed.
- Ammonia Distribution Manifold (ADM) is placed and anchored to the foundation.
- Interconnecting piping (supplied by Erector) between AFCU, ADM, and AIG is installed.
- Stack damper is installed and secured to Exhaust Stack.
- Instrumentation is wired to the DCS and all required control logic properly programmed.
- All utilities – including natural gas, aqueous ammonia, and instrument air – as required by the OTSG and IST supplied equipment is provided.
- Install grounding cables from foundation to grounding connections located on the Lower Inlet Plenum.

Checked by: ______________________________ Date: ___________________

18 CUSTOMER / CONTRACTOR BACKCHARGE PROCEDURE

The customer, or the designated Erector, should be aware of the following:

Any work that is deemed as extra to the contract, by which IST is considered wholly or partially responsible for, should be first brought to the attention of IST by filling out a Backcharge Procedure form. After all the specific details have been defined and work scope identified, this form is to be faxed to IST head office for approval before proceeding. This provides IST with an opportunity to give input and/or engineering solutions, and the option to have either an on site vendor or an outside contractor perform the work. The Backcharge Procedure form can be found in Appendix B.

NOTE
IST will not honour extra work charges without prior approval.

19 SYSTEM CLEANING

19.1 DRY RUN OPERATION

An advantage to the Innovative Steam Technologies OTSG is the ability to operate dry without any water in the pressure circuits. This has significant advantages because the gas turbine can be commissioned before the OTSG has been fully completed and operational. It also allows for increased plant operation flexibility.

There are, however, several conditions that must be completed before dry run operation can commence.

- The OTSG must be flushed using demineralised feedwater meeting the IST specification ES-020 to remove any desiccant in the steam header and other impurities in the tubes. **Note that the OTSG pressure parts are supplied in a clean state and free of oils.**

- Internal OTSG mechanical construction must be completed and signed off. All punch list items completed. Refer to OTSG related items in the checklist found in Section 19.

- Steam and feedwater piping connections (if connected to the OTSG), must be fully supported placing no strain on the header nozzles. If the piping has not been attached to the OTSG, it is **strongly recommended** the open pipe connections be blanked off and vented to a safe location to prevent personnel exposure to high temperature steam. Residual water from the flush will convert to steam and exit the feedwater and steam header openings.

- OTSG support columns must be installed and anchor bolt nuts adjusted as per the drawing requirements.
- Expansion joint alignment shipping brackets removed.
- During dry operation, the gas turbine exhaust gas temperature must be recorded on a regular schedule to ensure the maximum OTSG dry running temperature is not exceeded.
- Specific instructions with respect to the safety valve status must be given to the project site manager to be followed.

19.2 FEEDWATER SYSTEM CLEANING

To accomplish an effective cleaning and flush of the feedwater system, water flow rates should be as high as possible. The condensate and/or boiler feedwater pumps provide circulation and the condensate tank and condenser hotwell provide additional storage and surge capacity.

Prior to flushing the feedwater system, the condenser, hotwell, and deaerator storage tank are normally hand cleaned followed by a general hose washing. If there is a long delay before the deaerator is cleaned and brought to service, flash rusting will quickly occur. This will result in a dirty system that will require additional flushing and cleaning. A high-pressure water blast may be used to remove rust formed in the deaerator.

Demineralized water is used to flush the feedwater system. Flushing normally begins with the condenser hotwell, and continues stepwise through the condenser and feedwater systems up to the check valve on the OTSG feedwater inlet. Water flushing of the OTSG is not permitted until the feedwater piping is cleaned. Failure to do this may result in plugging the flow distribution orifices at the inlet flex tubes of the OTSG.

Any water that enters the OTSG tubing must meet the water requirements given IST Engineering Specification ES-020.

During the various cleaning operations, consideration must be given to the isolation and cleaning of all branch lines (drains, vents, isolation) to ensure an adequately cleaned system.

All feedwater control valves should be disassembled and the trim removed prior to flushing and orifice plates should not be installed until after the flush. Strainers are normally installed at the inlets to the condensate and feedwater pumps to protect them from damage by suspended material.

The high pressure feedwater check valve should be disassembled and undergo a full flush. Subsequently, stop the flush and inspect the feedwater flow control valve piping (or other low point in the feedwater piping) to ensure the line is clear and free of any grit. The flush should be repeated until the line is clear.

To aid in determining if the piping system is clean, collect a conductivity sample from the influent water supply and compare it to the effluent flush sample. When both conductivity readings are comparable, and within IST feedwater limits, the line is considered to be clean. After the flush, all strainers should be examined, cleaned and reinstalled.

The OTSG modules are assembled at the factory and the OTSG unit is assembled at site. An advantage to the OTSG is the elimination of grease and rolling oils that are used for the construction of drum type HRSG's. A simple flush is all that is required to clean the tubing of an IST OTSG. Once the entire unit is assembled and before the first steam production, demineralized water must be flushed through the unit to ensure a clear path and remove of any dirt particles or desiccant that may have been introduced during shipping.

This procedure can be accomplished in the following manner:

1. Ensure the water supply system upstream of the feedwater control valves is clean, tested, and meets the water specification (See ES-020).
2. Disconnect the feedwater flow meter impulse lines and remove the feedwater flow orifice.
3. Ensure the main steam pipe stop check valve is closed.
4. Open the main steam pipe drain valves located before the main steam pipe stop check valve, and then open feedwater control valves to flush the OTSG.
5. Observe the drain connections and continue to flush until the effluent water appears clean. Test the effluent water conductivity and ensure it is the same as the influent water.
6. Flush the feedwater meter impulse lines.
7. When the effluent water is clean, close the feedwater pipe block valve and completely drain the OTSG. Ensure the feedwater vent block valves are open. Dry the tubing as required in Engineering Specification ES-020.
8. Remove the attemperator feedwater flow orifice and disconnect the attemperator from the feedwater line.
9. Flush the attemperator feedwater line by opening the motorized feedwater block valve and then close the motorized valve when the line is clean.
10. Repeat the above procedure for all pressure circuits.

CAUTION

DO NOT INTRODUNCE ANY CAUSTIC OR ACIDIC SOLUTIONS INTO THE OTSG WITHOUT FIRST CONSULTING WITH IST.

Appendix A

Reference Figures for Erection and Installation Instructions

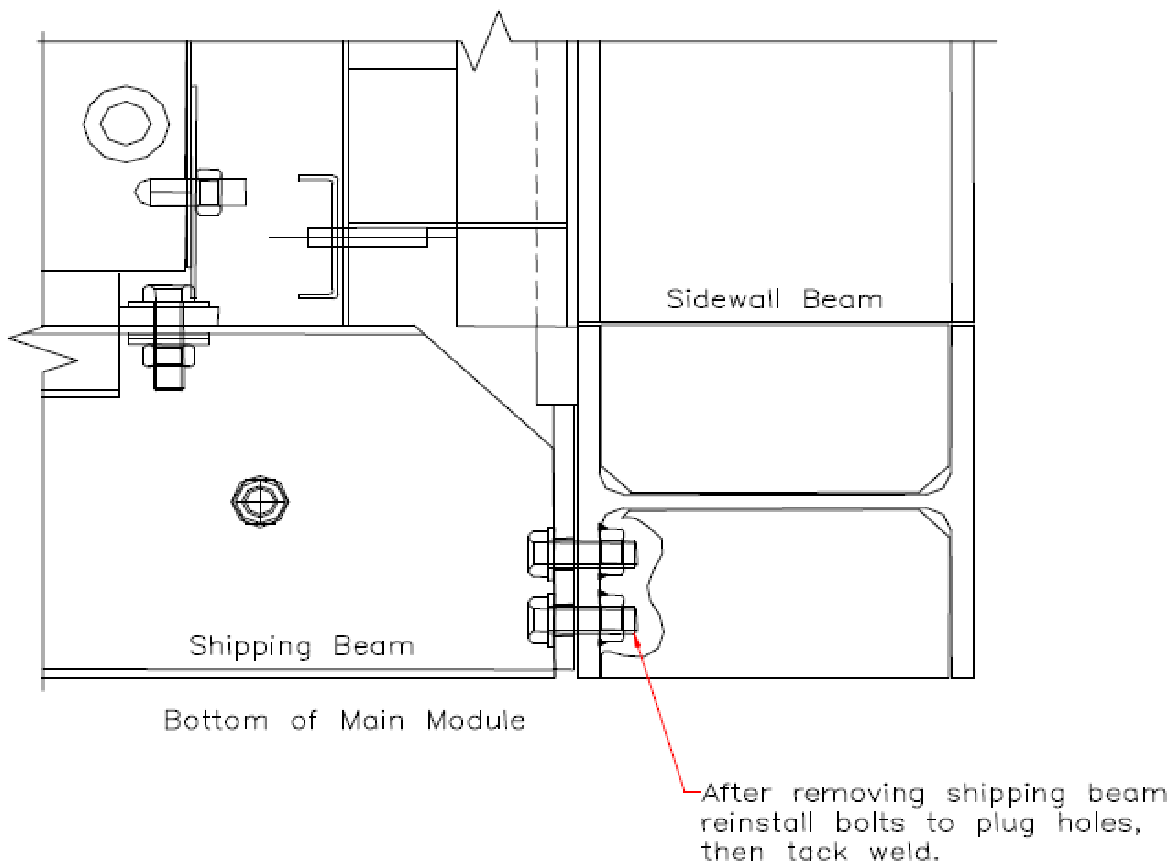


Figure 1 – OTSG Module Shipping Beam Detail

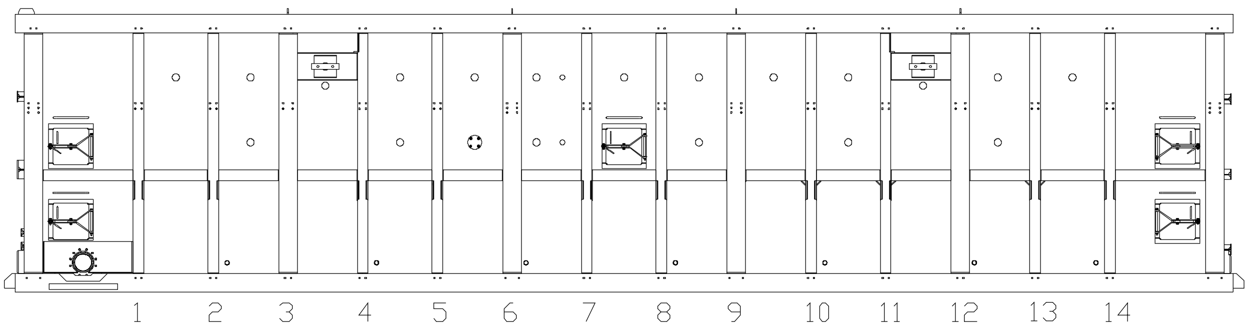


Figure 2 –Lower OTSG Module Shipping Beam Location

Prior to module lift into position, shipping beams 1, 2, 4, 5, 7, 8, 10, 11, 13, and 14 can be removed.

All other beams to remain in position until module has been lifted and secured on the Upper Inlet Plenum.

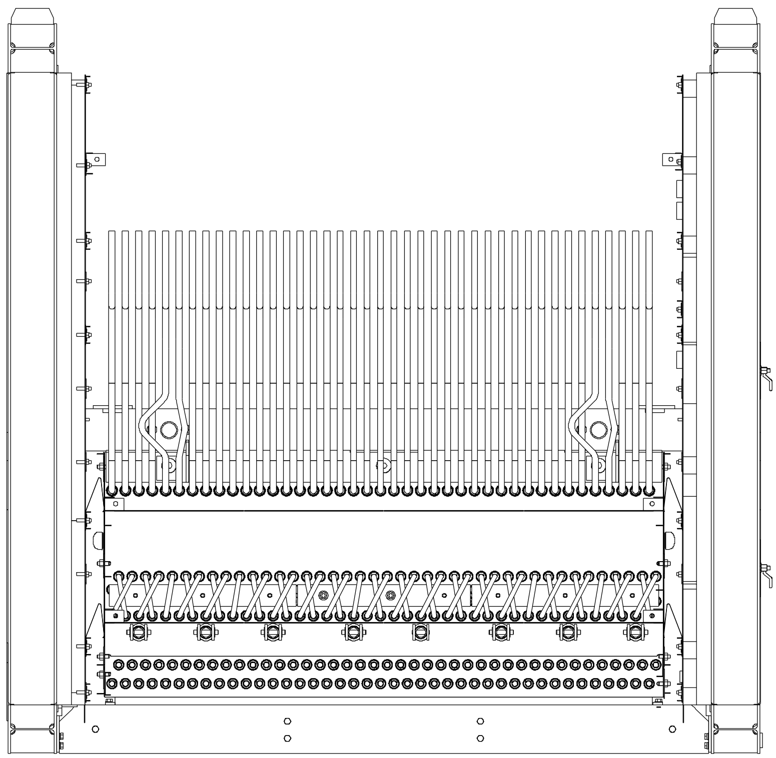


Figure 3 – Cross Section Through Lower OTSG Module

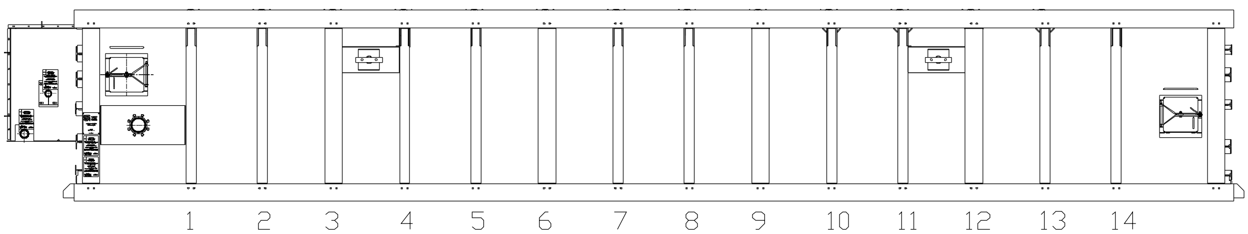


Figure 4 – Upper OTSG Module Shipping Beam Location

Prior to module lift into position, shipping beams 1, 2, 4, 5, 7, 8, 10, 11, 13, and 14 can be removed.

All other beams to remain in position until module has been lifted and secured on the SCR Module.

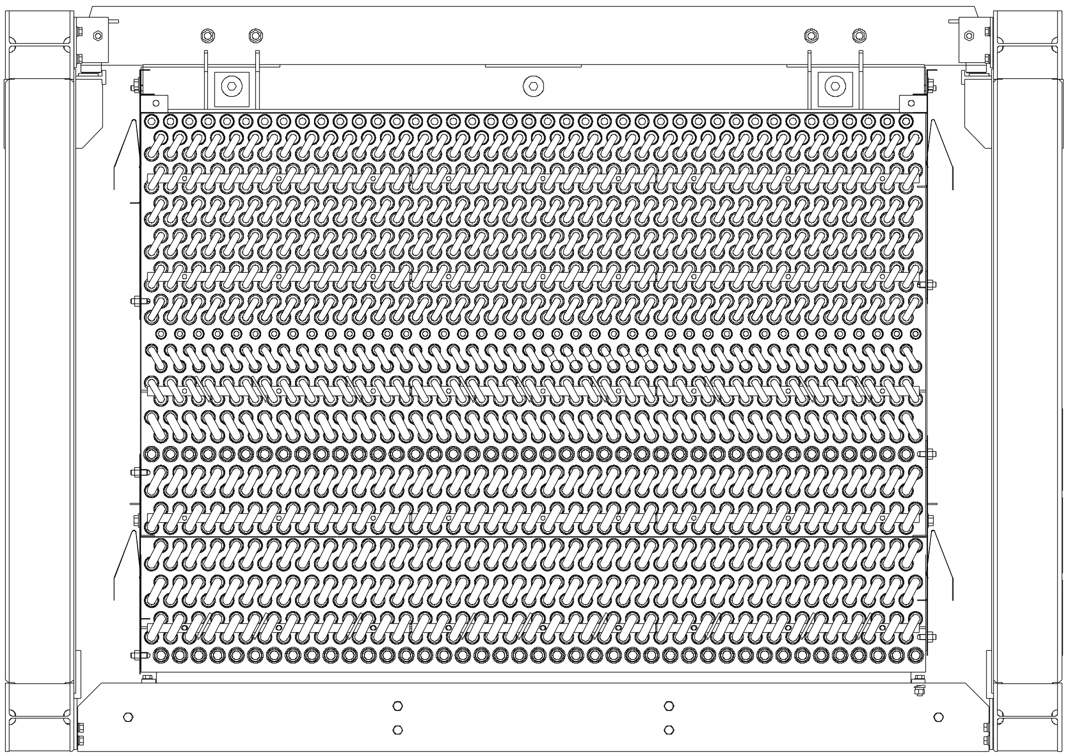
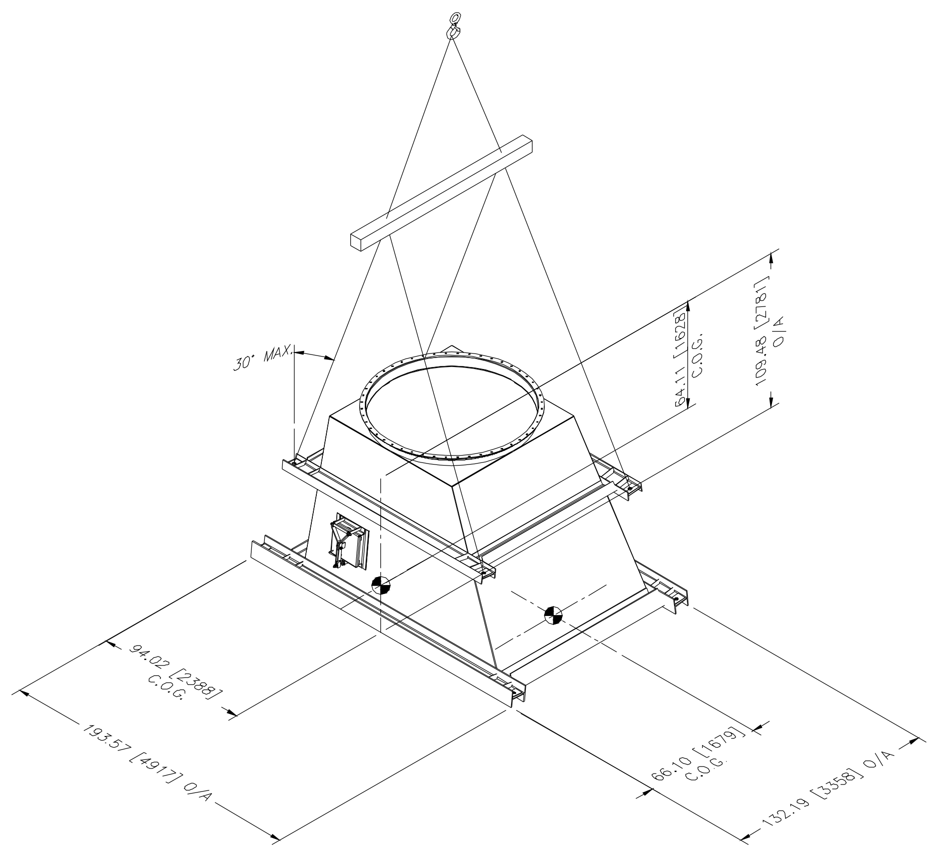


Figure 5 – Cross Section Through Upper OTSG Module



Project No. C10082
Weight: 13,500 lbs [6,124 kg] (approx)

* Shipper shall be responsible for levelling duct work for transit.

Figure 6 – Inlet Transition Duct #1 Lifting Layout for Shipping

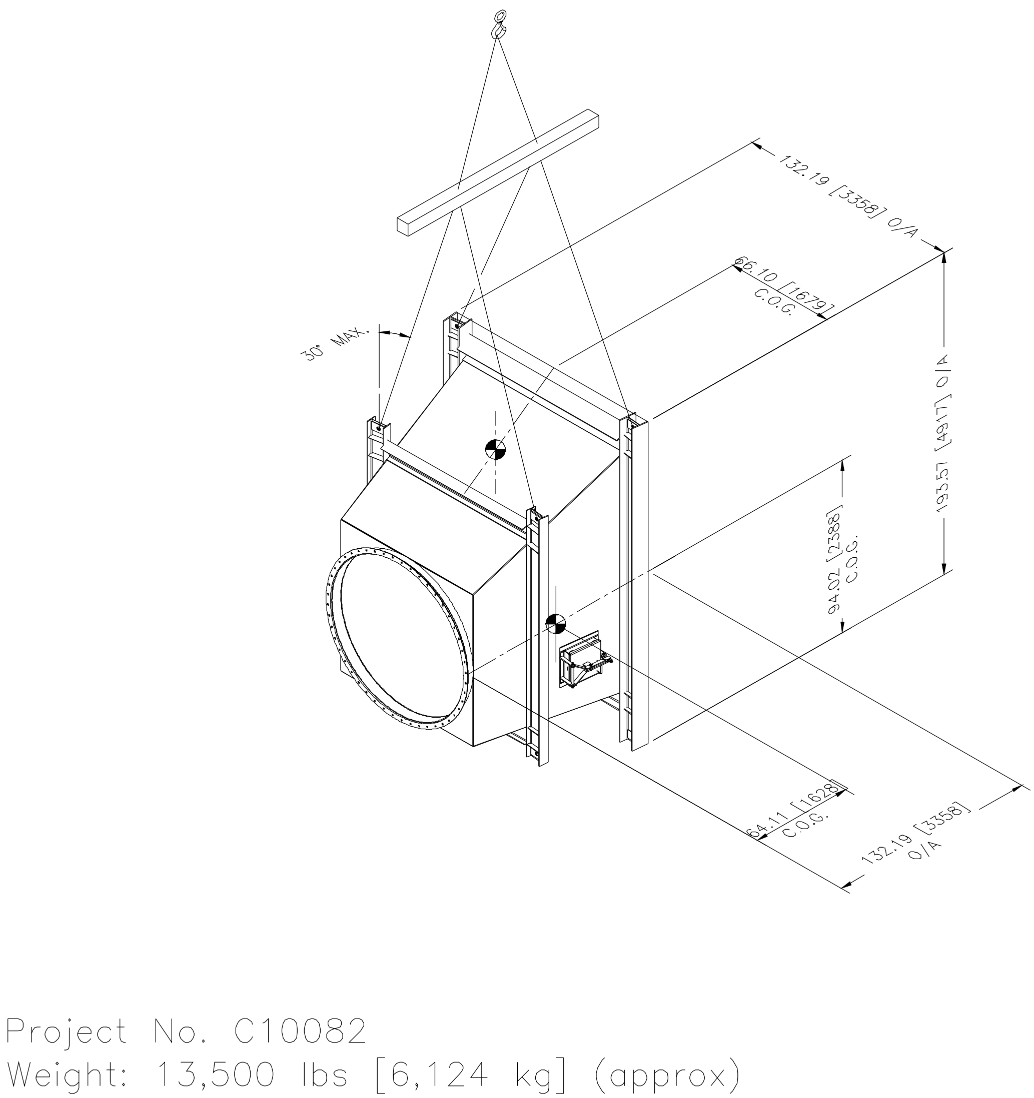
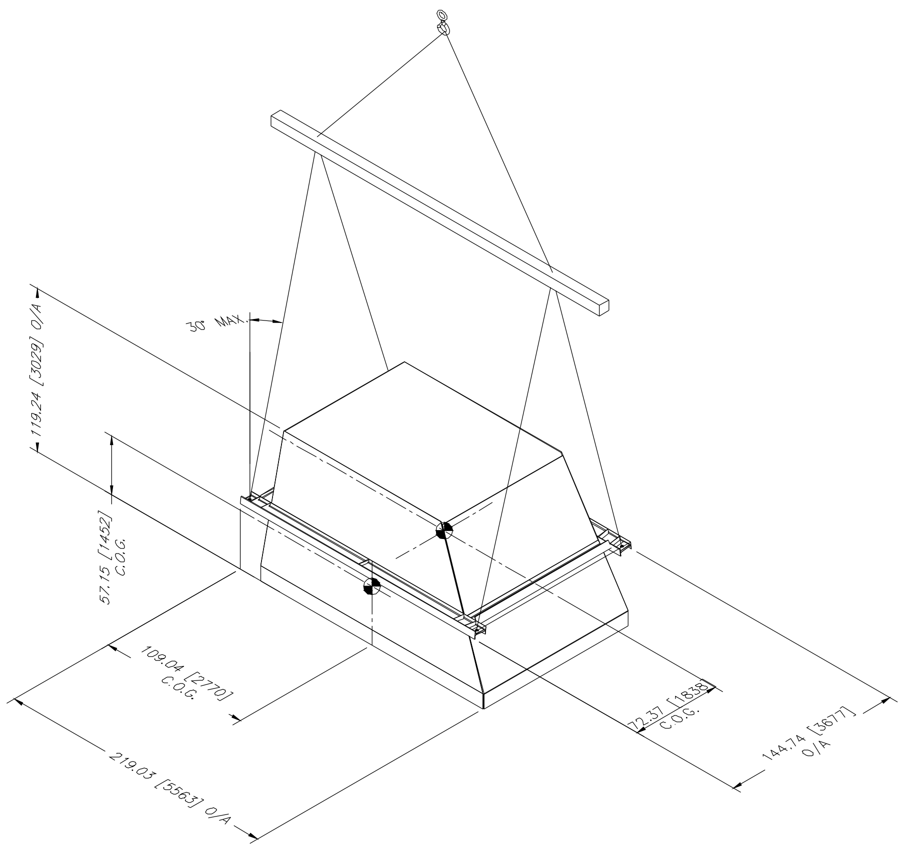


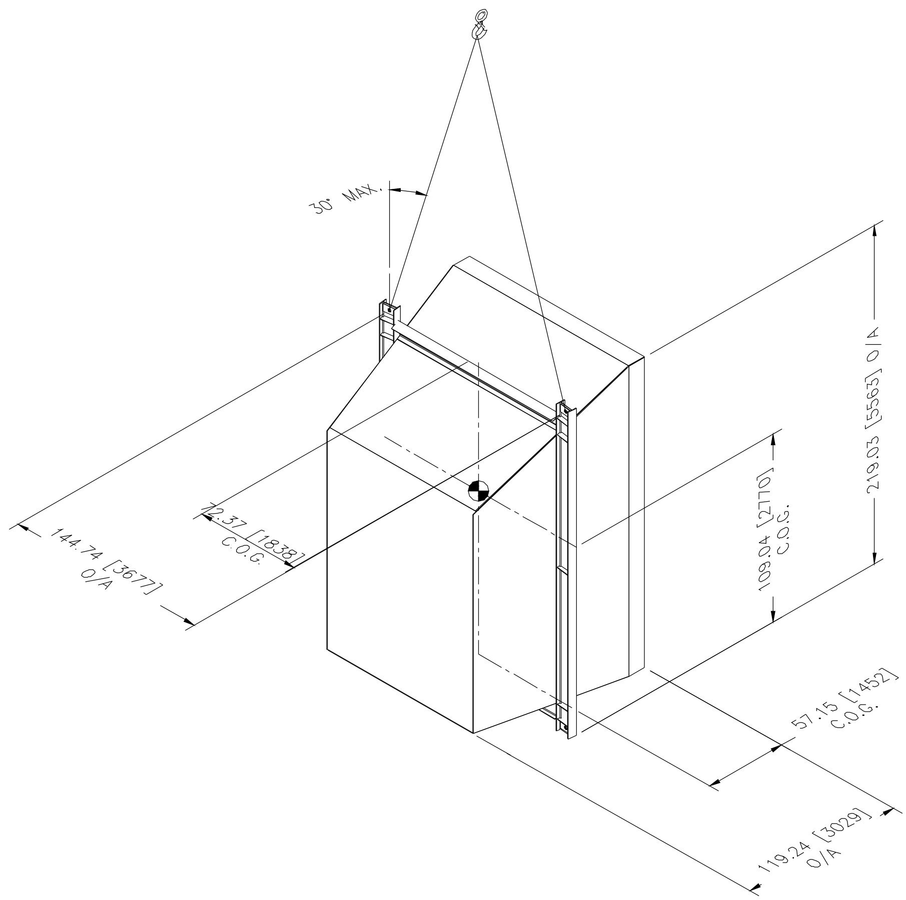
Figure 7 – Inlet Transition Duct #1 Lifting Layout for Positioning



Project No. C10082
Weight: 16,000 lbs [7,258 kg] (approx)

* Shipper shall be responsible for
levelling duct work for transit.

Figure 8 – Inlet Transition Duct #2 Lifting Layout for Shipping



Project No. C10082
Weight: 16,000 lbs [7,258 kg] (approx)

Figure 9 – Inlet Transition Duct #2 Lifting Layout for Positioning

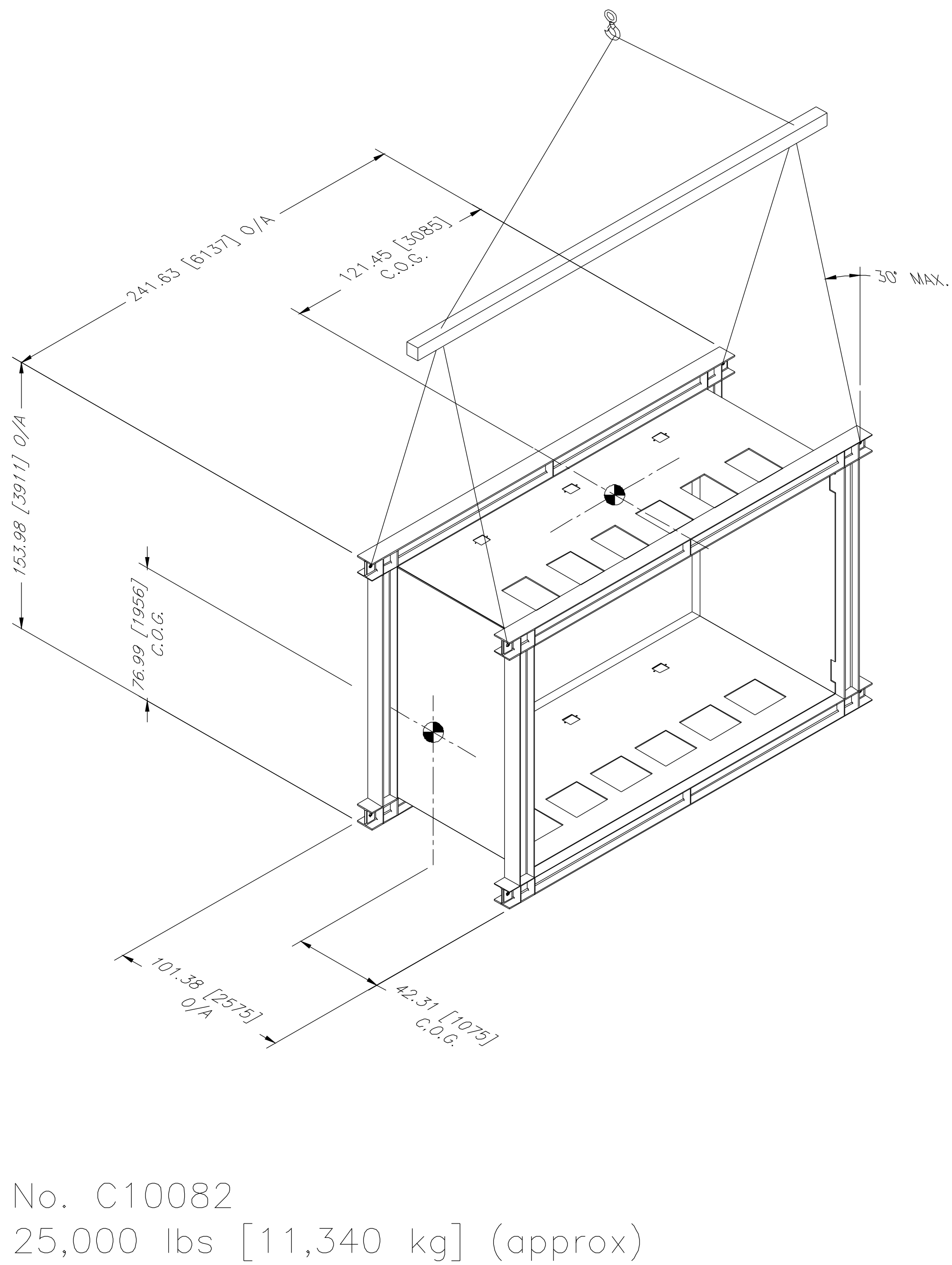


Figure 10 – Dilution Air Duct Lifting Layout for Shipping

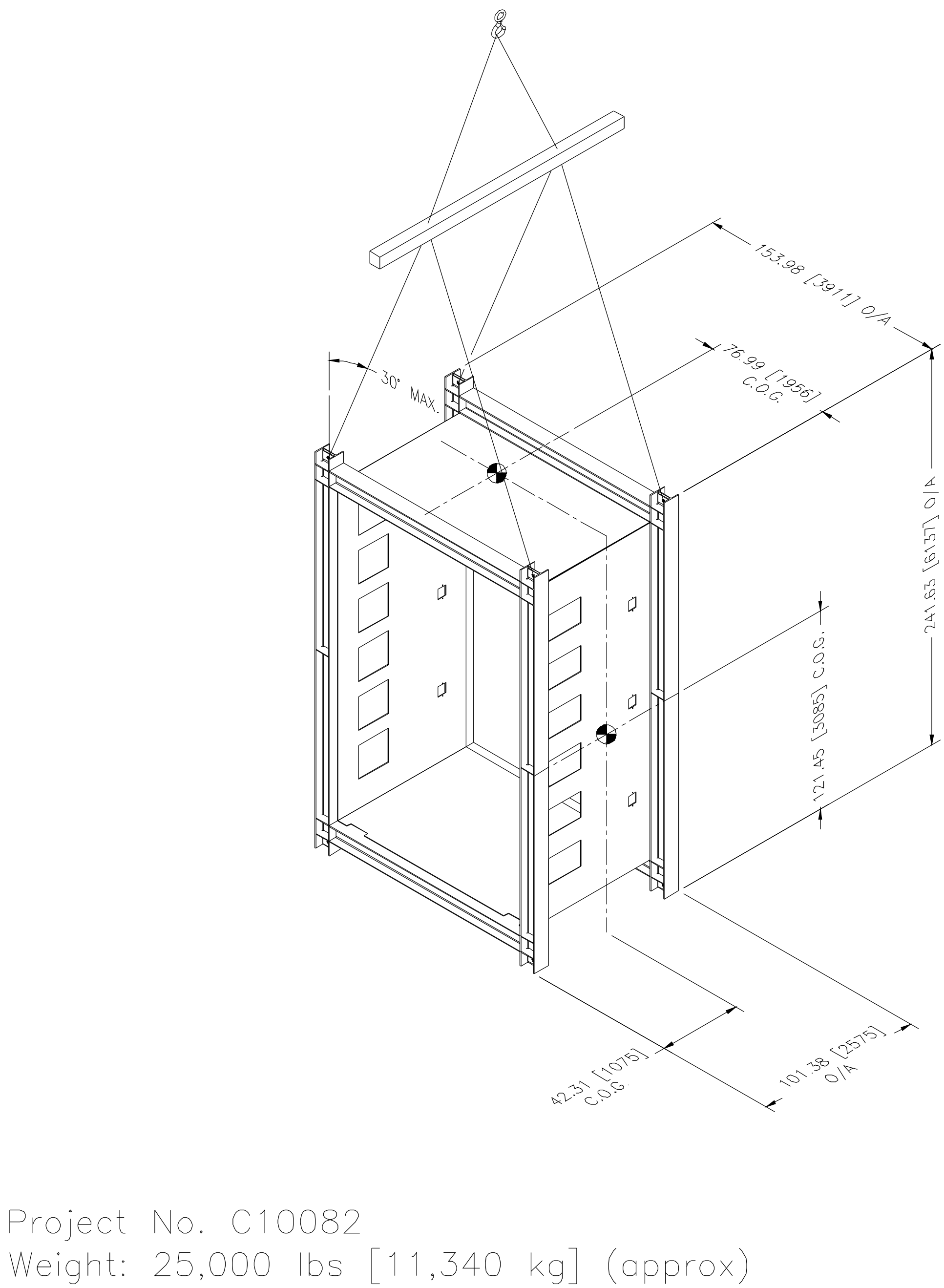
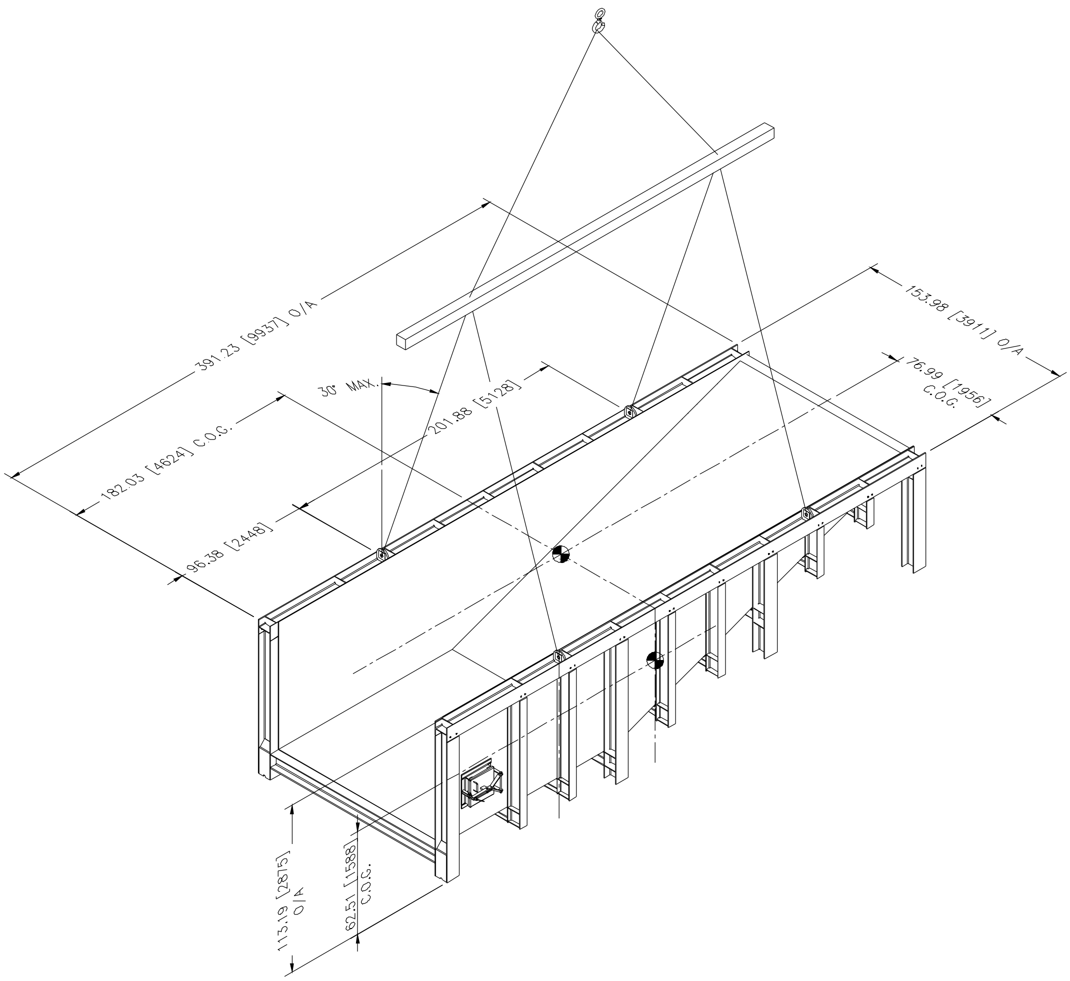


Figure 11 – Dilution Air Lifting Layout for Positioning



Project No. C10082
Weight: 33,100 lbs [15,014 kg] (approx)

* Shipper shall be responsible for
levelling duct work for transit.

