**Bharat Heavy Electricals Limited**
**Heavy Plates & Vessels Plant**
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# INVITATION TO TENDER

Ref : OS/19-20/7887/Non-IBR Piping/33/56 Date : 26.09.2019

Sub : **Pre-fabrication of Non-IBR Piping for HPCL, Visakhapatnam against S.O. 7887 inside the premises of BHEL, HPVP, Visakhapatnam.**

Dear Sir,

Sealed tenders are invited for the subject work in **two part bid** system from Vendors who are experienced in carrying out piping fabrication or similar works subject to the following eligibility criteria :

## ELIGIBILITY CRITERIA

(1) Bidders shall have an experience of executing similar works (i.e. Fabrication of CS & SS Piping) for a minimum of one project as on 31st Aug'2019. Bidders shall have to enclose Work Orders and Work Completion Certificates in support of the same.

(2) Average Annual Turnover of the bidders for the last 3 financial years should be Rs.30 Lakhs. Bidders shall enclose IT Returns and other necessary documents in support of the same.

(3) Bidders shall have to enclose the documents of Registration of Firm, EPF, ESI, PAN & GST.

(4) The works executed in the name of individual / firm of the tenderer will only be considered for eligibility criteria.

## 1. LOCATION OF WORK SPOT :

The fabrication work is to be carried out inside the premises of Bharat Heavy Electricals Ltd., Heavy Plates & Vessels Plant, Visakhapatnam, Andhra Pradesh.

## 2. VENDOR'S SCOPE OF WORK :

- Fabrication, Blast Cleaning & Painting of Non-IBR Piping is to be carried out for various Piping Systems of M/s HPCL, Visakhapatnam Refinery as briefed below :

| | | | |
|---|---|---|---|
| **(a)** | **Fabrication & Painting of CS Piping** | **:** | **205 MT** |
| **(b)** | **Fabrication & Painting of SS Piping** | **:** | **29 MT** |
| **(c)** | **Painting of Loose Pipes & Fittings** | **:** | **116 MT** |
| | **Total Quantity** | **:** | **350 MT** |

It may be noted that the quantity indicated above is tentative and may vary up to + or – 10 % after completion of Detailed Engineering.

- For Technical specifications, Annexure – II (A) and for details of various systems of piping & pipe line wise scope of work, Annexure – II (B) may be referred.
- Collection of all free issue materials from HPVP Stores and shifting to work location including unloading at site
- Complete fabrication of the CS & SS Piping Spools as per the approved drawings, MQP, WPS, Specifications & Standards, etc. and it involves Marking, Cutting, Edge Preparation, Drilling, Machining, Assembly, Purging & Welding, NDT like LPI, MPI, RT, etc. :
- Grit Blast Cleaning and Painting including **Supply of all Paints** as per Painting Schedule & Specification
- Supplying & Fixing of Plastic End Caps on Pipe Spool Ends and Stub Ends
- Hardness Test is to be carried out for A11A Spec. Piping near Weld Joints

Contd…2

- Punching and Stenciling / Letter painting on the Pipe Spools in a prescribed / specified format.
- Loading of finished Piping Spools onto the trailers, Transportation & Delivery to BHEL, PSNR Site, located at BHEL Township, Visakhapatnam including unloading at delivery point
- Hydro test is to be carried out system wise and hence not covered in the bidder's scope. Hence Weld defects, if any found during Hydro testing, shall have to be repaired by the bidders at HPCL, Vizag site by mobilising suitable manpower & machinery.
- Cranes required for fabrication, unloading & loading at HPVP site
- Free issue items cleared by QC shall be collected within 3 days from the date of intimation without failure. Any delay beyond the 3 days shall be considered for levying of L.D.
- Qualified Welders are to be deployed for the welding job.
- Welder's qualification is the responsibility of the Vendor and shall be carried out by the vendor at their cost. However, Test Pieces shall be provided by BHEL as free issue.
- Qualified Engineers & Supervisors shall be deployed for proper co-ordination of the job.
- Submission of economic Cutting Plans for all the plate materials, pipes, tubes and sections issued by BHEL and approval must be obtained from competent authority before taking up fabrication.

  Wherever fabrication is done without proper approved cutting plans, any loss of materials arising due to the same will be recovered as per BHEL recovery rates.
- Any modification work due to revision of drawings during fabrication is to be carried out by the vendor without any extra cost.
- Though not mentioned specifically, any activity which is required for completion of the work is deemed to be included in the scope of work of vendors.

**3. <u>BHEL SCOPE</u>:**

BHEL – HPVP shall provide the following as free issue :

- Applicable drawings, GMS**, M**QP & WPS, Painting Schedule etc.
- The following raw materials and BOCs from HPVP Shops / stores :
  - Pipes / Tubes in Running Meters
  - Elbows, Stubs, Reducers
  - Other Pipe Fittings like Flanges, Blind Flanges, etc.
- Area required for fabrication will be provided free of charge.
- Power, Water shall also be provided free of charge at one point but further distribution to desired location is in vendor's scope. In case of power failure, the vendor shall have to make alternative arrangement for smooth functioning of the work without any extra cost to BHEL.

**4. <u>INSPECTION</u> :**

Inspection shall be carried out by M/s. BHEL – Vizag / BHEL Authorized Inspection Agency / Customer as per approved MQP. Contractor shall have to offer for Stage wise and Final inspection as per approved MQP and obtain necessary clearances before proceeding for further operations.

**5. <u>DELIVERY</u> :**

Finished Pipe Spools along with all inspection documents and other certificates are to be handed over within **12 weeks** from the date of issue of first consignment of free issue materials or 4 weeks from the date of issue of last consignment of materials.

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**6. PRICE** :

The price shall be quoted as per the Schedule of Rates enclosed at Annexure – I for the detailed scope of work of each item. The prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work

The quoted price shall be inclusive of all applicable taxes & duties except GST and Income tax will be deducted at applicable rates from RA & Final bills. GST shall be reimbursable to the vendor as detailed in Clause – 8 and as per Annexure – GST.

**7. EVALUATION, COUNTER OFFER & ORDERING**:

a) L1 status will be evaluated based on the quoted total price.

b) Counter offer of item wise rates of the L1 bidder shall be given to the L2 and next lowest bidders for acceptance. Vendors, who accept all counter offer rates shall only be considered for ordering.

c) **Ordering shall be done piping system wise or likewise.**

Total quantity shall be distributed among three (3) bidders i.e. L1 and next two lowest bidders accepting counter offered rates in the ratio of 45:30:25 approximately.

d) Successful bidders shall have to complete site mobilization within 15 days from the date of receipt of Order.

**8. GOODS & SERVICES TAX (GST) :**

Bidders shall make a note of the following points of GST before submission of their offer **:**

- Vendors registered under GST Act shall have to produce their GSTIN no. (15 Digits) in their Technical Bid in case their turnover exceeds 20.00 lakh. In case, any vendor is unregistered, they have to produce a certificate from Chartered Accountant that their turnover does not exceed Rs. 20.00 lakh.

- Semi finished goods are to be delivered by the Vendors in BHEL, HPVP premises within a maximum period of one year from the date of issue of the material, failing which the whole transaction will be considered as Supply and Sale and GST is required to be paid along with interest from the date of Challan on the whole value of materials. Hence vendors shall have to ensure that materials issued to them are returned within 365 days.

- After fabrication, the vendors shall have to deliver the Semi - finished Goods by fulfilling the following formalities :

  GST invoice should be raised by the vendors by paying GST on job work charges at applicable rates and by incorporating the HPVP GSTIN no. in the invoice for availing the reimbursement of GST from HPVP.

  The vendor shall also have to enter in their GST Return -1 (GSTR-1) the details of invoice raised for payment of GST so as to enable HPVP to avail input credit

**9. REVERSE AUCTION :**

BHEL reserves the right to opt for Reverse Auction at its discretion instead of opening the price bids submitted in sealed envelope and any information regarding the reverse auction shall be decided after technical evaluation and shall be intimated to the bidders at appropriate time. The bidders are requested to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids in case BHEL decides to go for RA.

In case BHEL decides to go for RA, only those bidders who give their acceptance will be allowed to participate in RA and these bidders shall have to necessarily submit 'Online Sealed Bid' in the RA. Non-submission of 'Online Sealed Bid' by the bidder will be considered as tampering of the tendering process and will invite action by BHEL as per extent guidelines in vogue.

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**10.** Other Terms & Conditions shall be as per Annexure – III enclosed.

**11. RISK PURCHASE** :

In case the contractor fails to execute the work within the scheduled time or due to any other reasons, BHEL - HPVP reserves the right to get the same completed through some other party at the risk & cost of the contractor and any additional expenditure incurred due to the same shall be charged to the contractor**.**

**12. VALIDITY OF OFFER :**

The offer shall be valid for a period of **3 months** from the last date for tender submission.

**13. GENERAL :**

- The bidders shall study the Tender documents, Drawings, Quality Documents and all other relevant documents in detail for understanding the scope of work and the processes involved before submission of offers. One complete set of drawings shall be made available in the office of Sr. Manager (Outsourcing) and the same shall be referred during working hours. Drawings, QAP, WPS etc. shall be sent to vendor's e-mail address.

  For any clarifications required on this tender document, scope of work etc., the bidders shall depute their authorized representatives to BHEL, Visakhapatnam with prior intimation to get clarifications from concerned authorities between 09:00 AM and 04:30 PM.

- Bidders shall confirm their acceptance to all the terms & conditions of the tender enquiry. Any deviations to the tender terms & conditions are not acceptable and BHEL reserves the right to reject such offers without further correspondence

- BHEL reserves the right to modify or cancel the tender enquiry at any stage without assigning any reasons thereof.

**14.** The following documents shall form part of the tender enquiry **:**

i) Schedule of Rates : Annexure – I
ii) Technical Specifications : Annexure – II (A)
iii) Scope of Work (Systemwise / Pipelinewise) : Annexure – II (B)
iv) List of applicable Drawings & Documents : Annexure – II (C)

(Any of the documents mentioned in the above list, if required for tendering purpose, shall be sent by e-mail to vendor's registered e-mail address on specific request)

v) General Terms & Conditions : Annexure – III
vi) Acceptance to tender terms & conditions : Annexure – IV
vii) Reverse Auction Rules & Regulations : Annexure – V
viii) Procedure for GST Payment : Annexure – GST

**15. TENDER SUBMISSION :**

Techno-commercial bids shall be submitted along with **a covering letter on Bidder's Letter Head** and **with** the **tender document duly signed by the bidder on all pages.** Techno-Commercial Bid and Price bid shall be kept in two separate envelopes and both shall be kept in another big envelope.

Tenders completed in all respects shall be dropped in the **Outsourcing Tender Box** placed at Reception counter, Administration Building, BHEL - HPVP, Visakhapatnam, PIN - 530012 before **14.00 hrs. on 10.10.2019** duly superscribing the Subject, Tender Ref. No. and Technical / Price Bid on the envelopes.

**TENDERS RECEIVED AFTER THE DUE DATE & TIME ARE NOT ACCEPTABLE.**

**Note : Offers sent in any other form will be treated as invalid and will be summarily rejected.**

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Ref : OS/19-20/7887/Non-IBR Piping/33/56 Date : 26.09.2019

16. **OPENING OF TENDERS** :

Techno-commercial Bids will be opened on **10.10.2019 at 14.00 Hrs.** at Customer Cell, Adminstration Building, BHEL - HPVP, Visakhapatnam. The price bid of the techno-commercially qualified bidders will be opened in presence of representatives of the bidders and the date & time of opening of price bids will be intimated later. The bidders may depute their representatives at the time of opening.