Figure 12 – Lower Inlet Plenum Lifting Layout for Shipping and Positioning

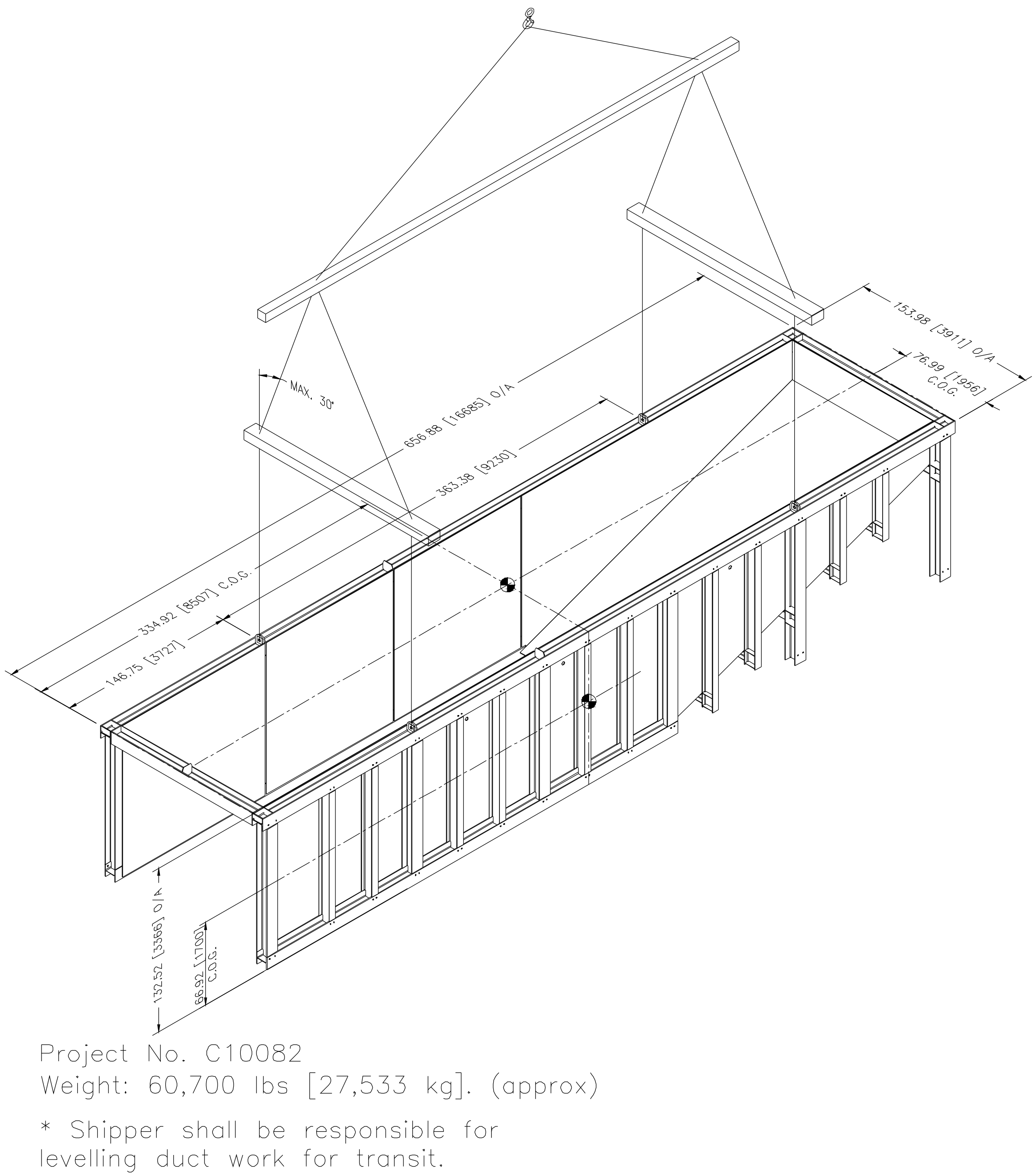
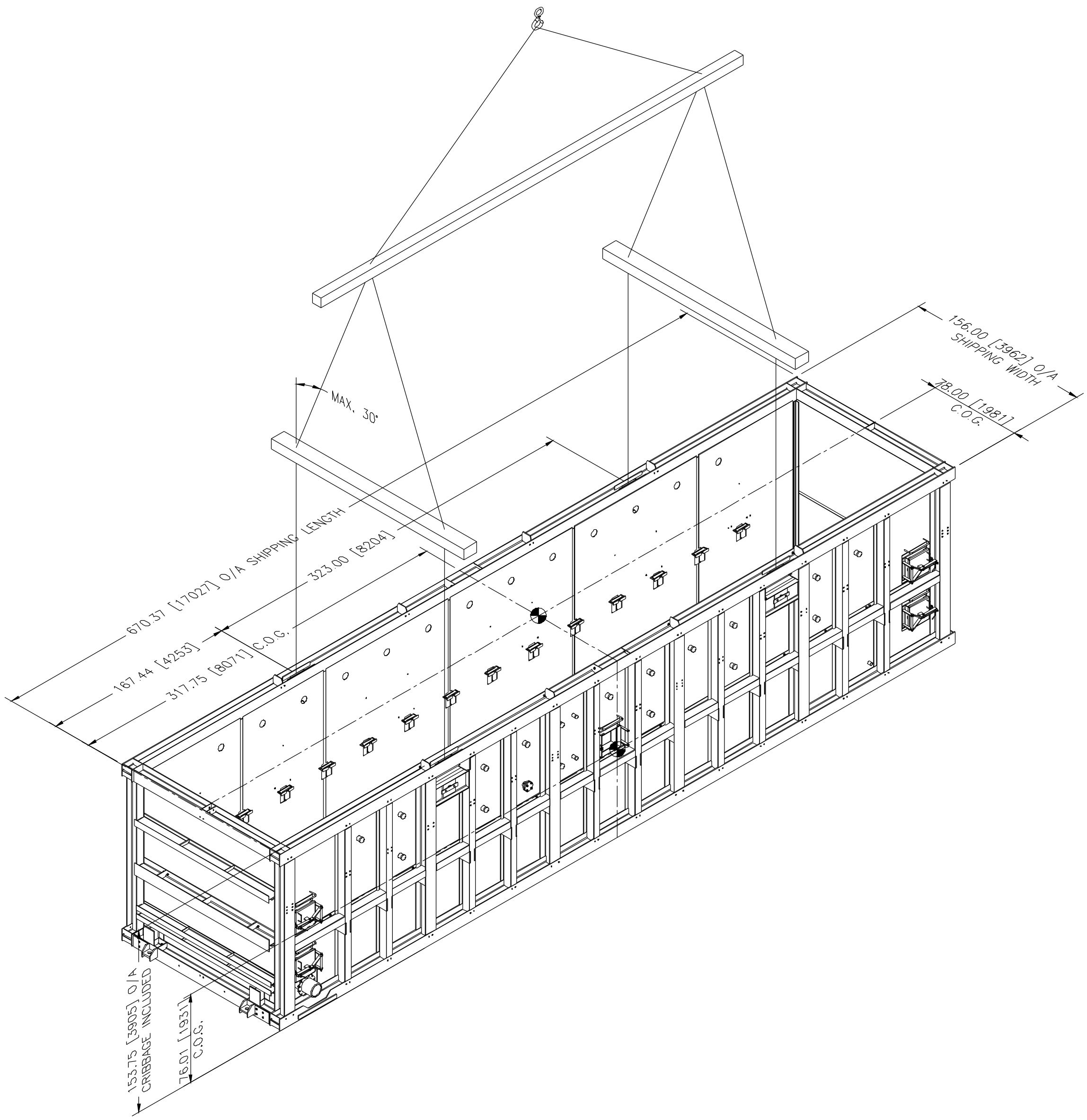


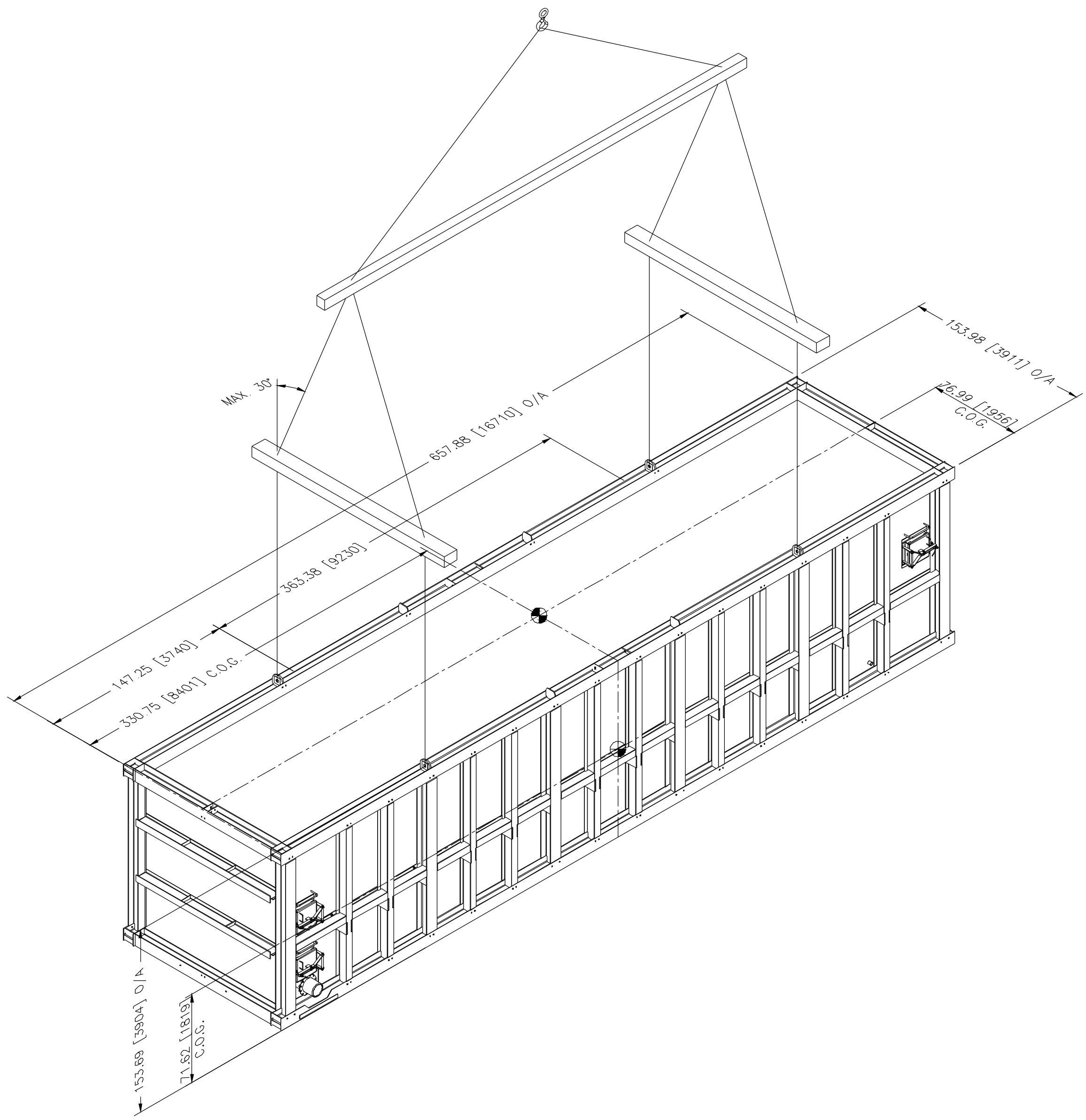
Figure 13 – Upper Inlet Plenum Lifting Layout for Shipping and Positioning



Project No. C10082
Weight: 162,000 lb. [73,482 kg.] (approx)

* Module shall be shipped below
deck for transit over water.

Figure 14 – Lower OTSG Module Lifting Layout for Shipping and Positioning



Project No. C10082
Weight: 75,000 lb. [34,020 kg.] (approx)

* Module shall be shipped below
deck for transit over water.

Figure 15 – SCR Module Lifting Layout for Shipping and Positioning

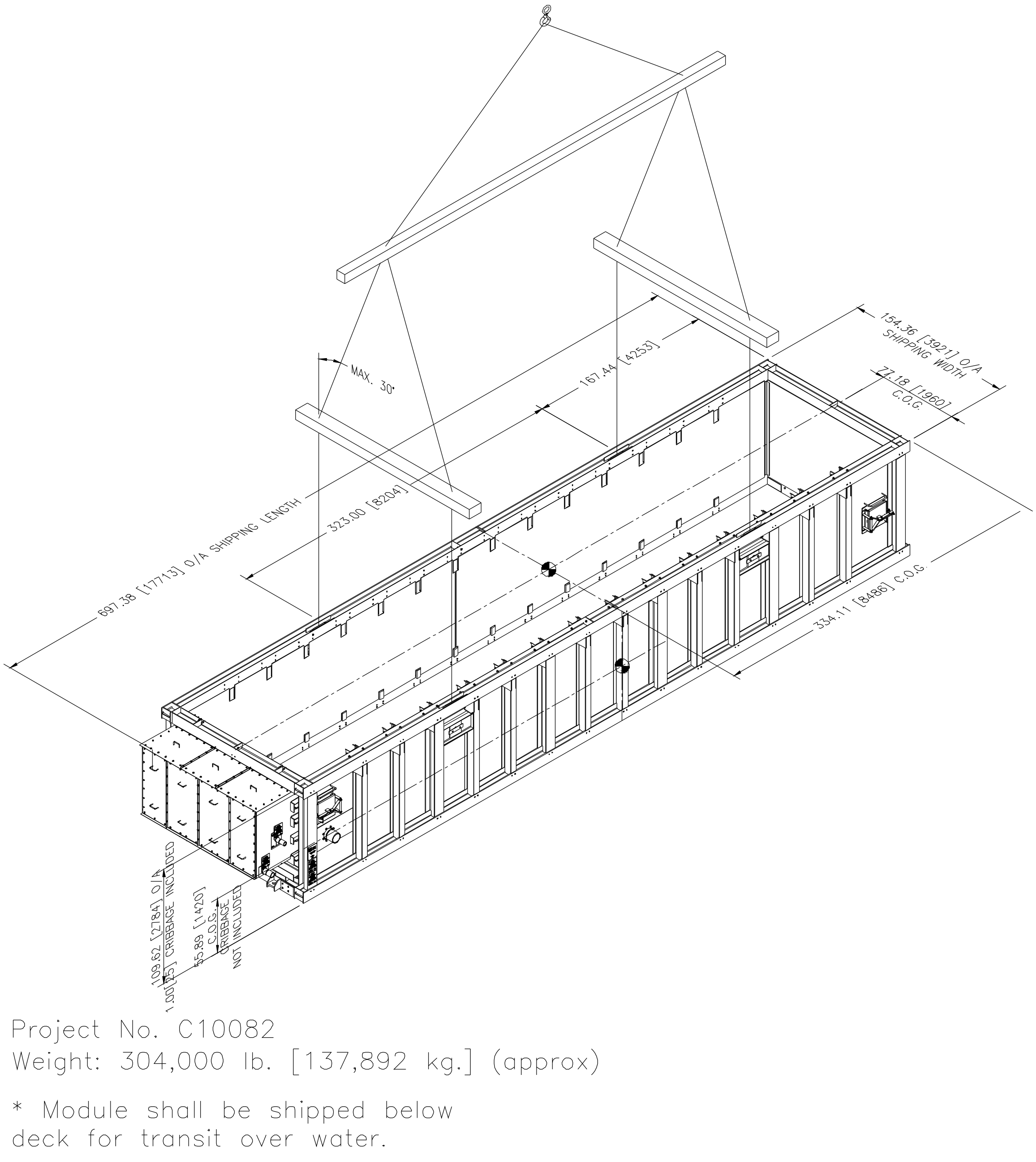
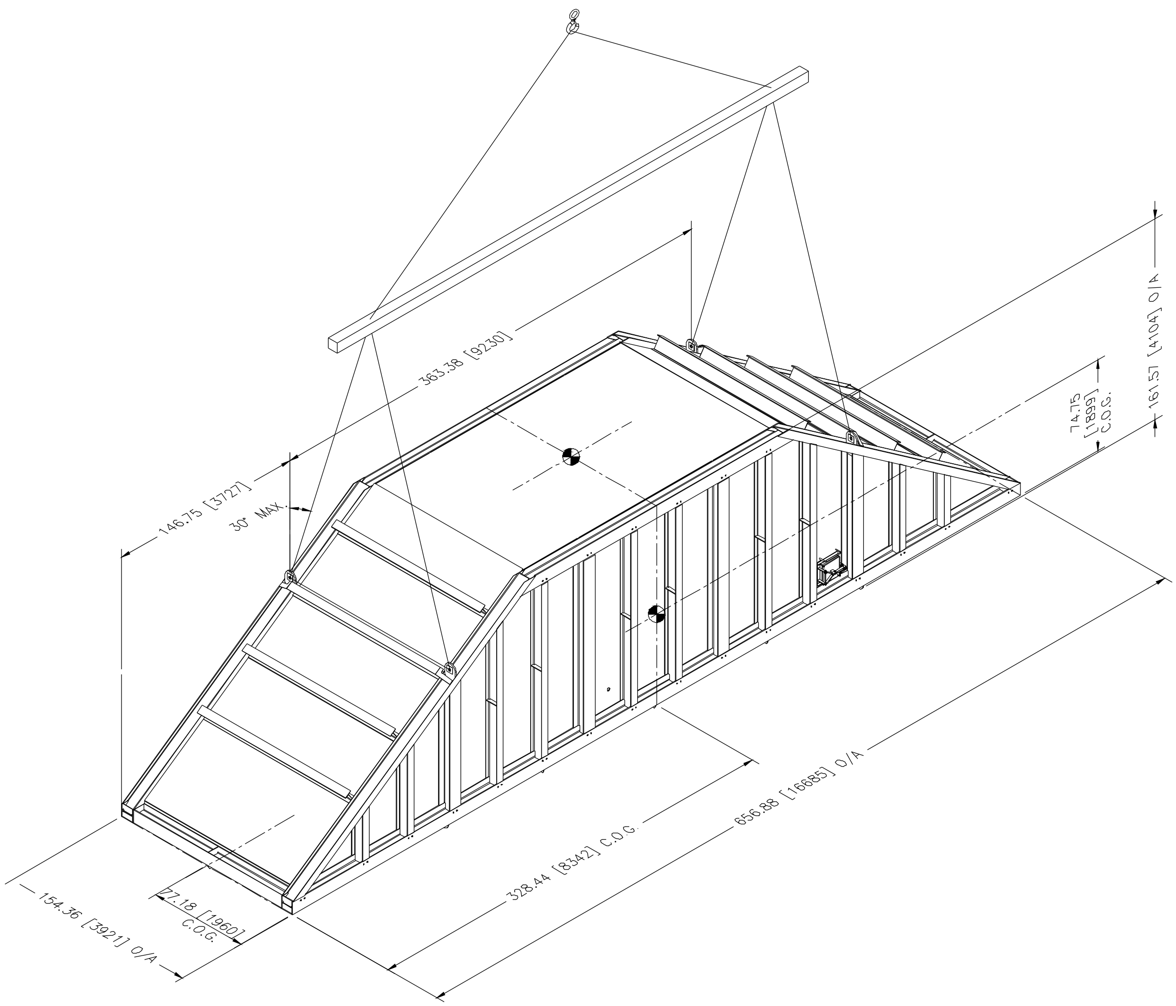


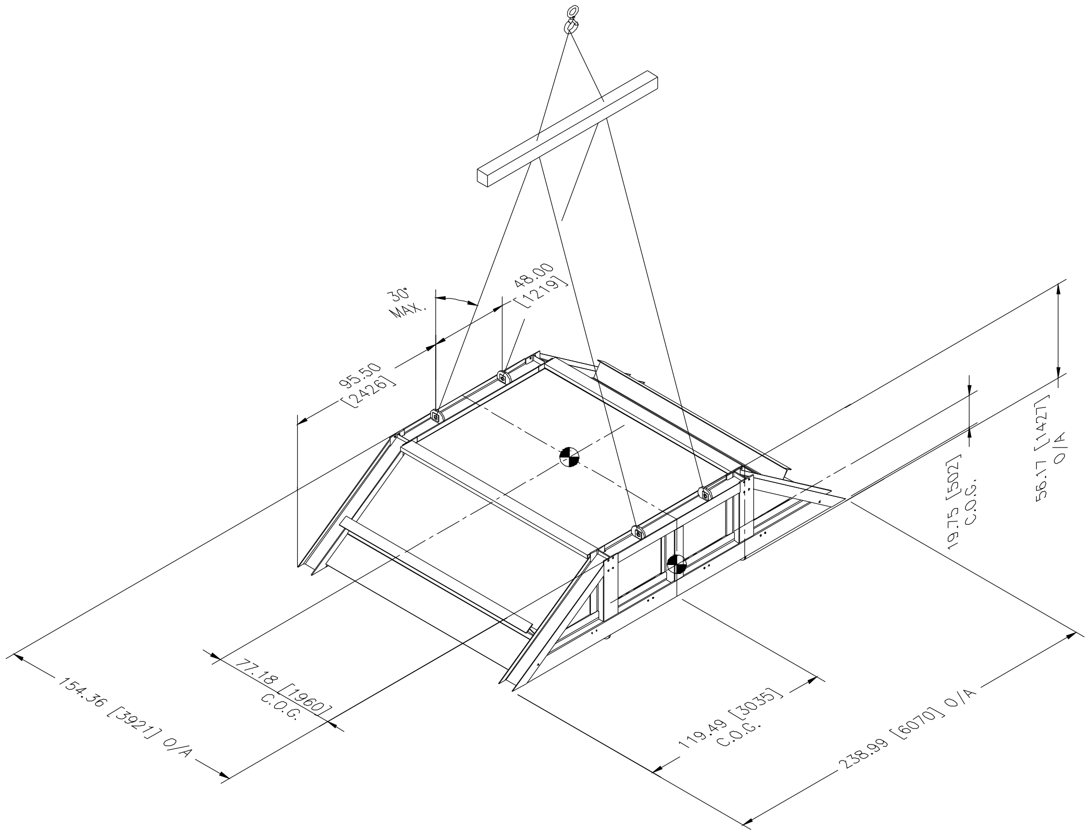
Figure 16 – Upper OTSG Module Lifting Layout for Shipping and Positioning



Project No. C10082
Weight: 106,500 lbs [48,308 kg] (approx)

* Shipper shall be responsible for levelling duct work for transit.

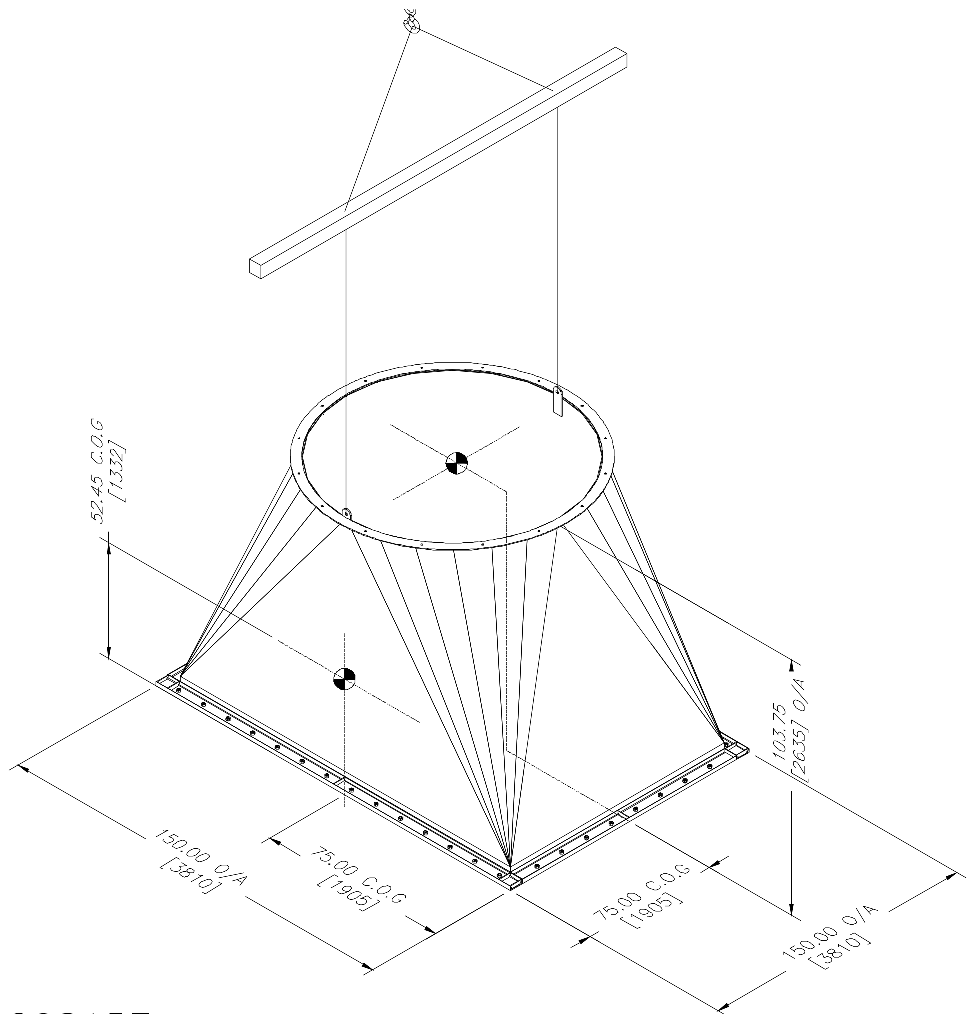
Figure 17 – Lower Exhaust Hood Lifting Layout for Shipping and Positioning



Project No. C10082
Weight: 11,500 lbs [5,216 kg] (approx)

* Shipper shall be responsible for
levelling duct work for transit.

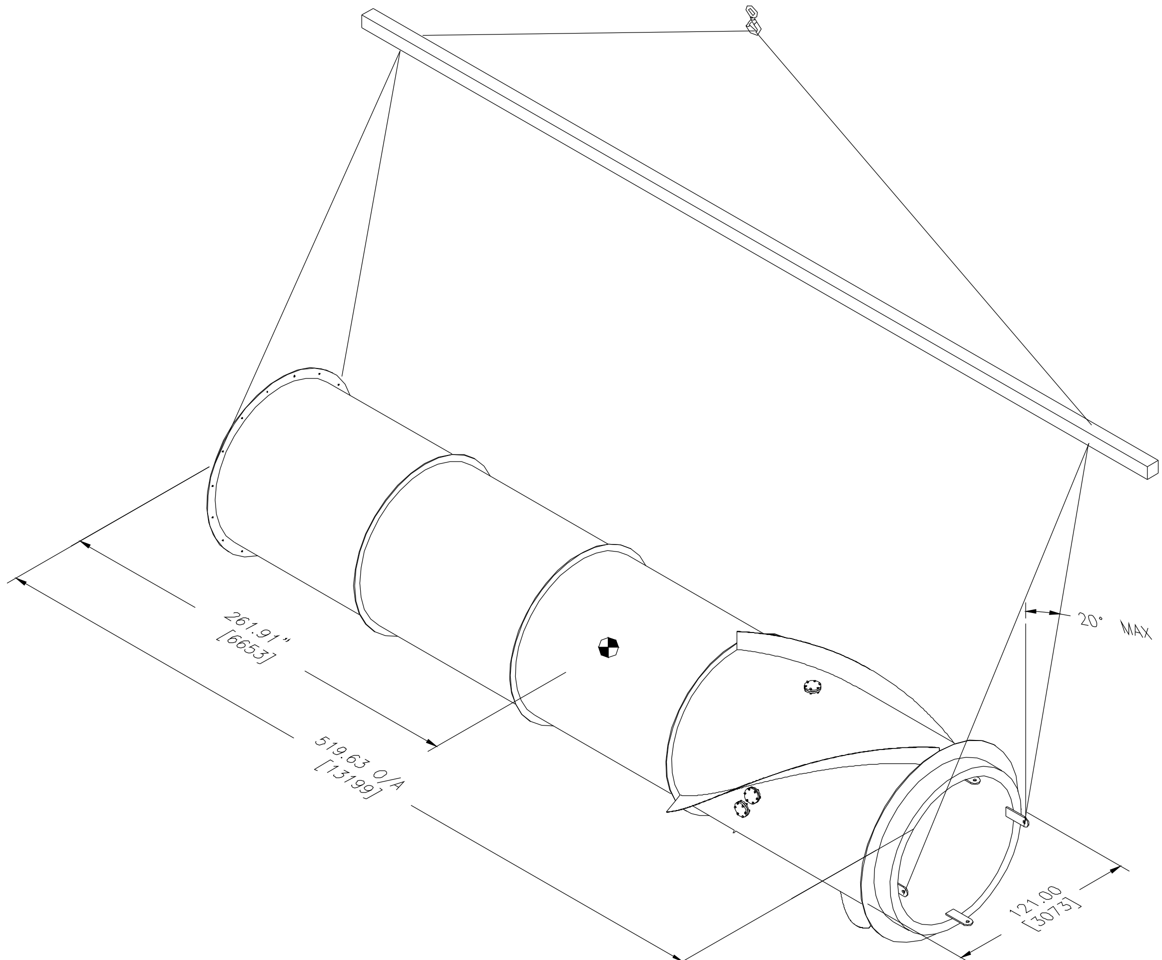
Figure 18 – Upper Exhaust Hood Lifting Layout for Shipping and Positioning



Project No. C08157
Weight: 9,200 lb [4,170] Kg (approx)

* ALL primary dimensions are in inches, all secondary [in brackets] dimensions are millimeters.

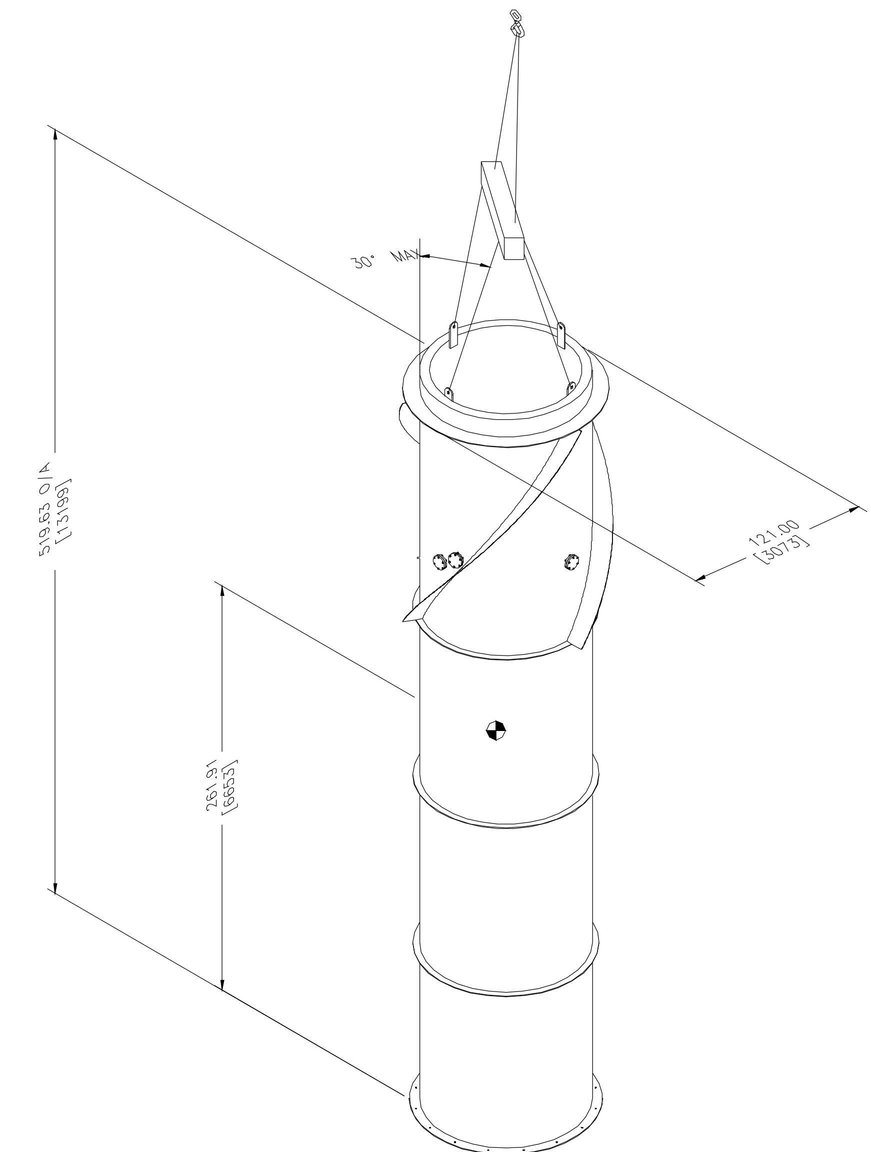
Figure 19 –Stack Adapter Lifting Layout for Shipping and Positioning



Project No. C08157
Weight: 27,200 lb [12,340] Kg (approx)

* ALL primary dimensions are in inches, all secondary [in brackets] dimensions are millimeters.

Figure 20 – Exhaust Stack Lifting Layout for Shipping



Project No. C08157
Weight: 27,200 lb [12,340] Kg (approx)

* ALL primary dimensions are in inches, all
secondary [in brackets] dimensions are millimeters.