In case of opting for Reverse Auction, intimation shall be given to the qualified bidders in advance at appropriate time.

for Bharat Heavy Electricals Limited,

YVRao 26/9/19

(Y.V.R.Rao)
Dy.General Manager (Outsourcing)

**ANNEXURE - I**

# Schedule of Rates

**Ref : OS/19-20/Non-IBR Piping/33/56** **Date : 26.09.2019**

**Sub : Pre-fabrication of Non-IBR Piping for HPCL, Visakhapatnam against S.O. 7887 inside the premises of BHEL, HPVP, Visakhapatnam**

| Sl. No. | S.O. No. | Description of Work | Unit | Qty. | Unit Rate (in ₹) | Total Amount (in ₹) |
|---|---|---|---|---|---|---|
| 1 | 7887 | Collection of free issue materials from HPVP Stores, Pre-fabrication of **CS Piping Spools** involving Cutting to Size of Pipes, **Edge Preparation**, Fixing Plastic End Caps at the ends of Pipe Spools. Transportation to the delivery Point and Handing over to BHEL, PSNR site inside BHEL presmises etc., complete in all respects as per relevant drawings, QAP, WPS, specifications and as per detailed scope of work mentioned in the tender document **(Cost for Blasting, Supply & Application of Paints of this item not included here and will be paid as per Item No. 7)** | MT | 28.00 | | |
| 2 | 7887 | Collection of free issue materials from HPVP Stores, Pre-fabrication of **CS Piping Spool**s with attachments involving Edge Prepation, assembly & welding of Stubs, Branch Pipes, Pad Plates, Half Couplings etc, **(excluding Pipe to Pipe , Pipe to Elbow and Pipe to Reducer Butt Welding)**, Fixing Plastic End Caps at the ends of Pipe Spools, Transportation to the delivery Point and Handing over to BHEL, PSNR site inside BHEL presmises etc, complete in all respects as per relevant drawings, QAP, WPS, specifications and as per detailed scope of work mentioned in the tender document **(Cost for Blasting, Supply & Application of Paints of this item not included here and will be paid as per Item No. 7)** | MT | 177.00 | | |
| 3 | 7887 | Welding of **CS Butt joints of Pipe to Pipe, Pipe to Elbow, Pipe to Reducer etc.** as per relevant Pipe assembly drawings, QAP & WPS including NDT like LPI, MPI, Radiography etc, complete in all respects | | | | |
| 3.1 | | **For Pipe OD upto 115 mm and upto 14.27 mm thick** | No. | 1261.00 | | |
| 3.2 | | **For Pipe OD above 115 mm dia to 350 mm and upto 14.27 mm thick** | No. | 687.00 | | |
| 3.3 | | **For Pipe OD above 350 mm dia to 610 mm and upto 14.27 mm thick** | No. | 98.00 | | |
| 4 | | Collection of free issue materials from HPVP Stores, Pre-fabrication of **SS Piping Spools** involving Cutting to Size of Pipes, **Edge Preparation**, Fixing Plastic End Caps at the ends of Pipe Spools, Transportation to the delivery Point and Handing over to BHEL, PSNR site inside BHEL presmises etc, complete in all respects as per relevant drawings, QAP, WPS, specifications and as per detailed scope of work mentioned in the tender document **(Cost for Blasting, Supply & Application of Paints of this item not included here and will be paid as per Item No. 7)** | MT | 1.00 | | |

**ANNEXURE - I**

# Schedule of Rates

**Ref : OS/19-20/Non-IBR Piping/33/56** **Date : 26.09.2019**

**Sub : Pre-fabrication of Non-IBR Piping for HPCL, Visakhapatnam against S.O. 7887 inside the premises of BHEL, HPVP, Visakhapatnam**

| Sl. No. | S.O. No. | Description of Work | Unit | Qty. | Unit Rate (in ₹) | Total Amount (in ₹) |
|---|---|---|---|---|---|---|
| **5** | **7887** | Collection of free issue materials from HPVP Stores, Pre-fabrication of **SS Piping Spool**s with attachments involving Edge Prepation, assembly & welding of Stubs, Branch Pipes, Pad Plates, Half Couplings etc, **(excluding Pipe to Pipe , Pipe to Elbow and Pipe to Reducer Butt Welding),** Fixing Plastic End Caps at the ends of Pipe Spools, Transportation to the delivery Point and Handing over to BHEL, PSNR site inside BHEL presmises etc, complete in all respects as per relevant drawings, QAP, WPS, specifications and as per detailed scope of work mentioned in the tender document **(Cost for Blasting, Supply & Application of Paints of this item not included here and will be paid as per Item No. 7)** | **MT** | **28.00** | | |
| **6** | **7887** | Welding of **SS Butt joints like Joints of Pipe to Pipe, Pipe to Elbow, Pipe to Reducer etc.** as per relevant Pipe assembly drawings, QAP & WPS including NDT like LPI, MPI, Radiography etc, complete in all respects | | | | |
| **6.1** | | **For Pipe OD upto 115 mm and upto 14.27 mm thick** | **No.** | **348.00** | | |
| **6.2** | | **For Pipe OD above 115 mm dia to 350 mm and upto 14.27 mm thick** | **No.** | **246.00** | | |
| **7** | **7887** | **Grit Blasting, Supply and Application of Paint**s **for the above SOR items (1), (2), (4) & (5)** of fabricated **CS & SS Pipe Spools** as per Painting Schedule & Specifications. | | | | |
| **7.1** | | **F12 – Heat Resistant Silicon Aluminium paint – DFT - 20 Microns** | **Sq. Mt.** | **345** | | |
| **7.2** | | **F15- Epoxy Phenolic paint- DFT - 75 Microns** | **Sq. Mt.** | **470** | | |
| **7.3** | | **F16- Poly siloxene paint – DFT - 125 Microns** | **Sq. Mt.** | **35** | | |
| **7.4** | | **F9 – Inorganic zinc silicate paint – DFT - 65 Microns** | **Sq. Mt.** | **2450** | | |
| **7.5** | | **P6 – Epoxy Zinc phosphate – DFT - 40 Microns** | **Sq. Mt.** | **1080** | | |
| **8** | **7887** | **Collection of Loose Pipes & Fittings from HPVP Stores, Shifting to Work Site, Grit Blasting, Supply and Application of Paint**s**, Transportation to the delivery Point and Handing over to BHEL, PSNR site inside BHEL presmises etc, complete in all respects as per relevant drawings, QAP, WPS, specifications and as per detailed scope of work mentioned in the tender document** | | | | |
| **8.1** | | **F12 – Heat Resistant Silicon Aluminium paint – DFT - 20 Microns** | **Sq. Mt.** | **75** | | |
| **8.2** | | **F15 - Epoxy Phenolic paint- DFT - 75 Microns** | **Sq. Mt.** | **120** | | |