Figure 21 – Exhaust Stack Lifting Layout for Positioning

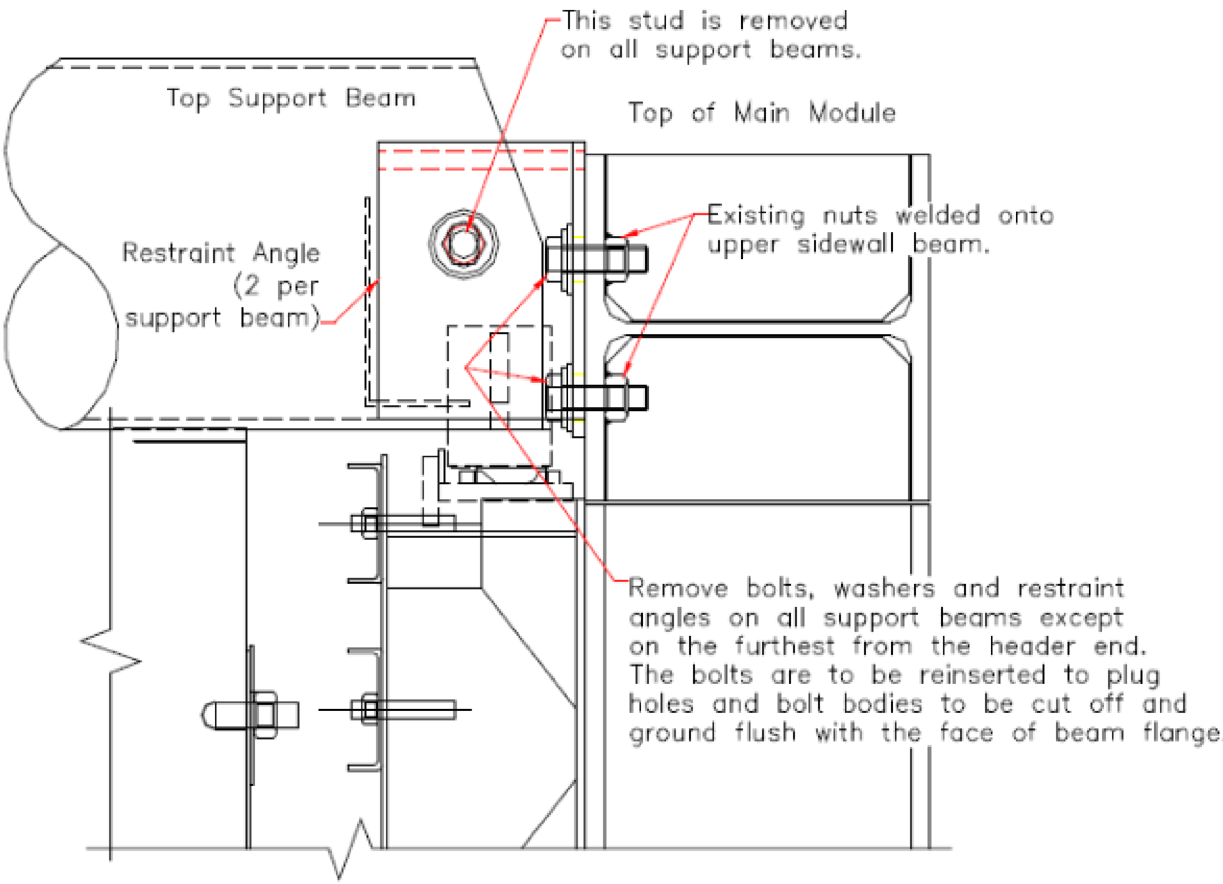


Figure 22 – OTSG Module Top Support Beam Detail

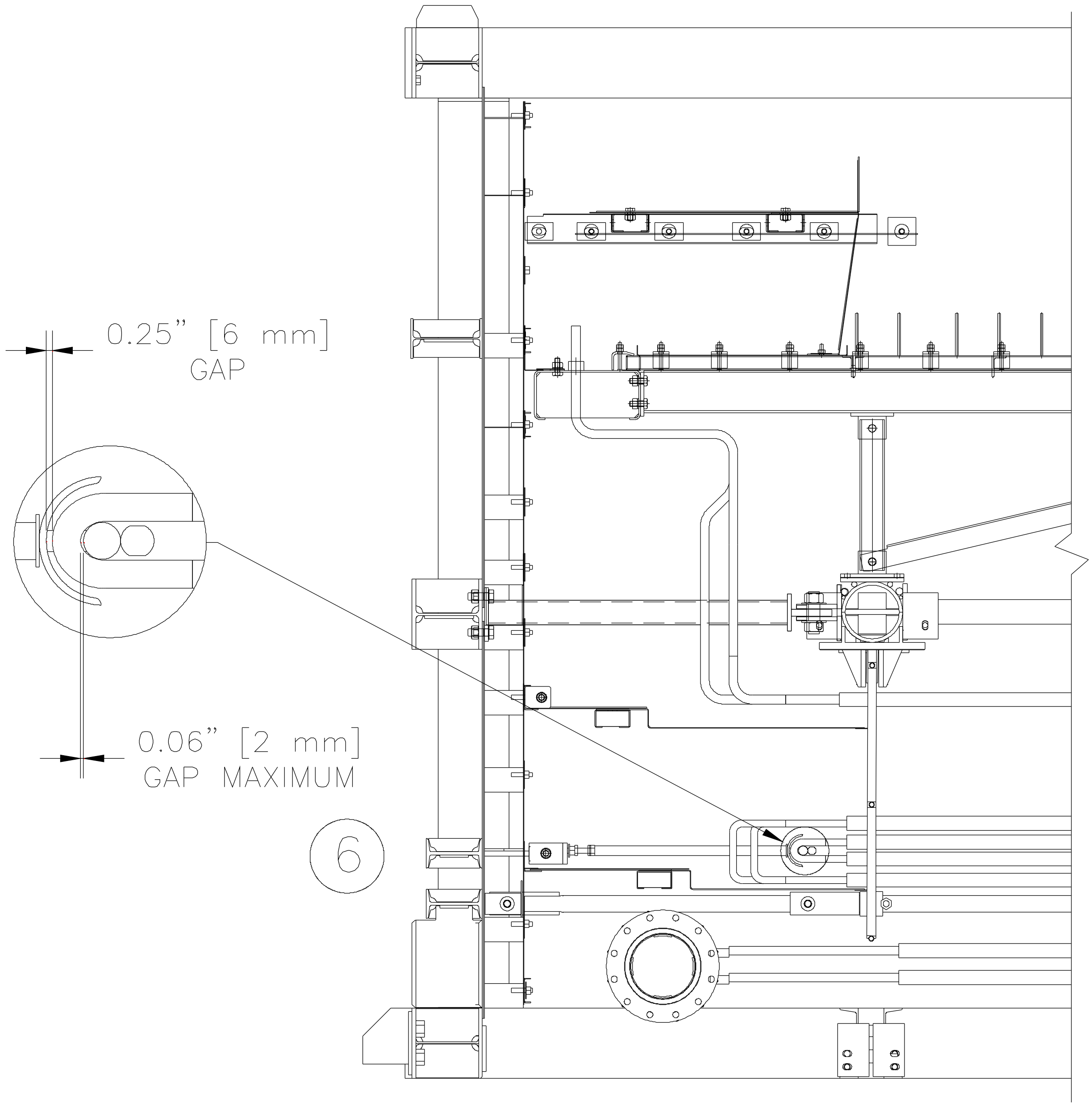


Figure 23 – Lower OTSG Module Front Restraint Rod / Endseal Detail

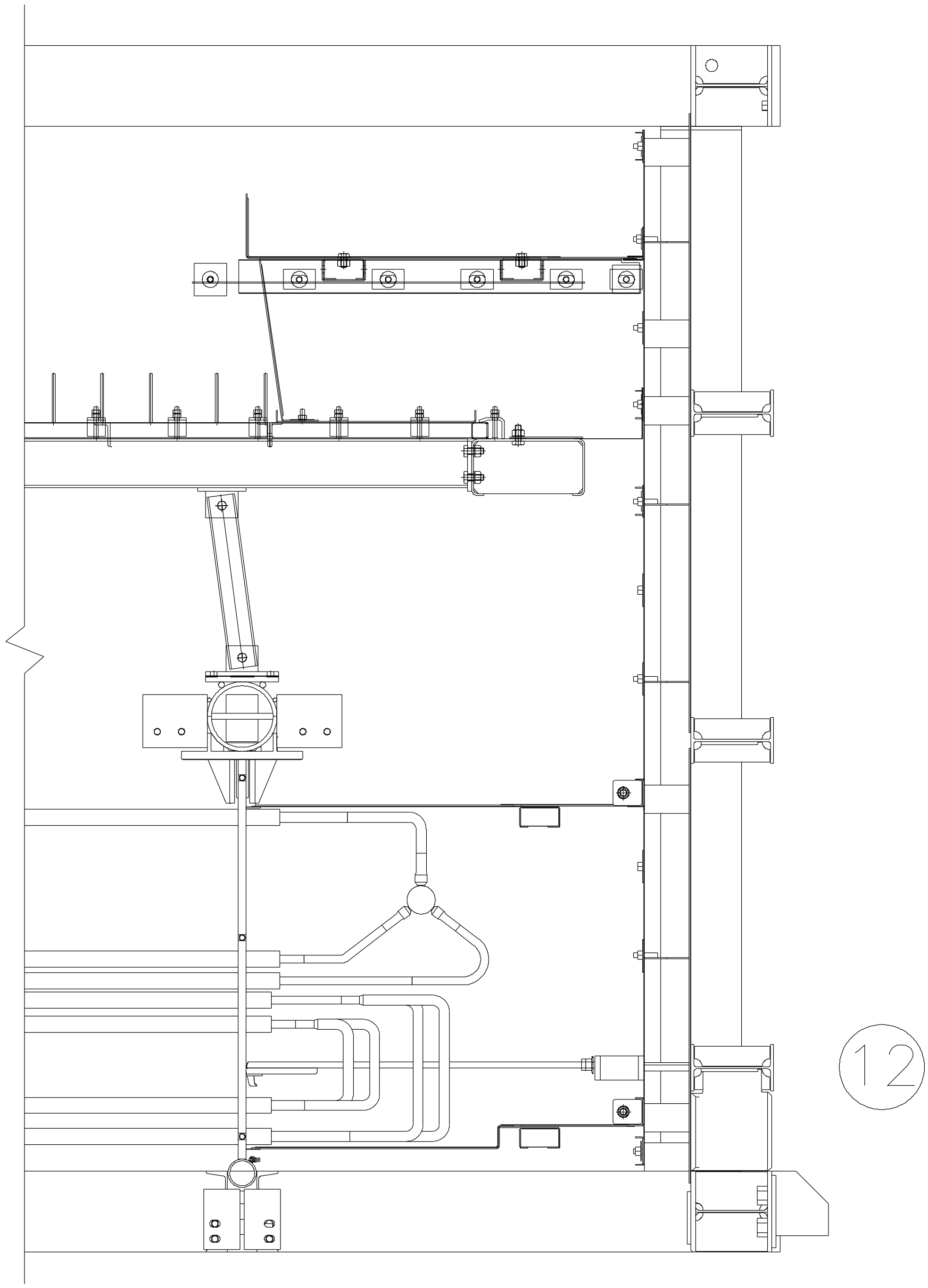


Figure 24 – Lower OTSG Module Rear Restraint Rod / Endseal Detail

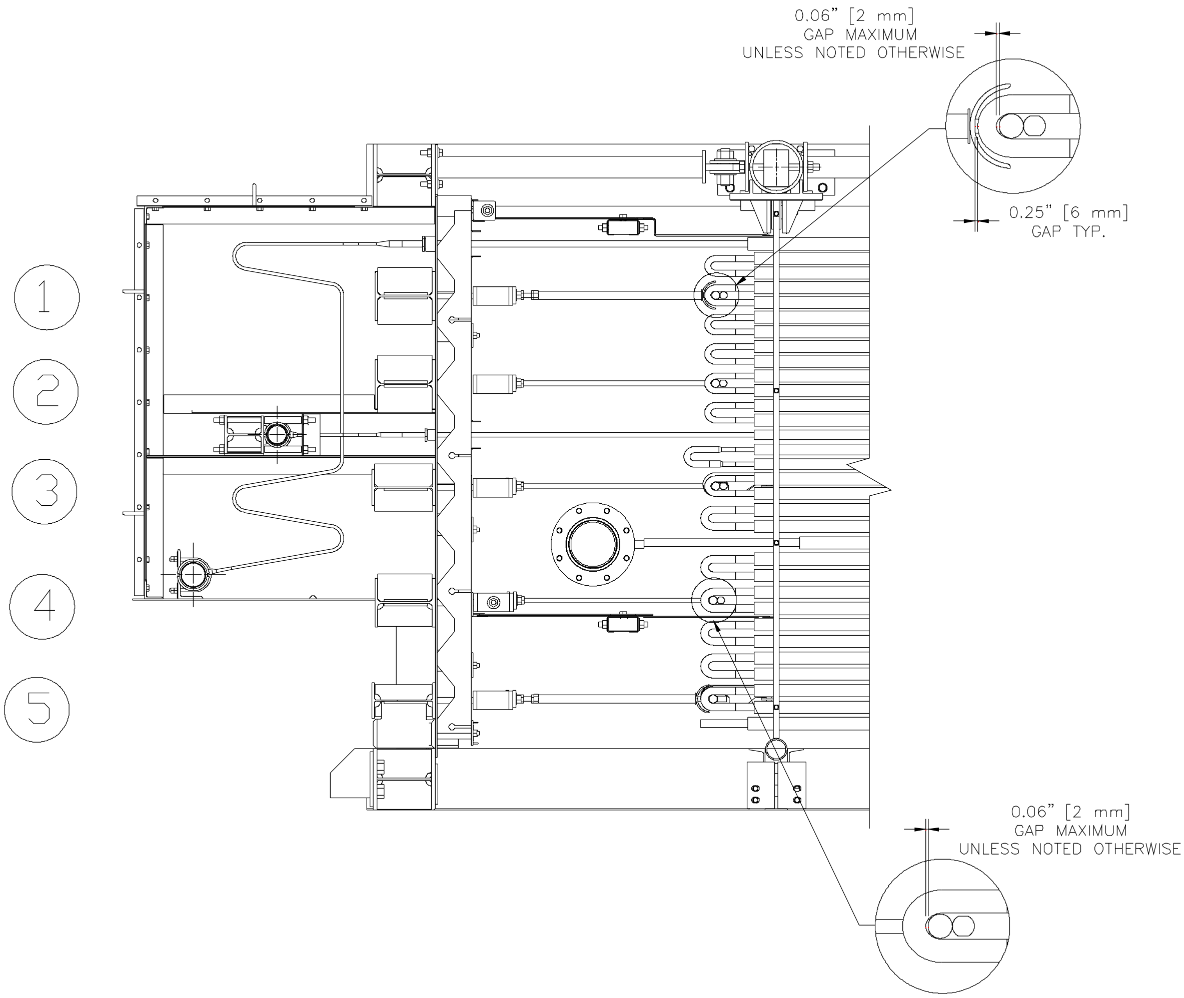


Figure 25 – Upper OTSG Module Front Restraint Rod / Endseal Detail

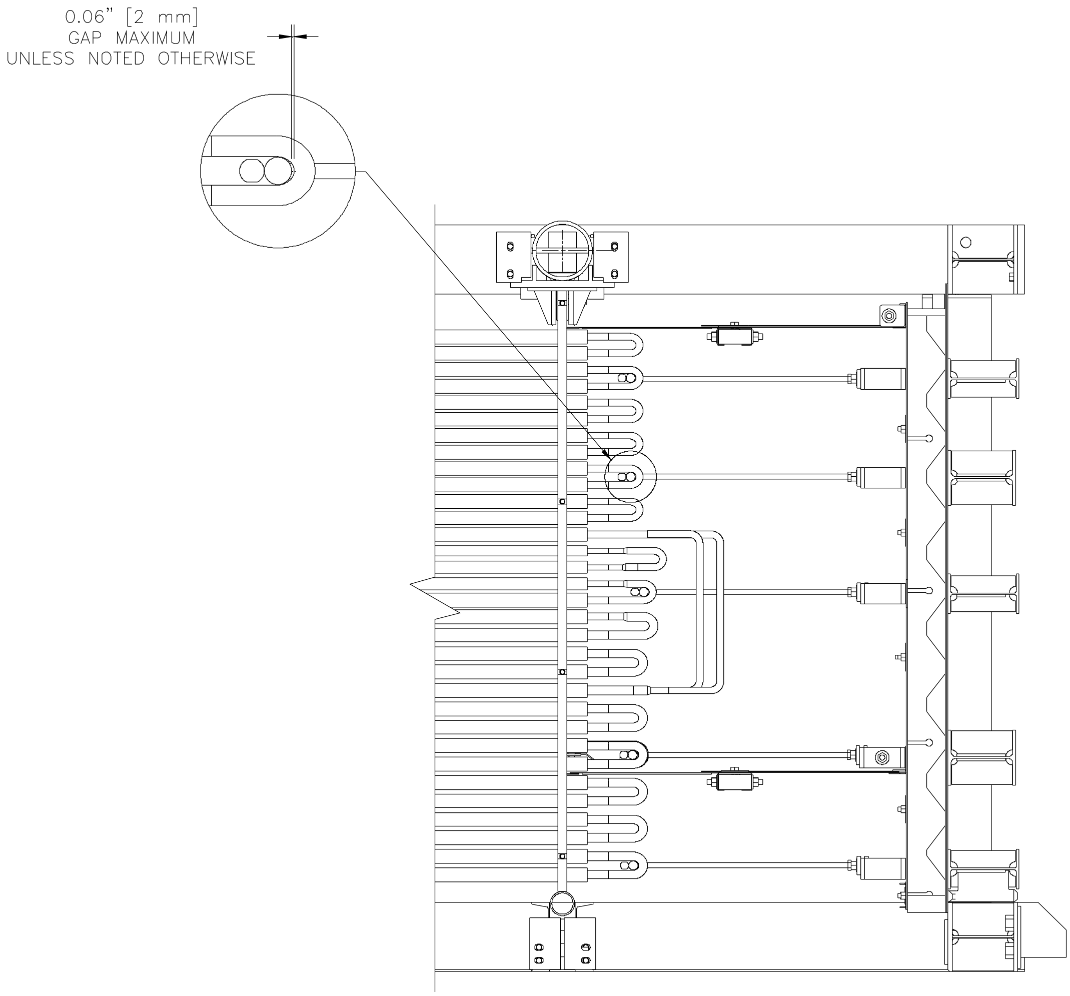


Figure 26 – Upper OTSG Module Rear Restraint Rod / Endseal Detail

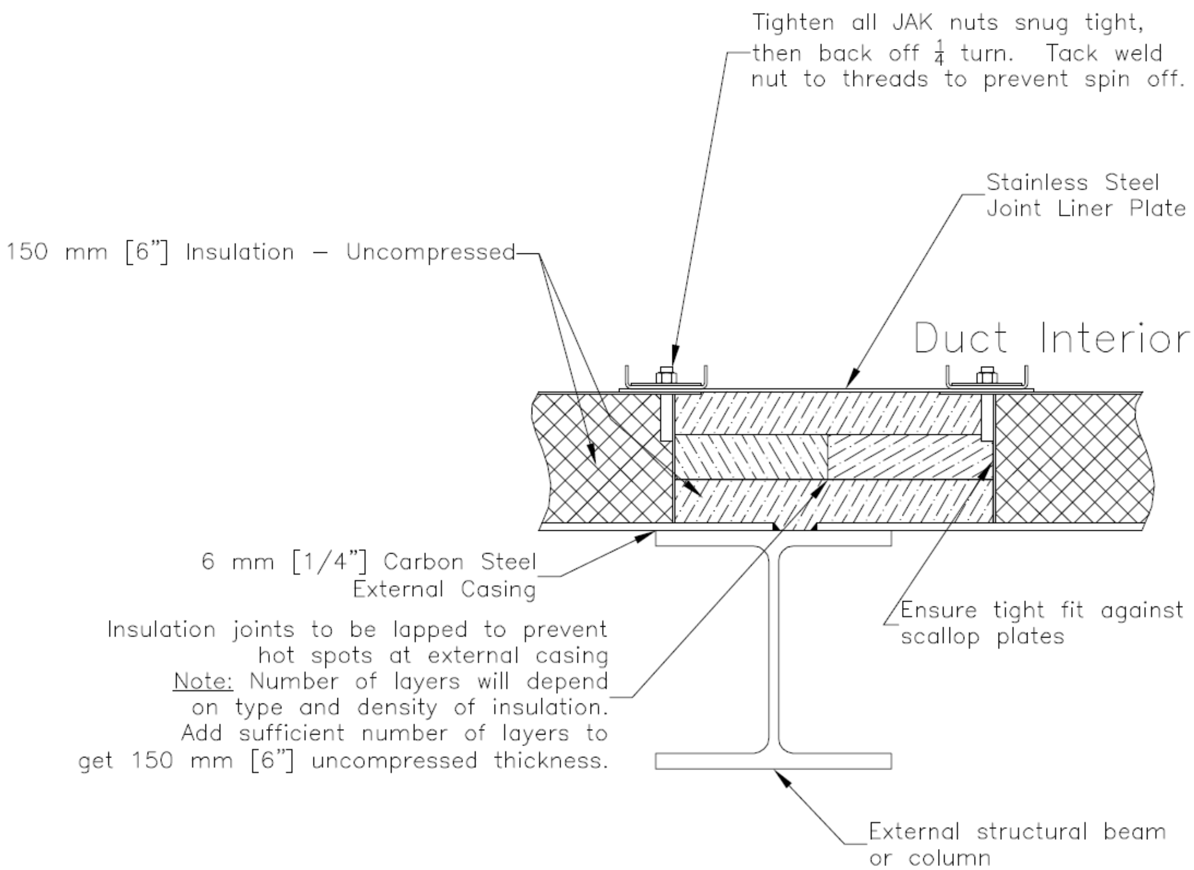


Figure 27 – Duct Joint Insulation Sketch

Appendix B

Extra Work Order Form

SUBCONTRACTOR EXTRA WORK ORDER (EWO)

IST Project Name:		IST Project Number:	
Contractor EWO No.:		Date Issued (dd/mm/yy):	
To (Name /Company):			
From (Name/Company):			

Description of Extra Work:

Cost Type:							
Fixed		Time & Mat'l		Unit Price		Other	

Summary:	Cost	Details	
Direct Manhours			
Labour Amount			
Material Amount			
Subcontract Amount			
Equipment Amount			
Other (Specify)			
Subtotal			
Overhead			
Grand TOTAL		Currency	
Date work will begin:		Date work will finish:	

Will the schedule, as specified in the purchase order, be impacted (Y/N)		
If YES, State number of days project schedule is impacted		

The above value takes into account all costs and impacts for this extra work. IST is released from any further claim for additional time or money associated with this Extra Work Order.		
Subcontrator Sign-off:		Date:

The following section is to be completed by IST				
Extra Work Approved by:		Project Manager	Date:	
Extra Work Approved by:		Site Rep.	Date:	
Extra Work Cost Allocation:				
Purchase Order Number:				

Appendix C

Customer Backcharge Procedure and Authorization Form

Customer Backcharge Procedure and Authorization Form

IST is committed to offering our customers the best support possible for our world class technology. Please take the time to familiarize yourself and your staff with this very important procedure. This will help us to respond quickly to any backcharge related issues.

1.0 Introduction

A backcharge is considered to be a method by which a Customer can recover expenses and costs incurred to correct, repair, or replace an assigned item of IST's scope of supply. This includes, but is not limited to, malfunctions, failure to meet specifications, and overs, shorts or damages (OS&D).

2.0 Notification

On knowledge of a possible backcharge, Customer will notify IST on the pending backcharge and shall propose the method of handling, or otherwise request an IST proposed method of handling. IST will first be given the opportunity to inspect and correct the condition considering reasonable time parameters established by the Customer.

3.0 Execution

Customer shall evaluate all recommended methods of correction and select the method that is most economical and advantageous to all parties. Customer will prepare an estimate of charges before IST can approve the field work and any associated procurement. Any verbal instructions between the Customer and Contractor shall be followed by a letter of confirmation. Customer must make an attempt to obtain an IST signature on the backcharge before any work is performed. Failure to notify IST of potential backcharges before the initiation of work associated with the backcharge may result in non-coverage by IST. Backcharge claims received more than 30 calendar days after the work has been initiated will not be accepted by IST. If an IST Field Services Representative is on-site during the execution of a backcharge claim, then copies of all labour and equipment timesheets and all material and supply acquisitions will be handed over to IST Field Services Representative, in a timely manner, for review. Copies are also to be provided to IST together with the official backcharge claim.

4.0 Authorization

Included with this procedure is a form (Field Work Authorization for Backcharges, included as part of this SYS-126) to facilitate communication of acceptance. Other forms of communication/ acknowledgement may be considered valid as well. If an alternate Field Work Authorization form is to be considered then it shall be provided to IST ahead of time for review and understanding. Customer and IST are to jointly agree on the form that will be used prior to initiating the first backcharge event.

Customer's receipt of an approved/ accepted Field Work Authorization for Backcharge shall be the approval to proceed.

5.0 Reconciliation

Backcharge Costs will be limited to the following:

1) Direct labour hours at fully burdened rate
2) Direct costs of 3rd party subcontractors, materials and supplies
3) Direct construction equipment usage will be based on actual hours used. Depending on the rental agreement, hourly rates shall be based on 1/217th of the monthly rental rate or 1/50th of the weekly rate or 1/10th of the daily rental rate. In cases where the equipment is rented solely for the execution of the backcharge work then the full rental cost is applied.
4) Direct design engineering hours at a fully burdened rate
5) Direct cost of 3rd party rentals
6) Mark-up fees for administration and overhead limited to 5%

6.0 Collection

The method for collection of backcharges shall be jointly agreed to between the Customer and IST and will include, but not be limited to, the following:

1) Debit memo applied to last invoice
2) Credit amendment
3) Set off against other monies owed by Customer to IST
4) Direct invoice for payment by IST

7.0 Dispute Resolution

Any backcharge dispute shall be resolved in accordance with the contract terms and conditions for dispute resolution.

IST	BACKCHARGE AUTHORIZATION FORM	SYS-126 REV00

PROJECT NAME:						
LOCATION:		DATE:				
IST CUSTOMER:		SHEET:	1	of	2	
CUSTOMER's CONTRACTOR:						
REPORTED BY:		BACKCHARGE CLAIM #:				
BACKCHARGE DESCRIPTION:						
REQUIRED FIELD WORK START DATE:						
IST RESPONSE REQUIRED BY DATE:						

ESTIMATE SUMMARY

		DOLLARS		
LABOUR			CURRENCY:	
MATERIAL				
EQUIPMENT				
SUBCONTRACTS				
SUBTOTAL				
	%			
ADMINISTRATION AND OVERHEAD	5			
TOTAL				

****

TO BE COMPLETED BY IST

FIELD WORK APPROVED BY: ____________________ DATE: ____________________

FIELD WORK APPROVED BY: ____________________ DATE: ____________________

IST CHANGE REQUEST No.: ____________________

COMMENTS: ____________________

simply generates more profit

IST	BACKCHARGE ESTIMATING WORK SHEET	SYS-126 REV00

PROJECT NAME: ______________________________

LOCATION: ______________________________ DATE: ______________

IST CUSTOMER: ______________________________ SHEET: 2 of 2

CUSTOMER's CONTRACTOR: ______________________________

REPORTED BY: ______________________________ BACKCHARGE CLAIM #: ______________

LINE	WEIGHT	QTY	DESCRIPTION	MATERIAL UNIT COST	MATERIAL DOLLARS	LABOUR UNIT COST	LABOUR DOLLARS
				TOTALS			

Appendix D

Painting –
IST Specification 11303-0450
with Vendor Equipment Coating System
Product Datasheets and MSDS

TABLE OF CONTENTS

product data

carboline®

Carbozinc® 11 HS

Selection & Specification Data

Generic Type Solvent Based Inorganic Zinc

Description Ultra-low VOC member of the Carbozinc family with extraordinary performance characteristics. Carbozinc 11 HS combines unparalleled performance properties with a 2.4 lbs/gallon (unthinned) and 2.7 lbs/gallon (thinned) formulation that meets even the most stringent VOC restrictions.

Features

- Meets Class B slip co-efficient and creep testing criteria for use on faying surfaces
- Rapid cure. Dry to handle in 1 hour at 75°F (24°C) and 50% relative humidity
- Low temperature cure down to 15°F (-9°C)
- High zinc loading
- Very good resistance to salting
- May be applied with standard airless or conventional spray equipment
- May be used as a weldable pre-construction primer where VOC regulations prohibit traditional coatings. Exhibits long-term corrosion resistance during pre-construction and can be recoated or topcoated as specified for the intended service.
- VOC compliant to current AIM regulations

Color Green (0300)

Finish Flat

Primers Self Priming

Topcoats Not required for certain exposures. Can be topcoated with Epoxies, Polyurethanes, Acrylics, High-Heat Silicones and others as recommended by your Carboline sales representative. Under certain conditions, a mist coat is required to minimize topcoat bubbling.

Dry Film Thickness 2.0-3.0 mils (50-75 microns). Dry film thickness in excess of 6.0 mils (150 microns) per coat is not recommended. When used as a weldable pre-construction primer, the recommended DFT is 0.75-1.25 mils (19-31 microns).

Solids Content By Weight: 91% ± 2%

Zinc Content By Weight: 84% ± 2% in dry film

Theoretical Coverage Rate
1203 mil ft^2/gal (30.0 m^2/l at 25 microns)
401 ft^2 at 3.0 mils (10.0 m^2/l at 75 microns)
Allow for loss in mixing and application

VOC Values
EPA Method 24

Supplied:: 2.4 lbs./gal (288 g/l)
Thinned:
15 oz/gal w/ #26, #33, or #230: 2.95 lbs./gal (354 g/l)
(11 oz/.72 gal. kit or 55 oz/3.6 gal kit)
15 oz/gal w/ #237: 2.77 lbs/gal (332 g/l)
(11 oz/.72 gal. kit or 55 oz/3.6 gal kit)
These are nominal values.

Thinned (As pre-construction primer):
38 oz/gal w/ #26: 3.6 lbs./gal (435 g/l)
27 oz/.72 gallon kit or 138 oz/3.6 gallon kit

Selection & Specification Data Cont.

Dry Temp. Resistance

Untopcoated:
Continuous: 750°F (399°C)
Non-Continuous: 800°F (427°C)
With recommended high heat topcoats:
Continuous: 1000°F (538°C)
Non-Continuous: 1200°F (649°C)

Substrates & Surface Preparation

General Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Steel SSPC-SP6
Surface Profile: 1.0-3.0 mils (25-75 micron)

Performance Data

Test Method	System	Results	Report #
ASTM D3363 Pencil hardness	1 ct. CZ11HS	Pencil Hardness 3H	03278
ASTM A-325 or A-490 Slip co-efficient	1 ct. CZ11HS	0.58 meets requirements for Class B rating	08510
AASHTO M300	Blasted steel 1ct. CZ11HS	No blistering or rusting of coating or any bare steel areas.	02934
ASTM B117 Salt Spray	Blasted Steel 1 ct. CZ11HS	No rusting or blistering; slight rust in scribe, no creepage at scribe after 70,000 hours	SR 380

Test reports and additional data available upon written request.

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Spray Application (General) The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco. Keep material under mild agitation during application. If spraying stops for more than 10 minutes, recirculate the material remaining in the spray line. Do not leave mixed primer in the hoses during work stoppages.

Conventional Spray Agitated pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, with a maximum length of 50', .070" I.D. fluid tip and appropriate air cap.

Airless Spray
Pump Ratio: 30:1 (min.)
GPM Output: 3.0 (min.)
Material Hose: 3/8" I.D. (min.)
Tip Size: .017-.021"
Output PSI: 2100-2500
Filter Size: 60 mesh
Teflon packings are recommended and available from the pump manufacturer.

Brush For touch-up of areas less than one square foot only. Use medium bristle brush and avoid rebrushing.

Roller Not recommended

Carbozinc®11 HS

Mixing & Thinning

Mixing Power mix base, then combine and power mix as follows. Pour zinc filler very slowly into premixed base with continuous agitation. Mix until free of lumps. Then add activator and mix for another 2 minutes. Pour mixture through a 30 mesh screen. DO NOT MIX PARTIAL KITS. **Note**: Carbozinc 11 HS will not cure without the use of the Activator as defined below.
Tip: Sifting zinc through a window screen will aid in the mixing process by breaking up or catching dry zinc lumps.

Ratio

	.72 Gal Kit	3.6 Gal Kit
Part A:	1 gal. (short fill)	5 gals. (short fill)
Activator:	6.4 fl. oz.	32 fl. oz.
Zinc Filler:	14.6 lbs	73 lbs

Thinning Normally not required but may be thinned up to 11 oz per .72 gal kit or 55 oz per 3.6 gal kit with Thinner #26, #33, #230 or #237. Use of thinners other than those supplied by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

For use as a weldable zinc primer to achieve a recommended DFT of 0.75-1.25 mils, thin this product 30% with Thinner #26.

Carboline Thinner #236E may also be used to thin this product to minimize HAP and VOC emissions. Consult Carboline Technical Service for guidance.

Pot Life 8 Hours at 75°F (24°C) and less at higher temperatures. Pot life ends when coating becomes too viscous to use.

Cleanup & Safety

Cleanup Use Thinner #21 or Isopropyl Alcohol. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. In addition to ensuring proper ventilation, appropriate respirators must be used by all application personnel.

Caution This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	40°-95°F (4°-35°C)	40°-95°F (4°-35°C)	40-90%
Minimum	15°F (-9°C)	15°F (-9°C)	15°F (-9°C)	30%
Maximum	95°F (35°C)	150°F (66°C)	120°F (49°C)	95%

This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Handle	Dry to Topcoat
15°F (-9°C)	16 Hours	7 Days
40°F (4°C)	4 Hours	72 Hours
60°F (16°C)	2 Hours	36 Hours
75°F (24°C)	1 Hour	18 Hours
100°F (32°C)	¾ Hour	14 Hours

These times are based on a 3.0 mil (75 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Humidity levels below 50% will require longer cure times. **Notes**: Any salting that appears on the zinc surface as a result of prolonged weathering exposure must be removed prior to the application of additional coatings. Also, loose zinc must be removed from the cured film by rubbing with fiberglass or aluminum screen wire when "dry spray/overspray" is evident on the cured film and a topcoat will be applied. For **accelerated curing** or **where the relative humidity is below 40%**, allow an initial 2-hour ambient cure followed by misting with water or steam to keep the coated surface wet for a minimum of 8 hours and/or until the coated surface achieves a "2H" pencil hardness per ASTM D3363.

Packaging, Handling & Storage

	.72 Gallon Kit	3.6 Gallon Kit
Shipping Weight (Approximate)	22 lbs (10 kg)	103 lbs (47 kg)

Flash Point (Setaflash) Carbozinc 11 HS base: 55°F (13°C)
HS Activator: 90°F (33°C)
Zinc Filler: N/A

Storage (General) Store Indoors.

Storage Temperature & Humidity 40° -100°F (4-38°C).
0-90% Relative Humidity

Shelf Life Part A: 12 months at 75°F (24°C)
Part B: 24 months at 75°F (24°C)
Part C: Min. 24 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**

carboline®

350 Hanley Industrial Court, St. Louis, MO 63144-1599
314/644-1000 314/644-4617 (fax) www.carboline.com

An RPM Company

November 2009 replaces August 2009

carboline	Material Safety Data Sheet	**CHEMTREC Transportation Emergency Phone: 800-424-9300** **Pittsburgh Poison Control Center Health Emergency No.: 412-681-6669** NOTE: The CHEMTREC Transportation Emergency Phone is to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals

Section 1 - Chemical Product / Company Information

Product Name:	CARBOZINC 11 HS BASE	**Revision Date:**	03/10/2010
Identification Number:	PLMSDS 0249A1NL	**Supercedes :**	06/04/2007
Product Use/Class:	Solvent Based Inorganic Zinc - FOR INDUSTRIAL USE ONLY	**Preparer:**	Regulatory, Department
Manufacturer:	**Carboline Company 2150 Schuetz Road St. Louis, MO 63146 (800) 848-4645**		

Section 2 - Composition / Information On Ingredients

Chemical Name	CAS Number	Weight % Less Than	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA-CEIL
ALKYL SILICATE	PMN# P89-882	40.0	NE	NE	NE	NE
ETHYL ALCOHOL	64-17-5	25.0	1000 PPM	1000 PPM	1900 MGM3	N/E
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2	10.0	100 PPM	150 PPM	360 MGM3	NE
MICA	12001-26-2	5.0	3 MGM3	N/E	3 MGM3	N/E
TITANIUM DIOXIDE	13463-67-7	5.0	10 MGM3	N/E	10 MGM3	N/E
ETHYL POLYSILICATE	11099-06-2	5.0	N/E	N/E	N/E	N/E

Section 3 - Hazards Identification

Emergency Overview: Warning! Flammable. Harmful if inhaled. Causes eye and skin irritation. Aspiration may cause lung damage. May cause dizziness and drowsiness. Keep away from heat, sparks, flame. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Do not swallow. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

Effects Of Overexposure - Eye Contact: May cause eye irritation.

Effects Of Overexposure - Skin Contact: Direct skin contact may cause irritation. May be harmful if absorbed through the skin.

Effects Of Overexposure - Inhalation: Harmful if inhaled, may affect the brain or nervous system, causing dizziness, headache, or nausea. May cause nose and throat irritation.

Effects Of Overexposure - Ingestion: Harmful if swallowed.

Effects Of Overexposure - Chronic Hazards: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage.

Primary Route(s) Of Entry: Skin Contact, Skin Absorption, Inhalation, Ingestion, Eye Contact

Medical Conditions Prone to Aggravation by Exposure: If you have a condition that could be aggravated by exposure to dust or organic vapors, see a physician prior to use.

Section 4 - First Aid Measures

First Aid - Eye Contact: If material gets into eyes, flush with water immediately for 15 minutes. Consult a physician.

First Aid - Skin Contact: In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes. Launder clothing before reuse. If rash or irritation develops, consult a physician.

First Aid - Inhalation: If inhaled, remove to fresh air. Administer oxygen if necessary. Consult a physician if symptoms persist or exposure was severe.

First Aid - Ingestion: If swallowed do not induce vomiting. Seek immediate medical attention.

Section 5 - Fire Fighting Measures

Flash Point, F: 55F (12C) (Setaflash)

Lower Explosive Limit, %: 1.2
Upper Explosive Limit, %: 36.0

Extinguishing Media: Carbon Dioxide, Dry Chemical, Foam, Water Fog

Unusual Fire And Explosion Hazards: Flammable Liquid. Vapors are heavier than air and will accumulate. Vapors will form explosive concentrations with air. Vapors travel long distances and will flashback. Use mechanical ventilation when necessary to keep percent vapor below the "Lower Explosion Level" (LEL). Eliminate all ignition sources. Keep away from sparks, open flames and heat sources. All electric equipment and installations should be made and grounded in accordance with the National Electrical Code. In areas where explosion hazards exist, workers should be required to use non-ferrous tools and to wear conductive and non-sparking shoes.

Special Firefighting Procedures: Flammable. Cool fire-exposed containers using water spray.

Section 6 - Accidental Release Measures

Steps To Be Taken If Material Is Released Or Spilled: Eliminate all ignition sources. Handling equipment must be grounded to prevent sparking. Evacuate the area of unprotected personnel. Wear appropriate personal protection clothing and equipment. Follow exposure controls/personal protection guidelines in Section 8. Contain and soak up residual with an aborbent (clay or sand). Take up absorbant material and seal tightly for proper disposal. Dispose of in accordance with local, state and federal regulations. Refer to Section 15 for SARA Title III and CERCLA information.

Section 7 - Handling And Storage

Handling: Do not get in eyes, on skin, or on clothing. Keep container tightly closed when not in use. Wear personal protection equipment. Do not breathe vapors. Wash thoroughly after handling. If pouring or transferring materials, ground all containers and tools. Do not weld, heat, cut or drill on full or empty containers. Use only in accordance with Carboline application instructions, container label and Product Data Sheet. Avoid breathing vapors or spray mist.

Storage: Keep away from heat, sparks, open flames and oxidizing agents. Keep containers closed. Store in a cool, dry place with adequate ventilation.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use explosion-proof ventilation when required to keep below health exposure guidelines and Lower Explosion Limit (LEL).

Respiratory Protection: Use only with ventilation to keep levels below exposure guidelines listed in Section 2. User should test and monitor exposure levels to ensure all personnel are below guidelines. If not sure, or not able to monitor, use MSHA/NIOSH approved supplied air respirator. Follow all current OSHA requirements for respirator use. For silica containing coatings in a liquid state, and/or if no exposure limits are established in Section 2 above, supplied air respirators are generally not required.

Skin Protection: Recommend impervious gloves and clothing to avoid skin contact. If material penetrates to skin, change gloves and clothing. The use of protective creams may be beneficial to certain individuals. Protective creams should be applied before exposure.

Eye Protection: Recommend safety glasses with side shields or chemical goggles to avoid eye contact.

Other protective equipment: Eye wash and safety showers should be readily available.

Hygienic Practices: Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet facilities. Use of a hand cleaner is recommended. Launder contaminated clothing before reuse. Leather shoes can absorb and allow hazardous materials to pass through. Check shoes carefully after soaking before reuse.

Section 9 - Physical And Chemical Properties

Boiling Range:	149 F (65 C) - 248 F (120 C)	**Vapor Density:**	Heavier than Air
Odor:	Solvent	**Odor Threshold:**	N/D
Appearance:	Viscous Green, Grey or Red Liquid	**Evaporation Rate:**	Slower Than Ether
Solubility in H2O:	N/D		
Freeze Point:	N/D	**Specific Gravity:**	1.26
Vapor Pressure:	N/D	**PH:**	N/D
Physical State:	Liquid		

(See section 16 for abbreviation legend)

Section 10 - Stability And Reactivity

Conditions To Avoid: Heat, sparks and open flames.

Incompatibility: Keep away from strong oxidizing agents, heat and open flames.

Hazardous Decomposition Products: Carbon monoxide, nitrogen oxides, and unidentified organic compounds. Consider all smoke and fumes from burning material as very hazardous. Welding, cutting or abrasive grinding can create smoke and fumes. Do not breathe any fumes or smoke from these operations.

Hazardous Polymerization: Will not occur under normal conditions.

Stability: This product is stable under normal storage conditions.

Section 11 - Toxicological Information

Product LD50: N/D

Product LC50: N/D

Chemical Name	CAS Number	LD50	LC50
ALKYL SILICATE	PMN# P89-882	NOT AVAILABLE	NOT AVAILABLE
ETHYL ALCOHOL	64-17-5	7060 MG/KG, ORAL, RAT	20000 PPM/10 HRS, RAT, INHALATION
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2	>5180 MG/KG, ORAL, RAT	10000 PPM/4HRS RAT,INHALATION
MICA	12001-26-2	NOT AVAILABLE	NOT AVAILABLE
TITANIUM DIOXIDE	13463-67-7	>25 G/KG, ORAL, RAT	>6.82 MG/L 4 HR, RAT
ETHYL POLYSILICATE	11099-06-2	NOT AVAILABLE	NOT AVAILABLE

Section 12 - Ecological Information

Ecological Information: No data

Section 13 - Disposal Information

Disposal Information: Dispose of in accordance with State, Local, and Federal Environmental regulations. Responsibility for proper waste disposal is with the owner of the waste.

Section 14 - Transportation Information

DOT Proper Shipping Name:	Flammable Liquid NOS	**Packing Group:**	II
DOT Technical Name:	(Ethanol, Isopropanol)	**Hazard Subclass:**	N/A
DOT Hazard Class:	3	**Resp. Guide Page:**	128
DOT UN/NA Number:	UN 1993		

Additional Notes: None.

Section 15 - Regulatory Information

CERCLA - SARA HAZARD CATEGORY

This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD, CHRONIC HEALTH HAZARD, FIRE HAZARD

SARA SECTION 313

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

No Section 313 Substances exist in this product

TOXIC SUBSTANCES CONTROL ACT

All components of this product are listed on the TSCA inventory.

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

No TSCA 12(B) Substances exist in this product

U.S. STATE REGULATIONS AS FOLLOWS:

NEW JERSEY RIGHT-TO-KNOW

The following materials are non-hazardous, but are among the top five components in this product.

Chemical Name	CAS Number
CERAMIC MICROSPHERES	66402-68-4

PENNSYLVANIA RIGHT-TO-KNOW

The following non-hazardous ingredients are present in the product at greater than 3%.

Chemical Name	CAS Number
CERAMIC MICROSPHERES	66402-68-4
IRON OXIDE	1332-37-2

CALIFORNIA PROPOSITION 65

Warning: The following ingredients present in the product are known to the state of California to cause Cancer:

Chemical Name	CAS Number
MICROCRYSTALLINE SILICA	14808-60-7

Warning: The following ingredients present in the product are known to the state of California to cause birth defects, or other reproductive hazards:

No California Proposition 65 Reproductive Toxins exist

INTERNATIONAL REGULATIONS AS FOLLOWS:

CANADIAN WHMIS

This MSDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

CANADIAN WHMIS CLASS: B2 D2B

Section 16 - Other Information

HMIS Ratings
Health: 2 **Flammability:** 3 **Reactivity:** 1 **Personal Protection:** X

VOLATILE ORGANIC COMPOUNDS, GR/LTR MIXED (UNTHINNED): 288

REASON FOR REVISION: Changes made in Section(s): 1, 2, 3, and 11

Legend: N.A. - Not Applicable, N.E. - Not Established, N.D. - Not Determined

The information contained herein is, to the best of our knowledge and belief accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations

carboline	Material Safety Data Sheet	**CHEMTREC Transportation Emergency Phone: 800-424-9300** **Pittsburgh Poison Control Center Health Emergency No.: 412-681-6669** NOTE: The CHEMTREC Transportation Emergency Phone is to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals

Section 1 - Chemical Product / Company Information

Product Name:	CARBOZINC HS ACTIVATOR	**Revision Date:**	07/29/2008
Identification Number:	PLMSDS 0249C1NL	**Supercedes :**	08/01/2005
Product Use/Class:	Catalyst for Inorganic Zinc - FOR INDUSTRIAL USE ONLY		
		Preparer:	Regulatory, Department
Manufacturer:	**Carboline Company 350 Hanley Industrial Ct. St. Louis, MO 63144**		

Section 2 - Composition / Information On Ingredients

Chemical Name	CAS Number	Weight % Less Than	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA-CEIL
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2	90.0	100 PPM	150 PPM	360 MGM3	NE
ZINC CHLORIDE	7646-85-7	5.0	1 MGM3	2 MGM3	1 MGM3	NE

Section 3 - Hazards Identification

Emergency Overview: Warning! Flammable. Harmful if inhaled. Causes eye and skin irritation. Aspiration may cause lung damage. May cause dizziness and drowsiness. Keep away from heat, sparks, flame. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Do not swallow. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

Effects Of Overexposure - Eye Contact: May cause eye burns.

Effects Of Overexposure - Skin Contact: May cause skin burns.

Effects Of Overexposure - Inhalation: Harmful if inhaled, may affect the brain or nervous system, causing dizziness, headache, or nausea. May cause nose and throat irritation. May cause lung injury.

Effects Of Overexposure - Ingestion: Harmful if swallowed.

Effects Of Overexposure - Chronic Hazards: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage.

Primary Route(s) Of Entry: Skin Contact, Skin Absorption, Inhalation, Ingestion, Eye Contact

Medical Conditions Prone to Aggravation by Exposure: If you have a condition that could be aggravated by exposure to dust or organic vapors, see a physician prior to use.

Section 4 - First Aid Measures

First Aid - Eye Contact: If material gets into eyes, flush with water immediately for 15 minutes. Consult a physician.

First Aid - Skin Contact: In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes. Launder clothing before reuse. If rash or irritation develops, consult a physician.

First Aid - Inhalation: If inhaled, remove to fresh air. Administer oxygen if necessary. Consult a physician if symptoms persist or exposure was severe.

First Aid - Ingestion: If swallowed do not induce vomiting. Seek immediate medical attention.

Section 5 - Fire Fighting Measures

Flash Point, F: 91F (32C)
(Setaflash)

Lower Explosive Limit, %: 1.4
Upper Explosive Limit, %: 11.2

Extinguishing Media: Carbon Dioxide, Dry Chemical, Foam, Water Fog

Unusual Fire And Explosion Hazards: Flammable Liquid. Vapors are heavier than air and will accumulate. Vapors will form explosive concentrations with air. Vapors travel long distances and will flashback. Use mechanical ventilation when necessary to keep percent vapor below the "Lower Explosion Level" (LEL). Eliminate all ignition sources. Keep away from sparks, open flames and heat sources. All electric equipment and installations should be made and grounded in accordance with the National Electrical Code. In areas where explosion hazards exist, workers should be required to use non-ferrous tools and to wear conductive and non-sparking shoes.

Special Firefighting Procedures: Flammable. Cool fire-exposed containers using water spray.

Section 6 - Accidental Release Measures

Steps To Be Taken If Material Is Released Or Spilled: Eliminate all ignition sources. Handling equipment must be grounded to prevent sparking. Evacuate the area of unprotected personnel. Wear appropriate personal protection clothing and equipment. Follow exposure controls/personal protection guidelines in Section 8. Contain and soak up residual with an aborbent (clay or sand). Take up absorbant material and seal tightly for proper disposal. Dispose of in accordance with local, state and federal regulations. Refer to Section 15 for SARA Title III and CERCLA information.

Section 7 - Handling And Storage

Handling: Do not get in eyes, on skin, or on clothing. Keep container tightly closed when not in use. Wear personal protection equipment. Do not breathe vapors. Wash thoroughly after handling. If pouring or transferring materials, ground all containers and tools. Do not weld, heat, cut or drill on full or empty containers. Use only in accordance with Carboline application instructions, container label and Product Data Sheet.

Storage: Keep away from heat, sparks, open flames and oxidizing agents. Keep containers closed. Store in a cool, dry place with adequate ventilation.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use explosion-proof ventilation when required to keep below health exposure guidelines and Lower Explosion Limit (LEL).

Respiratory Protection: Use only with ventilation to keep levels below exposure guidelines listed in Section 2. User should test and monitor exposure levels to ensure all personnel are below guidelines. If not sure, or not able to monitor, use MSHA/NIOSH approved supplied air respirator. Follow all current OSHA requirements for respirator use. For silica containing coatings in a liquid state, and/or if no exposure limits are established in Section 2 above, supplied air respirators are generally not required.

Skin Protection: Recommend impervious gloves and clothing to avoid skin contact. If material penetrates to skin, change gloves and clothing. The use of protective creams may be beneficial to certain individuals.

Protective creams should be applied before exposure.

Eye Protection: Recommend safety glasses with side shields or chemical goggles to avoid eye contact.

Other protective equipment: Eye wash and safety showers should be readily available.

Hygienic Practices: Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet facilities. Use of a hand cleaner is recommended. Launder contaminated clothing before reuse. Leather shoes can absorb and allow hazardous materials to pass through. Check shoes carefully after soaking before reuse.

Section 9 - Physical And Chemical Properties

Boiling Range:	243 F (117 C) - 248 F (120 C)	**Vapor Density:**	Heavier than Air
Odor:	Solvent	**Odor Threshold:**	N/D
Appearance:	Clear, Water Thin Liquid	**Evaporation Rate:**	Slower Than Ether
Solubility in H2O:	N/D		
Freeze Point:	N/D	**Specific Gravity:**	0.94
Vapor Pressure:	N/D	**PH:**	N/D
Physical State:	Liquid		

(See section 16 for abbreviation legend)

Section 10 - Stability And Reactivity

Conditions To Avoid: Heat, sparks and open flames.

Incompatibility: Keep away from strong oxidizing agents, heat and open flames.

Hazardous Decomposition Products: Carbon monoxide, nitrogen oxides, and unidentified organic compounds. Consider all smoke and fumes from burning material as very hazardous. Welding, cutting or abrasive grinding can create smoke and fumes. Do not breathe any fumes or smoke from these operations.

Hazardous Polymerization: Will not occur under normal conditions.

Stability: This product is stable under normal storage conditions.

Section 11 - Toxicological Information

Product LD50: N/D

Product LC50: N/D

Chemical Name	CAS Number	LD50	LC50
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2	>5180 MG/KG, ORAL, RAT	10000 PPM/4HRS RAT,INHALATION
ZINC CHLORIDE	7646-85-7	NOT AVAILABLE	NOT AVAILABLE

Section 12 - Ecological Information

Ecological Information: No data

Section 13 - Disposal Information

Disposal Information: Dispose of in accordance with State, Local, and Federal Environmental regulations. Responsibility for proper waste disposal is with the owner of the waste.

Section 14 - Transportation Information

DOT Proper Shipping Paint

Packing Group: III

Name:			
DOT Technical Name:	N/A	**Hazard Subclass:**	N/A
DOT Hazard Class:	3	**Resp. Guide Page:**	128
DOT UN/NA Number:	UN1263		

Additional Notes: None.

Section 15 - Regulatory Information

CERCLA - SARA HAZARD CATEGORY

This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD, CHRONIC HEALTH HAZARD, FIRE HAZARD

SARA SECTION 313

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

No Section 313 Substances exist in this product

TOXIC SUBSTANCES CONTROL ACT

All components of this product are listed on the TSCA inventory.

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

No TSCA 12(B) Substances exist in this product

U.S. STATE REGULATIONS AS FOLLOWS:

NEW JERSEY RIGHT-TO-KNOW

The following materials are non-hazardous, but are among the top five components in this product.

Chemical Name	CAS Number
TETRABUTYL TITANATE	5593-70-4

PENNSYLVANIA RIGHT-TO-KNOW

The following non-hazardous ingredients are present in the product at greater than 3%.

Chemical Name	CAS Number
TETRABUTYL TITANATE	5593-70-4

CALIFORNIA PROPOSITION 65

Warning: The following ingredients present in the product are known to the state of California to cause Cancer:

No California Proposition 65 Carcinogens exist

Warning: The following ingredients present in the product are known to the state of California to cause birth defects, or other reproductive hazards:

No California Proposition 65 Reproductive Toxins exist

INTERNATIONAL REGULATIONS AS FOLLOWS:

CANADIAN WHMIS

This MSDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

CANADIAN WHMIS CLASS: B2 D2B

Section 16 - Other Information

HMIS Ratings
Health: 3 **Flammability:** 3 **Reactivity:** 1 **Personal Protection:** X

VOLATILE ORGANIC COMPOUNDS, GR/LTR MIXED (UNTHINNED): 288

REASON FOR REVISION: Routine Update

Legend: N.A. - Not Applicable, N.E. - Not Established, N.D. - Not Determined

The information contained herein is, to the best of our knowledge and belief accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations

Appendix E

Hydrostatic Testing –
IST Specification ES-020

ENGINEERING SPECIFICATION

WATER QUALITY REQUIREMENTS FOR HYDROSTATIC TESTING

SPECIFICATION NO. ES-020

REVISION 09

simply generates more profit

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Revision Page

Revision Number	Description of Revision	Prepared By	Approved By	Approval Date
01	General update	--------	--------	--------
02	Address updated to Conestoga Blvd.	--------	--------	Nov 13/00
03	Revised title	--------	--------	June 12/03
04	Major revision	--------	--------	Apr 5/03
05	Various changes	AB	JM	May 1/03
06	Table 1.0 and notes, Section 2.3	AB	JM	July 2/03
07	Section 2.1, Table 1.0, added Table 2.0	AB	JM	Apr. 18/05
08	Paragraph 2.2(d) rewritten	BM	JL	June 14/05
09	Format change update to new logo/font	SV		March 2/07

Table of Contents

1.0 INTRODUCTION

This specification details the water quality required for a hydrotest of an Innovative Steam Technologies (IST) Once Through Steam Generator (OTSG) and auxiliary piping. Deviations from the limits and requirements must have specific written approval from Innovative Steam Technologies.

The technical criteria for formulating these guidelines includes:

- Prevention of corrosion in the OTSG and external piping. If necessary, more stringent limits can be used based on the requirements for other components in the system, which may be more sensitive to impurities.
- Prevention of suspended solids from entering the OTSG, which could end up plugging the stabilization orifices.

2.0 WATER QUALITY REQUIREMENTS

2.1 Hydrotest Water Specification

The rationale for determination of the water quality requirements for these guidelines is based on the requirements for the OTSG and auxiliary piping. The following water quality requirements provided in Tables 1.0 or 2.0 shall be met.

If a mixed bed unit is used to purify the water and the de-ionized water is sent directly to the steam generator to fill the unit, then the water quality measurements shall be taken at the mixed bed outlet.

If the de-ionized water is stored in a tank, then the water quality measurements shall be taken at the tank outlet.

Conductivity and pH readings shall be continuously monitored. Chlorides and sulfates shall be measured as required to ensure compliance during the hydro fill.

Parameter	Limit	Unit	Notes
pH	≥ 7.0	------	3, 9
Water Specific Conductivity	≤ 0.077	μS/cm	5, 7, 8
Water Specific Resistivity	≥ 13.0	megohm/cm	
Suspended Solids	Not detectable	ppb	2

Table 1.0 Hydrotest water quality specification without measuring chloride and sulfate levels.

Table 1.0 Notes:

1) Conductivity and pH measured at 25°C.
2) Suspended solids must be prevented to avoid clogging of feedwater orifices. Suspended solids are commonly measured by examining the undissolved material trapped on a 0.45 micrometer filter after filtration. Material that passes through is referred to as dissolved solids.
3) pH below 7.0 is prohibited.
4) No turbidity, oil or sediment is allowed.
5) Water test temperature to be in accordance with ASME Section I or B31.1 guidelines.
6) Water resistivity is the reciprocal of water conductivity and either parameter may be used.
7) Resistivity level corresponds to Total Dissolved Solids at 10 ppb.
8) To help achieve the resistivity levels, it may be necessary to recirculate the water through the mixed bed polisher before the water is flowed through the bed and into the OTSG.
9) The pH reading must be made on a moving flow stream without exposure to the atmosphere (i.e. inside the pipe). Carbon dioxide in the air will lower the pH in the water by naturally forming carbonic acid.

Parameter	Limit	Unit	Notes
pH	≥ 7.0	------	3, 9
Water Specific Conductivity	≤ 0.27	μS/cm	6, 7, 8
Water Specific Resistivity	≥ 3.70	megohm/cm	
Chloride (Organic and inorganic)	< 10	ppb	
Sulfate (Organic and inorganic)	< 10	ppb	
Suspended Solids	Not detectable	ppb	2

Table 2.0 Hydrotest water quality specification when chloride and sulfate levels are measured.

Table 2.0 Notes:

1) Conductivity and pH measured at 25°C.
2) Suspended solids must be prevented to avoid clogging of feedwater orifices. Suspended solids are commonly measured by examining the undissolved material trapped on a 0.45 micrometer filter after filtration. Material that passes through is referred to as dissolved solids.
3) pH below 7.0 is prohibited.
4) No turbidity, oil or sediment is allowed.
5) Water test temperature to be in accordance with ASME Section I or B31.1 guidelines.
6) Water resistivity is the reciprocal of water conductivity and either parameter may be used.
7) Chloride and sulfate levels must be initially met and maintained in order to use the conductivity level in this table.
8) To help achieve the resistivity levels in Table 1.0, it may be necessary to recirculate the water through the mixed bed polisher before the water is flowed through the bed and into the OTSG.
9) The pH reading must be made on a moving flow stream without exposure to the atmosphere (i.e. inside the pipe). Carbon dioxide in the air will lower the pH in the water by naturally forming carbonic acid.

2.2 Post Hydrotest Drying Requirements

The OTSG and associated piping should be hydrotested with water in accordance with the specifications given in Table 1.0 or 2.0. After testing is completed, the OTSG and associated piping shall be thoroughly drained and dried (all high point vents should be open during draining).

The tube surface must be dried to remove any chlorides or bacteria which can lead to corrosion. Acceleration of corrosion can occur as a result of the influence of microbial activity. Certain strains of bacteria can grow on the metal surface and provide a location of stagnant and highly acidic water between the growth and tube surface. Iron bacteria called Gallionella, and iron/manganese bacteria called Siderocapsa, have been documented to cause severe corrosion. These problems can be avoided provided the water is not allowed to stay on the metal surface for extended periods of time. For this reason, the boiler and piping must be drained and dried of hydrotest water immediately after testing.

The following procedures are to be followed:

Shop Hydrotest

Idle Time Between Hydrotest and Transportation by Rail or Truck	Drying Requirements
Up to 1 week	OTSG will be drained using gravity immediately after hydrotest. Prior to loading the module on the rail car, the OTSG will be rocked in the fore and aft direction on the trailer until no water exits the steam header. A slow rocking pattern will be used to give the water time to run down through the tubing.
Greater than 1 week	The tubing will be dried using high pressure oil free compressed air. Each circuit will be individually isolated and purged. Isolating dams will be required at the inlet headers to isolate individual circuits. In modules with mixing headers, nitrogen shall be used for drying the tubes.

Field Hydrotest

Idle Time Between Hydrotest and OTSG Start-Up	Drying Requirements
Up to 1 week	OTSG will be drained using gravity immediately after the hydrotest. OTSG start up to occur within 1 week time span
Greater than 1 week	The tubing and piping will be dried using nitrogen. The gas will be fed through the feedwater piping and towards the steam outlet pipe. Once dry, the OTSG can remain off-line as long as required. In marine of other corrosive locations, the pressure parts will be given a nitrogen purge once the inside surface has been dried.

The following notes are applicable:

a) Ensure that the pressure tubing is protected from water freezing in cold climates. If a potential of freezing exists, the water is to be drained and the tubing immediately blown dry, or if in the field, the tubing heated with the gas turbine to boil out the remaining water.
b) The field hydrotest should not be conducted until after a thorough flush of the module and feedwater piping has occurred.
c) Confirmation of the final field weld X-rays and inspections on both the steam and feedwater piping must be submitted to the site contractor before filling and pressurizing the circuits during the field hydrotest.
8 d) During hydrotest, the extra weight of the water will impose additional loads on the steam piping. Additional pipe supports and/or stops may be required during hydrotest to minimize the transfer of these loads to the OTSG steam outlet header.
e) The Authorized Inspector must be present for the hydrotesting.

2.3 Water Quality Inspection

The hydrotest water shall be inspected by Quality Control prior to hydrotesting to ensure it meets the requirements of Table 1.0 or 2.0, as applicable. Maintaining the conductivity limits in Table 1.0 will ensure the chloride and sulfate levels are within acceptable limits and separate measurements of chloride and sulfates are not required.

ISO form SYS-116 shall be filled out and included in the document control package for each shop hydrotested OTSG. The calibration record of the conductivity (resistivity) meter shall be recorded on the form.

Appendix F

Pipe Cleaning –
IST Specification ES-021

ENGINEERING SPECIFICATION

Pipe Cleaning Specification

SPECIFICATION NO. ES-021
REVISION 06

Revision Page

Revision Number	Description of Revision	Prepared By	Approved By	Approval Date
00	Original Issue			April 23, 1996
01	Added sections 2.6 and 3.7			Dec. 17, 1996
02	Address updated to Conestoga Blvd.			Nov 13, 2000
03	Format change update to new font/logo			March 2/07
04	Added Incoloy to Section 2.0 Additional notes added to Section 2.2			October 23/09
05	Added Section 4.0 - cleaning requirements for carbon steel piping	AB	JL	Dec 3/09
06	Added note requiring steam headers to be internally cleaned. Altered title of sections 3.0 and 4.0	CK	JL	Sept 27/11

Table of Contents

1.0 Scope - This specification outlines cleaning requirements for boiler piping.

2.0 Stainless steel and Incoloy (NO8800 & NO8825) pipe cleaning requirements

2.1 Remove all weld flux and splatter using power or hand tools as necessary. Verify all nozzle inside surfaces at run pipe welded connections are free of weld grapes and other obstructions.

2.2 Surface damage caused by cleaning tools is to be avoided, such as burrs and sharp cuts. In order to avoid trace amounts of material transfer that cause rust, do not use cutting or cleaning tools that have been used on carbon steel.

2.3 Thoroughly clean the inside of pipe using a compressed air blow with special care taken to ensure all welded nozzles/branches are free of obstructions.

2.4 Immediately following the air blow, pipe and branch ends are to be sealed with plastic end caps securely fastened. Care should be taken to ensure there is no ingress of foreign material into the pipe at this stage.

2.5 If the pipe has been hydro tested, <u>all</u> water must be removed prior to the sealing of the pipe and branch ends.

2.6 Water for hydro test must conform with specification ES-020.

06

3.0 Chroloy pipe cleaning requirements for steam headers and piping not subject to steam blows prior to operation

3.1 Remove all weld flux and splatter using power or hand tools as necessary. Verify all nozzle inside surfaces at run pipe welded connections are free of weld grapes and other obstructions.

3.2 Surface damage caused by cleaning tools is to be avoided, such as burrs and sharp cuts.

3.3 Following post weld heat treatment, sand blast inside pipe surface per

SSPC-SP10.

3.4 Thoroughly blow out, using compressed air, all sand residue from inside of pipe following sand blasting, and immediately coat the inside surface with CORTEC VCI-307 or equal corrosion inhibitor.

3.5 Following the application of the inhibitor, all pipe and branch ends are to be sealed with plastic end caps securely fastened. Care should be taken to ensure there is no ingress of foreign material into the pipe at this stage.

3.6 Should a hydrostatic test be performed on the pipe following the application of the corrosion inhibitor, the pipe must be completely dried and re-coated with the inhibitor.

3.7 Water for hydro test must conform with specification ES-020.

3.8 Steam headers require internal cleaning as sufficient velocity in not developed within the header to adequately clean them during a steam blow.

4.0 Carbon steel pipe cleaning requirements for piping not subject to steam blows prior to operation

4.1 Remove all weld flux and splatter using power or hand tools as necessary. Verify all nozzle inside surfaces at run pipe welded connections are free of weld grapes and other obstructions.

4.2 Surface damage caused by cleaning tools is to be avoided, such as burrs and sharp cuts.

4.3 Thoroughly blow out, using compressed air, all residue from inside of pipe following assembly.

4.4 Should a hydrostatic test be performed, the pipe must be completely dried after the test and confirmed using a humidity meter at the pipe exit.

4.5 All pipe and branch ends are to be sealed with plastic end caps securely fastened. Care should be taken to ensure there is no ingress of foreign material into the pipe at this stage.

4.6 Water for hydro test must conform with specification ES-020.

Appendix G

Outdoor Storage and Shipping Protection –
IST Specification ES-023

Appendix G

Outdoor Storage and Shipping Protection – IST Specification ES-023

ENGINEERING SPECIFICATION

OUTDOOR STORAGE AND SHIPPING PROTECTION REQUIREMENTS

SPECIFICATION NO. ES-023
REVISION 04

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Revision Page

Revision Number	Description of Revision	Developed By	Approved By	Approval Date
00	Original Issue	-----------	-----------	Apr 7 / 98
01	Revised to apply shipping protection	-----------	-----------	Jan 7/99
02	Address updated to Conestoga Blvd.	-----------	-----------	Nov 13/00
03	Added 3.3.5 and 3.3.6	AB	JL	June 1/05
04	Format change update to new font/logo	SV		March 2/07

TABLE OF CONTENTS

1.0 SCOPE

This specification covers the outdoor storage and shipping protection of components supplied by Innovative Steam Technologies. If prolonged storage of the units is required (over 3 months), contact IST for additional requirements.

2.0 APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Documents not identified by date, revision or amendment shall be of the latest issue on the date of this specification.

SPECIFICATIONS

<u>Innovative Steam Technologies</u>

Engineering Specification ES-010	Paint Specification
Engineering Specification ES-021	Pipe Cleaning Specification

3.0 PACKING REQUIREMENTS

3.1 General Requirements

- Packaging shall be adequate to prevent contamination, mechanical damage, or deterioration of the components supplied.
- All expendable materials, such as tapes, barriers, plugs, desiccants, desiccant bags, caps, inhibitors etc. to be in contact with austenitic stainless steel or nickel alloys shall not contribute to corrosion during the storage period.
- Metal fasteners, straps, or covers shall not be tack welded to any manufactured part, and shall be of a material compatible with the equipment material to avoid any corrosion.
- Prior to packaging, all components shall be inspected for cleanliness, completely drained and thoroughly dry.
- The packing instructions are applicable immediately after manufacture. Items not immediately packaged after manufacture shall be protected from contamination.

3.2 Pipe Openings and Connections

3.2.1 Prior to packaging of piping, the piping shall be cleaned in accordance with IST Engineering Specification ES-021 (Pipe Cleaning Specification).

3.2.2 All openings shall be closed with temporary closures to prevent entry of dust, dirt, precipitation, moisture or other foreign matter. All openings shall be protected by plastic caps designed to cover the entire weld end area and secured fastened.

3.2.3 Threaded or socket weld connections shall be closed with screwed or snap-in type plastic protectors. Cast iron plugs are not acceptable for shipping protection unless part of the final field assembly.

3.2.4 All exterior unpainted machined surfaces and threaded connections shall be coated with an easily removable rust preventative suitable for six months outdoor storage.

3.2.5 All exposed threads of external bolting shall be coated with an anti-seize compound following assembly.

3.3 Tubing Bundles

3.3.1 All tube bundle module tops shall be covered for outdoor storage and transportation. To prevent contamination from dust, dirt, salt, spray and other forms of contaminants exposed portions of tube bundle module bottoms shall be covered.

3.3.2 Items shall be covered by tarpaulins (or equivalent) to minimize the wetting of the insulation and to prevent contamination from dust, dirt, salt, spray and other forms of contaminants. Cover installation shall be made so that air circulates under the cover to prevent condensation.

3.3.3 Modules are to be stored on a level surface and blocked up a minimum of four inches off the ground at jacking locations. If the module is to be stored for more than two weeks the module shall be blocked up at each column location and at the module ends.

3.3.4 All access doors shall be secured closed.

03 3.3.5 Overseas ship transportation shall be below deck stowage and protected from salt spray. On-deck transportation is strictly prohibited.

03 3.3.6 When the module is sitting on dock for longer than 48 hours or during periods of severe weather, it shall be protected from salt water spray by being fully covered with tarps.

3.4 Ducting Components (including inlet plenum, exhaust hood and exhaust stack)

3.4.1 Ducting components are to be prepared and coated in accordance with IST Engineering Specification ES-010 prior to packaging.

3.4.2 Insulation is to be protected against precipitation if stored outdoors. Open insulated ends of ducting components are to be covered for transportation or outdoor storage.

3.4.3 All ducting openings shall be covered if the ducting is to be transported or stored in a salt air environment.

3.4.4 Items shall be covered by tarpaulins (or equivalent) where possible to prevent contamination from dust, dirt, salt, spray and other forms of contaminants. Cover installation shall be made so that air circulates under the cover to prevent condensation. If the components cannot be covered by tarpaulins (or equivalent), all ducting components shall be thoroughly cleaned by power water wash (or equivalent while minimizing the wetting of insulation) prior to assembly. This is to be the site erector’s responsibility.

3.4.5 All access doors shall be secured closed.

3.5 Vendor Equipment

3.5.1 Follow the manufacturers recommended procedures for long term storage of individual components.

4. QUALITY ASSURANCE PROVISIONS

Quality Control shall be responsible to verify compliance with the requirements of this specification by issuing and implementing a quality control plan prior to commencing with the storage of ducting. Engineering and Manufacturing shall approve the quality control plan prior to being issued

Appendix H

Module Shipping and Lifting Instructions –
IST Specification ES-024

ENGINEERING SPECIFICATION

OTSG MODULE HANDLING REQUIREMENTS DURING TRANSPORT

SPECIFICATION NO. ES-024

REVISION 08

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Revision Page

Revision Number	Description of Revision	Prepared By	Approved By	Approval Date
00	Original Issue	-------	-------	Jan 05/01
01	Revised sections 4.0 & 5.0 Figure 3.0 replaced by figures 3.1, 3.2 & 3.3	-------	-------	June 27/03
02	Revised 3.0 to include B30.20 for lifting equipment, safety meeting requirement, weighing module. Revised 4.0 to eliminate double bolt down but to include fore and aft restraints, general revision, Figure 3.1	JL	AB	Nov 2/05
03	Revised 3.0 to include ground surveys Revised 4.0 for reference of items 01 and 02 to figure 3.1 Revised Figure 1.0 to replace double lug with single lug Revised Figure 3.1 to remove dimensions and project specific references Revised Figure 4.0 to include reference for Detail "A"	PH	JL	Mar 10/06
04	Format change update to new logo/font	SV		March 2/07
05	Revisions to Section 4.0 for module weights and Figure 3.1a and Figure 3.1b	GT	CK	Dec 18/09
06	Revised typical rail car tie down Figure 3.1a and Figure 3.1b	CK	JMcA	Jan 19/11
07	Revised typical rail car tie down Figure 3.1a and Figure 3.1b Removed references to restraint rods	CK	JMcA	April 26/13
08	Page 4. 3g longitudinal and 2g lateral accelerations to generate longitudinal and lateral loads	HG	CK	Oct. 09/13

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1.0 PURPOSE

This specification covers the minimum requirements for moving, draining, handling, outdoor storage and shipping protection during transportation of an OTSG module supplied by Innovative Steam Technologies.

2.0 APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Documents not identified by date, revision or amendment shall be of the latest issue on the date of this specification.

SPECIFICATIONS

IST Engineering Specification ES-023, Outdoor Storage and Shipping Protection
IST Engineering Specification ES-025, OTSG Pre-Operational Long Term Storage
IST Work Instruction 028
IST Work Instruction 029
IST Contract Specific Drawing "Rail Car Tie-down Reinforcing Plate Assembly and Arrangement" Drawing No. XXX888 (XXX to be replaced with contract ID No.)

3.0 MODULE HANDLING INSTRUCTIONS

With the possible exception of the IST lifting links (which are available for rental), there is no special lifting gear required for handling this equipment. The module lifting lugs have been designed for VERTICAL equalized lifts only. Casing structural damage and/or lug failure may result if the cables are not maintained vertical or the load is not equalized.

Refer to Figure 1.0 for a typical lifting arrangement for the module.

Correct length spreader beams are required in BOTH directions to ensure the cable remains vertical and the load is equalized as shown in the figure. Lifting links can be used to connect the lifting cable to the module lifting points as shown in Figure 2.0. ONLY the lifting points designated in Figure 1.0 may be used for lifting the component. Attachment to other locations is strictly prohibited.

The lift shall be accomplished in a smooth and level motion without jerking. Component impacts during lifting or descent are prohibited.

If the module is to be placed temporarily in an area for storage (intermediate moves etc.), it shall be on a level surface, clear of debris. The unit shall be supported at eight locations on a firm foundation to prevent settling resulting in twisting of the unit. These locations shall be directly below the OTSG side wall vertical beams, on either side of the module lift points. All supports are to be level prior to the module being set down. The unit is NOT to be supported on the flange tips at the eight locations but a beam, suitably sized as indicated below if the unit is to be jacked, or 6 inch x8 inch hardwood blocks if the unit is to be pulled up, is to be inserted between the flanges (Fig.4) and the unit blocked off its lower surface.

It is recommended that lifting/jacking equipment be in conformance with ASME B30.20 (Standards for Below the Hook Lifting Devices), that a written lift procedure be prepared, that a prelift safety meeting be held (to minimize personnel in the lift area, discuss any safety issues and implement any required changes, clarify the jobs of the required personnel, designate the person in charge of the lift and designate a signalman, etc.). On lifts where the work is being done by an IST contractor, or his subcontractor, the above are requirements and all custom equipment used (spreaders, lifting beams etc.) as well as any required ground surveys will be stamped by a Professional Engineer and submitted with the Lift Procedure prior to the lift.

If the module is to be jacked up, a member is to be placed within the bottom beam as shown in Figure 4.0, Detail "A". The member is to be of sufficient strength to carry a moment equal to the following:

$$M_{minimum} = \frac{\text{Module weight}}{8} \text{ (lbs) x } \frac{40.375}{2} = \text{in * lbs}$$

$$M_{minimum} = 2.52 \text{ x Module weight} = \text{in * lbs}$$

The member minimum moment of inertia shall be 200 in^4. Alternatively, the design shall permit the structural member to deflect independently of the sidewall beam

The weight on the module assembly drawing will be used to size the rigging for the initial lift however the module shall be weighed prior to loading and transport, and adjustments made to the rigging if necessary. Modules at IST will be weighed using calibrated load cells according to Work Instruction 028.

Before the Module is loaded on a railcar or truck, but prior to it moving outdoors when the expected minimum outdoor temperature will be less than 40F, it shall be rocked from end to end to remove any water remaining in the unit. The rocking procedure will be per Work Instruction 029. Modules will be rocked a minimum of 6 full times (i.e. each end is raised above the other end a minimum of 6 times) after the last time that water was seen to drain from the unit.

Any damage to the equipment or lifting lugs shall be immediately reported to IST.

4.0 MODULE ATTACHMENT TO RAILCAR OR TRUCK

Prior to loading the unit 1"x 6" softwood lumber is to be laid along the length of the carrier, close to the outer edges of the deck to soften the load on the shipping beams located across the bottom of the unit and the endwall beams. The height of the softener is to be adjusted to compensate for any bow in the carrier so that the load on the shipping beams and end walls is equalized. The method of attachment to the railcar is the responsibility of the shipping contractor.

The module restraints are required to resist the forces resulting from fore-aft, lateral and upward loading during transportation.

Tie-down lugs are used to secure the boiler to the bed of the railcar for transportation in one of two standard configurations:

- single bolt tie-down lugs on the bottom beams of the module end walls (figure 3.2)
- single bolt tie-down lugs on the bottom beams of the module side walls (figure 3.3)

On modules weighing up to 200,000 pounds, the rail-car tie down restraint configuration in Figure 3.1a shall be used.

On Modules weighing between 200,001 and 400,000 pounds, the rail-car tie down restraint configuration in Figure 3.1b shall be used.

07 ~~All Modules require two tie down rods at each corner extending down from the top of the unit to, and usually through, the railcar bed. Two 1 3/8 inch diameter holes have been provided in the upper corners of the module for attachment and it is recommended that as a minimum the rods be 1 ¼ inch diameter steel with a minimum yield of 50,000 psi. It is preferred that the rods run directly from the holes provided in the unit to the railcar with no bends which might affect their function. Depending on the connection between the Module attachment holes and the rod welding may be required and if so, the rod material should be such that its yield stress is not reduced by that welding below the design value.~~

07 The method of attachment suggested by IST is for information only. The tie-down lugs, fore and aft restraint plates and lateral restraint plates have been sized to resist the transportation loads. It is the responsibility of the contractor to ensure the transportation attachments to the bed are adequate and meet with carrier requirements. Tie down locations other than those specified herein by IST are strictly prohibited.

08 Special precautions shall be made to ensure that NO HUMPING of railcars is allowed. A maximum 3g longitudinal and 2g lateral acceleration force is allowed.

Please refer to IST standards ES-023 and ES-025 for additional shipping and weather protection instructions.

5.0 ITEMS REQUIRED FOR HANDLING MODULE

Equipment	Supply	Comments
Lifting links	By Others (see Note 1 below)	Links can be rented from IST
Module tie down lugs on endwalls	By IST	Total 4 (2 per end) See Fig. 3.2 or 3.3
07 ~~Module end wall attachment holes for tying to railcar~~	~~By IST~~	~~Tie down rods, etc. to rail deck by others~~
Module tie down plates to railcar including rods and nuts	By Others	IST can provide 4 tie down plates see Fig. 3.2 or 3.3
Spreader Beams for lifting	By Others	Common Erection Equipment
Chokers & Shackles for lifting	By Others	Common Erection Equipment
Fore and Aft restraint plates	By Others	IST can provide 4 restraint plates See Fig. 3.1

Note 1) For overseas projects, one set of lifting links is included in IST's scope of supply. Additional lifting links can be purchased from IST.

6.0 WEATHER PROTECTION

Until the unit is ready to be erected, the module is to be protected at the top from rain, snow etc. by tarping or other suitable means. For storage instructions see IST standards ES-023 and ES-025

All test ports, instrumentation connections, header openings etc. are to be capped during transportation and the header caps are to be taped to the header (drain hole to be provided in header cap at the bottom)

7.0 PROTECTION FROM ROAD CHEMICALS

If during the transportation period, road conditions exist such that the road salt or other chemicals may be deposited up into the bottom of the OTSG module, protection is to be provided to ensure that no deposition is allowed to take place and the tubes and fins remain clean.

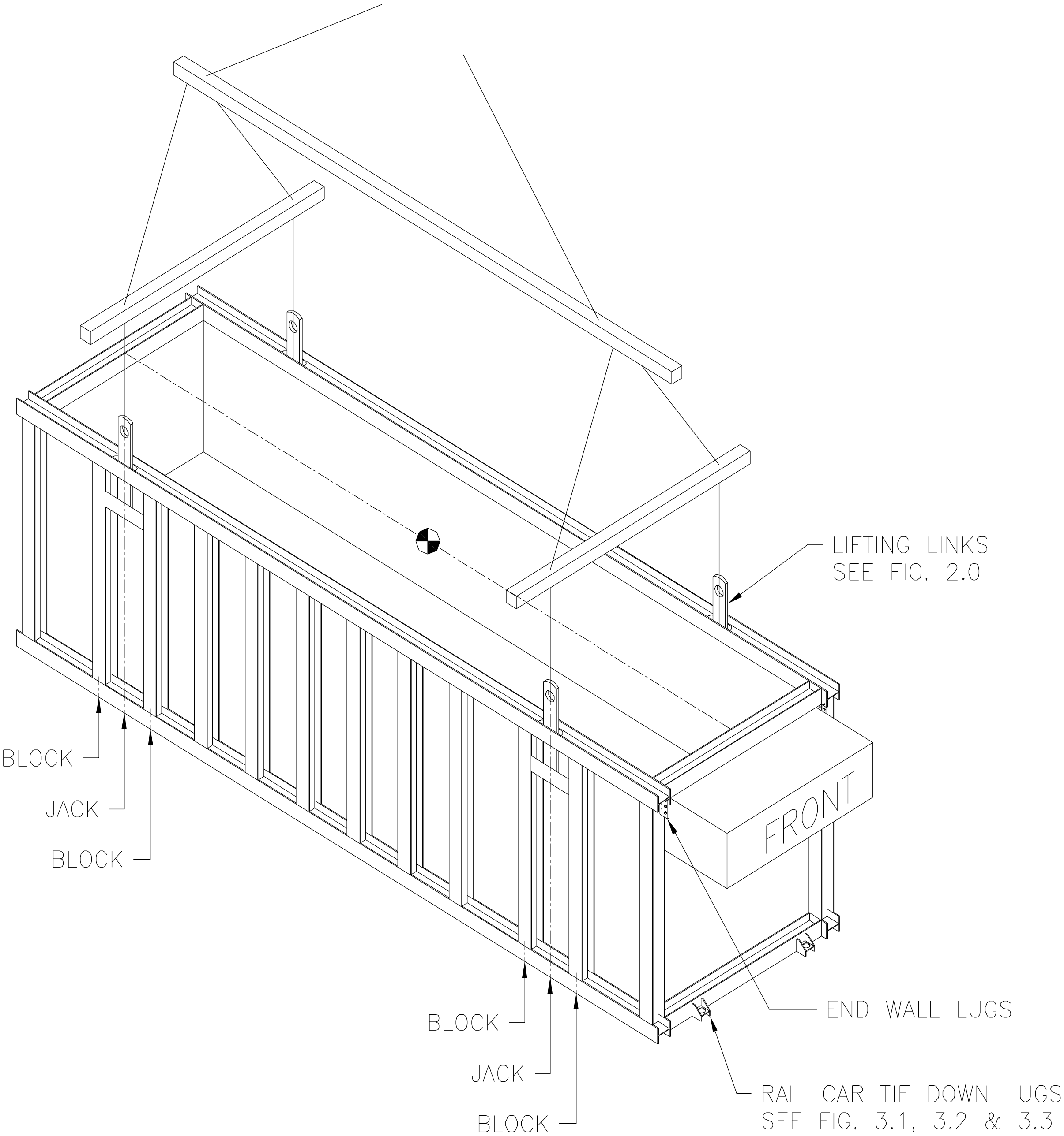


Figure 1.0

NOTE:

1. Rail car tie down lugs quantity and style are project specific
2. See following figures

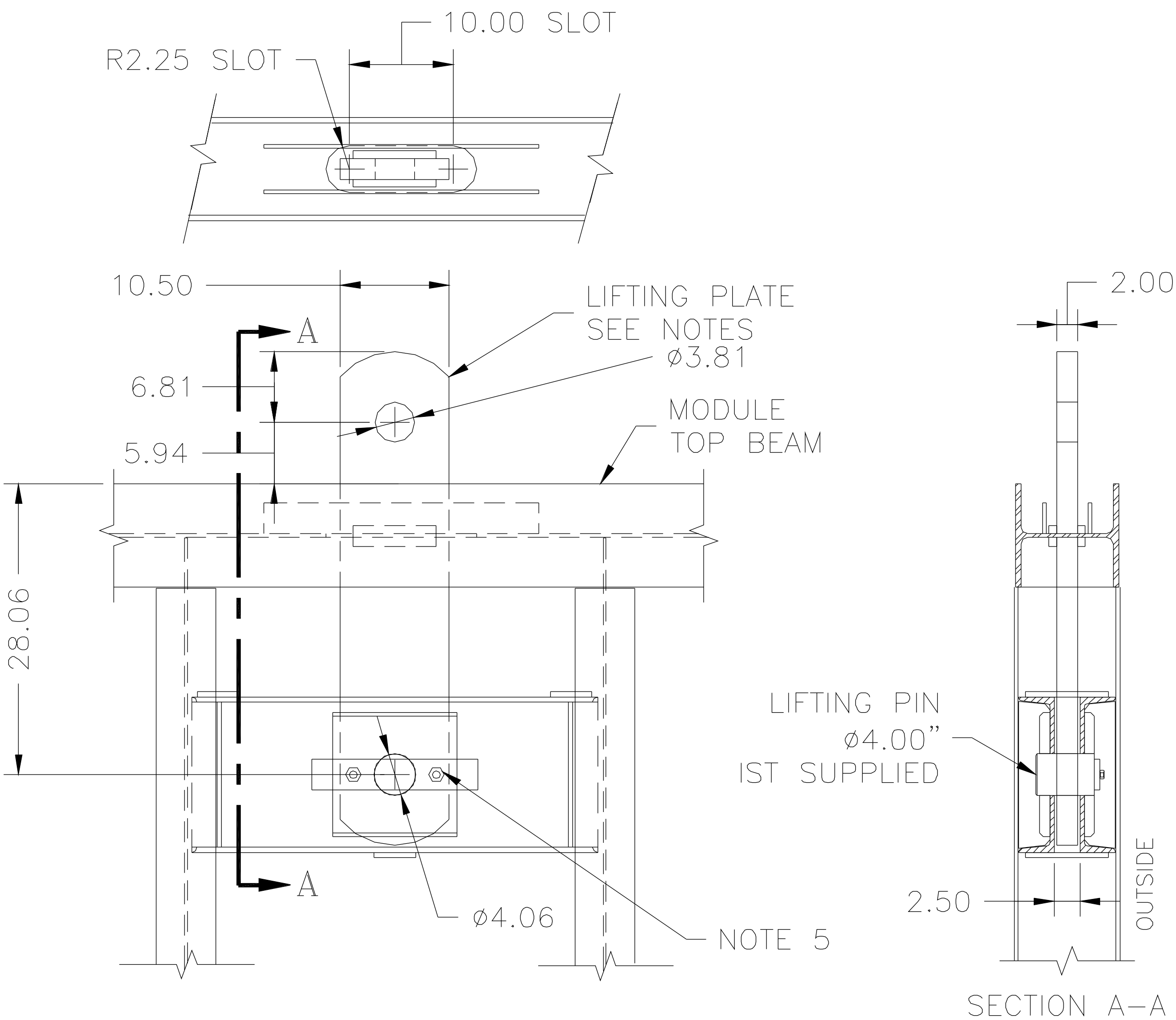
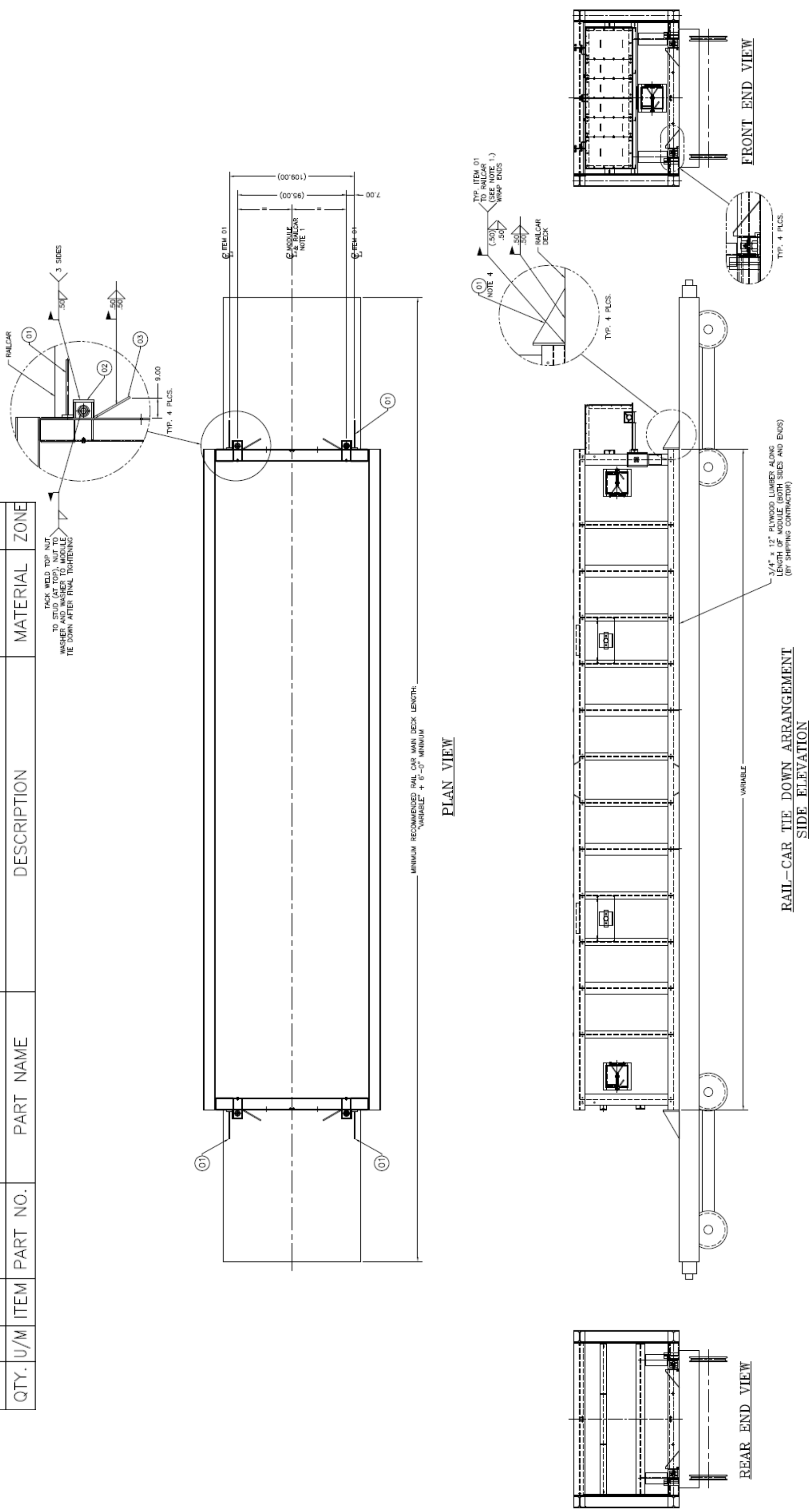


Figure 2.0

Notes:

1. Lifting link supplied by others or requested from IST. Refer to supply list.
2. Depending on module weight a direct cable connection to the 4" pin can be used. Erector to determine feasibility.
3. If others supply lifting link, the contractor is to determine the appropriate design of plate for given load.
4. Dimensions are in inches.
5. Ensure bolts are tightened and pin is completely installed prior to lift.

QTY.	U/M	ITEM	PART NO.	PART NAME	DESCRIPTION	MATERIAL	ZONE
4	EA	03	140901-01	RAIL-CAR RESTRAINT PLATE	0.75" PLATE		
4	EA	02	183078-100	SHIPPING RESTRAINT	SHIPPING RESTRAINT ASSEMBLY		
4	EA	01	140772-100	REINFORCING PLATE	REINFORCING PLATE ASSY.		



07

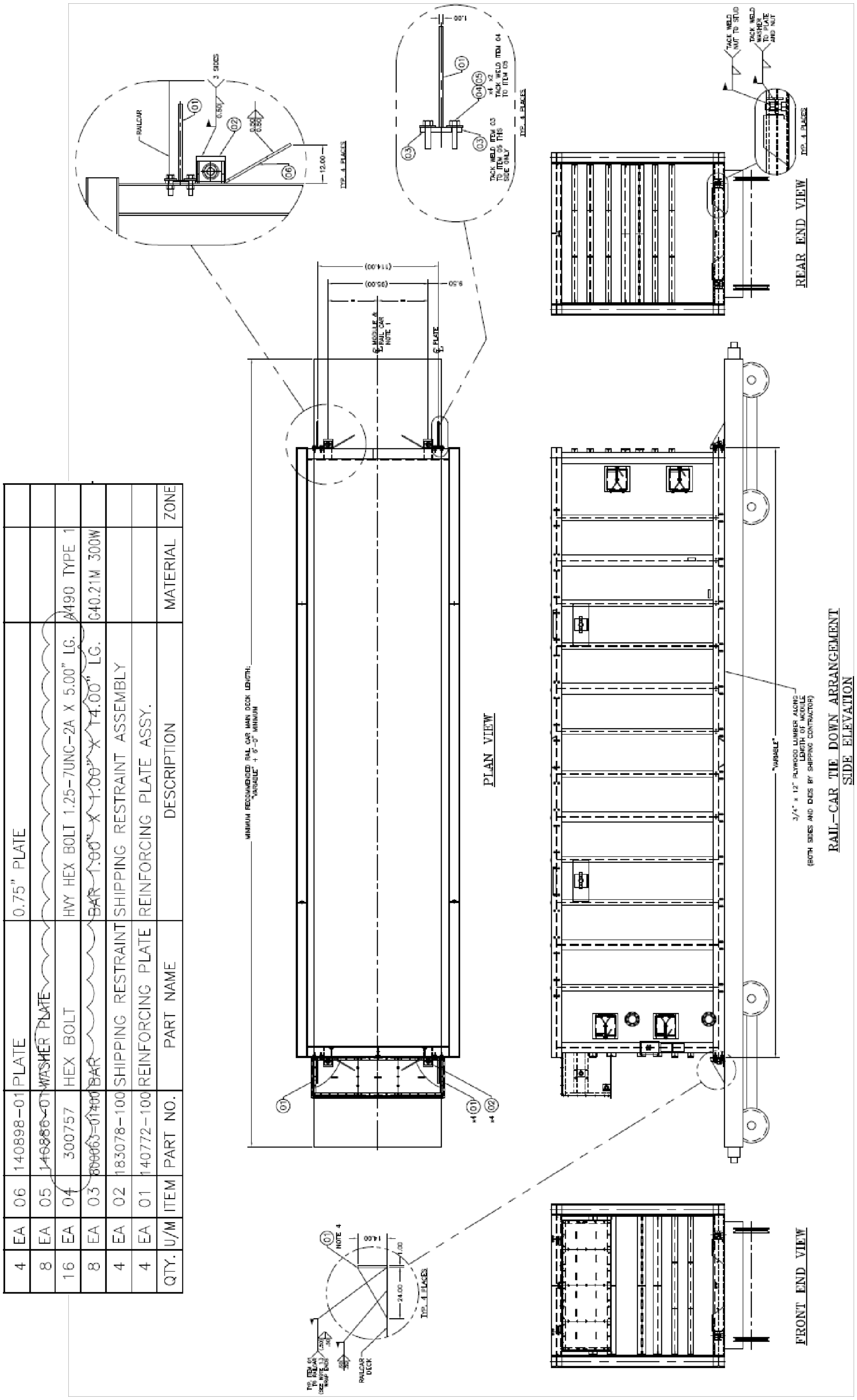
Figure 3.1a
(Notes on Next Page)

Figure 3.1a notes:

1. Shipping contractor shall be responsible for positioning and securing module to rail car. No allowances have been given for module to be off-centre of railcar.
2. The contractor shall confirm adequacy of IST proposed tie-down arrangement and devices. Additional securing devices (not shown) may be required as determined by the contractor such as chains, tie rods, etc.
3. Installation of tie-down devices to the rail car (incl. welding) shall be by the contractor.
4. Tighten shipping restraint nuts (item 02) prior to welding on triangular gusset plate.
5. Rail car and no. of axles shown may changed, as freight forward is to select appropriate car.
6. Welding must be performed by a welder certified in accordance with AAR or American Welding Society (AWS) standards or CWB standards
7. To retain nuts in their original position, three or more threads on rods or bolts must be nicked, chisel-checked, flattened, or otherwise distorted immediately behind single or double nuts, or nuts may be tack welded to the rods to ensure that the nuts will not back off.