**ANNEXURE - I**

# Schedule of Rates

**Ref : OS/19-20/Non-IBR Piping/33/56** **Date : 26.09.2019**

**Sub : Pre-fabrication of Non-IBR Piping for HPCL, Visakhapatnam against S.O. 7887 inside the premises of BHEL, HPVP, Visakhapatnam**

| Sl. No. | S.O. No. | Description of Work | Unit | Qty. | Unit Rate (in ₹) | Total Amount (in ₹) |
|---|---|---|---|---|---|---|
| 8.3 | | F16 - Poly siloxene paint – DFT - 125 Microns | Sq. Mt. | 90 | | |
| 8.4 | 7887 | F9 – Inorganic zinc silicate paint – DFT - 65 Microns | Sq. Mt. | 1510 | | |
| 8.5 | | P6 – Epoxy Zinc phosphate – DFT - 40 Microns | Sq. Mt. | 1510 | | |
| | | **Grand Total** | | | | |
| **Total Amount in Words :** | | | | | | |

**Notes** :

1) **L1 Status will be evaluated based on the total quoted value.**

2) **Distribution** : Total quantity shall be distributed to 3 bidders as detailed in Clause no. 8 of NIT.

3) The quantity and weights indicated above are approximate and may vary upto + or - 10% subject to revision of Engg. details or addition or deletion of drawings. However, payment shall be made for the actual quantities / weights as per the applicable drawings / GMS.

4) The prices shall be fixed & firm without any escalation during the entire period of contract and till completion of work.

5) The quoted price shall be inclusive of all applicable taxes & duties except GST and Income tax will be deducted from Vendor's bills at applicable rates. However, GST shall be reimbursed by BHEL on submission of proof of GST payment.

6) The bidders are advised to go through all the drawings & documents before quoting the tender.

7) BHEL reserves the right to go for Reverse auction as per the applicable guidelines instead of opening price bids.

8) Tenderer should quote the amount in figures & words. It may be noted that corrections, overwriting etc. are not allowed. If there is a discrepancy between amount in figures & words, the amount in words shall prevail unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail. If there is an error in the total corresponding to the addition or subtraction of sub-totals, the sub-totals shall prevail and total shall be corrected accordingly.

   In case of any mismatch between rate and amount in figures, rate in figures shall be taken into consideration for further evaluation and processing.

**Signature of the Bidder with Stamp**

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## 1.0 INTENT OF SPECIFICATION

1.1 The intent of this specification is to establish the minimum requirements of fabrication, quality, inspection, shop testing, surface preparation, shop painting, marking, packaging for preservation, weather protection and transportation for the Non IBR Piping.

1.2 It is not the intent to completely specify all the details of fabrication. Nevertheless, the finished product shall confirm to highest standards of engineering & fabrication and shall be capable of performing in continuous commercial operation in a manner acceptable to the Purchaser and end customer.

## 2.0 LEGEND / GLOSSARY OF TERMS

Purchaser : BHEL
Owner : BHEL's Customer
Bidder : Eligible vendors from whom offers are received against the Enquiry
Vendor : Successful Bidder of the Package on whom Order is placed

## 3.0 SCOPE OF SUPPLY / SERVICES

1) Prefabrication of non-IBR piping of HPCL Vizag covering various systems as listed below are to be executed by the successful piping contractor.
   a) Refinery gas system
   b) Natural gas system
   c) High speed Diesel (HSD) system
   d) Naphtha system
   e) Blow down System
   f) Atomising air system
   g) Condensate system
   h) Demineralize Water system
   i) Safety valve vent and drain system
   j) Cooling water system
   k) Miscellaneous systems.

2) Complete system engineering, layout engineering, Isometric drawings and spool drawings of all systems indicated in sl. no 1 above are prepared by BHEL. The spools in each system are strategically decided by BHEL. BHEL will hand over the spool drawings as input for fabrication to the successful piping fabrication contractor.

3) The complete list covering various systems and quantum of work in the scope of fabrication contractor is covered in **Annexure - II (B).**

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4) Annexure-1 covers the scope of piping pre fabrication including pipe cutting, edge preparation, drilling of hole for stub welding, reinforcement pad preparation from main pipe, welding, testing, inspection, surface preparation and painting as per BHEL documents like **GT 57124 Rev 03 (6 sheets),** Job specification for Non-Destructive Examination requirements of piping **B016-6-44-0016 Rev.2 (21 pages) & PY-AQ-3-M104-2001-01 Rev 00 (3 sheets)** which are part of this enquiry. However, if there is a discrepancy on a particular operation / clause between the referred documents, the more stringent shall be followed.
5) **Annexure-1, Item No. 8** covers the scope of surface preparation and painting of various pipes and pipe fittings to be carried out as per **PY-AQ-3-M104-2001-01 Rev 00 (3 sheets)** which is part of this enquiry.
**6)** Piping contractor to understand the scope from the **Annexures** and the other documents indicated in sl. no. 4 and submit their most competitive price in the attached Price Format **Annexure-1.**
7) All materials required for pre fabrication of piping will be free issue by BHEL (as commercially available in market) from storage location within BHEL HPVP Visakhapatnam. Transport of raw material from store to contractor's work place is in contractor scope.
8) The pipe spool /fitting end shall be suitably protected against damage/ingress of foreign material with end caps and shall be securely and tightly attached. These end caps are to be part of piping contractor's scope.
9) Successful piping contractor shall establish the fabrication facility within the premises of BHEL HPVP, Visakhapatnam and carry out the fabrication work. Power and other utilities shall be provided at single point on chargeable basis. Further distribution is in contractor's scope. Labour management including compliance to statutory regulations shall be in the scope of contractor.
10) Welding rods, other tools required for piping fabrication to be arranged by Bidder.
11) Required equipment/machinery/trolleys for transportation shall be arranged by Bidder.
12) Required equipment for performing surface preparation of piping and shop primer to be arranged by Bidder.

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13) Required primer and Paint as per **PY-AQ-3-M104-2001-01 Rev 00 (3 sheets)** is in bidder scope.

14) Fabricated spools as part of **Annexure-II (B)**, after inspection shall be surface prepared and painted and marked with spool no before dispatch.

15) Pipe and fittings which are covered under **Annexure-1, Item No. 8** shall be surface prepared and painted and transported to the designated location within HPVP by contractor.

16) The final spools shall be transported to the designated location within HPVP by contractor.

17) All the spools are going to be joined/assembled at HPCL site and hydraulically tested. In case of leakage of any weld made by piping contractor shall be repaired by piping contractor at HPCL site without any cost implication and time.

## 4.0 SPECIAL INSTRUCTIONS TO BIDDER

4.1 In case of any discrepancy arising between this specification and its enclosures, it shall be bidder's sole responsibility to clearly bring out/ highlight any discrepancies in his pre-bid queries within 6 working days from the receipt of enquiry, so as to enable purchaser to furnish their decision/ clarification. If such issues/ requirements are not duly addressed by bidder during the pre-bid stage and are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.

4.2 Compliance with this specification shall not relieve the bidder of the responsibility of producing pre-fabricated piping package of proper design, materials and workmanship to meet the specified operating conditions.

4.3 The specification and enclosures indicate only the minimum requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid.

4.4 Bidder shall provide replies / clarifications within 4 working days from the date of the queries / comments raised by Purchaser, during technical scrutiny of bidder's offer and execution of the order. Any further delay will be seriously viewed by the purchaser and bidder's offer may not be considered for evaluation.

4.5 Drawings / documents attached with the enquiry are preliminary & may get revised at the time of placement of order. The percentage limitation of the variation in weight of the package from the Tender stage to post order, shall be as specified in the tender and the bidder shall make a note of the same while submitting the bid.

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4.6 Gross Weight of the fabricated piping package at the time of enquiry is arrived at by considering the unit weights of the individual piping components as per the applicable standards. These unit weights shall be binding on the successful bidder to arrive at the final weight of the package that is supplied.

4.7 It is vendor's sole responsibility to clearly bring out/ highlight any missing information on the final spool drawings issued for fabrication before start of fabrication activity so as to enable the purchaser to furnish their decision/ clarification. Only after the receipt of clarification in writing from purchaser, successful bidder should proceed with the manufacturing / fabrication of the relevant items.

## 5.0 DOCUMENTATION

5.1 ALONG WITH THE OFFER

Bidder shall submit the following documents along with the offer, with respect to every item of the Purchaser's specifications. Any offer not confirming to this requirement is liable for rejection.

1. Copy of Technical specification duly stamped & signed by the Bidder.
2. Copy of Annexure-1 duly stamped & signed by the Bidder.
3. Copy of Annexure-2 duly stamped & signed by the Bidder.
4. Unpriced Commercial offer.
5. Price bid in a separate sealed cover.
6. Deviation list, if any, (In case of no deviation, 'NIL' to be mentioned in the deviation list, duly signed and to be submitted along with offer). Offer without deviation list will not be evaluated & shall be liable for rejection.

5.2 AFTER PLACEMENT OF PO BEFORE START OF FABRICATION

5.2.1 Purchaser shall issue the Fabrication drawings to successful bidder post order within 7 working days from placement of Order.

5.2.2 Vendor shall review all the Fabrication drawings, QAP and shall prepare a detailed plan for fabrication works inline with the time frame indicated in the contract and the same shall be approved by the purchaser.

5.2.3 Vendor shall start fabrication only after receipt of approval from the purchaser on the documentation submitted by the vendor.

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It must not be used directly or indirectly in any way detrimental to the interest of the company.

5.3 AFTER DISPATCH

Vendor shall furnish the details like LR numbers, Invoice details, Weight details etc for all the dispatches. The data shall be furnished for every individual spool number / part number. Same shall be furnished in a spread sheet progressively as per schedule of dispatches.

5.4 SUBMISSION & REVIEW OF DOCUMENTS POST ORDER

5.4.1 The approval and /or review by the purchaser / owner shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements specified under these specifications and drawings.

## 6.0 DISPATCH & SHIPPING

6.1 All packages shall properly be packed for transportation by trailer.

6.2 The following minimum packing procedures shall be followed:

- Prior to shipment, Vendor to ensure that all items are dry, clean and free from moisture, dirt and loose foreign material of all kinds.
- All the items shall be protected from rust, corrosion, and mechanical damage during loading, unloading, transportation and storage.
- All the machined surfaces (to be welded at site) shall be protected by coating with easily removable rust preventive. Rust preventive on machined surfaces to be welded shall not be harmful to welding and shall be easily removable with a petroleum solvent.
- Pipe spool / fittings ends shall be suitably protected against damage and ingress of foreign material including water with end caps and shall be securely and tightly attached.