07

8. ~~Consult IST engineering if this dimension is < 0.6 H due to the configuration of the rail car.~~
9. ~~Rod to clear inlet header on the outward side by at least 1".~~
10. Refer to supply table for supply of hardware, nuts and rods.
11. Dimensions are in inches.
12. See contract specific drawing "<u>Rail Car Tie-down Reinforcing Plate Assembly and Arrangement</u>" for weld sizes and other details. Drawing No. XXX888 ("XXX" to be replaced with contract ID No.)



QTY.	U/M	ITEM	PART NO.	PART NAME	DESCRIPTION	MATERIAL	ZONE
4	EA	06	140898-01	PLATE	0.75" PLATE		
8	EA	05	140886-01	WASHER PLATE			
16	EA	04	300757	HEX BOLT	HVY HEX BOLT 1.25-7UNC-2A X 5.00" LG.	A490 TYPE 1	
8	EA	03	800063-01400	BAR	BAR 1.00" X 1.00" X 14.00" LG.	G40.21M 300W	
4	EA	02	183078-100	SHIPPING RESTRAINT	SHIPPING RESTRAINT ASSEMBLY		
4	EA	01	140772-100	REINFORCING PLATE	REINFORCING PLATE ASSY.		

07

Figure 3.1b
(Notes on Next Page)

Figure 3.1b notes:

1. Shipping contractor shall be responsible for positioning and securing module to rail car. No allowances have been given for module to be off-centre of railcar.
2. The contractor shall confirm adequacy of IST proposed tie-down arrangement and devices. Additional securing devices (not shown) may be required as determined by the contractor such as chains, tie rods, etc.
3. Installation of tie-down devices to the rail car (incl. welding) shall be by the contractor.
4. Tighten shipping restraint nuts (item 02) prior to welding on triangular gusset plate.
5. Rail car and no. of axles shown may changed, as freight forward is to select appropriate car.
6. Welding must be performed by a welder certified in accordance with AAR or American Welding Society (AWS) standards or CWB standards
7. To retain nuts in their original position, three or more threads on rods or bolts must be nicked, chisel-checked, flattened, or otherwise distorted immediately behind single or double nuts, or nuts may be tack welded to the rods to ensure that the nuts will not back off.

07

8. ~~Consult IST engineering if this dimension is < 0.6 H due to the configuration of the rail car.~~
9. ~~Rod to clear inlet header on the outward side by at least 1".~~
10. Refer to supply table for supply of hardware, nuts and rods.
11. Dimensions are in inches.
12. See contract specific drawing "Rail Car Tie-down Reinforcing Plate Assembly and Arrangement" for weld sizes and other details. Drawing No. XXX888 ("XXX" to be replaced with contract ID No.)

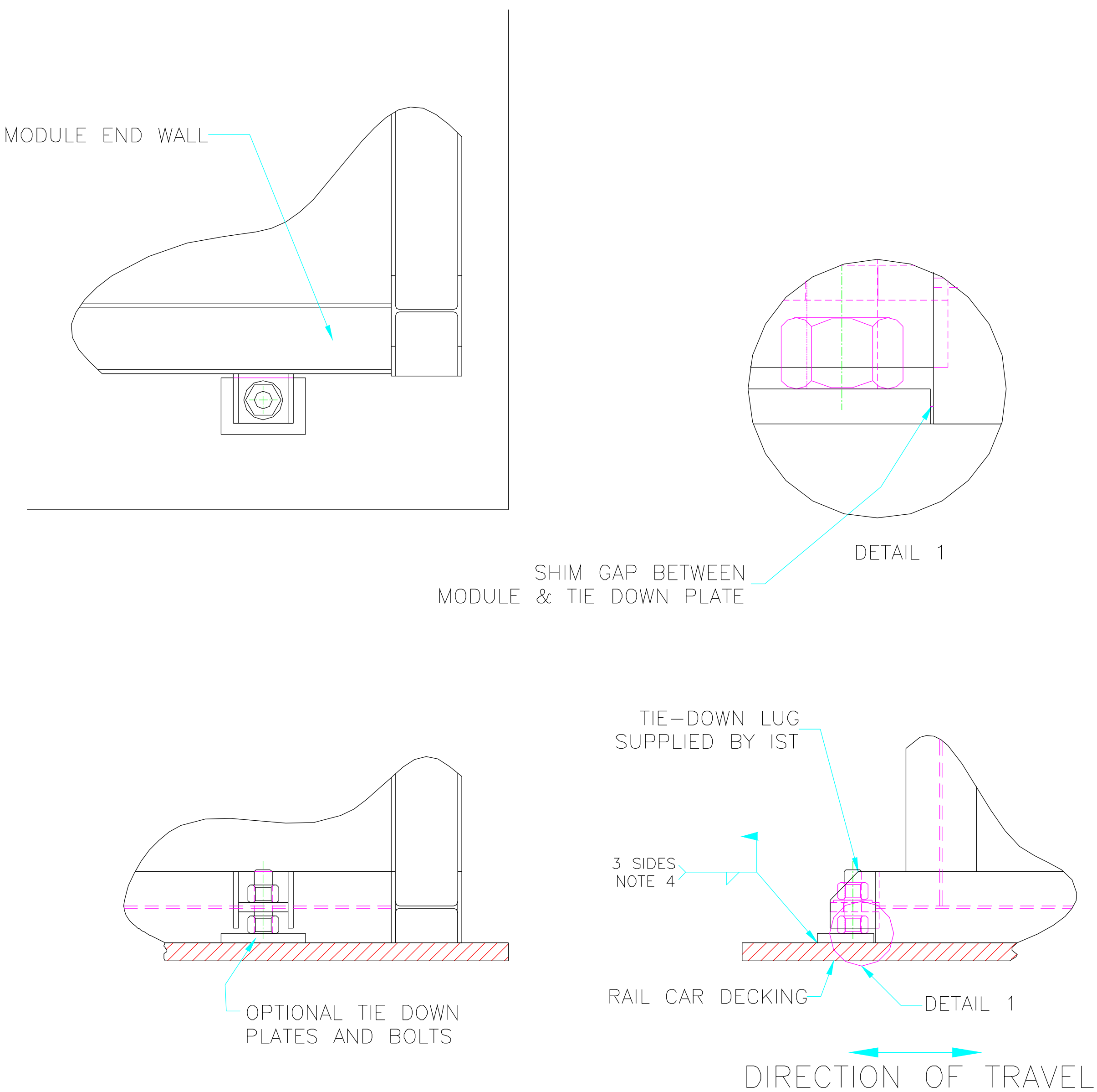


Figure 3.2

Notes:
1. Tie downs are located in 4 places
2. Shipping contractor is to determine appropriate design of tie down plate for given load, if not IST supplied.
3. Refer to supply table for supply of hardware, nuts and rods.
4. Weld type and size specified by others.
5. Dimensions are in inches.

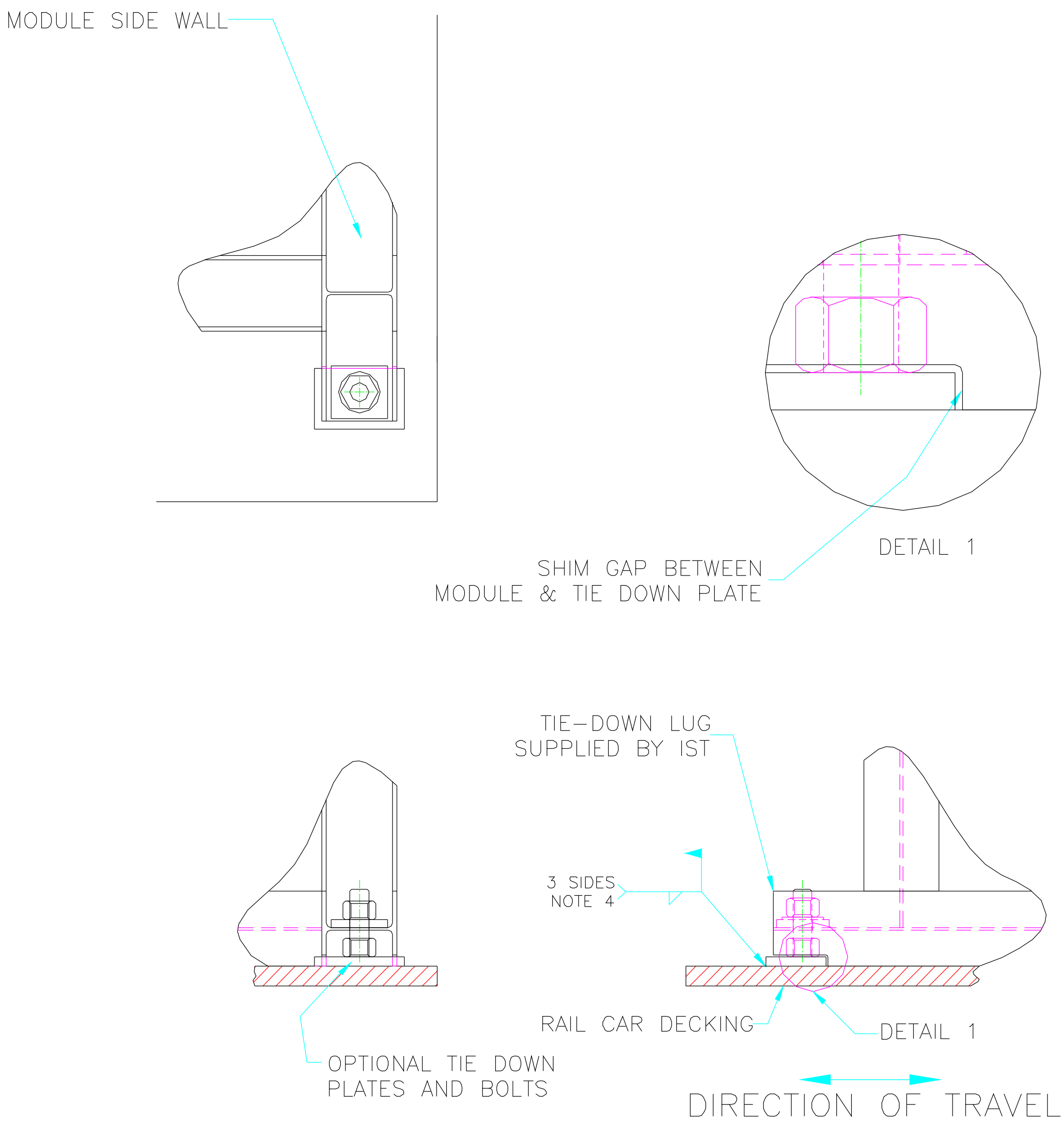
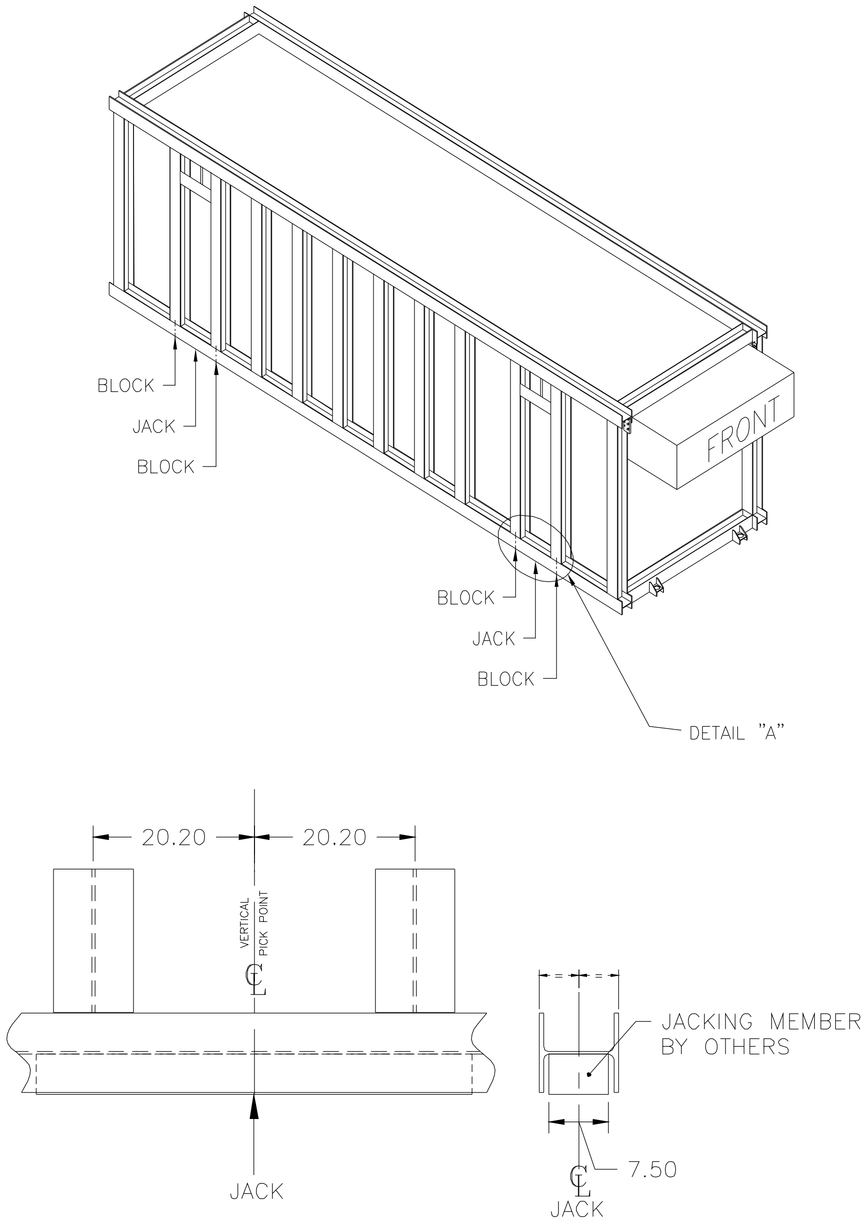


Figure 3.3

Notes:

1. Tie downs are located in 4 places
2. Shipping contractor is to determine appropriate design of tie down plate for given load, if not IST supplied.
3. Refer to supply table for supply of hardware, nuts and rods.
4. Weld type and size specified by others.
5. Dimensions are in inches.



DETAIL "A"

03

Figure 4.0

Notes:

1. Dimensions are in inches
2. Sizing of Jacking member described in Section 3.0

Appendix I

Soluble Fiber Insulating Materials –
IST Specification ES-026

ENGINEERING SPECIFICATION

Soluble Fiber Insulating Materials

SPECIFICATION
ES-026

REVISION 02

simply generates more profit

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Revision Page

Revision Number	Description of Revision	Developed By	Approved By	Approval Date
00	Original Issue	JMc	JL	Aug 4, 2004
01	Added values for 200 F	JMc	JL	Dec.1, 2004
02	Format change update to new logo/font	SV		March 5, 07

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1.0 OVERVIEW

1.1 This document details the requirements to be applied to the supply of soluble fibre insulation.

2.0 PURPOSE

2.1 The purpose of this specification is to document the technical requirements that shall be applied to the supply of soluble fiber insulation to IST.

3.0 REFERENCED STANDARDS

3.1 ASTM C167-Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulation

3.2 ASTM C177-Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by means of the Guarded-Hot-Plate Apparatus

3.3 ASTM C892-Standard Specification for High-Temperature Fibre Blanket Thermal Insulation

(Note that most recent addition at order placement applies)

4.0 MATERIALS

The soluble fibre material shall be exonerated from any carcinogenic classification in the countries of the European Union under the provisions of the European Commission Directive 97/69/EC. Certificates of independent animal testing consistent with EU protocol are required.

The insulation shall be free from any visible imperfections including holes, pockets, or local compressed areas which may adversely affect its service qualities. The insulation shall contain no asbestos.

Material nominal thickness and densities shall be as specified on IST Purchase Order. Only spun fibre is acceptable. Material shall contain no binder. Material shall maintain its physical properties once dried, if exposed to water. Material should not dissolve when exposed to rain water.

4.1 Material Composition – Material shall have a composition in accordance with the following limits:

CaO - 25% to 35%
MgO - 2% to 7%
SiO2 - 60% to 70%

4.2 Material Shrinkage – Shrinkage of the soluble fiber shall be < 3% average linear shrinkage after 24 hours at 1800 F.

4.3 Material Strength – Material strength shall be in accordance with the following:

Tensile Strength: 2.5 psi minimum (6 pcf)
4.0 psi minimum (8 pcf)
4.5 psi minimum (10 pcf)

4.4 Density -The density of the supplied product shall not be less than the nominal density specified on the purchase order i.e. no under tolerance is allowed. Density shall be checked per ASTM C167 or equivalent and the results shall be shipped with the order.

4.5 Thickness-The insulation thickness will be measured per ASTM C167 or equivalent. An under tolerance (including measurement error) of 7% and an over tolerance of 25% is acceptable.

4.6 Only new materials shall be used (used or reclaimed material is not permitted).

4.7 Width –Tolerance on specified width shall be -2% ,+10% (per ASTM C892).

4.8 Workmanship, Finish and Appearance –The insulation shall indicate good workmanship in fabrication by a uniform appearance, shall not have visible defects such as tears and holes that will adversely affect the service quality, and shall be free from foreign materials (ASTM C 892 para . 8).

4.9 Unfiberized shot content to be in accordance with Table 5 ASTM C892. Alternative testing may be used for unfiberized shot content but must be equivalent to ASTM C892.

4.9 Thermal Conductivity

Thermal Conductivity shall be tested in accordance with ASTM C177 and, on average, shall not exceed the following values (Btu-in/hr sq. ft .F):

Temperature (°F)	6 lb/ft^3 density	8 lb/ft^3 density	10 lb/ft^3 density
200	0.43	0.41	0.39
400	0.46	0.46	0.46
600	0.63	0.61	0.59
800	0.86	0.79	0.76
1000	1.18	1.03	0.96
1200	1.53	1.29	1.21
1400	1.86	1.64	1.50
1600	2.39	2.07	1.86

Appendix J

Feedwater Quality –
IST Specification ES-1000

IST ENGINEERING SPECIFICATION

Feedwater Quality Requirements for Superheated Steam Applications

ES-1000

Revision 10

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Feedwater Quality Requirements for Superheated Steam Applications

REVISION TABLE

Rev	Revision Description	Edited	Reviewed	Date
01	General Revision	--------	--------	Sept 11/96
02	General Revision	--------	--------	Sept 23/96
03	Updated address to Conestoga Blvd	--------	--------	Nov 13/00
04	Revision of entire specification	--------	--------	April 3/02
05	Revision of oxygen levels Added Notes to Table 1 and Table 2	--------	--------	Sept 17/02
06	Added note (7) following cycle chemistry limits regarding pH values	--------	--------	Nov 20/02
07	Table 1.0, 2.0, Note (3) for Tables 1.0 and 2.0, Section 2.2	AB	JM	Aug 8/03
08	Format change update to new logo/font	SV		March 5/07
09	Removed specific conductivity	JM	CK	July 22/11
10	Added AVT(O), AVT(R) along with general revision	JM	LG	Dec 4/13

Feedwater Quality Requirements for Superheated Steam Applications

1.0 INTRODUCTION

1.1. Background

This specification details the requirements of feedwater quality for Innovative Steam Technologies Once Through Steam Generators (OTSGs) producing superheated steam. Deviations from the limits and requirements within the warranty period must have specific written approval from Innovative Steam Technologies.

This specification addresses the following:

- All volatile treatments (AVT) suitable for the OTSG and feedwater systems
- Chemical addition and control
- Cycle chemistry instrumentation and monitoring guidance
- Response to chemistry excursions

The technical criteria for the establishment of these guidelines include:

- Minimization of deposit formation in the OTSG. Solids (dissolved, colloidal or suspended) which are carried into the OTSG are either deposited in the tubing or carried through as a solid or vapour into the dry out zone where deposition may occur. Deposits may restrict flow, reduce heat transfer and potentially act as corrosion sites.
- Minimization of suspended solids that could end up plugging stabilization orifices, restricting flow to individual circuits.
- Recognition of the critical importance of matching the feedwater treatment to other steam-water cycle components.

This specification is not a substitute for complete cycle chemistry guidelines, which should include monitoring of additional cycle streams as required. Successful implementation of this specification requires the provision of the necessary tools, procedures along with proper training of operators and is the responsibility of the owner.

Please note that some of the chemicals referred to in this specification are hazardous to human health and/or environment and should be handled with care.

1.2 Treatment Options

In OTSGs, there are three available options for water treatment; Reducing All Volatile treatment - AVT(R), Oxidizing All Volatile treatment - AVT(O) and Oxygenated treatment – (OT).

<u>Reducing All-Volatile Treatment - AVT(R)</u>, in which a volatile chemical such as ammonia or neutralizing amine is added to establish the desired pH and a reducing agent such as hydrazine is applied to maintain a reducing potential in the feedwater. This treatment can only be effectively adopted in situations where the air in-leakage to the cycle is low and the feedwater dissolved oxygen level is less than the limits provided in this specification. This treatment is recommended for plant cycles which use copper alloys in the feedwater.

<u>Oxidizing All-Volatile Treatment - AVT(O)</u>, in which a volatile chemical such as ammonia or neutralizing amine is added to establish the desired pH. No reducing agent is added and the oxygen level present in the condensate is controlled by the air in-leakage of the condenser. In this case the feedwater will have an oxidizing potential and should not be used with copper alloys in the feedwater.

Oxygenated Treatment - (OT), in which a volatile chemical such as ammonia or neutralizing amine is added to establish the desired pH. As with AVT(O), no reducing agent is added. Instead, the feedwater is dosed with oxygen (in the range of 30 ppb to 150 ppb) to increase the oxidizing potential. In this case the water will have an oxidizing potential which should not be used with copper alloys in the feedwater. While OT provides better protection of carbon steel, OT is not recommended for units that are subject to frequent startup and shutdown cycles with variations in cation conductivity. If the feedwater system is composed entirely of stainless steel, OT holds no significant advantage over AVT(O) and the additional requirements of operation with OT are not easily justified. Currently IST does not have operating experience with oxygenated treatment and, as such, IST has not provided recommended feedwater limits for OT.

2.0 CYCLE CHEMISTRY LIMITS

The rationale for determination of the cycle chemistry limits for these guidelines is based on the requirements for the OTSG and the potential contribution of upstream materials. If necessary, more stringent limits can be used based on the requirements for other components in the system, which may be more sensitive to impurities.
The control limits to be used during normal operation are shown in Tables 1 and 2 for units on AVT(R) and AVT(O) respectively. These tables also include recommended monitoring frequencies and action levels, which allow exceeding the normal limits for short durations.

For further information in regards to the rationale please refer to Appendix A.

Feedwater Quality Requirements for Superheated Steam Applications

Parameter	Monitoring Frequency	Target Value	Action Level 1	Action Level 2	Action Level 3	Action Level 4
pH	C	9.1 to 9.3	<9.1or >9.3	-	-	-
Water Cation Conductivity (µS/cm)	C	< 0.25	0.25 to 0.45	>0.45 to 0.85	>0.85 to 1.0	> 1.0
Steam Cation Conductivity (µS/cm)	W	< 0.25	0.25 to 0.45	>0.45 to 0.85	>0.85 to 1.0	>1.0
ORP (mV)	T	-350 to -300	-	-	-	-
Dissolved Oxygen (ppb)	C	< 5	> 5	-	-	-
Sodium (ppb) (see Note 7)	W	< 6	6 to 12	>12 to 24	> 24 to 30	> 30
Chloride (Organic and inorganic) (ppb)	T	< 6	6 to 12	>12 to 24	> 24 to 30	> 30
Sulfate (Organic and Inorganic) (ppb)	T	< 6	6 to 12	>12 to 24	> 24 to 30	> 30
Silica (ppb)	D	< 20	20 to 40	>40 to 80	> 80 to 100	> 100
Iron (ppb)	W	< 10	10 – 20	>20 to 40	> 40 to 50	> 50
Copper (ppb)	W	< 2	2 to 4	>4 to 8	> 8 to 10	> 10
Total Organic Carbon (TOC) (ppb)	W	< 100	> 100	-	-	-
Hardness (ppb)	T	< 1	> 1	-	-	-
Suspended Solids (ppb) (see Note 4)	T	Not detectable	-	-	-	-

* Nomenclature and notes follow Table 2. Action levels are given in Section 2.2.

Table 1.0 – Reducing All Volatile Treatment – AVT(R)

Feedwater Quality Requirements for Superheated Steam Applications

Parameter	Monitoring Frequency	Target Value	Action Level 1	Action Level 2	Action Level 3	Action Level 4
pH (see Note 6)	C	9.2 to 9.8	<9.2 or >9.8	-	-	-
Water Cation Conductivity (μS/cm)	C	< 0.25	0.25 to 0.45	>0.45 to 0.85	>0.85 to 1.0	> 1.0
Steam Cation Conductivity (μS/cm)	W	< 0.25	0.25 to 0.45	>0.45 to 0.85	>0.85 to 1.0	>1.0
ORP (mV)	T	0 to +100	-	-	-	-
Dissolved Oxygen (ppb) (see Note 5)	C	10 to 20	> 20	-	-	-
Sodium (ppb) (see Note 7)	W	< 6	6 to 12	>12 to 24	> 24 to 30	> 30
Chloride (Organic and inorganic) (ppb)	T	< 6	6 to 12	>12 to 24	> 24 to 30	> 30
Sulfate (Organic and Inorganic) (ppb)	T	< 6	6 to 12	>12 to 24	> 24 to 30	> 30
Silica (ppb)	D	< 20	20 to 40	>40 to 80	> 80 to 100	> 100
Iron (ppb)	W	< 10	10 – 20	>20 to 40	> 40 to 50	> 50
Copper (ppb)	W	< 2	2 to 4	>4 to 8	> 8 to 10	> 10
Total Organic Carbon (TOC) (ppb)	W	< 100	> 100	-	-	-
Hardness (ppb)	T	< 1	> 1	-	-	-
Suspended Solids (ppb) (see Note 4)	T	Not detectable	-	-	-	-

* Nomenclature and notes follow Table 2. Action levels are given in Section 2.2.

Table 2.0 – Oxidizing All Volatile Treatment – AVT(O)

Feedwater Quality Requirements for Superheated Steam Applications

Nomenclature:

C = continuous W = grab sample, once per week

D = grab sample, once per day T = troubleshooting and commissioning

Notes (Table 1 and Table 2):

1) Conductivity and pH measured at 25°C.
2) Grab samples are to be more frequent during startup. Grab samples should be once per day until benchmark levels are obtained.
3) In start-up situations feedwater must be circulated to reduce the dissolved material and suspended particles and should not be introduced into the OTSG until the cation conductivity is below 1.0 μS/cm (or 0.27 μS/cm for specific conductivity).
4) Suspended solids must be prevented to avoid clogging of feedwater orifices. Suspended solids are commonly measured by examining the undissolved material trapped on a 0.45 micrometer filter after filtration. Material that passes through is referred to as dissolved solids.
5) In systems with all stainless feedwater material the oxygen levels can be as high as 200 ppb. IST can review the allowable oxygen levels for feedwater temperatures less than 50°C.
6) The recommended pH value for all stainless metallurgy can be reduced to levels of 8.0 to 8.5 in order to achieve improved condensate polisher performance with some resins.
7) Sodium analysis of condensate and steam complements the conductivity analysis for identification of contamination of the cycle. Monitoring for sodium is particularly important in plants with condensate polishers, since sodium in the effluent may exist as sodium hydroxide, which cannot be detected using cation conductivity.

2.1 Action Levels

Operation at the lowest achievable impurity levels, with the shortest and least frequent excursions, is the most desirable mode of operation. The probability of corrosion damage and deposit formation grows significantly with increasing impurity concentration, and the damage is proportional to the exposure time. When corrosive impurities concentrate on metal surfaces, the breakdown of passivity (damage to the protective oxide layer) occurs within a few minutes to several hours.

To give more flexibility in the water and steam chemistry control, particularly during startups, three action levels are recommended. The target values for Action Levels 1, 2, and 3 were established to allow for and provide guidance during transient or abnormal operating conditions. If the problem is not corrected within the time allotted to each action level, the next higher action level takes effect.

Normal - Values are consistent with long-term system reliability. A safety margin has been provided to avoid concentration of contaminants at surfaces.

Action Level 1 - There is potential for the accumulation of contaminants and corrosion. Normal Limit can be exceeded for one week with the total yearly accumulation of two weeks. If the time allotted is exceeded an orderly shutdown should occur.

Action Level 2 - The accumulation of impurities and corrosion will occur. Operation is limited to 24 hours with the total yearly accumulation of 48 hours. If the time allotted is exceeded an orderly shutdown should occur.

Action Level 3 - The accumulation of impurities and corrosion will occur very quickly. Operation is limited to 4 hours maximum with the total yearly accumulation of 8 hours. Damage to the OTSG can occur when operating in this condition and immediate action is required to return the feedwater to the target value.

During excursions, when the impurity concentration increases sharply, the accumulation of impurities in the cycle occurs quickly, but the subsequent cleanup upon return to good chemistry may take weeks. Therefore, yearly time accumulations were also established as a guide. If the unit is shutdown due to water or steam chemistry (i.e. a major condenser leak), it should be an orderly shutdown, not a trip.

Action Level 4 – Impurity levels are too high and severe damage may occur to the OTSG. Immediate orderly shutdown of the OTSG is recommended.

APPENDIX A

A1.0 SELECTION OF FEEDWATER TREATMENT

A1.1 Factors Affecting the Selection of Feedwater Treatment

Certain aspects of the system must be considered to properly select the appropriate feedwater treatment. These include:

- Materials used in the feedwater system (defined as between the condensate pump discharge and the OTSG). The most common designs employ either carbon steel or stainless steels. In some isolated cases, components with copper alloys may be present in the feedwater system.
- Condenser design and control of air in-leakage along with resultant levels of dissolved oxygen in the feedwater
- Presence or absence of a condensate polishing system in the steam-water cycle.

A1.2 Feedwater System Materials

Proper selection of treatment requires consideration of the materials used in the feedwater system. Generally, the feedwater components will consist entirely of carbon steel and/or stainless steel. Use of AVT(O) is recommended for these applications as it will provide suitable protection.

Cycle designs which include copper alloys in the feedwater system require the use of AVT(R). AVT(R), which involves addition of a reducing agent to the feedwater, must be considered for protection of the copper alloys. AVT(R) should not be used in systems which do not contain copper as the protection of carbon steel is significantly less effective than is possible with AVT(O).

A1.3 Condenser Design

For air-cooled condensers, the tube material needs to be identified. For units with air-cooled condensers tubed with carbon steel, the pH will need to be at the upper limits of Table 2 (approximately 9.8) to avoid the serious corrosion that takes place in air cooled condenser tubing.

The type of condenser design can also have an impact on the preferred demineralizer (see Para 3.4 for more information).

Condensers intended for use under part-load operating conditions such as those that exist for example in cycling power plants may require specialized design considerations such as enhanced air removal capacity and hotwell steam-reheating in the lower segments to avoid condensate subcooling.

A1.4 Demineralizer and Polisher

The production of quality feedwater is usually a function of a makeup demineralizer and a condensate polisher, although depending on system requirements, one of these items can sometimes be eliminated.

Where demineralizer or polisher requirements are minimal, replacement powdered resins can minimize system capital and operating costs. This can eliminate the need for onsite acid and caustic facilities used for regeneration. Powdered resin systems can also have an advantage in systems using an air-cooled condenser due to additional filtration capability but may not provide sufficient upset protection for systems using a cooling tower. A mixed bed polisher may be a preferred selection for this application. The entire system should be analyzed when selecting the appropriate equipment.

Polishers can be operated in either the hydrogen form or ammonium form. Hydrogen form operation is most common. When cations, such as sodium, are exchanged onto the cation resin, hydrogen ions are released and acids are formed. These acids are immediately exchanged onto the anion exchange resin and the hydroxide ions are released. The hydrogen and hydroxide ions combine to form water. The result is water of exceptional quality. Among the advantages of hydrogen form operation is an ability to easily maintain acceptable water quality levels, even with a certain amount of condenser in-leakage. The regeneration is also simpler and more forgiving to the operators; however polisher-train run lengths tend to be less than that with ammonium form operation.

Ammonia form operation can achieve very long run lengths which can result in significant operational savings. However there are disadvantages to using resins in this mode. Ionic impurity leakage levels can be significantly higher when operating in the ammonia form even when the polisher is reasonably well regenerated. They can be orders of magnitude higher when resins are improperly regenerated. In order to avoid problems for example with ‘sodium throw’, the polisher resin would need to contain less than 0.08% residual sodium on the resin after it has been regenerated. Additional anion and cation separation and post regeneration and backwashing techniques must be incorporated into the design of the polisher, and knowledgeable well trained operators employed in order to use this form of operation successfully. It is also not well suited to plants that frequently stop and start.

A1.5 Makeup and Condensate Return Treatment

Raw water used for makeup contains impurities that must be removed before the water enters the OTSG. The extent of makeup water purification is system dependent (dependent on makeup rate) and site specific (dependent on raw water quality). Condensate return water may contain impurities that must be removed before the water enters the OTSG. Some examples of configurations which involve steam export and possibly condensate return include but are not limited to food processing, dairy operations, district heating, and paper making. There are many other examples and each requires careful analysis.

If the make-up water rate exceeds 3% of the total condensate circulation flow rate, design enhancements related to how and where to re-introduce the make-up water into the steam turbine condenser and/or condenser hotwell should be considered.

A1.6 Organic Compounds

Precautions must be taken to eliminate organics prior to the water reaching the OTSG since they can break down to acid type compounds at elevated operating temperatures. These acids can be harmful to the tubing of the OTSG and may have a negative affect on the feedwater treatment system resins. The use of organic feedwater treatment chemicals (amines and oxygen scavengers) need to be thoroughly evaluated concerning their decomposition, monitoring, analytical interferences, and toxicity.

Amines are typically not recommended for control of feedwater pH. All amines thermally decompose to some extent in the OTSG and the steam circuits, forming organic acids, carbon dioxide, ammonia, and other decomposition products. This also happens to oxygen scavengers other than hydrazine. The harmful effects of some of the decomposition products may be reduced when condensate polishers are used.

A2.0 CHEMICAL FEED AND SAMPLING

A2.1 Chemical Treatments

In units employing AVT(O), dosing with a pH conditioning chemical such as ammonia is preferred owing to the fact that additions to the cycle do not increase cation conductivity levels. This is important as it provides the best basis for identification and correction of chemistry excursions. If the use of ammonia is not permitted, other chemicals have successfully been used on other IST installations for pH control. Other chemicals that have been successfully used include morpholine, ethanolamine (ETA), dimethylamine (DMA), 3-methoxypropylamine (3-MPA) and cyclohexylamine.

In addition to ammonia or amine treatment, AVT(R) operation requires dosing the feedwater with a reducing agent (oxygen scavenger) to the feedwater. The reducing agent addition should not be relied on for pH control. The purpose is to establish a reducing environment which will protect copper alloy materials in the feedwater. Historically hydrazine has been a preferred oxygen scavenger but in recent years many countries have banned its use because it is carcinogenic. As a result carbohydrazide has become the most commonly used oxygen scavenger in the OTSG. It is in a more benign form for handling that doesn't break down into hydrazine until after it enters the boiler. Another successfully used chemical for oxygen scavenging is DEHA (Diethylhydroxylamine) provided that care is taken to avoid overfeeding. Alternative products and their decomposition products contribute to the measured cation conductivity values around the cycle (especially in steam) making it difficult to identify contamination events and comply with operating chemistry targets.

A2.2 Chemical Feed Points

Chemicals should be added as close to the beginning of the feedwater system as possible. This is most commonly the condensate pump discharge. If the cycle includes a condensate polisher, chemicals should be added on the downstream side, since these compounds can be removed by the polisher. However, if the polishers are operated in the ammonium form, the ammonia addition can be at the exit of the condensate pumps. If there is a deaerator in the feedwater system, the best location to add the oxygen scavenger is into the drop leg of the deaerator. This allows a greater residence time of the scavenger in the feedwater, increasing its effectiveness.

If AVT(R) is selected as the feedwater treatment, a separate line should be provided for injection of the reducing agent. Only a small addition is needed to meet the target for oxidation-reduction potential (ORP) when dissolved oxygen is in compliance with its target.

A2.3 Sample Points

To monitor the OTSG, it is recommended that sample points be located on the feedwater piping at the OTSG inlet, typically between the condensate polisher and the feedwater pump inlet, and on the steam piping at the exit of the OTSG, after attemperating sprays (if installed).

It has been shown that for sampling of superheated steam, an isokinetic sampling nozzle is needed. Multi-port nozzles which are installed in the superheated steam piping are not isokinetic and do not give a representative sample. The same isokinetic sampling is needed when sampling feedwater for suspended oxides (Fe, Cu oxides) to ensure a representative sample.

When sampling cation conductivity a calibration check of the measuring instrument should be made using a standard solution of known value. If the reading is high, the measurement probe may need replacing.

A3.0 CONTROL PARAMETERS AND LIMITS

A3.1 Conductivity Measurements

Feedwater cation conductivity is widely regarded as the most important chemistry control parameter. With use of suitable treatment chemicals which make no contribution to cation conductivity within the cycle, contamination events can be quickly identified and responded to. Conductivity measurement is recommended because there is a direct correlation between dissolved solids and conductivity. The purpose of the cation conductivity measurement is to remove the masking effect of the ammonia/amines and its derivatives, in the water.

The use of a degasification device prior to measurement of cation conductivity is sometimes used. The conductivity value resulting from this scheme is generally referred to as degassed cation conductivity. Degasification of the sample prior to cation conductivity measurement removes non-condensable gases including carbon dioxide, which is present primarily as a result of condenser air in-leakage and increases the cation conductivity value. Carbon dioxide and volatile organic compounds may be present as a consequence of thermal decomposition of organic species entering the cycle in the makeup water or as a consequence of condenser leakage or other contamination events. Volatile organics based treatment chemicals and their breakdown products also can make a considerable contribution to cation conductivity readings unless removed by degasification.

Steam and feedwater conductivity measurements are both required to alert the operator of any components breaking down in the OTSG.

A3.2 pH Levels

In the case of all-ferrous cycles employing AVT(O), pH control is the main protection of carbon steel. Flow-accelerated corrosion (FAC) of carbon steel is the damage mechanism responsible for most of the iron measured in the feedwater and deposited in the steam generator. FAC can occur in both single-phase (liquid) and two-phase (steam-water mixtures) over a temperature range of about 40-300°C (105-572°F). The mechanisms of single-phase and two-phase FAC are different; though each is controlled by the chemistry, the oxidizing power (influenced by the dissolved oxygen concentration) of the liquid is the major influence on the single phase FAC while pH is the most significant influence on the two-phase FAC. If the cycle design utilizes carbon steel in the two-phase areas it is preferable to operate with the feedwater pH at the upper end of the ranges indicated in Table 2.

In the case of all-ferrous cycles employing AVT(O) it is not uncommon to continuously monitor iron levels in the closed-condensate system using a particle counter and analyser, and to control oxygen levels/dosing based on maintaining iron at less than 2-ppb.

A different situation exists when AVT(R) is used in cycles which contain copper as well as carbon steel. For these systems the pH range in Table 1.0 is suggested to protect the copper alloy materials while also limiting iron transport as a consequence of FAC. The indicated pH and dissolved oxygen ranges associated with each of the allowable treatment regimes are also acceptable when the cycle includes stainless steel materials, which are not susceptible to damage by FAC.

A3.3 ORP Measurements

Oxidation-Reduction potential is used to determine the condition of the feedwater. Positive ORP values reflect oxidizing conditions while negative ORP readings are indicative of reducing conditions. Monitoring ORP in addition to other measurements can be useful in the optimization of the treatment. For example, if the ORP is negative, a reducing environment exists that can reduce or eliminate a protective layer of magnetite.

A3.4 Customization of Chemistry for Industrial Applications

Users of OTSGs in cycles which export steam and/or receive condensate or makeup from an outside source may need to consider further modification of Table 1 and Table 2 targets and consider impacts of these targets when developing action levels and response procedures. Conditions which may require customization include:

- Steam purity requirements which prohibit use of preferred treatment chemicals
- Requirements on use of return condensates

Applications under which customization of chemistry targets could be required include medical applications (sterilization), pharmaceutical applications, chemical processing, etc. As an example, there are a number of conditions including chemical usage restraints for food processing applications. Individual requirements within food processing exist and need to be considered. For instance, in dairy processing applications, use of ammonia for pH control is generally not allowed. Similarly, use of reducing agents may be prohibited entirely or restricted to “zero” or un-measurable in the steam.

A4.0 CORRECTIVE ACTIONS

Typical corrective actions to respond to out-of-specification steam and/or water chemistry conditions are listed in this Section. These corrective actions are not meant to be all-inclusive or universally applicable. Each utility and/or plant should establish plant-specific corrective actions that consider plant design features and other plant-specific concerns. Successful implementation of this specification requires proper training of operators and is the responsibility of the owner. ONLY AFTER DETERMINING THE ROOT CAUSES OF AN EXCURSION CAN A PERMANENT SOLUTION BE SELECTED.