6.3 Dispatches shall be System wise i.e., all the material pertaining to a drawing shall be dispatched as a set.

6.4 It shall be bidder's sole responsibility to protect all the material during period of transportation against corrosion, incidental damage due to adverse atmospheric conditions, rough handling in transit including delays in transit. Bidder shall be responsible for any damage to material due to above reasons and shall take necessary corrective action at site without any price implication.

## 7.0 QUALITY REQUIREMENTS, INSPECTION & TESTING

7.1 Inspection shall be either by purchaser, owner or purchaser's appointed third party agency as per the approved QAP.

7.2 Vendor is responsible for performance of all tests and inspection to ensure that the supplied package meets the requirements of this specification. Vendor may use their own facilities or any approved laboratory acceptable to purchaser / owner. Purchaser / owner reserves the right to inspect and witness any test prior to dispatch and as per "HOLD-POINTS" defined in

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the QA plan. Vendor shall give reasonable notice in writing of the date and place of any test and inspection by purchaser / owner.

7.3 Unless otherwise specified, BHEL reserves the right to test and inspect all the items at the Bidder works.

7.4 Vendor to produce Welder Qualification Certificates for purchaser's review before start of fabrication. Alternatively purchaser may ask for Welder Qualification Testing at shop, which shall be witnessed and certified by a qualified third party agency and shall be reviewed by Purchaser/TPIA.

7.5 The shop QAP may indicate hold points. The vendor shall furnish minimum two weeks' time for all such shop inspection / testing - hold points.

7.6 All shop testing shall be conducted by vendor at their own cost and measuring and testing equipment shall be made available by them and all shall have valid calibration certificate.

7.7 All inspection test reports shall be submitted to Purchaser / owner for review / approval before final dispatch clearance note.

7.8 **Witness Inspection**

Vendor shall offer all the items for pre-dispatch inspection and the following tests/ checks shall be carried out as a minimum:

- Physical and Dimensional Check.
- Review of all test reports.
- BOM check
- Painting workmanship and finish

7.9 **Testing Procedure**

The welds shall be tested and inspected as per the document GT-57124, Rev-03 titled "Details of Welding, Testing & Inspection"

**Hydrostatic test is excluded for the individual fabricated spools at shop.**

Though Hydrostatic test is excluded for the individual fabricated spools at shop, it is the sole responsibility of the vendor to ensure required quality of the materials and welds. If any defects (which are not attributable to field welds) were to be found at the time of field Hydrostatic Test of the Piping system, then the Vendor shall take necessary corrective action at site with his own expenses. No claim for any additional price will be allowed.

## 8.0 RECORD OF REVISIONS

| Rev No | Date | Revision Detail | Revised by | Approved by |
|---|---|---|---|---|
| 00 | 17.09.19 | FIRST ISSUE | - | - |

# Scope of Work - Systemwise / Pipelinewise

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Refinery Gas | 1 | U9095 | 1/11 | 323.8 x 9.53 | CS | 17 | 34 | | 17 | | | | | 3.34 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 2 | U9096 | 2/11 | 323.8 x 9.53 | CS | 18 | 36 | | 0 | | | | | 8.6 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 3 | U9097 | 3/11 | 323.8 x 9.53 | CS | 2 | 4 | | | | | | | 0.17 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 4 | U9097 | 3/11 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 5 | U9098 | 4/11 | 323.8 x 9.53 | CS | 2 | 4 | | | | | | | 0.23 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 6 | U9098 | 4/11 | 3/4" | CS | | | | | | | 3 | 3 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 7 | U9098 | 4/11 | 1.5" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 8 | U9098 | 4/11 | 1.0" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 9 | U9099 | 5/11 | 323.8 x 9.53 | CS | 2 | 4 | | 2 | | | | | 0.16 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 10 | U9099 | 5/11 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 11 | U9100 | 6/11 | 323.8 x 9.53 | CS | 6 | 12 | 3 | 6 | | | | | 1.32 | A1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Refinery Gas | 12 | U9101 | 7/11 | 323.8 x 9.53 | CS | 4 | 8 | 4 | | | | | | 1.8 | A1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Refinery Gas | 13 | U9102 | 8/11 | 60.3 x 5.54 | CS | 4 | 8 | | 4 | | | | | 0.03 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 14 | U9103 | 9/11 | 60.3 x 5.54 | CS | 5 | 10 | | | | | | | 0.2 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 15 | U9104 | 10/11 | 60.3 x 5.54 | CS | 1 | 2 | | | | | | | 0.03 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 16 | U9104 | 10/11 | 3/4" | CS | | | | | | | 3 | 3 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 17 | U9104 | 10/11 | 1.0" | CS | | | | | | | 1 | 1 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Refinery Gas | 18 | U9105 | 11/11 | 114.3 x 6.02 | CS | 2 | 4 | | 1 | | | | | 0.06 | A11A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| HSD | 1 | U9134 | 1/22 | 114.3 x 6.02 | CS | 19 | 38 | | 0 | | | | | 0.470 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 2 | U9134 | 1/22 | 114.3 x 3.05 | SS | 3 | 6 | | 0 | | | | | 0.005 | A1K | 65 | |
| HSD | 3 | U9135 | 2/22 | 114.3 x 6.02 | CS | 30 | 60 | | 30 | | | | | 1.514 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 4 | U9135 | 2/22 | 114.3 x 3.05 | SS | 2 | 4 | | 2 | | | | | 0.020 | A1K | 65 | |
| HSD | 5 | U9136 | 3/22 | 114.3 x 6.02 | CS | 2 | 4 | | 2 | | | | | 0.031 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 6 | U9136 | 3/22 | 1.5" | CS | | | | | | | 2 | 2 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 7 | U9136 | 3/22 | 114.3 x 3.05 | SS | 2 | 4 | | 2 | | | | | 0.015 | A1K | 65 | |
| HSD | 8 | U9136 | 3/22 | 3/4" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| HSD | 9 | U9137 | 4/22 | 114.3 x 6.02 | CS | 36 | 72 | | 36 | | | | | 0.670 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HSD | 10 | U9137 | 4/22 | 114.3 x 3.05 | SS | 6 | 12 | 1 | 6 | | | | | 0.067 | A1K | 65 | |
| HSD | 11 | U9138 | 5/22 | 114.3 x 6.02 | CS | 1 | 2 | | 1 | | | | | 0.047 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 12 | U9138 | 5/22 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 13 | U9138 | 5/22 | 1.5" | CS | | | | | | | 2 | 2 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 14 | U9138 | 5/22 | 114.3 x 3.05 | SS | 1 | 2 | | 1 | | | | | 0.022 | A1K | 65 | |
| HSD | 15 | U9138 | 5/22 | 3/4" | SS | | | | | | | 3 | 3 | | A1K | 65 | |
| HSD | 16 | U9139 | 6/22 | 114.3 x 6.02 | CS | 10 | 20 | | | | | | | 0.143 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 17 | U9139 | 6/22 | 3/4" | CS | | | | | | | 9 | 9 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 18 | U9139 | 6/22 | 1.0" | . | | | | | | | 1 | 1 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 19 | U9139 | 6/22 | 114.3 x 3.05 | SS | 1 | 2 | | | | | | | 0.004 | A1K | 65 | |
| HSD | 20 | U9139 | 6/22 | 3/4" | SS | | | | | | | 1 | 1 | 0.030 | A1K | 65 | |
| HSD | 21 | U9140 | 7/22 | 114.3 x 6.02 | CS | 4 | 8 | | | | | | | 0.046 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 22 | U9140 | 7/22 | 3/4" | CS | | | | | | | 8 | 8 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 23 | U9141 | 8/22 | 114.3 x 6.02 | CS | 12 | 24 | | 12 | | 6 | | | 0.226 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 24 | U9142 | 9/22 | 114.3 x 6.02 | CS | 11 | 22 | | | | 11 | | | 0.083 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 25 | U9142 | 9/22 | 3/4" | CS | | | | | | | 11 | 11 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 26 | U9142 | 9/22 | 114.3 x 3.05 | SS | 2 | 4 | 2 | | | 2 | | | 0.009 | A1K | 65 | |
| HSD | 27 | U9142 | 9/22 | 3/4" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| HSD | 28 | U9143 | 10/22 | 114.3 x 6.02 | CS | 2 | 4 | | 2 | | 2 | | | 0.019 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 29 | U9143 | 10/22 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 30 | U9143 | 10/22 | 114.3 x 3.05 | SS | 1 | 2 | | 1 | | 1 | | | 0.006 | A1K | 65 | |
| HSD | 31 | U9143 | 10/22 | 3/4" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| HSD | 32 | U9144 | 11/22 | 114.3 x 6.02 | CS | 1 | 2 | | | | | | | 0.034 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 33 | U9144 | 11/22 | 1.0" | CS | | | | | | | 1 | 1 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HSD | 34 | U9144 | 11/22 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 35 | U9144 | 11/22 | 1.5" | CS | | | | | | | 2 | 2 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 36 | U9144 | 11/22 | 3/4" | CS | | | | | | | 3 | 3 | | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 37 | U9221 | 12/22 | 60.3 x 5.54 | CS | 26 | 52 | | | | | | | 0.836 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 38 | U9222 | 13/22 | 60.3 x 5.54 | CS | 33 | 66 | | | | | | | 1.490 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 39 | U9223 | 14/22 | 60.3 x 5.54 | CS | 36 | 72 | | 36 | | | | | 0.535 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 40 | U9224 | 15/22 | 60.3 x 5.54 | CS | 18 | 36 | | 18 | | | | | 0.325 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 41 | U9224 | 15/22 | 88.9 x 5.49 | CS | 16 | 32 | | 16 | | | | | 0.538 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 42 | U9225 | 16/22 | 60.3 x 5.54 | CS | 18 | 36 | | 18 | | | | | 0.421 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 43 | U9226 | 17/22 | 60.3 x 5.54 | CS | 31 | 62 | | 31 | | | | | 0.229 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 44 | U9227 | 18/22 | 60.3 x 5.54 | CS | 10 | 20 | | 10 | | | | | 0.289 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 45 | U9227 | 18/22 | 88.9 x 5.49 | CS | 13 | 26 | | 13 | | | | | 0.421 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 46 | U9228 | 19/22 | 60.3 x 5.54 | CS | 3 | 6 | | | | | | | 0.008 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 47 | U9228 | 19/22 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 48 | U9228 | 19/22 | 1.0" | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 49 | U9229 | 20/22 | 60.3 x 5.54 | CS | 7 | 14 | | 7 | | | | | 0.131 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 50 | U9229 | 20/22 | 1.0" | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 51 | U9229 | 20/22 | 3/4" | CS | | | | | | | 4 | 4 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 52 | U9230 | 21/22 | 