The action to be taken to confirm and correct water and the time to confirm and correct a water chemistry upset depends on the severity of the chemical excursion. On-line and grab sample analysis data must be used to determine the source(s) of ingress of various impurities. Possible causes of feedwater chemistry excursions are described below.

Out of Limit Parameter	Condenser Leak	Bad Makeup	NH_3 Feed System	O_2 Scavenger Feed	Air In Leakage	Condensate Polisher Malfunction
1) Sodium	X	X				X
2) Chloride	X	X			X	X
3) Sulfate	X	X			X	X
4) Silica		X			X	X
5) Cation/specific conductivity	X	X			X	X
6) Total organic carbon		X				X
7) pH			X		X	X
8) ORP	X			X	X	
9) Iron	X		X	X	X	
10) Copper	X		X	X	X	
11) High dissolved oxygen (AVT)	X	X		X	X	

Table 3.0 – Possible Causes of Feedwater Chemistry Excursions

Corrective actions for each monitored parameter are listed below

Feedwater Quality Requirements for Superheated Steam Applications

Parameter	Corrective Action
pH	Check ammonia feed and adjust as necessary within allowed limits. Identify sources of possible contaminants by checking: • makeup purity • condensers for tube and air leakage • purity of chemical feeds
Ammonia	Check pH, and adjust chemical feed as necessary.
Cation Conductivity	Identify source of contaminants by checking: • performance of condensate polisher, resin leakage • makeup purity • condensers for tube and air in leakage • purity of chemical feeds
Dissolved Oxygen	Identify source of dissolved oxygen by checking: • condensers for air in leakage • feedwater train for air in leakage (pump suction, etc.) • condensate storage tanks – saturation in air
ORP	Check and adjust chemical feed to maintain ORP within limits. Reduce air in leakage.
Sodium, Chloride, Sulfate, Silica, TOC	Identify source of contaminants by checking: • performance of condensate polisher, resin leakage • makeup purity • condensers for tube and air leakage • purity of chemical feeds
Iron and/or Copper	Identify cause by checking: • iron and copper in all streams and lay-up protection • pH and ORP of feedwater • dissolved oxygen in condensate and feedwater, optimize feed and concentration of oxygen scavenger • condensers for air in leakage • erosion-corrosion of carbon steel piping and other cycle components by downtime inspection (wall thickness measurement) and/or iron and copper pickup • exfoliation in the steam pipes

Table 4.0 – Examples of Corrective Actions for Chemistry Excursions

Appendix K

OTSG Erection Presentation

we find a better way

Glenarm Repowering Project OTSG Erection

James Tong

January 8, 2014

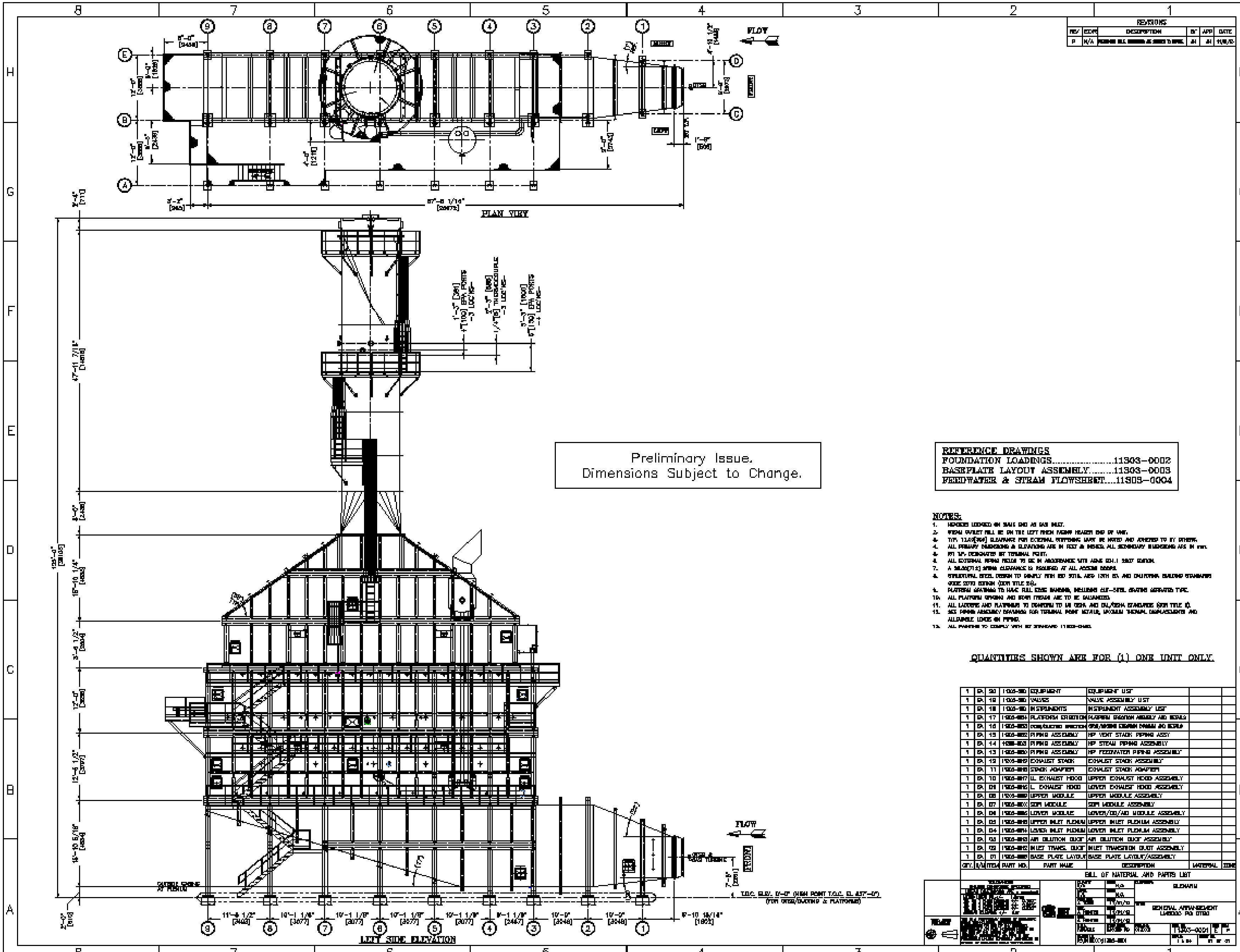
Agenda

- General Arrangement Overview
- OTSG Module Details
- 3D View of OTSG
- Flowsheet Overview
- Erection Sequence
  - Baseplate Assemblies
  - Inlet Plenum
  - Erection Plate Installation
  - OTSG Modules
  - Exhaust Hood
  - Exhaust Stack
  - Inlet Transition Duct
  - Expansion Joint

Agenda

- Erection Sequence (Continued)
  - Pressure Part Support (Top Support Beams)
  - Internal Joint Welding and JAK Installation
  - Internal Restraint Adjustment
  - Platform Steel and SRV Silencer Installation
  - Boiler External Piping Installation
  - “Jumper” Tube Installation
  - Instrumentation and Thermocouple Installations
- Questions / Discussions

Preliminary General Arrangement / Shipping Pieces



OTSG Details

OTSG Mechanical Data: LM6000 PG

For Information Only. May be changed during contract stage

Overall Length, ft	88.60	
Overall Width, ft	12.95	
Overall Height, ft	125.00	
Overall Weight, lbs	884,149	
Number of pressure part modules per OTSG	2	
	Upper Module	Lower Module
OTSG Module Length, ft	54.74	61.47
OTSG Module Width, ft	12.95	12.95
OTSG Module Height, ft	8.53	9.56
OTSG Module Weight, lbs	301,291	194,422
Effective Net Surface Area, ft^2	231,436	
Number of Circuits per Module	41	
Tubes per Circuit	38	
Total Number of Tubes	1,558	
Transverse Pitch, inches	2.75	
Longitudinal Pitch, inches	2.38	
Effective Finned Tube Length, ft	42.73	
Tube Diameter, inches	0.75 / 1.0 / 1.25	
Tube Wall Thickness, inches	As req'd	
Fin Material	As req'd	
Fin Pitch, fins per inch	As req'd	
Fin Height, inches	As req'd	
Fin Thickness, inches	As req'd	

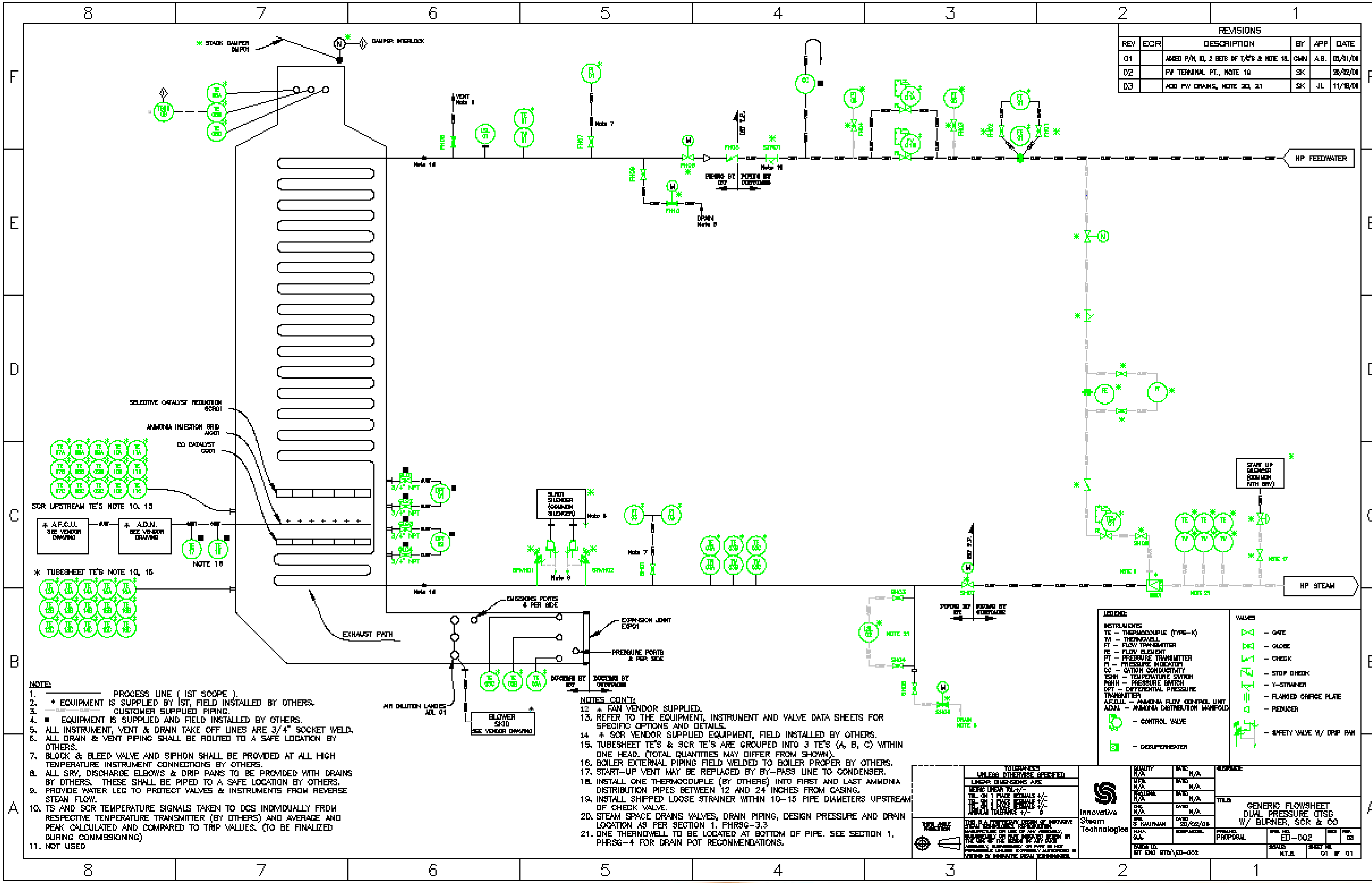
Approximate Exterior Dimensions & Weights (Please refer to attached drawing for referenced dimensions)

	Length		Width	Height		Weight
Inlet Duct Inlet, ft .			7.98	7.98	' A '	
Inlet Duct, ft & lbs	15.14	' B '				17,755
Inlet Duct Outlet, ft			12.86	15.49		
Air Dilution Duct, ft & lbs	10.00	' D '	12.86	15.49		15,494
Burner Duct Outlet, ft			12.86	15.49		
Inlet Plenum, ft & lbs	61.47	' E '	12.95	15.86	' F '	95,229
OTSG Lower Module, ft & lbs	61.47		12.95	9.56		194,422
SCR Module, ft & lbs	61.47		12.95	16.50	' G '	77,617
OTSG Upper Modules, ft & lbs	54.74		12.95	8.53		301,291
Exhaust Hood, ft & lbs	54.74		12.95	15.95	' H '	52,090
Exhaust Stack, ft & lbs	12.85	' K '	12.85	56.82	' J '	65,250
Ladders & Platforms. lot, lbs						65,000
				Total		**884,149**

IST An Aecon Company

3D View of a Similar OTSG

Glenarm GE OTSG Flowsheet

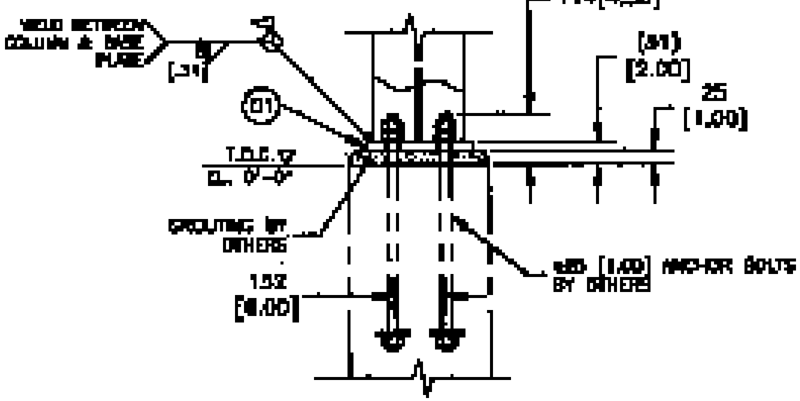


IST
An Aecon Company

Baseplate Assemblies

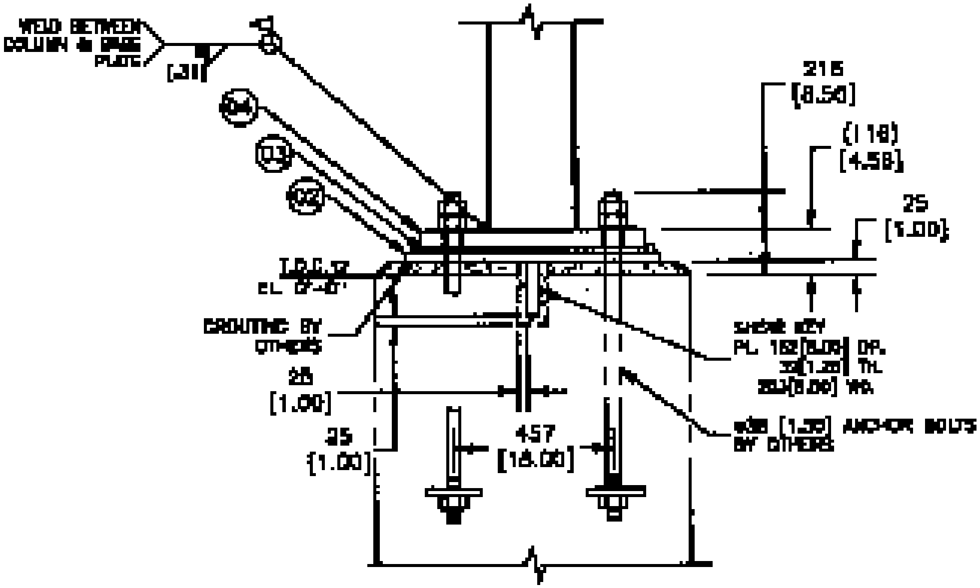
- OTSG baseplates are designed to allow thermal expansion. One baseplate location is fixed.
- Platform column baseplate assemblies are fixed and do not include soleplates nor fabreeka pads.
- Check elevations at top of concrete and check for level at each footing using a transit before installing soleplates. Avoid installing shims below soleplates.
- Verify elevations of baseplates and for level with a transit after installation.
- All OTSG anchor bolt nuts are installed snug tight.
- At fixed column locations, anchor bolt nuts are installed snug tight and tightened an additional ¼ turn and baseplate is welded to soleplate.
- Lock all anchor bolt nuts with a tack weld or jam nut.
- Grouting of sole plates must be completed prior to installation of inlet plenum.

Typical Baseplate Arrangements



VIEW A–A (F7)

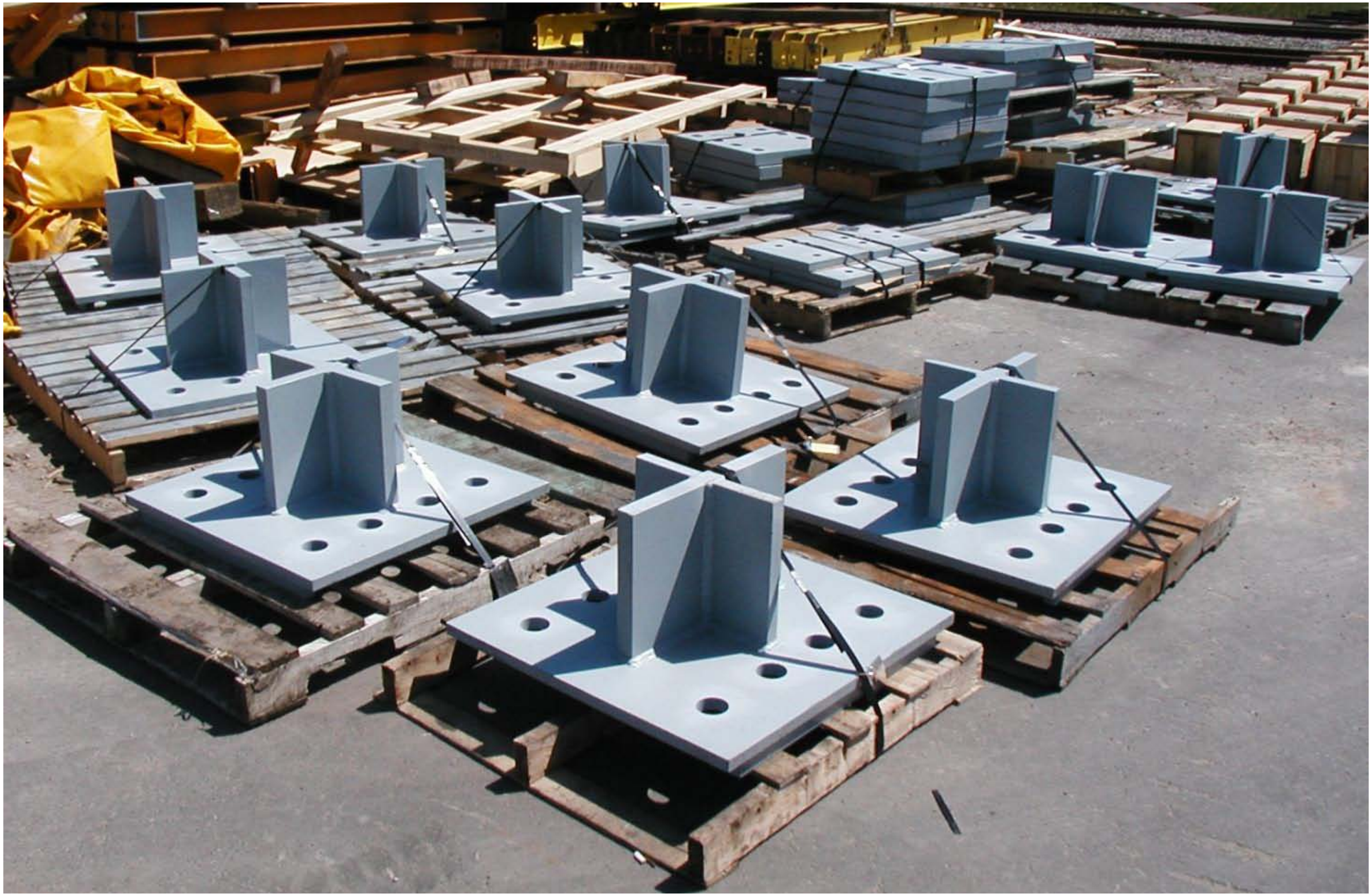
A1,A2,A3,A4,A5,A6
ARRANGEMENT
N.T.S.



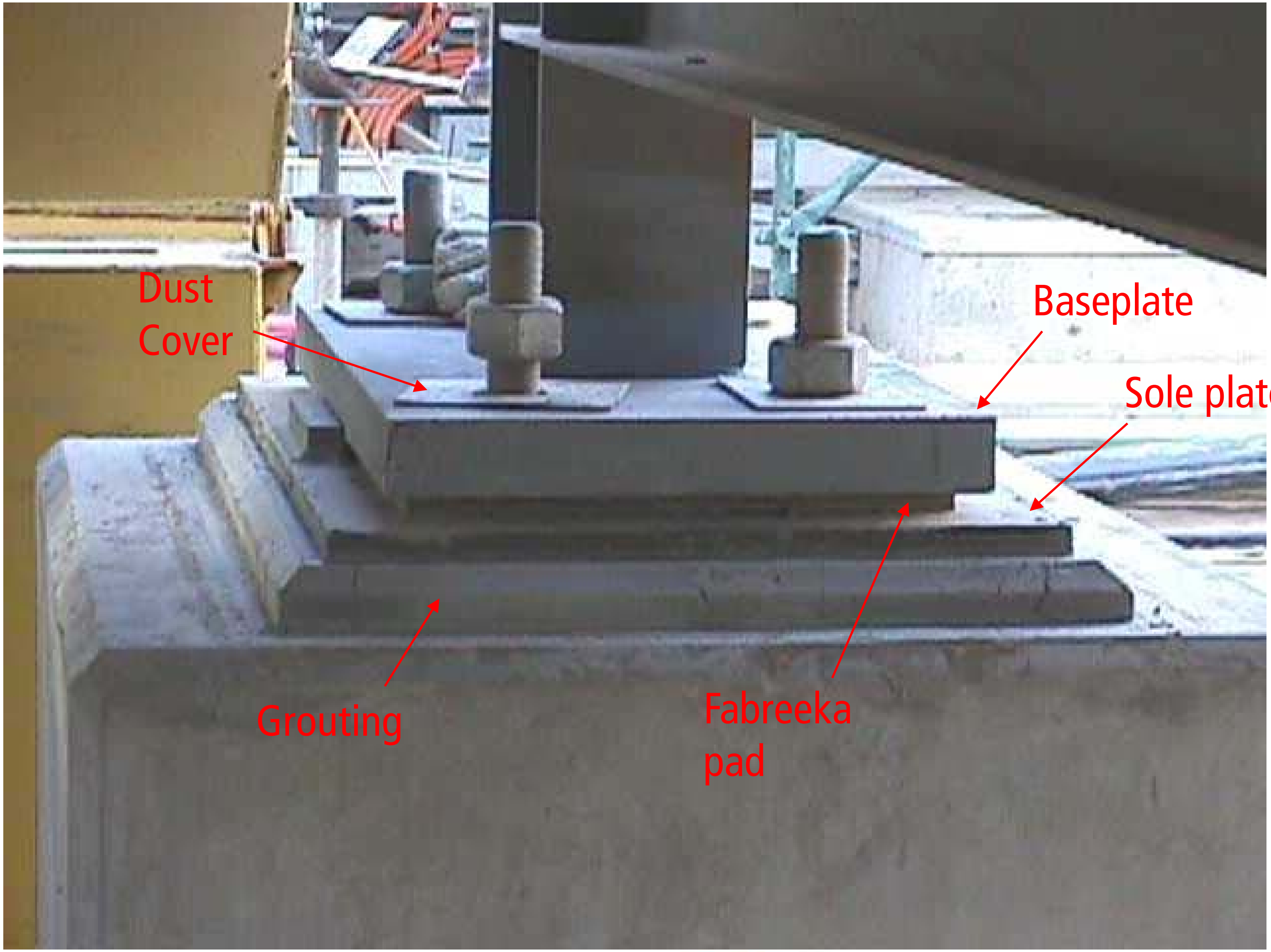
VIEW B–B

B1,B2,B3,B4
ARRANGEMENT
N.T.S.
(ROTATED 90°)

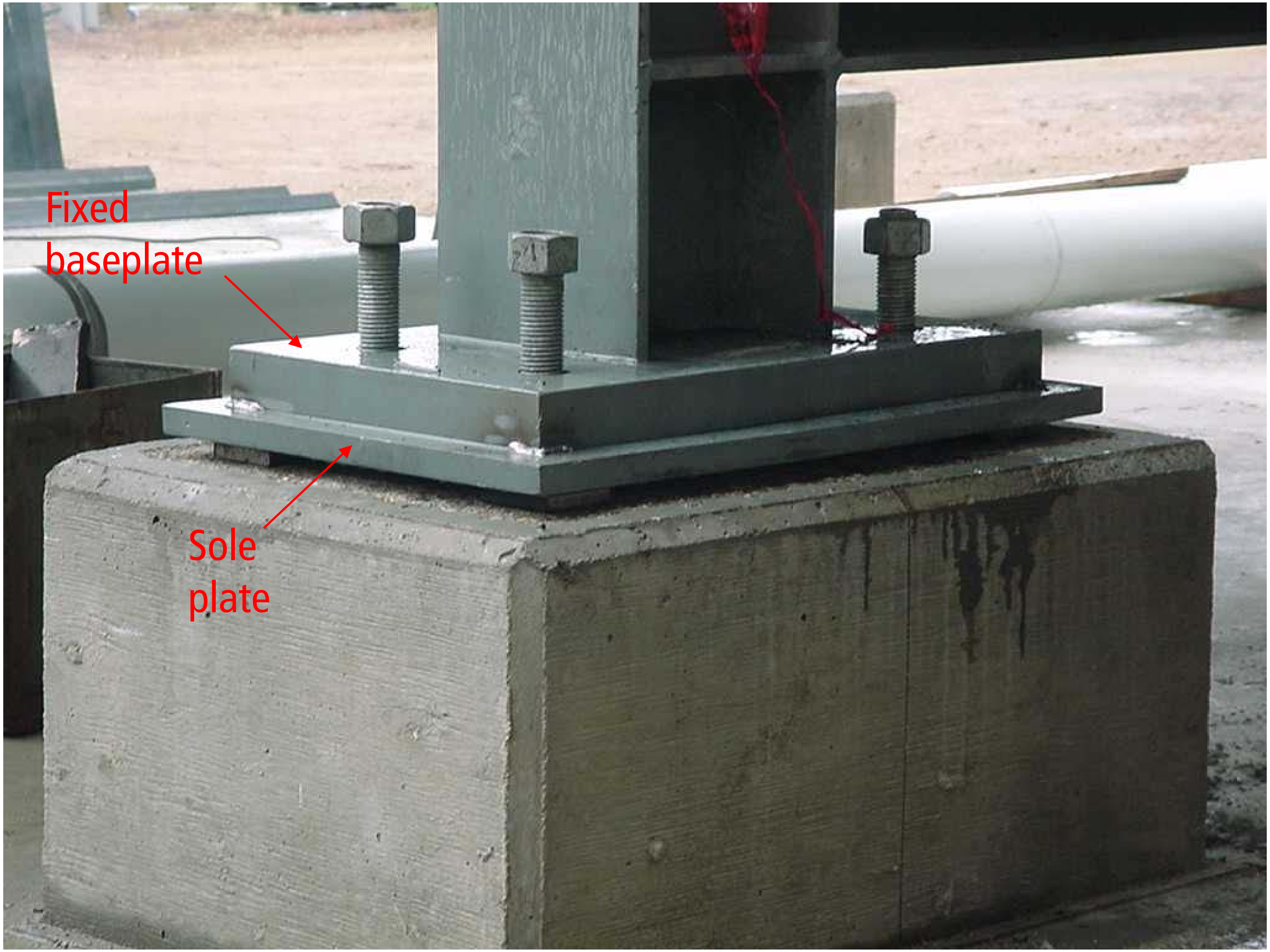
Baseplate/Soleplate Shipments



Sliding Baseplate Assemblies



Fixed Baseplate Assemblies



Inlet Plenum Installation

- Two inlet plenum assemblies.
- Lift the inlet plenum into position so that each column rests centrally on its respective baseplate.
- Check the centreline distances to the gas turbine discharge to ensure fit-up dimensions are aligned and correct.
- Check the elevation dimensions at the four top corners of the inlet plenum to ensure that the plenum is level and matches the specified elevation on the drawings.
- Weld inlet plenum column to baseplates.
- Upper inlet plenums will have split rear columns that need to be bolted to the duct before being welded to their respective baseplate.

Inlet Plenum Vertical Lift

Inlet Plenum with External Scaffolding

Inlet Plenum with Internal Scaffolding

Erection Plate Installation

- Erection plates are installed at all columns and vertical stiffener locations around the perimeter.
- Bolts are installed “snug” tight to the exterior of the erection plate and tightened by an additional ¼ turn.
- Tightening shall progress systematically, from the most rigid part of the joint to its free edges.
- After erection plates are installed, weld the plate to the beam on 3 sides (top and sides).

Erection Plate Troubleshooting

- If erection plate holes are misaligned…
  - ❖ Install all erection plates that can be installed.
  - ❖ Open up misaligned holes with a carbide burr bit.

- If side or end beams do not align…
  - ❖ Install shims or spacers to make plate flush, or
  - ❖ For minor discrepancies, just install the plate tightly by slightly bending the plate.

- If the end perimeter joint has gaps at either end…
  - ❖ Leave the erection plates unbolted until internal seal welding is complete. Follow Erection instructions on welding sequence.

Erection Plates – Inlet Plenum to Module

OTSG Module Installation

- The OTSG consists of three (3) primary modules
  - OTSG Lower Module
    - Pressure parts including balance headers and steam outlet header
    - CO catalyst support structure
    - AIG lances
  - SCR Module
    - SCR catalyst support structure
  - OTSG Upper Module
    - Pressure parts including feedwater inlet header

Note:

1. Removeable panel doors are located at the rear of the module for catalyst installation. It is recommended that the panel doors be kept in place during the SCR module lift.
2. CO catalyst and SCR catalyst not be installed until after OTSG burn-out procedure is completed.

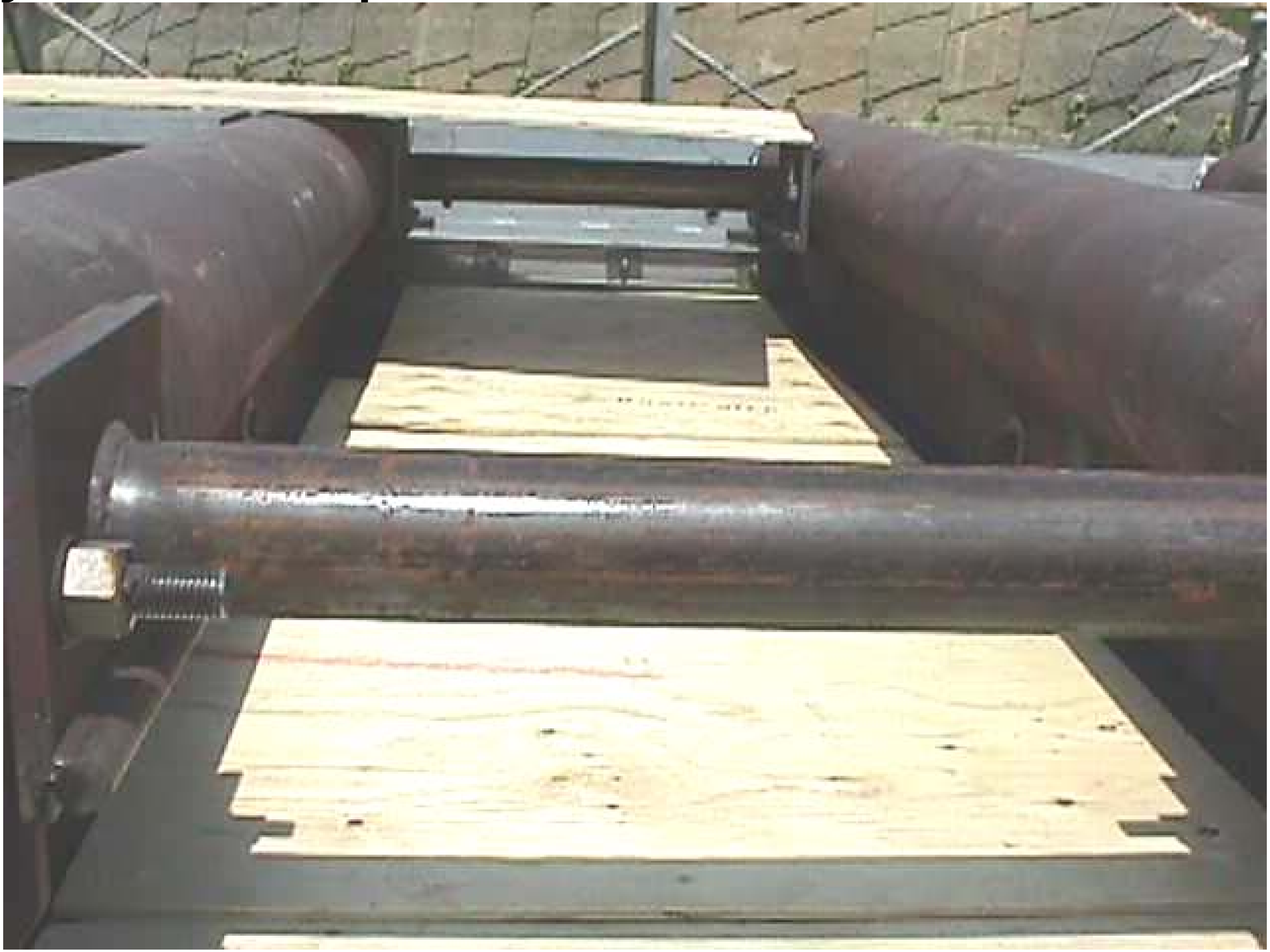
OTSG Module Installation

- Position crane (or cranes) as required in preparation for lift.
- Transfer OTSG module to the lifting location and securely place OTSG module on concrete/steel stools or dunnage in prescribed locations marked on the module.
- “Prepare” the module by removing protective tarp, placing plywood strips between top support beams to protect fin tubes, remove designated shipping beams, place JAK on plywood strips.
- Loosely install erection plates around the top of the upper inlet plenum beam and locate erection plate hardware in web of lower module bottom beam so they are readily available for installation.
- Lifting plates must be installed to hoist the module into place. Install all lower erection plates before releasing the crane.
- Remove the lifting plates, reinstall and secure the lifting pins.

Lower Module Transferred At Site

Dunnage Detail

Plywood Strips for Finned Tube Protection



Lower Module Lift – Single Crane Lift

Lower Module Lift – Two Crane Lift

Lower Module Lift – Two Crane Lift

Lower Module Lift – Two Crane Lift

Lower Module Lift – Two Crane Lift

SCR Module Internal View

Exhaust Hood Installation

- Exhaust Hood will be shipped in two modules. Lower Exhaust Hood contains silencer baffles.

- Prepare the exhaust hood by installing plywood over the silencer baffles for protection, placing JAKs on plywood for future installation.

- Lower Exhaust Hood and Upper Exhaust Hood will be installed using two separate lifts.

Exhaust Hood – Single Crane Lift

Exhaust Stack Installation

- Properly supporting the Exhaust Stack assembly in the horizontal position, install platforms, handrails, and ladders at grade.
- Place the Stack Adaptor assembly in a vertical position on dunnage and install the Exhaust Stack Assembly at grade. Complete assembly of erection plates and all joint welds at grade. The combined assembly can be installed in a single lift.
- Once the assembly is placed on the Upper Exhaust Hood assembly, all erection plates and full penetration welds at the base of the Stack Adaptor shall be completed prior to releasing the crane.
- Stack damper can be installed immediately after the Exhaust Stack is secured in place.
- Stack damper actuator should be installed prior to the assembly being lifted to the top of stack. Rain skirt liner panels will be bolted into position after damper is secured.

Stack Platform Installation

Stack in Vertical Position with Platforms

Stack Damper Placement

Inlet Transition Duct Installation

- Install the inlet plenum flow screen prior to installing the Inlet Transition Duct.

- Place insulation and JAKS inside the Inlet Transition Duct prior to installation.

- Inlet ducting installations are slip fit connections. With the duct still on the hook of the crane, pull the inlet duct into the inlet plenum opening with come-a-longs.

- Check to ensure all ducts are centered over the baseplates in both directions. At the inlet plenum to duct interface, the edge of the duct casing should line up with the plenum column centerline.

- Check the inlet duct center alignment with the combustion turbine centerline and compare distance between the inlet duct and combustion turbine flanges at four points – top, bottom, left, and right

Inlet Transition Duct Installation

Inlet Transition Duct Installation

Expansion Joint Installation

- Expansion joint is supplied in a compressed state to permit installation between combustion turbine and inlet duct flanges.

- All hardware, gasket tape, insulation, and liner plates required for joint installation are provided.

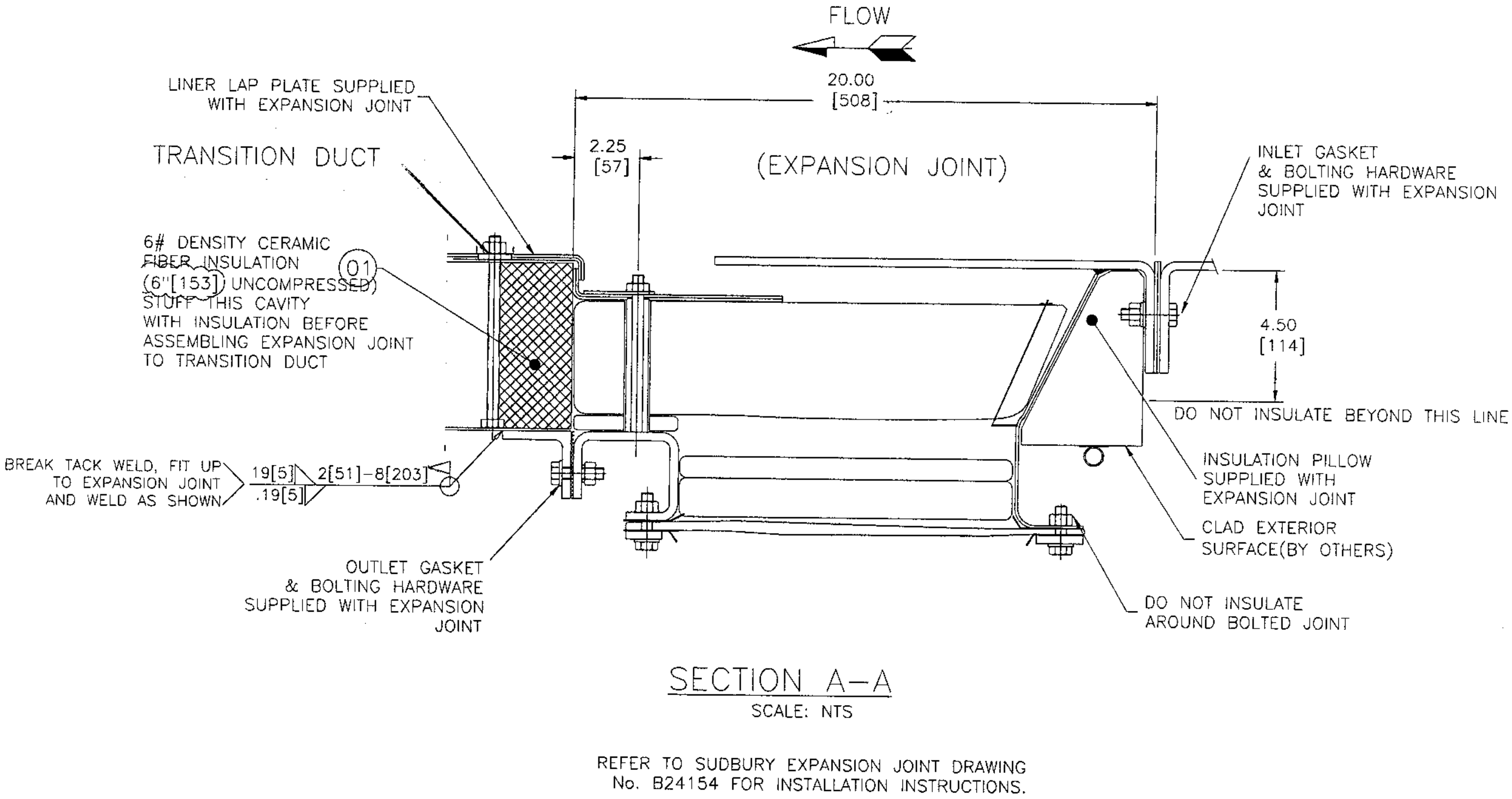
- Lift expansion joint to the combustion turbine exhaust flange and secure in place. Next, loosen the preset bars on the expansion joint and allow the joint to expand to the inlet duct flange. Securely bolt the joint to the inlet duct and then remove the preset bars.

- Fill internal void of expansion joint and transition duct with insulation and liners provided. Place these items into ducting prior to lifting the expansion joint for installation.

- An external insulation pillow for the expansion joint may be supplied for site installation. Cladding should be installed (by others) over the pillow.

Inlet Transition Duct Installation

Inlet Transition Duct Installation



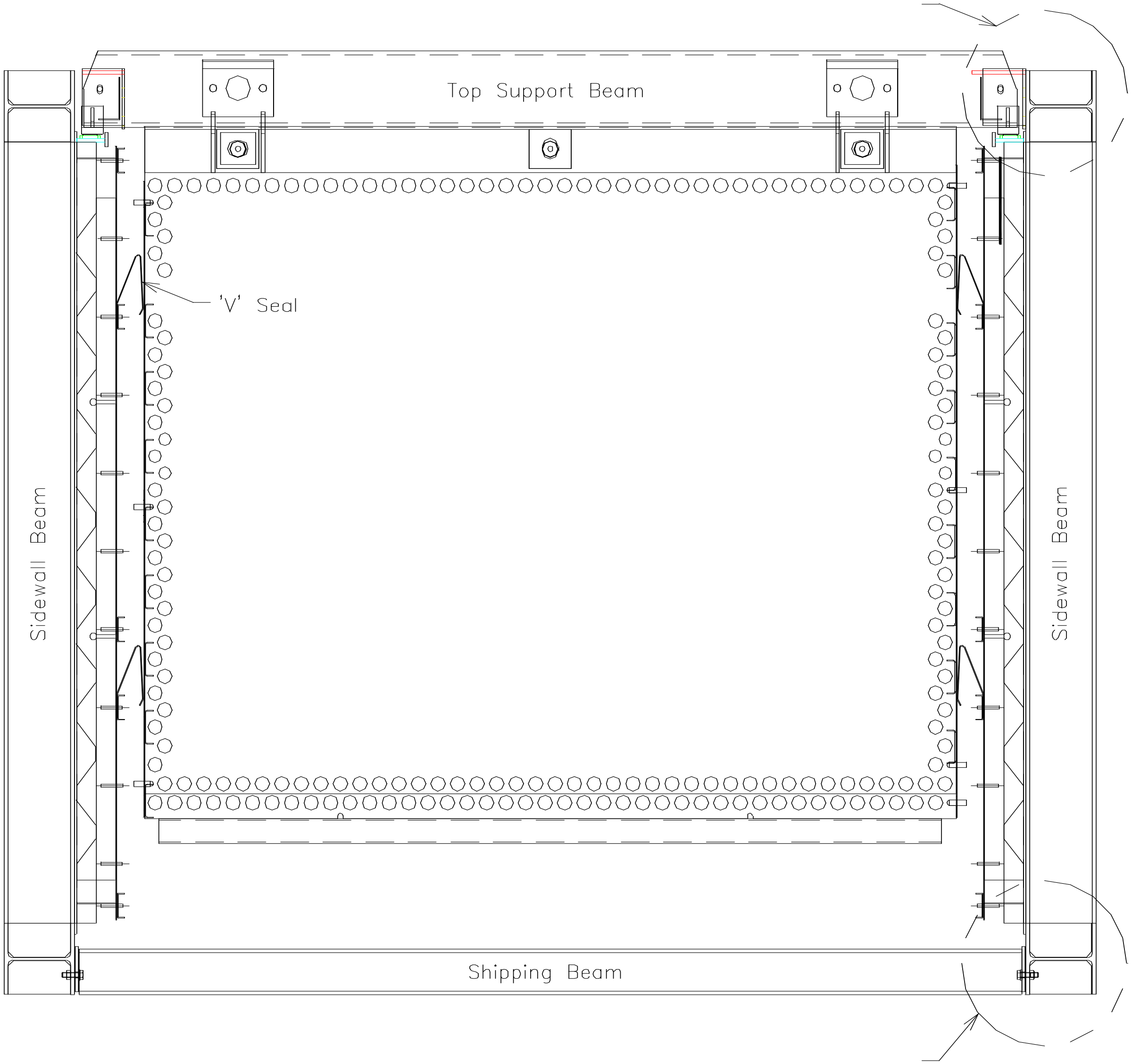
Top Support Beams

- Remove yellow painted shipping angles from the tubesheet support beams. This will involve removing two bolts that tie into the casing and one stud that attaches into the support beam.

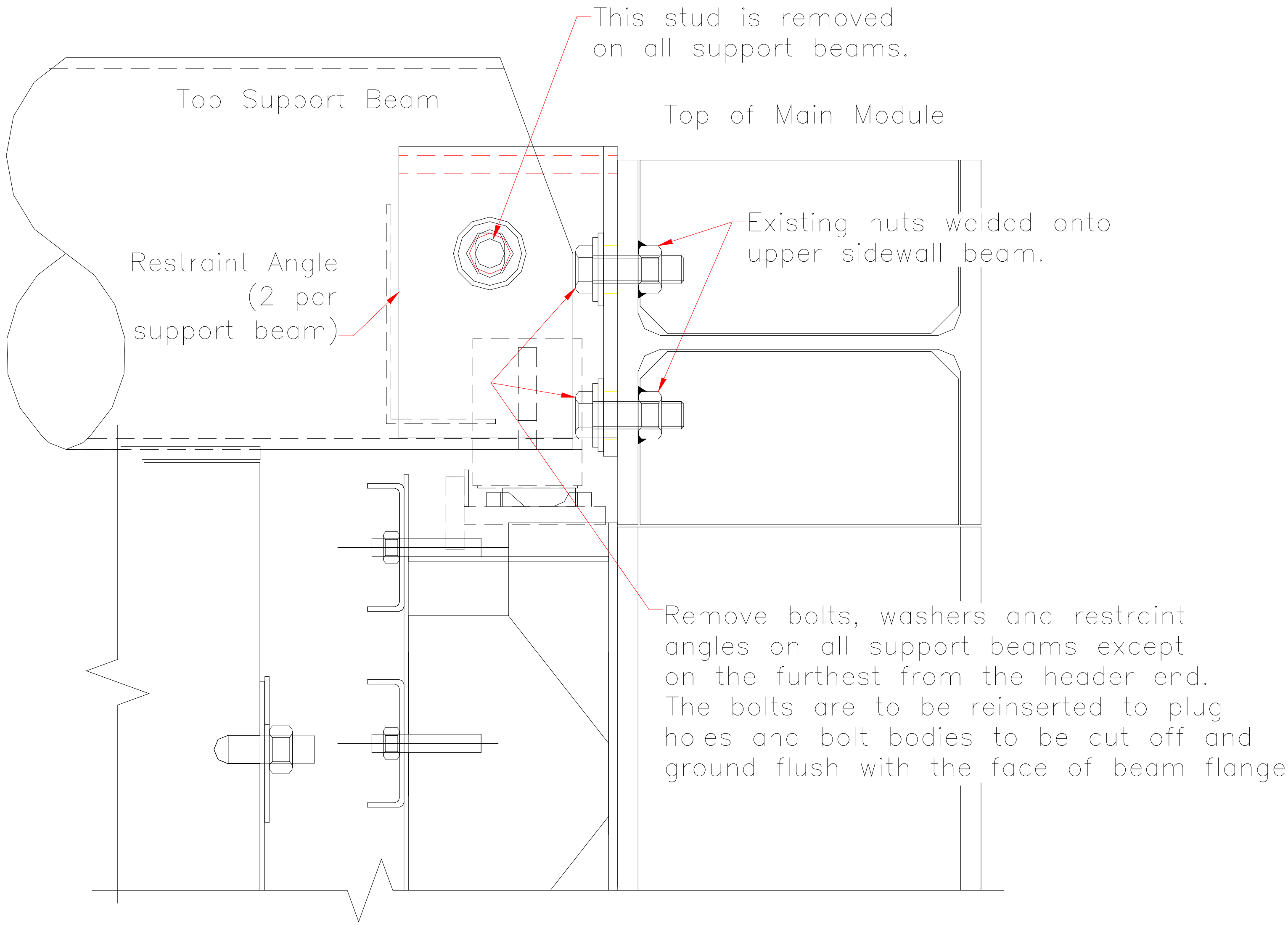
- On rear-most support beam, the angles restraining longitudinal movement are fixed and are not to be removed. The bolts tying the angle to the casing are to remain. The stud tying the angle to the support beam will be removed.

- At all locations where shipping angles have been removed, reinsert the bolts into their respective holes, cut heads off with a grinder and seal weld.

Module Cross Section



Top Support Beam Hardware Removal



Top Support Beam Shipping Angles

Internal Perimeter Joint Welding and Joint Assembly Kits

Note: These instructions are typical for all duct-to-duct joints.

Joint Assembly Kits = JAKs

- Remove all remaining shipping beams and seal weld casing bolt holes by reinstalling removed bolts and seal welding them into place.
- Seal weld internal perimeter joint between two components.
- Remove existing internal liner hardware (channel, nuts, and washers) adjacent to the joint for JAK installations.
- Install 3 layers of ceramic fiber insulation into the joint. Ensure insulation ends are tight against one another and that seams are overlapping.
- JAK liner panels must be installed in the same overlap sequence shown on the drawings to allow for unimpeded thermal expansion.
- All removed internal liner hardware are to be reinstalled. Nuts are to be installed "snug" tight and backed off ¼ turn of the wrench, then tack welded.

Module Joint Prior to JAK Installation

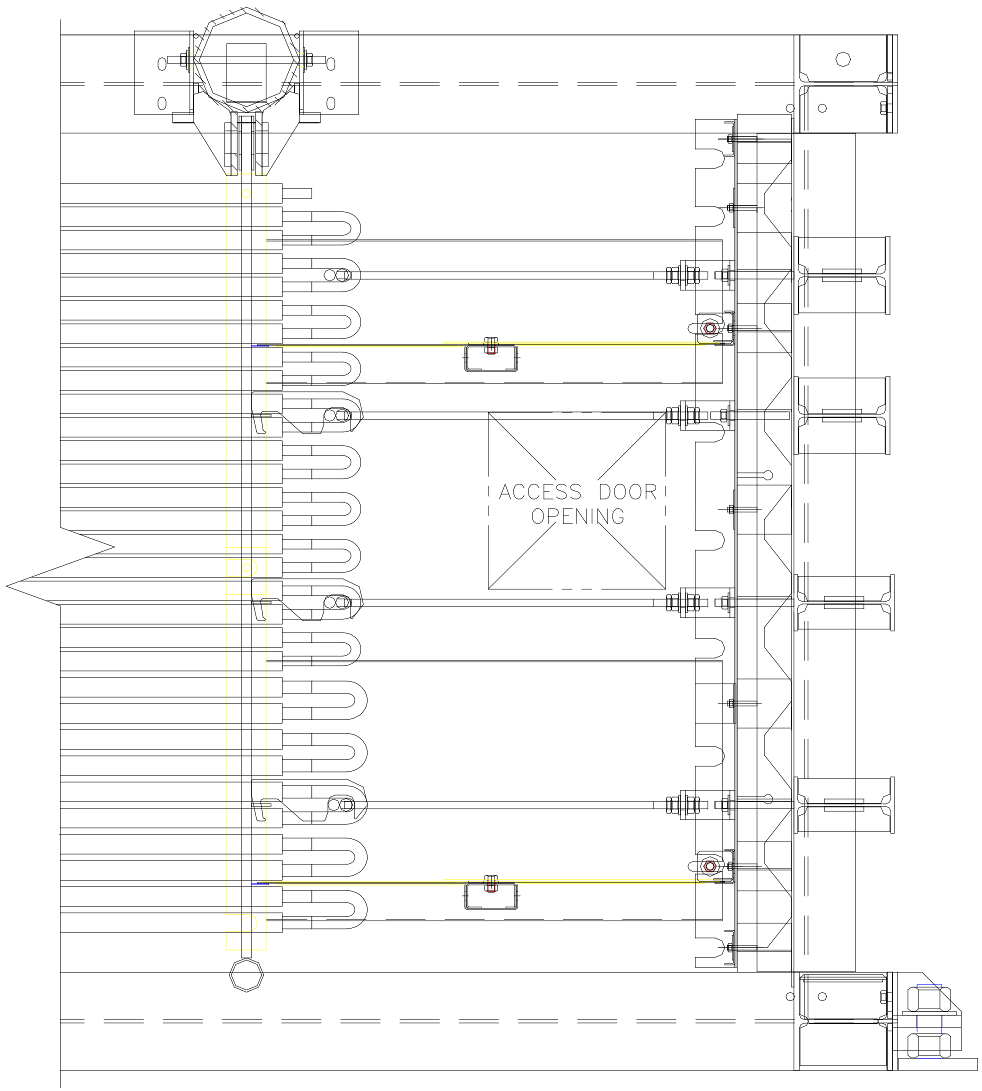
Module Joint Insulation

Completed Module JAK Installation

Pressure Part Restraint Adjustment

- After internal seal welding is complete and JAKs installed, the OTSG module tube bundles have restraint hardware that require adjustment.
- Rubber pads have been installed on the inside radius of radius bends at all restraint levels for shipping protection. These rubber pads have to be removed.
- All restraint rods require adjustments after the shipping protective rubber is removed.
- It is critical not to over tighten and to maintain the required gaps between restraint rods and return bends. Refer to erection drawing for instructions.
- In order to access all levels of restraints, some endseal panels will need to be removed. Ensure all panels are reinstalled immediately after the restraint is adjusted.

Sample Restraint Rods and End Seals



Platform Steel and SRV Silencer Installation

- Platform steel is typically installed after major components are in place.
  - Occasionally it is installed prior to the exhaust hood and stack installation in areas with high seismic zones or high wind loads.

- Brackets are welded to the OTSG vertical beams and columns from which platform beams are bolted.

- Pre-assembly of structural steel columns and beams should commence on the ground.

- In the event that piping or conduit penetrations are required through the grating, the contractor is responsible for cutting the grating and installing additional kick plate required for protection.

- Prior to installing the SRV Silencer, confirm the distance between bolt holes on the silencer support base plate versus the platform steel. Ensure platform steel support for the silencer is completely installed and secure before placing the SRV Silencer.

- Check orientation of the SRV Silencer outlet against the erection diagram.

Platform Steel Installation

IST
An Aecon Company

SRV Silencer Lift

SRV Silencer Installation

Boiler External Piping Installation

- OTSG Boiler External Piping is supplied in two feedwater assemblies and one steam assembly.
  - Motorized valves are shipped loose for protection and will be welded at site.
  - Drain piping off the main run will terminate at the motorized block valve (second valve), balance of piping to be designed and supplied by others.
  - SRV and SRV Silencer drain and vent piping to be supplied by others.
  - Vent and instrument lines will terminate at the first block valve. Balance of tubing to instrumentation will be designed and supplied by others.
  - Piping stress analysis will be performed by others.
  - Pipe supports will be designed and supplied by others.

- Additional valves and instruments will be shipped loose to site for installation into piping beyond the IST terminal points.

Boiler External Piping Installation

- Check to ensure all piping assemblies, valves, and hardware are available and inspect all equipment for damage prior to installation.
- Boiler External Piping should not proceed until platform steel is in place.
- Do not remove protective end caps from piping until it is necessary.
- Ensure the safety relief valve hydrostatic test plugs have been installed prior to the hydrostatic testing.
- Check that the SRV vent pipes are secure and that sufficient clearance exists between the safety valve discharge elbow and the inside of the vent pipe to allow for thermal expansion.
- Ensure valves are installed in the correct flow direction. Motorized and pneumatic valves should be checked for proper operation. Operate the valve actuators to ensure the linkages do not bind.

Boiler External Piping Installation

- Check that pipe orifices and/or flow devices are properly installed.
- Ensure all flange bolts are tight and proper gaskets have been installed.
- Check that all drains and vents are free of obstructions and that the lines have been properly supported. Ensure all vent pipnig has been properly routed and is pointing safely away from access platforms.
- Ensure strainers are installed in the feedwater piping. Strainers will prevent plugging of OTSG flow orifices and damage to control valves by foreign matter.
- Ensure all necessary post weld treatment and non-destructive examination has been completed as necessary.
- Conduct a successful hydrostatic test as requried.

Steam Outlet Piping Installation

“Jumper” Tube Installation

Where the complete OTSG pressure tubing is contained in two or more modules, a connection must be made between these modules to complete the tubing circuitry from the inlet header to the outlet header. This activity is to be completed by IST orbital welding technicians using a specialized TIG welding process.

Orbital welding process…

- Prepare ends, on both “jumper” tubes and OTSG module tubes for welding.
- Fill the inside of the tubing circuit/bundle with argon.
- Fit-up and weld “jumper” tubes to OTSG module tubes.

“Jumper” Tube Installation

During this process, the construction contractor will be responsible for providing the following…

- Electrical junction and uninterrupted power source and hook-up service for IST tool crib container and transformer for orbital welding and 110V power tools.
- Designated lay-down area local to OTSG for IST tool crib container.
- Compressed air.
- Scaffolding, if platform steel and grating is not completed.
- Tarps for scaffold areas at feedwater inlet box, in case of inclement weather.
- Site safety induction of IST personnel prior to commencement of site activities.
- Provision of two personnel for assistance with general support labour duties and requirements of IST welding technicians / supervisors.
- Designated lunch, smoking area, and washroom facilities.
- Arrangement of any on site permit requirements.
- Supply of ample demineralized water and pressurizing equipment to perform a hydrostatic test of each OTSG circuit once “jumper” tube welding is complete and piping tie-ins are made.

Instrumentation and Thermocouple Installation

- Check that all instrumentation, thermocouples, and associated components are available. Inspect for damage prior to installation.

- During installation ensure that the correct fittings are utilized for the application.

- Check the inside of all thermowells to ensure they are void of any obstructions or deformities.

- Ensure that all gas side temperature probes install easily into the connection pipes.

- Ensure that any installed instrumentation does not interfere with platform access or walkways.

- Ensure that tubesheet thermocouples are installed per IST drawings.

- The supply of all wiring and junction boxes required for instrumentation installation will be by others.

Questions/Discussion

Enclosure 12

DaveT@cpsqrd.com

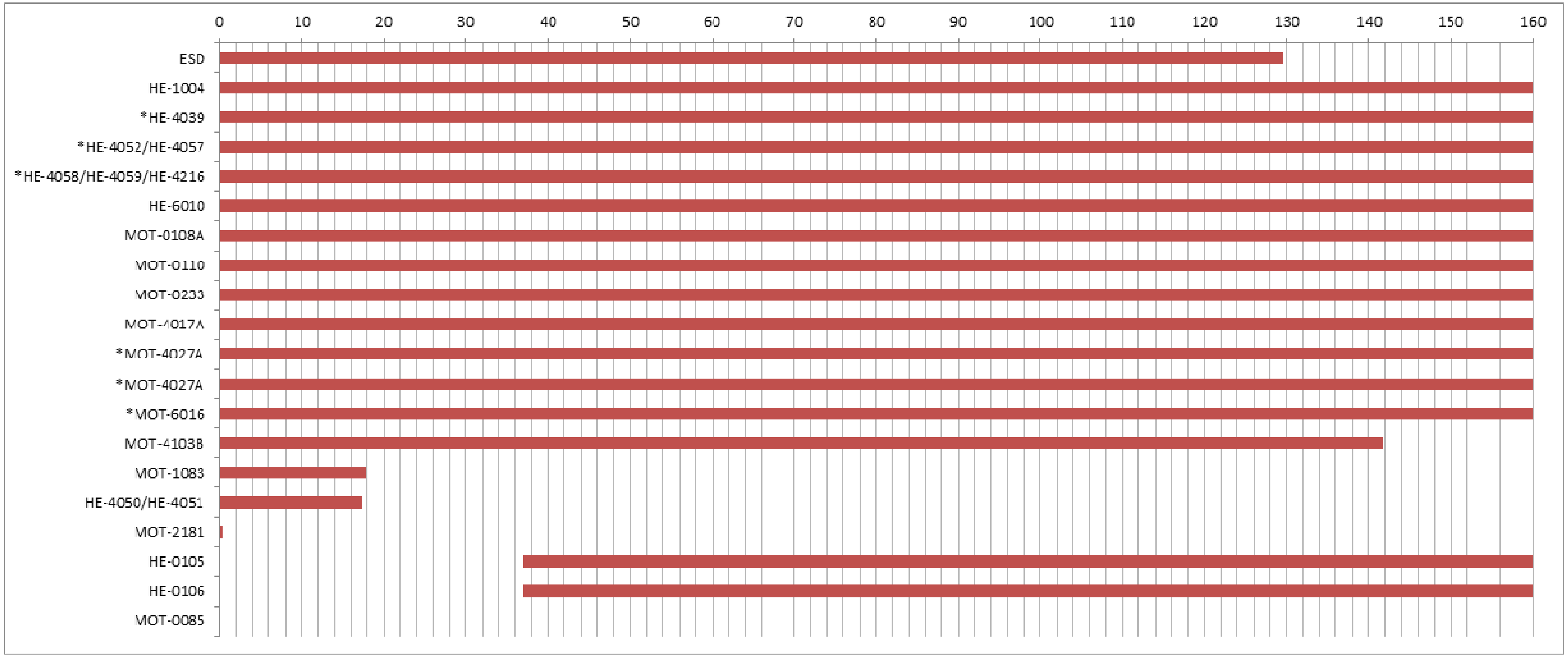
From:	Aranda, Angela (GE Power & Water)
Sent:	Wednesday, January 22, 2014 7:53 AM
To:	Aranda, Angela (GE Power & Water)
Subject:	FW: Aero RFI System -- Pasadena-Glenarm -- Shutdown load list --

---

From: Montoya, Juan (GE Power & Water)
Sent: Tuesday, January 21, 2014 5:33 PM
To: Rahim, Muhammed (GE Power & Water); Aranda, Angela (GE Power & Water)
Subject: RE: Aero RFI System -- Pasadena-Glenarm -- Shutdown load list --

ESN - Emergency Stop No motoring (Fast Stop Lock-Out)
Immediately shutdown the unit by shutting off fuel, water / steam and trip the breaker.
When N25 (HP shaft) coasts down below 300 RPM and if the T48 temperature is above 1150 degrees F (621 degrees C) then a 4-hour lockout will be initiated after a 10 minute delay.
The 4-hour lockout can be avoided if the ESN condition can be reset and a turbine crank initiated within the 10 minute delay period.
A 15 minute crank cycle must complete to reset the 10 minute delay timer.
If the crank cycle is interrupted, causing N25 to coast below 300 RPM, and if the high T48 temperature persists, then a 4-hour lockout period is initiated.

Below the loads for ESN



For this one we need MOT-6015

ES - Emergency Stop (Fast Stop With Motoring)
Immediately shutdown the unit by shutting off fuel, water / steam and trip the breaker.
When N25 (HP shaft) coasts down to 1700 RPM, engage starter and crank for 15 minutes.

Only add the Load of the MOT in the Max Load calculated for the previous one.

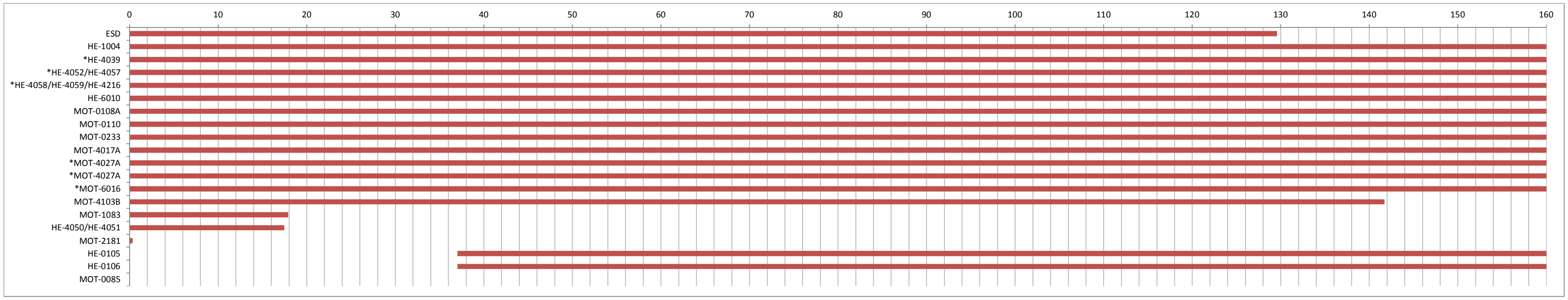
Regards,

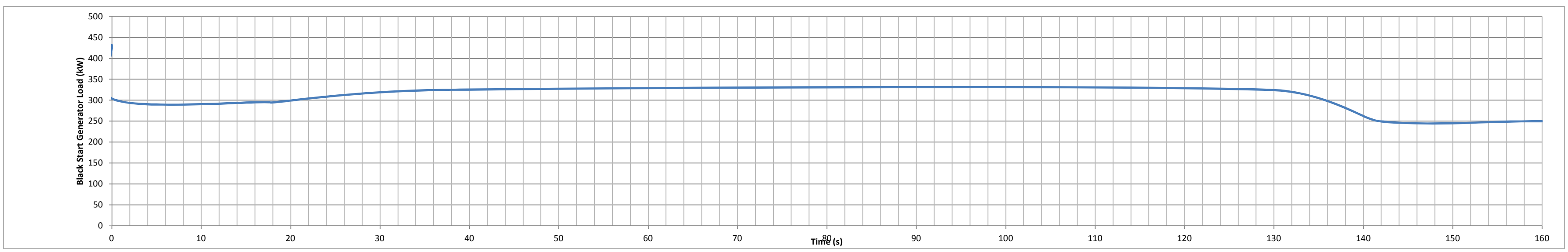
Juan Uziel Montoya
Aeroderivative Controls Engineer
LM6000 Requisition Leader
Distributed Power
GE Power & Water

T + 52 442 296 2733
E juanuziel.montoya@ge.com

Campo Real #1692
Col. Ampliacion El Refugio, C.P. 76146
Querétaro, México
GEIQ – Centro de Ingeniería Avanzada en Turbomaquinas S. de R.L. de C.V.

TIME	ESD	HE-1004	*HE-4039	*HE-4052/HE-4057	*HE-4058/HE-4059/HE-4216	HE-6010	MOT-0108A	MOT-0110	MOT-0233	MOT-4017A	*MOT-4027A	*MOT-4027A	*MOT-6016	MOT-4103B	MOT-1083	HE-4050/HE-4051	MOT-2181	HE-0105	HE-0106	MOT-0085	BS Gen (kW)
Starts at (s)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.023	37.023	0	
Finished at (s)	129.588	160	160	160	160	160	160	160	160	160	160	160	160	141.729	17.911	17.491	0.353	160	160	0	
Duration (s)	129.588	160	160	160	160	160	160	160	160	160	160	160	160	141.729	17.911	17.491	0.353	122.977	122.977	0	
Load (kW)	-	3	10	50	25	3	29.8	2.2	0	93.3	0.75	0.75	2.2	74.6	0.75	5.5	131	15	15	11.2	
Seconds																					
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	431.85
0.353	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	300.85
17.491	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	295.35
17.911	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	294.6
37.023	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	324.6
129.588	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	324.6
141.729	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0	250
160	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0	250





REFERENCE DRAWING ONLY
MOTOR CONTROL CENTER IS NOT IN GE PACKAGED POWER, L.P. SCOPE OF SUPPLY

CUSTOMER:	LM6000 PG/PH
GENERATOR:	**BRUSH**
ENTRY/NEMA:	TOP & BOTTOM / NEMA 1 (12" WIREWAYS)
MOUNTING:	BACK TO BACK
VOLTAGE/ FREQUENCY:	480 V/ 60 Hz
MAIN BUS:	3 PH/3 W/1200 A BUS/1200 A LUGS
INTERRUPTING/BRACINC	65000 A
MAIN CIRCUIT BREAKER	NONE, MLO
TRANSFORMER(S):	ONE (1) 45 kVA , 480: 208/120 V, EXTERNAl ONE (1) 45 kVA , 480: 208/120 V, EXTERNAL (WINTERIZATION OPTION)
OTHER:	(4) 500 kcmil INCOMING CABLES PER PHASE (4) 1/0 AWG INCOMING GROUND CABLES 300 A MIN VERTICAL COPPER MCC LOCATION: CUSTOMER CONTROL HOUSE MANUFACTURED PER GE PACKAGED POWER, L.P. SPECIFICATION 285439 (IF SUPPLIED BY GE PACKAGED POWER, L.P.)
REFERENCE DRAWINGS:	X-969005 ELECTRICAL SYMBOLS, ABBREVIATIONS, AND REFERENCE DATA X-969044 SCHEMATIC DIAGRAM, MOTOR CONTROL CENTER

ITEM	kW	HP	STARTER TYPE	FLA	AUX	NAMEPLATE INFORMATION	TAG NAME	OPTION	READY TO START STANDBY LOADS	BLACK START LOADS	NORMAL OPERATING LOADS	NORMAL SHUTDOWN LOADS	EMERGENCY SHUTDOWN LOADS
1	5.5 kW		FVC	6.6		GENERATOR STATOR / EXCITER SPACE HEATERS	HE-4050 / 4051		X				
2	15 kW		FVC	18.0		MINERAL LUBE OIL TANK HEATER (NO. 1)	HE-0105		X	X			
3	15 kW		FVC	18.0		MINERAL LUBE OIL TANK HEATER (NO. 2)	HE-0106		X	X			
4	3 kW		FVC	3.6		TURBINE HYDRAULIC STARTER OIL TANK HEATER	HE-6010		X	X			
5	3 kW		FVC	3.6		TURBINE LUBE OIL TANK HEATER	HE-1004		X	X			
6	74.6 kW	100 HP	FVNR	116.0		GENERATOR/GEARBOX ENCLOSURE VENTILATION FAN (A)	MOT-4103A			X	X	X	X
7	74.6 kW	100 HP	FVNR	116.0		GENERATOR/GEARBOX ENCLOSURE VENTILATION FAN (B)	MOT-4103B						
8	93.3 kW	125 HP	FVNR	140.0		TURBINE ENCLOSURE VENTILATION FAN (A)	MOT-4017A			X	X	X	X
9	93.3 kW	125 HP	FVNR	140.0		TURBINE ENCLOSURE VENTILATION FAN (B)	MOT-4017B						
10	29.8 kW	40 HP	FVNR	47.0	1 NO	MINERAL LUBE OIL AC PUMP (A)	MOT-0108A			X	X	X	X
11	29.8 kW	40 HP	FVNR	47.0	1 NO	MINERAL LUBE OIL AC PUMP (B)	MOT-0108B						
12	11.2 kW	15 HP	FVNR	18.3	1 NO	GENERATOR JACKING OIL PUMP	MOT-0085			X			
13	2.2 kW	3 HP	FVNR	3.9		MINERAL LUBE OIL AIR/OIL SEPARATOR FAN	MOT-0110			X	X	X	X
14	22.4 kW	30 HP	FVNR	36.5		GEARBOX TURNING GEAR	MOT-0129	SEE NOTE 3		X			
15	0.75 kW	1 HP	FVNR	1.5		TURBINE AIR/OIL SEPARATOR HEAT EXCHANGER FAN	MOT-1083			X	X	X	X
16	3.7 kW	5 HP	FVNR	6.2		TURBINE WATER WASH PUMP	MOT-5035						
17	149.2 kW	200 HP	FVNR	222.0	1 NC	TURBINE HYDRAULIC STARTER PUMP	MOT-6015			X		X	X
18	2.2 kW	3 HP	FVNR	3.9		TURBINE HYDRAULIC STARTER OIL HEAT EXCHANGER FAN	MOT-6016			X		X	X
19	0.75 kW	1 HP	FVNR	1.5		AUXILIARY SKID ENCLOSURE VENTILATION FAN (A)	MOT-4027A			X	X	X	X
20	0.75 kW	1 HP	FVNR	1.5		AUXILIARY SKID ENCLOSURE VENTILATION FAN (B)	MOT-4027B						
21	45 kVA			54.0		LIGHTING AND DISTRIBUTION PANEL	208Y/120 V 3PH 4W 42 CKTS		X	X	X	X	X
22				125.0		LIGHTING AND DISTRIBUTION BREAKER							
23	45 kVA			54.0		LIGHTING AND DISTRIBUTION PANEL #2	208Y/120 V 3PH 4W 42 CKTS		X	X	X	X	X
24				125.0		LIGHTING AND DISTRIBUTION BREAKER #2							
25	131 kW	175 HP	SR DRIVE	180.0		TURBINE NOX WATER INJECTION PUMP (NO. 1) BREAKER	MOT-2181				X		
26	131 kW	175 HP	SR DRIVE	180.0		TURBINE NOX WATER INJECTION PUMP (NO. 2) BREAKER	MOT-2193						
27	7.5 kW	10 HP	FVNR	12.7	1 NO	SPRINT WATER SUPPLY PUMP	MOT-2100				X		
28	9 kW		FVC	10.8		TURBINE WATER WASH TANK HEATER (NO. 1)	HE-5036						
29	9 kW		FVC	10.8		TURBINE WATER WASH TANK HEATER (NO. 2)	HE-5044						
30	50 kW		FVC	60.2		TURBINE ENCLOSURE SPACE HEATERS	HE-4052/HE-4057		X	X			
31	25 kW		FVC	30.1		GENERATOR/GEARBOX ENCLOSURE SPACE HEATERS	HE-4058/HE-4059/HE-4216		X	X			
32	10 kW		FVC	12.0		AUXILIARY SKID ENCLOSURE SPACE HEATER	HE-4039		X	X			
33	1.5 kW	2 HP	FVNR	1.8		TURBINE ENCLOSURE HEATED AIR FLOW DISTRIBUTION BLOWER	MOT-4187		X	X			

	TOTAL READY TO START STANDBY LOAD (KW)	TOTAL BLACK START LOAD (KW)	TOTAL NORMAL OPERATING LOAD (KW)	TOTAL NORMAL SHUTDOWN LOAD (KW)	TOTAL EMERGENCY SHUTDOWN LOAD (KW)
GAS OPERATION	241	577	**430**	**443**	**443**

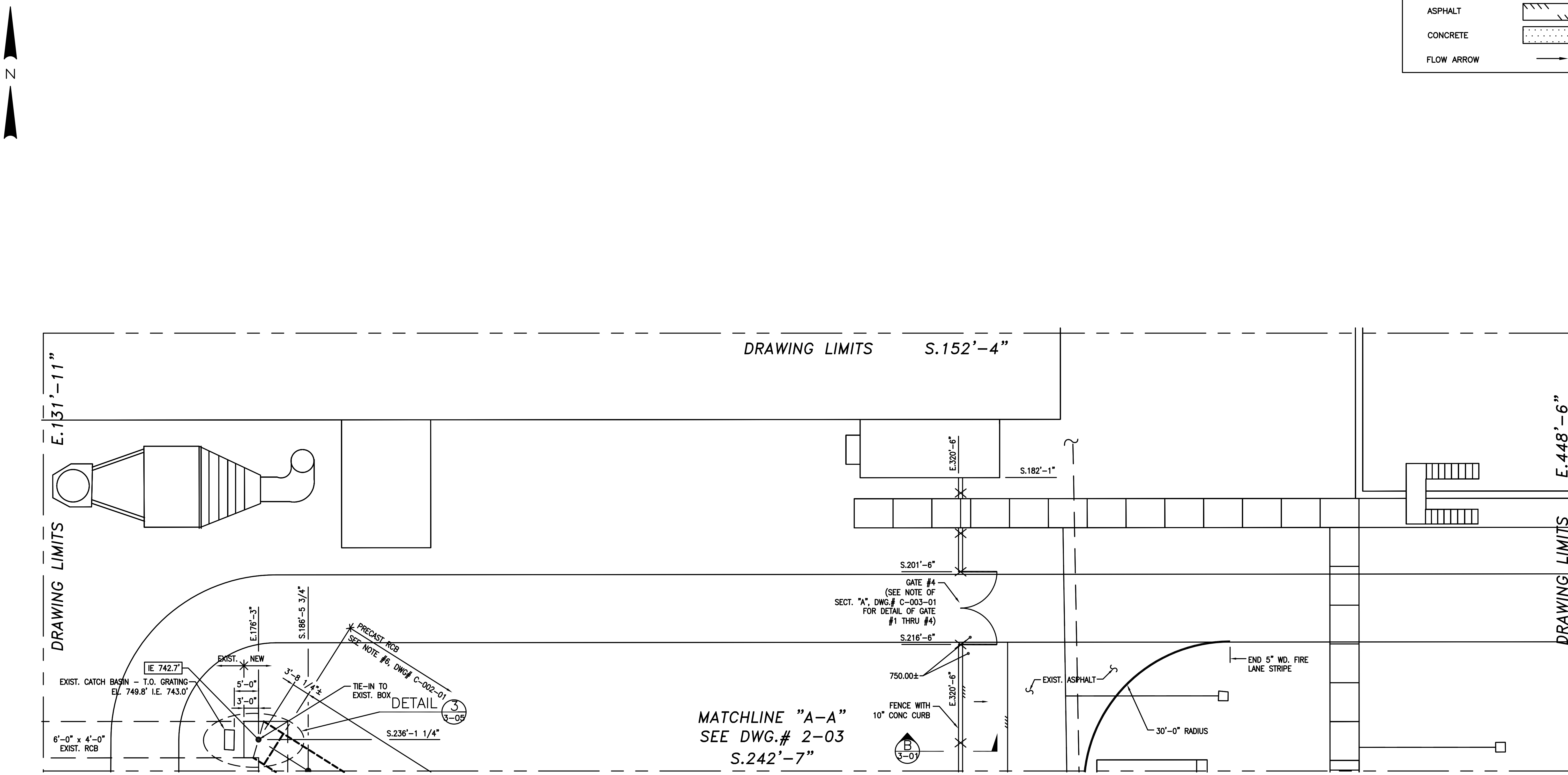
ITEM	kW	HP	STARTER TYPE	FLA	AUX	NAMEPLATE INFORMATION	TAG NAME	OPTION	READY TO START STANDBY LOADS	BLACK START LOADS	NORMAL OPERATING LOADS	NORMAL SHUTDOWN LOADS	EMERGENCY SHUTDOWN LOADS

NOTES: 1) LOAD VALUES ARE MINIMUM REQUIRED AND DO NOT REFLECT ADDED MARGINS TO SIZE BLACKSTART DIESEL.
2) MOTOR CONTROL CENTER VENDOR TO PROVIDE AN AC VOLTAGE RELAY DEVICE 27 (LOSS OF VOLTAGE) RELAY, WITH TIME DELAY FROM 0 TO 5 SEC.
3) STARTER OVERLOAD FOR MOT-0129 MUST MEET IEC TRIP CLASS 30.
4) MOTOR CONTROL CENTER VENDOR TO PROVIDE GROUND FAULT EQUIPMENT PROTECTION (GFEP) (LEAKAGE CURRENT OF 30 mA) FOR LIGHTING & DISTRIBUTION PANEL #2.
5) SR DRIVE IS RATED TO 10kA AND NEEDS TO HAVE A BREAKER RATED FOR THIS APPLICATION OR ADDITIONAL FUSES OR BREAKERS TO COMPLY.

Enclosure 13

LEGEND

- ASPHALT
- CONCRETE
- FLOW ARROW



AREA 1
PLAN
SCALE: 1" = 10'-0"

FOR CONSTRUCTION
1-24-03

RESERVED

P.B.SUMMERS P.E.
CA. LIC. S3725
C44211

REFERENCE DRAWINGS:

20001-C-001	GENERAL NOTES
20001-C-002-01	CIVIL KEY PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-03	AREA 2-CIVIL PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-04	AREA 3-CIVIL PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-05	AREA 4-CIVIL PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-06	AREA 5-CIVIL PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-07	AREA 6-CIVIL PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-08	AREA 7-CIVIL PLAN PAVING / GRADING & U.G. SEWER
20001-C-002-09	AREA 8-CIVIL PLAN PAVING / GRADING & U.G. SEWER

NOTES:

1. SEE DWG.# C-002-004 FOR TEMPORARY BENCHMARK (TBM) ELEVATION.
2. SEE DWG.# C-002-001 FOR U.G. PIPING GENERAL NOTES.

CHEMIC ENGINEERS

PROJ. NO: 2115
FILE NAME: 20001c002-02.dwg
XREF DWG:

REV	DESCRIPTION	DRAWN	DATE	CHECK	DESIGN	APPR
0	ISSUED FOR CONSTRUCTION	JLG	1/24/03	P.LE	Y.H.	

REVISIONS

PASADENA POWERPLANT
UPGRADE PROJECT

GE PACKAGED POWER, INC.
WORK ORDER NO. 20001

TITLE
AREA 1
CIVIL PLAN PAVING / GRADING
& U.G. SEWER

DWG NO.
20001-C-002-02

SCALE 1"=10'-0" SHEET OF

Enclosure 14

123374 Pasadena OE
Project Deliverables List

Report Date February 25, 2014

Document No.	Engineering Discipline	Document Title	Current Rev. Date	Current Rev. No.	Released
081113	ARCHITECTURAL	HOLLOW METAL DOORS AND FRAMES	10-Oct-13	A	RFP
083323	ARCHITECTURAL	OVERHEAD COILING DOORS	10-Oct-13	A	RFP
087100	ARCHITECTURAL	DOOR HARDWARE	10-Oct-13	A	RFP
092900	ARCHITECTURAL	GYPSUM BOARD	10-Oct-13	A	RFP
093100	ARCHITECTURAL	CERAMIC TILE	10-Oct-13	A	RFP
095113	ARCHITECTURAL	ACOUSTICAL PANEL CEILINGS	10-Oct-13	A	RFP
096513	ARCHITECTURAL	RESILIENT BASE AND ACCESSORIES	10-Oct-13	A	RFP
096519	ARCHITECTURAL	RESILIENT TILE FLOORING	10-Oct-13	A	RFP
096723	ARCHITECTURAL	RESINOUS FLOOR COATING	10-Oct-13	A	RFP
096900	ARCHITECTURAL	ACCESS FLOORING	10-Oct-13	A	RFP
099123	ARCHITECTURAL	INTERIOR PAINTING	10-Oct-13	A	RFP
102113	ARCHITECTURAL	TOILET COMPARTMENTS	10-Oct-13	A	RFP
102800	ARCHITECTURAL	TOILET ACCESSORIES	10-Oct-13	A	RFP
105113	ARCHITECTURAL	METAL LOCKERS	10-Oct-13	A	RFP
123200	ARCHITECTURAL	MANUFACTURED WOOD CASEWORK	10-Oct-13	A	RFP
123553	ARCHITECTURAL	LABORATORY CASEWORK	10-Oct-13	A	RFP
133419	ARCHITECTURAL	METAL BLDG SYS SINGLE METAL PANELS WALLS AND ROOF	10-Oct-13	A	RFP
260000	ELECTRICAL	ELECTRICAL-MECHANICAL EQUIPMENT	10-Sep-13	D	RFP
260533	ELECTRICAL	NON-SEG BUS SPECIFICATION	9-Sep-13	A	RFP
261200.2	ELECTRICAL	MEDIUM VOLTAGE AUXILIARY TRANSFORMERS SPECIFICATION	9-Sep-13	B	RFP
262050	ELECTRICAL	LOW VOLTAGE MOTORS	10-Sep-13	C	RFP
262600	ELECTRICAL	PDC SPECIFICATION	9-Sep-13	B	RFP
263323.1	ELECTRICAL	125VDC BATTERY SYSTEM SPECIFICATION	9-Sep-13	B	RFP
262323.2	ELECTRICAL	24VDC BATTERY SYSTEM SPECIFICATION	6-Sep-13	A	RFP
480020	ALL	PASADENA SITE CONDITIONS	20-Feb-14	K	RFP
480033	ALL	NOISE CONTROL PERFORMANCE	10-Dec-13	B	RFP
480032.1	-	BALANCE OF PLANT CONTRACTOR PERFORMANCE TESTING	21-Oct-13	A	RFP
485072	MECHANICAL	COATING OF PIPING AND TANKS	9-Sep-13	A	RFP
485080	MECHANICAL	PIPING AND EQUIP INSULATION	18-Sep-13	A	RFP
485090	MECHANICAL	CATHODIC PROTECTION	9-Sep-13	A	RFP
485121	MECHANICAL	GENERAL SERVICE CONTROL VALVES	15-Jul-13	A	RFP
485172	MECHANICAL	FIELD FABRICATED TANKS - STEEL SPECIFICATION	15-Jul-13	A	RFP
485173	MECHANICAL	SHOP FABRICATED TANKS SPECIFICATION	10-Dec-13	C	RFP
485311.10	MECHANICAL	HORIZONTAL CENTRIFUGAL PUMPS – GENERAL SERVICE SPECIFICATION	10-Dec-13	C	RFP
485325.11	MECHANICAL	AMMONIA FORWARDING PUMP SKID SPECIFICATION	26-Jul-13	A	RFP
485422	MECHANICAL	SHELL AND TUBE HEAT EXCHANGER	9-Dec-13	B	RFP
485951.96	MECHANICAL	POTABLE WATER SYSTEM PUMP SKID	9-Dec-13	B	RFP
485952.05	MECHANICAL	CHEMICAL FEED SYSTEM - COOLING TOWER	14-Oct-13	B	RFP
485952.06	MECHANICAL	CHEMICAL FEED SYSTEMS - STEAM GENERATOR	14-Oct-13	B	RFP
485956	MECHANICAL	FIRE PREVENTION AND PROTECTION SYSTEM	30-Jan-14	C	RFP
485956.10	MECHANICAL	FIRE ALARM AND SIGNALING SYSTEMS	29-Aug-13	A	RFP
485956.30	MECHANICAL	FIRE WATER SPRINKLER SYSTEM	14-Oct-13	B	RFP
037-1758	ALL	SOIL EXCAVATION VOLUMES	18-Aug-11	A	RFP
037-5033	ALL	PASADENA GT-5 DESIGN CRITERIA	17-Dec-13	D	SPEC
037-4780	CONTROLS	PCS/CONTROL SYSTEM SPECIFICATION	10-Dec-13	B	SPEC
037-5056	ARCHITECTURAL	ARCHITECTURAL SCOPE OF WORK	23-Oct-13	B	SPEC
261300-1	ELECTRICAL	15KV SWITCHGEAR SPECIFICATION	10-Oct-13	B	SPEC
261300-2	ELECTRICAL	5KV SWITCHGEAR SPECIFICATION	10-Oct-13	B	SPEC
263323-2	ELECTRICAL	24VDC BATTERY SYSTEM SPECIFICATION	9-Sep-13	A	SPEC
A1-2-1	ARCHITECTURAL	CONTROL BUILDING MAIN FLOOR PLAN	10-Oct-13	D	SPEC
A1-3-1	ARCHITECTURAL	CONTROL BUILDING EXTERIOR ELEVATIONS	10-Oct-13	D	SPEC
A1-9-1	ARCHITECTURAL	CONTROL BUILDING & WATER LAB ROOM FINISH, DOOR AND WINDOW SCHEDULES	10-Oct-13	D	SPEC
A1-9-2	ARCHITECTURAL	CONTROL BUILDING & WATER LAB DOOR AND WINDOW DETAILS	10-Oct-13	D	SPEC
A2-1-1	ARCHITECTURAL	ROOF DEMOLITION PLAN	24-Sep-13	C	SPEC

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Document No.	Engineering Discipline	Document Title	Current Rev. Date	Current Rev. No.	Released
A2-1A	ARCHITECTURAL	WELDING SHOP FLOOR PLAN	16-Jul-13	A	SPEC
A2-2-1	ARCHITECTURAL	MAINTENANCE SHOP MAIN FLOOR PLAN	10-Oct-13	D	SPEC
A2-2-2	ARCHITECTURAL	MAINTENANCE SHOP MEZZANINE	24-Sep-13	C	SPEC
A2-3-1	ARCHITECTURAL	MAINTENANCE SHOP EXTERIOR ELEVATIONS	24-Sep-13	C	SPEC
A2-4-1	ARCHITECTURAL	MAINTENANCE SHOP SECTIONS	10-Oct-13	D	SPEC
A2-5-1	ARCHITECTURAL	MAINTENANCE SHOP DETAILED PLANS	10-Oct-13	D	SPEC
A2-9-1	ARCHITECTURAL	ROOM DOOR FINISH SCHEDULES	10-Oct-13	D	SPEC
A3-1	ARCHITECTURAL	CONTROL BUILDING EXTERIOR ELEVATIONS	27-Mar-13	B	SPEC
A3-2-1	ARCHITECTURAL	WELDING SHOP FLOOR PLAN	24-Sep-13	C	SPEC
A3-3-1	ARCHITECTURAL	WELDING SHOP EXTERIOR ELEVATIONS	24-Sep-13	C	SPEC
A4-1	ARCHITECTURAL	CONTROL BUILDING & WATER LAB BUILDING SECTIONS	10-Oct-13	D	SPEC
A4-2-1	ARCHITECTURAL	WATER LABORATORY FLOOR PLAN	10-Oct-13	D	SPEC
A4-3-1	ARCHITECTURAL	WATER LABORATORY EXTERIOR ELEVATIONS	24-Sep-13	C	SPEC
C1-3	CIVIL	PRELIMINARY SITE PLAN LM6000 CONFIGURATION	17-Jan-14	L	SPEC
C3-1	CIVIL	PRELIMINARY GRADING & DRAINAGE PLAN GAS TURBINE/AXIAL EXHAUST	17-Jan-14	G	SPEC
C3-3	CIVIL	PRELIMINARY SITE SURFACING PLAN GAS TURBINE/AXIAL EXHAUST	17-Jan-14	B	SPEC
C3-4	CIVIL	CONSTRUCTION PARKING, LAYDOWN, STAGING AND ACCESS PLAN	2-Oct-13	B	SPEC
C3-5	CIVIL	PRELIMINARY SITE DETAILS GAS TURBINE/AXIAL EXHAUST	7-Oct-13	A	SPEC
CSK-1	CIVIL	BOREHOLE LOCATION PLAN	29-Apr-11	B	SPEC
E1-1A	ELECTRICAL	ELECTRICAL OVERALL CONCEPTUAL ONE-LINE DIAGRAM (LM 6000)	7-Jan-14	G	ADD 2
E1-2	ELECTRICAL	ELECTRICAL OVERALL CONCEPTUAL PDC BUILDING LAYOUT	10-Dec-13	E	ADD 2
E6-1	ELECTRICAL	ELECTRICAL UNDERGROUND NOTES AND LEGEND	4-Oct-13	A	SPEC
E6-10	ELECTRICAL	PROPOSED ELECTRICAL UNDERGROUND ROUTING	7-Jan-14	C	ADD 4
I1-1	CONTROLS	PLANT CONTROL SYSTEM ARCHITECTURE	30-Aug-13	A	SPEC
I1-2	CONTROLS	CONTROL ROOM WORKSTATIONS	30-Aug-13	A	SPEC
ISK1-1	CONTROLS	CONTROL SYSTEM ARCHITECTURE	26-May-11	A	SPEC
M1-1-1	MECHANICAL	GENERAL ARRANGEMENT GAS TURBINE/AXIAL EXHAUST	3-Jan-14	L	ADD 2
M1-1-6	MECHANICAL	TIE POINT DRAWING GAS TURBINE/AXIAL EXHAUST	3-Jan-14	E	ADD 2
M2-2-1	MECHANICAL	PROCESS FLOW DIAGRAM WATER BALANCE (W/ INLET CHILLING)	28-Feb-12	D	SPEC
M2-2-4	MECHANICAL	GLENARM INDUSTRIAL WASTEWATER	17-Jul-13	C	SPEC
M3-1-0	MECHANICAL	P&ID-COVER SHEET	15-Oct-13	E	SPEC
M3-10-1	MECHANICAL	P&ID-GLAND STEAM SYSTEM	6-Dec-13	E	SPEC
M3-1-1	MECHANICAL	P&ID - SYMBOLS AND LEGEND	15-Oct-13	C	SPEC
M3-11-1	MECHANICAL	P&ID-CONDENSATE SYSTEM	30-Jan-14	H	SPEC
M3-11-2	MECHANICAL	P&ID-CONDENSATE SYSTEM	30-Jan-14	H	SPEC
M3-11-3	MECHANICAL	P&ID-CONDENSATE SYSTEM	6-Dec-13	G	SPEC
M3-1-2	MECHANICAL	P&ID - SYMBOLS AND LEGEND	8-Oct-12	A	SPEC
M3-12-1	MECHANICAL	P&ID-CONDENSER AIR EXTRACTION	29-Nov-13	F	SPEC
M3-1-3	MECHANICAL	P&ID - SYMBOLS AND LEGEND	15-Oct-13	B	SPEC
M3-13-1	MECHANICAL	P&ID-CIRCULATING WATER SYSTEM	30-Jan-14	H	SPEC
M3-14-1	MECHANICAL	P&ID-AUXILIARY COOLING WATER SYSTEM	6-Dec-13	F	SPEC
M3-15-1	MECHANICAL	P&ID-COMPONENT COOLING WATER SYSTEM	15-Oct-13	D	SPEC
M3-15-2	MECHANICAL	P&ID-COMPONENT COOLING WATER SYSTEM	15-Oct-13	D	SPEC
M3-15-3	MECHANICAL	P&ID-COMPONENT COOLING WATER SYSTEM	15-Oct-13	E	SPEC
M3-16-1	MECHANICAL	P&ID-COOLING TOWER CHEMICAL FEED SYSTEM	13-Sep-13	D	SPEC
M3-17-1	MECHANICAL	P&ID-AQUEOUS AMMONIA SYSTEM	6-Dec-13	G	SPEC
M3-18-1	MECHANICAL	P&ID-FUEL GAS SYSTEM	6-Dec-13	G	SPEC
M3-18-2	MECHANICAL	P&ID-FUEL GAS SYSTEM	6-Dec-13	G	SPEC
M3-18-3	MECHANICAL	P&ID-FUEL GAS SYSTEM	15-Oct-13	B	SPEC
M3-19-1	MECHANICAL	P&ID-SERVICE AIR SYSTEM	15-Oct-13	E	SPEC
M3-20-1	MECHANICAL	P&ID-INSTRUMENT AIR SYSTEM	13-Sep-13	D	SPEC
M3-2-1	MECHANICAL	P&ID-GAS TURBINE INTERCONNECTIONS	15-Oct-13	E	SPEC
M3-21-1	MECHANICAL	P&ID-FIREWATER SYSTEM	15-Oct-13	D	SPEC
M3-22-1	MECHANICAL	P&ID-SERVICE WATER SYSTEM	15-Oct-13	E	SPEC
M3-23-1	MECHANICAL	P&ID-DEMINERALIZED WATER SYSTEM	15-Oct-13	E	SPEC
M3-23-2	MECHANICAL	P&ID-DEMINERALIZED WATER SYSTEM	15-Oct-13	C	SPEC

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Document No.	Engineering Discipline	Document Title	Current Rev. Date	Current Rev. No.	Released
M3-24-1	MECHANICAL	P&ID-POTABLE WATER SYSTEM	15-Oct-13	E	SPEC
M3-25-1	MECHANICAL	P&ID-CHILLED WATER SYSTEM	20-Feb-14	H	SPEC
M3-25-2	MECHANICAL	P&ID-CHILLED WATER SYSTEM	30-Jan-14	G	SPEC
M3-26-1	MECHANICAL	P&ID-WASTEWATER COLLECTION SYSTEM	15-Oct-13	E	SPEC
M3-26-2	MECHANICAL	P&ID-WASTEWATER COLLECTION SYSTEM	15-Oct-13	D	SPEC
M3-27-1	MECHANICAL	P&ID-AUXILIARY STEAM SYSTEM	15-Oct-13	C	SPEC
M3-3-1	MECHANICAL	P&ID-OTSG INTERCONNECTIONS (EXHAUST GAS)	6-Dec-13	G	SPEC
M3-3-2	MECHANICAL	P&ID-OTSG INTERCONNECTIONS (STEAM)	30-Jan-14	H	SPEC
M3-4-1	MECHANICAL	P&ID-BOILER FEEDWATER SYSTEM	6-Dec-13	G	SPEC
M3-5-1	MECHANICAL	P&ID-HIGH PRESSURE STEAM	6-Dec-13	E	SPEC
M3-6-1	MECHANICAL	P&ID-STEAM TURBINE INTERCONNECTIONS	6-Dec-13	F	SPEC
M3-7-1	MECHANICAL	P&ID-STEAM DRAINS ￢ﾀﾓ DRAIN TANK	10-Dec-13	G	SPEC
M3-8-1	MECHANICAL	P&ID-STEAM AND WATER SAMPLING	15-Oct-13	D	SPEC
M3-9-1	MECHANICAL	P&ID-CYCLE CHEMICAL FEED SYSTEM	13-Sep-13	D	SPEC
M9-1	MECHANICAL	EQUIPMENT LIST	6-Dec-13	C	SPEC
M9-10	MECHANICAL	TIE-IN LIST	20-Nov-13	D	SPEC
M9-2	MECHANICAL	SERVICE INDEX	22-Nov-13	C	SPEC
SKE6-1	ELECTRICAL	EXISTING ELECTRICAL UNDERGROUND ROUTING	4-Oct-13	A	SPEC
SKE6-2	ELECTRICAL	EXISTING ELECTRICAL UNDERGROUND ROUTING	4-Oct-13	A	SPEC
SKM1-7	MECHANICAL	AMMONIA (EXISTING)	4-Dec-13	A	SPEC
SKM1-8	MECHANICAL	INTERIM/TEMPORARY CONFIGURATION	18-Dec-13	B	ADD 2
SKM1-9	MECHANICAL	FINAL CONFIGURATION	18-Dec-13	B	ADD 2

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Document No./ Filename	Document Title	Current Rev. Date	Current Rev. No.	Released	Location
Air Compressor	Typical Drawing	10/06/08	1	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Air Compressor
260000	Elec-Mech Equip	09/10/13	D	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
261050	MV Motors	09/10/13	C	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
261200	GSU Transformer	09/10/13	G	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
262050	LV Motors	09/10/13	C	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
409413.22	CEMS	09/10/13	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
480020	Site Conditions	09/10/13	I	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
480031	Noise Control Perf	09/10/13	I	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
480032	Power Island Perf	09/10/13	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
481100	Combined Cycle PIE	09/10/13	N	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485122.11	Steam Bypass Valves	09/10/13	E	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485221	ST and TEWAC Generator	09/10/13	G	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485222	GTG Aeroderivative	09/10/13	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485311.10	Condensate Pumps	09/10/13	F	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485311.20	Boiler Feedwater Pumps	09/10/13	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485312	Circ Water & Aux Cooling Water Pumps	09/10/13	F	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485374.21	Compressed Air System	09/10/13	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485374.22	Fuel Gas Compressor	09/10/13	E	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485413	OTSG Spec	09/10/13	I	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485432	Surface Condenser	09/10/13	G	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485471	Inlet Air Chiller	09/10/13	E	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485491	Cooling Tower	09/10/13	F	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Att 24 Specs
485952	Condensate Polisher	08/24/12	F	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
ElectricBoiler brochure	ElectricBoiler brochure	-	11/10	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Aux Boiler Specs
ElectricBoiler Specifications	ElectricBoiler Specifications	-	11/10	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Aux Boiler Specs
ElectricBoilers Boiler Book	ElectricBoilers Boiler Book	-	11/10	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Aux Boiler Specs
CEMS	CEMS System Overview (Typical layout with optional equipment)	-	C	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\CEMS
PASADENA CHILLER GA	Chiller Module General Arrangement	09/12/12	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Chiller

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969031	One Line Diagram	-	F	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Electrical Drawings
Attachment 4	Attachment 4 Scheduled Major Component RTS and Delivery Dates_GE_13Dec4	-	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Equip Delivery Sched
Gas Compressor1	Machinery Arrangement Feed Gas Compressor System	11/20/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Gas Compressor
Att 10.1 MID-TD-0000-1	Fuel Gases for Combustion in Aeroderivative Gas Turbines Sept 2009	9/2009	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GE MID TD Specs
Att 10.2 MID-TD-0000-3	Water and Steam Purity for Injection in Aero Derivative Gas Turbines June 2010	6/2010	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GE MID TD Specs
Att 10.3 MID-TD-0000-4	Compressor Cleaning for GE Aircraft Derivative Gas Turbines June 2010	6/2010	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GE MID TD Specs
Att 10.4 MID-TD-0000-5.	Liquid Detergent for GE Aircraft Aero Derivative Gas Turbines June 2010	6/2010	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GE MID TD Specs
Att 10.5 MID-TD-0000-6	Lubricating Oil Specification for GE Aircraft Aero Derivative Gas Turbines June 2010	6/2010	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GE MID TD Specs
7253049-969014	Plan & Elevation Turbine Control Panel	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969741	Instrument Loop Diagram Hydraulic Start System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969742	Instrument Loop Diagram Ventilation & Combustion Air System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969743	Instrument Loop Diagram Mineral Lube Oil System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969744	Instrument Loop Diagram Turbine Lube Oil System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969746	Instrument Loop Diagram Fire & Gas Protection System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969750	Instrument Loop Diagram Nox Water Injections System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969751	Instrument Loop Diagram Fuel System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969753	Instrument Loop Diagram Water Wash System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969755	Instrument Loop Diagram Auxiliary Systems	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969758	Instrument Loop Diagram Sprint System	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
Pasadena CKOM -GTG Controls	LM6000 GE Aeroderivative Package	11/19/13	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Controls
7253049-969005	Electrical Symbols Abbreviations and Reference Data	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969006	Interconnect Plan Electrical	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969007	Interconnect Wiring Diagram Customer	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969009	Interconnect Cable Schedule	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969013	Nameplate List Engraving Schedule & Switch Development	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
7253049-969021	Plan & Elevation Generator Lineside Cubicle Cable Entry Top/Bottom	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969023	Plan & Elevation Generator Neutral Cubicle	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969031	One Line Diagram	10/09/13	A	ADD 4	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 4

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7253049-969032	Three Line Diagram Generator Metering	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969035	Schedule Motor Control Center	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969037	System Schematic Generator Excitation	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969041	Schematic Diagram Circuit Breaker Control	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969044	Schematic Diagram Motor Control Centers	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969690	Area Classification Drawing Main Unit	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969767	Schematic Diagram DC Power Distribution	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969768	Schematic Diagram Critical Shutdown Path	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969769	Schematic Diagram Miscellaneous	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969930	Schematic Diagram Lighting & Distribution	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
7253049-969934	Schematic Diagram Communication	10/09/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
Brush_GTG_Curves	Electrical Data Sheet	10/23/13	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Electrical
969224	Installation Footprint Anchor Bolt and Shear Lug Location	-	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
120E4746	General Arrangement	10/18/12	G	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
7253049-969201	General Arrangement Main Unit - LH	11/12/13	A	ADD 4	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 4
7253049-969204	General Arrangement Air Filter	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
7253049-969219	General Arrangement Auxiliary Skid Left Hand	11/11/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
7253049-969221	General Arrangement Generator / Gearbox Mineral Lube Oil Skid	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
7253049-969224	Installation Footprint Anchor Bolt and Shear Lug Location	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
7253049-969293	Piping Penetrations Option LH	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
CD19671	Air Filter GE-AEP_GSX LM6000 with Chiller Coil	02/10/12	0	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
ElectricBoiler Dimensions and ratings	ElectricBoiler Dimensions and ratings	-	11-10	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
GA 69200	GA 9 Main Unit - RH	-	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
GA 969209	GA Sprint Skid	-	D	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
GA 969218	GA Auxiliary Skid Right Hand	-	H	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings

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Document No./ Filename	Document Title	Current Rev. Date	Current Rev. No.	Released	Location
GA 969221	GA Generator_Gearbox Mineral Lube Oil Skid	-	F	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
GA A0 321638800	GA Generator	07/17/12	C	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
Sample 00	ElectricBoiler sample drawing S-302-700kW @ 480V	06/08/10	00	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
SK-01	GE_STG_Sk1 - PWP Comments	11/15/12	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Arrangement Drawings
7253049-969232	Flow & Instrument Diagram Hydraulic Start System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969239	Flow & Instrument Diagram Ventilation & Combustion Air System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969244	Flow & Instrument Diagram Turbine Lube Oil System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969247	Flow & Instrument Diagram Turbine Hydraulic System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969248	Flow & Instrument Diagram Mineral Lube Oil System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969254	Flow & Instrument Diagram Fire & Gas Protection System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969260	Flow & Instrument Diagram Fuel System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969262	Flow & Instrument Diagram Water Wash System	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969268	Flow & Instrument Diagram Sprint System Main Unit	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969269	Flow & Instrument Diagram Water Injection Pump	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969270	Flow & Instrument Diagram Sprint System Sprint Skid	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969272	Flow & Instrument Diagram Auxiliary Systems	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
Inlet Air Chilling_Heating Conceptual Design_R3 add pre-cooler	Inlet Air Chilling_Heating Conceptual Design_R3 add pre-cooler	10/08/13	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M005_(RG)_120E4746_SEP-12-2013	General Arrangement	09/12/13	G	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M101_(RB)_230F5536_AUG-23-2013	Flow Diagram Steam System	08/23/13	B	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M105 230F5512	Feedwater System	11/07/12	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M106 203D7522 sheet 2	Condenser Terminal Points On Waterboxes	08/23/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams

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M106_(RA)_203D7522_AUG-23-2013	Condenser Terminal Points	08/23/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M107_(RB)_120E4791_AUG-23-2013	Flow Diagram Circulating Water	08/23/13	B	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M109 230F5537	Auxiliary Cooling Water System	01/28/13	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M112_(RA)_230F5538_AUG-23-2013	Steam Drains System	08/23/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M119 120E4734 Sheet 2	Flow Diagram Steam Turbine	08/23/13	C	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M119_(RC)_120E4734_AUG-23-2013	Flow Diagram Steam Turbine	08/23/13	C	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M125_(RA)_230F5539_AUG-23-2013	Condenser Air Removal System	08/23/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M190_(RD)_230F5504_AUG-23-2013	Combined Cycle system Overview Diagram	08/23/13	D	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M195 230F5496 sheet 2	Ammonia Dilution Heating Flow Diagram	02/07/13	B	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
M195_(RD)_230F5496_AUG-23-2013	Flow Diagram OSTG-1 Pressure	08/23/13	D	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\F&IDs and Flow Diagrams
7253049-969225	Lift Arrangement	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Lift and Shipping Info
7253049-969226	Shipping Data	10/16/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Lift and Shipping Info
PWP_Estimated Heaviest Lifts_Equipment Weights	PWP_Estimated Heaviest Lifts_Equipment Weights	-	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical\Lift and Shipping Info
7253049-000231	Flow & Equipment Symbols Mechanical	10/31/13	A	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Mechanical
Chart Only SNM Start up	Chart Only SNM Start up	04/02/12	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Performance Data
Pasadena CKOM - GT Inlet Air Conditioning	Turbine inlet Air Temperature Conditioning System	-	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\GTG\Performance Data
Attachment 12	Mechanical Completion Certificate	-	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Mechanical Completion
C12079-EI RevP	ONCE THROUGH STEAM GENERATOR ERECTION & INSTALLATION INSTRUCTIONS	09/13/13	0	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\OTSG
IST Start-Up Curve	OTSG Start-Up Curve	-	-	SPEC	Attachment A3-Reference Information \A.3.A City-Supplied Power Island Equipment Info\OTSG
OTSG Erection Training - SCR-CO - Revised	OTSG INSTALLATION AND ERECTION TRAINING PRESENTATION	03/01/13	-	SPEC	Attachment A3-Reference Information \A.3.A City-Supplied Power Island Equipment Info\OTSG
Pasadena CKOM - OTSG (IST)	Glenarm Repowering Project OTSG Design	11/15/13	-	SPEC	Attachment A3-Reference Information \A.3.A City-Supplied Power Island Equipment Info\OTSG
11303-001	General Arrangement LM6000 PG OSTG	11/01/13	P1	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Typical OTSG Erection Drawings	Typical OTSG Erection Drawings	-	-	SPEC	Attachment A3-Reference Information \A.3.A City-Supplied Power Island Equipment Info\OTSG

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Attachment 6	Performance Guarantees	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Performance Data
Attachment 22	LM6000PG Degradation	02/01/13	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Performance Data
GE Guarantee Heat Balances	GE Guarantee Heat Balances	02/12/13	0	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Performance Data
Attachment 1.1	Scope of Supply GTG	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Attachment 1.2	Scope of Supply OTSG	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Attachment 1.3	Scope of Supply CEMS	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Attachment 1.4	Scope of Supply Mechanical and Fluid	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Attachment 1.5	Scope of Supply Terminal Points	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Attachment 1.7	Scope of Supply Engineering Design	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Attachment 1.8	Scope of Supply Commissioning and Startup	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Scope of Supply Documents
Pasadena CKOM - GE BOP Mechanical	Steam Turbine & Generator Overview	11/19/13	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\STG
STG Layout For Information Only	Steam Turbine Layout (For Information Only)	-	0	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\STG
STG_Generator Curves for Information Only	REACTIVE CAPABILITY CURVE, EFFICIENCY CURVES, SATURATION CURVES	-	0	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\STG
Attachment 23	Obligations of Site Representatives	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Technical Advisors
Attachment 5.1	Typical Site Test Measurement Procedures-Test Philosophy	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Testing Documents
Attachment 5.2	Typical Site Test Measurement Procedures-Standard Field Testing Procedure for Emission Compliance Based on US EPA, ISO and EN Methodology	10/2011	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Testing Documents
Attachment 5.3	Typical Site Test Measurement Procedures-SPECIFICATION FOR GAS TURBINE GENERATOR PERFORMANCE TEST MEASUREMENT (SGTGPTM) LM6000 PC / PG SAC, NATURAL GAS FUEL	-	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Testing Documents
Attachment 14.1	GTG Training Descriptions	-	2	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Training
Attachment 14.2	Training Program	2013	-	SPEC	Attachment A3-Reference Information\A.3.A City-Supplied Power Island Equipment Info\Training
mitigation summary	Mitigation Summary	-	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\Air Permit
South Coast Facility Permit to Construct and Operate	South Coast Facility Permit to Construct and Operate	08/15/13	26	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\Air Permit
Title V Facility Significant Permit Revision	Title V Facility Significant Permit Revision	08/15/13	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\Air Permit
0 TOC	Environmental Impact Report-Table Of Contents	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA

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0 TOC_Revised	Environmental Impact Report-TOC Revised	3/2013	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
0 Executive Summary	Environmental Impact Report-Executive Summary	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
1.0 Introduction	Environmental Impact Report-Introduction	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
1.0 Introduction_Revised	Environmental Impact Report-Introduction_Revised	3/2013	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
2.0 Project Description	Environmental Impact Report-Project Description	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
2.0 Comments and Responses on DEIR_Revised	Environmental Impact Report-Comments and Responses on DEIR_Revised	3/2013	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
3.0 Environmental Setting	Environmental Impact Report-Environmental Setting	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
3.0 Corrections and Additions_Revised_Revised	Environmental Impact Report-Corrections and Additions_Revised_Revised	3/2013	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.0 Mitigation Monitoring and Reporting Program	Environmental Impact Report-Mitigation Monitoring and Reporting Program	3/2013	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.A Aesthetics	Environmental Impact Report-Aesthetics	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.B Air Quality	Environmental Impact Report-Air Quality	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.C Cultural Resources	Environmental Impact Report-Cultural Resources	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.D Greenhouse Gases	Environmental Impact Report-Greenhouse Gases	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.E Hazards	Environmental Impact Report-Hazards	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.F Land Use and Planning	Environmental Impact Report-Land Use and Planning	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.G Noise	Environmental Impact Report-Noise	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
4.H Water Supply	Environmental Impact Report-Water Supply	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
5.0 Alternatives	Environmental Impact Report-Alternatives	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
6.0 Other Environmental Considerations	Environmental Impact Report-Other Environmental Considerations	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
7.0 Persons and Organizations	Environmental Impact Report-Persons and Organizations	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
8.0 References	Environmental Impact Report-References	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix_Table_of_Contents	Environmental Impact Report-Appendix Table of Contents	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix A_Revised	Environmental Impact Report-Appendix Table of Contents_Revised	04/15/10	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix-A_NOP-IS-Scoping Meeting Materials	Environmental Impact Report-NOP-IS-Scoping Meeting Materials	09/16/11	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix-B_Air Quality Assessment Files	Environmental Impact Report-Air Quality Assessment Files	11/2012	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA

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Appendix-C_Greenhouse Gas Impact Assessment	Environmental Impact Report-Greenhouse Gas Impact Assessment	06/15/12	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix-D.1_Figures 1-13	Environmental Impact Report-Figures 1-13	-	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix-D_Hazardous Materials	Environmental Impact Report-Hazardous Materials	07/29/11	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix-E_Noise	Environmental Impact Report-Noise	01	12/2011	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
Appendix-F_Water Supply Documentation	Environmental Impact Report-Water Supply Documentation	05/23/12	2	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\EIR CEQA
GT 3&4 SWPPP (Draft)	GT 3&4 SWPPP (Draft)	01/31/03	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\SUSMP & SWPPP
PWP SUSMP	Stormwater Treatment Certification	02/03/03	-	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\SUSMP & SWPPP
Broadway Wastewater Permit Rev B	Broadway Wastewater Permit Rev B	07/31/12	B	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\Waste Water
Glenarm Wastewater Permit Rev C	Glenarm Wastewater Permit Rev C	07/18/13	C	SPEC	Attachment A3-Reference Information\A.3.B City-Supplied Permitting Information\Waste Water
20001-C-004-06 4-06	GSU foundation plan	12/08/03	2	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural
8-2-2368	Electrical Shop Plot Plan	10/16/69	4	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2369	Electrical Shop Plan & Elevations	12/08/60	3	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2370	Electrical Shop Mezzanine Floor Plan & Details	09/21/60	3	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2371	Electrical Shop Floor Plan Anchor Bolt Setting Plan	06/21/20	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2372	Electrical Shop Partial Deck Plan & Longitudinal Sect.	03/03/60	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2373	Electrical Shop Basement Plan Sections & Details	02/17/69	2	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2374	Electrical Shop North & Partial East Elevations & Roof Slab Over Room B1	06/21/60	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2375	Electrical Shop Foundation Plan for New Deck Slab Basement Ramp & Room B1 Floor Slab	02/17/69	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2376	Electrical Shop Reinforcing Details for Beams, Girders, Floor Slab & Ramp	06/21/60	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2381	Electrical Shop Architectural Floor Plan & Room Elevations	02/17/69	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2382	Electrical Shop Architectural Room Elevations	09/16/60	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2383	Electrical Shop Miscellaneous Architectural Details	09/20/60	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing
8-2-2384	Electrical Construction Shop Electrical Layout	09/15/60	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Architectural and Structural\Pump Building Existing

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8-2-49	Circ Pipe Tunnels Demo 2	08/02/49	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
8-2-49B	Circ Pipe Tunnels Demo 3	08/02/49	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
8-2-49C	Circ Pipe Tunnels Demo 4	04/27/49	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
8-2-1337	Overall Tunnel Demo 1	01/02/58	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
8-2-1355	Stack Foundation Demo 5	11/01/56	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
8-2-1670	Plot Plan Crane Rail Demo 6	02/26/62	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
SKM-1	Existing Tunnels and Proposed Equipment Overlay	06/12/13	B	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Demolition Scope
2-2-1562	Underground Fair Oaks ave.	04/22/03	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
8-2-547	Receiving Stations and Dispatching Center Electrical Plot Plan	01/30/95	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
8-2-575	Powerhouse to Receiving Station Section A Interconnecting Tunnel Ground System	10/14/48	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
8-2-1341	General Arrangement of Existing Structures and Foundations	03/27/58	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
20001E004-01	Overall conduit routing plan & sect	04/10/03	4	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
20001E004-02	Overall conduit routing plan & sect	12/08/03	4	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
20001E004-03	Overall conduit routing plan & sect	12/08/03	4	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
20001E004-05	Conduit ductbank sect & misc sect	12/08/03	4	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
20001E004-13 004-13	Conduit ductbank details-GSU hv lines	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
8-2-6643, 6507, 6606, 6510, 6603, 6613 & 6602	Existing Trench and Sanitary Sewer East of Glenarm Building	-	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
Storm Drain and Conduit Trench Drawing	Storm Drain and Conduit Trench Drawing	04/10/03	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
V-228	UG Vault Standards	06/27/07	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Electrical
8-2-300	Fountain Drawing	09/02/38		SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
20001-071R0	Waste Water F & ID	11/08/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
20001-090	Flow & Instrument Diagram Ammonia System	05/19/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical

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20001M001	Overall Site Plan GT 3 & 4	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
20001P001-02	Key plan above ground and trenches	12/08/03	2	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
20001P026-01	29% NH3 tank area above ground piping	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
20001P026-02	29% NH3 tank area above ground piping	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
20001-P-011-01	Piping and Plan Details Existing OWS	11/18/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
Existing Oil-Water Separator	Existing Oil-Water Separator Manufacturer's Information	01/23/03	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Mechanical
Glenarm Parcel Map	Glenarm Parcel Map	08/09/04	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Survey Info
Glenarm Parcel Plan	Glenarm Parcel Plan	09/28/04	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Survey Info
Pasadena Glenarm Facility	Pasadena Glenarm Facility	-	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Survey Info
8-2-1002	General Location Plan	03/29/73	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Arrangement Dwgs Existing or Past
8-2-1477	Piping Arrangement	11/25/60	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Arrangement Dwgs Existing or Past
8-2-1669	Gas Equipment Building Miscellaneous Sections & Details	02/26/62	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Arrangement Dwgs Existing or Past
8-2-1670	Gas Equipment Building Plot Plan Paving & Yard Details	02/26/62	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Arrangement Dwgs Existing or Past
Site Water Utility Information	Site Water Utility Information	-	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Arrangement Dwgs Existing or Past
8-2-1355	Sootblowing Stack & Precipitator Support Foundations	11/05/56	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
20001c002-01	Civil Key Plan Paving / Grading & U.G. Sewer PDF	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
20001c002-01	Civil Key Plan Paving / Grading & U.G. Sewer CAD	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
20001c002-03	Area 2 paving grading sewer	12/23/03	2	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
20001c002-04	Area 3 paving grading sewer	12/23/03	2	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
20001c006-04	Oily Water Separator foundation sections and details	03/06/03	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
20001-c003-05	Civil Sections & Details	01/24/03	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil
8-2-6643, 6507, 6606, 6510, 6608, 6613 & 6602	Existing Trench and Sanitary Sewer East of Glenarm Building	6/1987	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Civil

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8-2-49	Circ Pipe Tunnels	02/06/31	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
8-2-49B	Circ Pipe Tunnels	08/14/31	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
8-2-49C	Circ Pipe Tunnels	08/05/31	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
8-2-49D	Circ Pipe Tunnels	05/22/31	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
8-2-598	Circ Pipe Tunnels	10/03/50	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
8-2-949	Broadway to Glenarm Pipe Tunnel	12/22/65	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
8-2-1337	Station Service Plot Plan	01/02/58	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
20001P006-03	West end culvert piping	11/18/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
20001P006-04	West end culvert piping	05/19/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
20001P027-01	Pipe trench between culvert & NH3 tanks	12/16/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
20001P028-01	Demin Water Pump 158A & Pipe Trench	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
20001P028-02	East end culvert & trench piping details	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
20001P00601	Ammonia truck unloading and culvert piping	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Mechanical Tunnels
33W	Location of power plant water services	08/29/40	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
3716	Utility Drawings in Public ROW - Fair Oaks Ave - Glenarm to State St	03/27/87	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001-274-M	Oil Water Separator Flo Trend Systems	01/16/03	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001E011-04	Cathodic protection pipe pit area	02/24/03	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001P001-01	Key plan underground piping A	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001P003-01	GT 3&4 equipment drains underground	12/08/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001P004-01	GT3 area underground piping	12/17/03	1	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001P005-01	GT4 area underground piping	12/17/03	2	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001P009-01	NH3 tank area underground piping	12/16/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities

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20001P011-01	Oily water separator pit piping	11/18/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
20001-P-011-01	Piping Plan & Details Oily Water Separator Pit	11/18/02	0	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
Glenarm Plant Fire Protection Drawing	Glenarm Plant Fire Protection Drawing	06/30/03	3	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
GT1 GT2 UG GAS DWG	Piping Area III	04/30/75	4	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
k350 OWS flow diagram	k350 oil water separator flow diagram	10/11/02	A	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
Storm Drain and Conduit Trench Drawing	Storm Drain and Conduit Trench Drawing	04/10/03	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Existing PWP Dwgs\Underground\Underground Utilities
3626-04-02	GT-5 FIRSTPCRCorrectionEnvironmental Investigation	07/29/11	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Geotech Report and GPR
3626-04-02	GT-5 Environmental Investigation - 1 of 4 txt only	07/29/11	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Geotech Report and GPR\Enviro
3626-03	Geophysical Investigation	04/15/10	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Geotech Report and GPR\Geotech
3626-04-01	GT5 Geotechnical Investigation	08/01/11	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Geotech Report and GPR\Geotech
11195Hydrologue_ThermalResistivity_01	Soil Thermal Resistivity Tests	09/16/11	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Geotech Report and GPR\Soil Resistivity
geovisionthermal Resistivity	Soil Thermal Resistivity Tests	08/10/11	-	SPEC	Attachment A3-Reference Information\A.3.C Existing Site and Reference Drawings\Geotech Report and GPR\Soil Resistivity
Attachment 1.6 Scope of Supply DOR	Attachment 1.6 Scope of Supply DOR	-	-	SPEC	Attachment A3-Reference Information\A.3.D Division of Responsibility
Completion Turnover Start-Up	GLENARM REPOWERING PROJECT SCOPE OF RESPONSIBILITY MATRIX	10/11/13	A	SPEC	Attachment A3-Reference Information\A.3.D Division of Responsibility
14-ST Steam Quality	Steam Quality	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
2014-01-08 GT5 Pre-Bid Meeting Introduction	2014-01-08 GT5 Pre-Bid Meeting Introduction	01/08/14	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
2014-01-08 GT5 Pre-Bid Meeting Local Participation	2014-01-08 GT5 Pre-Bid Meeting Local Participation	01/08/14	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
2014-01-08 GT5 Pre-Bid Meeting Working with Pasadena	2014-01-08 GT5 Pre-Bid Meeting Working with Pasadena	01/08/14	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
505-101 Sheet 01	Topographic Survey Pasadena Glenarm Facility	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
505-101 Sheet 02	Topographic Survey Pasadena Glenarm Facility	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
505-101 Sheet 03	Topographic Survey Pasadena Glenarm Facility	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
5065A0-C23	Generator outline dwg for reference	08/23/13	F	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2

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BOP RFP Pre-Bid Presentation 010814-updated	BOP RFP Pre-Bid Presentation 010814-updated	01/08/14	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
C8 foundation dwg	STG Foundatoin Drawing			ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
C8 Layout STG	Layout	04/30/08	2	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
8 Loading data STG Foundatio	Loading Data [kN]	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Construction Staging and Traffic Management Plan	Construction Staging and Traffic Management Plan	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Contracts_Purchase Orders_Permits Insurance Requirements	Contracts Purchase Orders Permits Insurance Requirements	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
ES-1000 Rev 9	Feedwater Quality Requirements for Superheated Steam Applications	07/22/11	9	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Exhibit A - DW_221732D01	Drawing 221732C1	-	0	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Exhibit B - HA_221732D01	Form 3.2.1-D	-	0	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
FY 2014 Adopted General Fee Schedule Part 2	FY 2014 Adopted General Fee Schedule Part 2	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
JV468844D	SPX Cooling Technologies Prelim Dwg - Basin Section & Details	10/22/12	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
JV4688445	SPX Cooling Technologies Prelim Dwg - Schematic View	10/22/12	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Jv468844B	SPX Cooling Technologies Prelim Dwg - Basin Section & Details	10/22/12	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Location and Working Hours	Location and Working Hours	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Moving Permit Application - For Wide Load and Heavy Equipment	Moving Permit Application - For Wide Load and Heavy Equipment	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
P12079-00 Jumper Tubes	Jumper Installation Proposal - IST	11/27/13	0	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Public Right-of-Way Permit	Public Right-of-Way Permit	12/19/12	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Rotor removal instructions _skid pan_	Rotor removal instructions skid pan	-	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
SK-8371-0	Condenser Outline Proposal Level (Proposal No. H-8371.HX)	-	0	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Storage Container - Application	Storage Container - Application	07/01/13	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Truck Route	Truck Route Map Exhibit 1	06/22/11	CAD90070A.MXD	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
11302-0004	Generic Flowsheet Dual Pressure OTSG W/ Burner, SCR & CO	02/20/06	P1	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
COP BOP Pre-Bid GE BOP Equipment_14Jan02	COP BOP Pre-Bid GE BOP Equipment	01/08/14	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
IST Presentation 20140108 (NXPowerLite)	IST Presentation 20140108 (NXPowerLite)	01/08/14	-	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2

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LM6000_Package_Layout_Evolution1.5.14r1	LM6000 Package Layout Evolution	-		ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
Bidder's Questions 2013-01-15 Rev 0	Bidder's Questions	01/15/14	0	ADD 2	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 2
7253049-969960	Recommended Settings For Model 175 Nox Water Injection Pump Sr Drive	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
7253049-969961	Jaquet T401 GT Backup Overspeed Device Settings, SSW1	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
7253049-969962	Digital Multifunction Meter Settings Satec Pm174	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum
7253049-969964	Suggested Settings For Beckwith Model M-3425a Generator Protection System	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
7253049-969965	Automatic Voltage Regulator Settings, Brush Prismic A30	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
7253049-969966	DSM Settings	10/09/13	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
7253049-969966	Asbestos Survey and Lead-Based Paint Assessment Report	02/24/99	A	ADD 3	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 3
11303-0001	General Arrangement LM6000 PG OTSG		E	ADD4	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 4
C12079-PCP	OTSG Pre-Construction Plan	01/24/13	00	ADD 4	EMAT\Procurement\Packages\BOP Contractor Scope\Addenda\Addendum 4