114.3 x 6.02 | CS | 1 | 2 | | | | 2 | | | 0.011 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 53 | U9230 | 21/22 | 1.5" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| HSD | 54 | U9231 | 22/22 | 88.9 x 5.49 | CS | 1 | 2 | | 1 | | 1 | | | 0.029 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^{0}$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | 1 | U9106 | 1/62 | 168.3 x 7.11 | CS | 16 | 32 | | 16 | | | | | 1.15 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 2 | U9107 | 2/62 | 168.3 x 7.11 | CS | 3 | 6 | | 0 | | | | | 0.18 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 3 | U9107 | 2/62 | 3/4" | CS | | | | | | | 3 | 3 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 4 | U9108 | 3/62 | 168.3 x 7.11 | CS | 8 | 16 | | 8 | | | | | 0.3 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 5 | U9109 | 4/62 | 168.3 x 7.11 | CS | 17 | 34 | | | | | | | 2.88 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 6 | U9110 | 5/62 | 168.3 x 7.11 | CS | 1 | 2 | | | | | | | 0.046 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 7 | U9110 | 5/62 | 3/4" | CS | | | | | | | 3 | 3 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 8 | U9110 | 5/62 | 1.5" | CS | | | | | | | 2 | 2 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 9 | U9111 | 6/62 | 168.3 x 7.11 | CS | 3 | 6 | | 3 | | 3 | | | 0.067 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 10 | U9111 | 6/62 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 11 | U9111 | 6/62 | 1.0" | CS | | | | | | | 1 | 1 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 12 | U9112 | 7/62 | 168.3 x 7.11 | CS | 4 | 8 | | 4 | | | | | 0.183 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 13 | U9113 | 8/62 | 168.3 x 7.11 | CS | 2 | 4 | | | | | | | 0.339 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 14 | U9113 | 8/62 | 168.3 x 10.97 | CS | 2 | 4 | | | | | | | 0.097 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 15 | U9114 | 9/62 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.180 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 16 | U9114 | 9/62 | 168.3 x 10.97 | CS | 3 | 6 | | 3 | | | | | 0.176 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 17 | U9115 | 10/62 | 168.3 x 10.97 | CS | 2 | 4 | | 2 | | | | | 0.093 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 18 | U9115 | 10/62 | 1.0" | CS | | | | | | | 1 | 1 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 19 | U9116 | 11/62 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.074 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 20 | U9116 | 11/62 | 3/4" | CS | | | | | | | 3 | 3 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 21 | U9116 | 11/62 | 1.0" | CS | | | | | | | 1 | 1 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | 22 | U9117 | 12/62 | 60.3 x 5.54 | CS | 1 | 2 | | 1 | | | | | 0.046 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 23 | U9117 | 12/62 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 24 | U9117 | 12/62 | 1.0" | CS | | | | | | | 1 | 1 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 25 | U9118 | 13/62 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.091 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 26 | U9118 | 13/62 | 3/4" | CS | | | | | | | 6 | 6 | | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 27 | U9119 | 14/62 | 60.3 x 5.54 | CS | 5 | 10 | | 5 | | | | | 0.052 | B1A | 75 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 28 | U9120 | 15/62 | 168.3 x 10.97 | CS | 4 | 8 | | 4 | | | | | 0.218 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 29 | U9121 | 16/62 | 168.3 x 10.97 | CS | 2 | 4 | | 2 | | | | | 0.098 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 30 | U9121 | 16/62 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 31 | U9121 | 16/62 | 1.0" | CS | | | | | | | 1 | 1 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 32 | U9122 | 17/62 | 168.3 x 10.97 | CS | 1 | 2 | | | | | | | 0.066 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 33 | U9122 | 17/62 | 3/4" | CS | | | | | | | 1 | 1 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 34 | U9122 | 17/62 | 1.5" | CS | | | | | | | 5 | 5 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 35 | U9123 | 18/62 | 168.3 x 10.97 | CS | 4 | 8 | | | | | | | 0.353 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 36 | U9124 | 19/62 | 168.3 x 10.97 | CS | 2 | 4 | | 2 | | | | | 0.099 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 37 | U9124 | 19/62 | 3/4" | CS | | | | | | | 1 | 1 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 38 | U9124 | 19/62 | 1.5" | CS | | | | | | | 2 | 2 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 39 | U9124 | 19/62 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 40 | U9125 | 20/62 | 168.3 x 10.97 | CS | 2 | 4 | | 2 | | | | | 0.092 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 41 | U9126 | 21/62 | 60.3 x 5.54 | CS | 1 | 2 | | | | | | | 0.046 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 42 | U9126 | 21/62 | 1.0" | CS | | | | | | | 2 | 2 | | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 43 | U9127 | 22/62 | 60.3 x 5.54 | CS | 4 | 8 | | 4 | | | | | 0.056 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 44 | U9128 | 23/62 | 60.3 x 5.54 | CS | 4 | 8 | | 4 | | | | | 0.083 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 45 | U9129 | 24/62 | 168.3 x 7.11 | CS | 4 | 8 | | 4 | | | | | 0.112 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 46 | U9130 | 25/62 | 168.3 x 7.11 | CS | 1 | 2 | | | | | | | 0.041 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 47 | U9130 | 25/62 | 3/4" | CS | | | | | | | 5 | 5 | | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 48 | U9130 | 25/62 | 1.5" | CS | | | | | | | 1 | 1 | | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 49 | U9131 | 26/62 | 168.3 x 7.11 | CS | 10 | 20 | | 10 | | | | | 0.386 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 50 | U9132 | 27/62 | 168.3 x 7.11 | CS | 2 | 4 | | | | | | | 0.061 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | 51 | U9132 | 27/62 | 3/4" | CS | | | | | | | 1 | 1 | | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 52 | U9132 | 27/62 | 323.8 x 9.53 | CS | 1 | 2 | | | | | | | 0.026 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 53 | U9133 | 28/62 | 168.3 x 7.11 | CS | 1 | 2 | | 1 | | | | | 0.041 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 54 | U9133 | 28/62 | 1.0" | CS | | | | | | | 1 | 1 | | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 55 | U9145 | 29/62 | 168.3 x 10.97 | CS | 4 | 8 | | 4 | | 4 | | | 0.158 | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 56 | U9145 | 29/62 | 3/4" | CS | | | | | | | 4 | 4 | | D1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 57 | U9323 | 30/62 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | 2 | | | 0.056 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 58 | U9323 | 30/62 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 59 | U9323 | 30/62 | 323.8 x 9.53 | CS | 2 | 4 | 2 | 2 | | 2 | | | 0.24 | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 60 | U9323 | 30/62 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 61 | U9146 | 31/62 | 406.4 x 9.53 | CS | 1 | 2 | 1 | | | | | | 0.635 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 62 | U9146 | 31/62 | 1.0" | CS | | | | | | | 2 | 2 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 63 | U9146 | 31/62 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 64 | U9146 | 31/62 | 88.9 x 5.49 | CS | | | | | | | 3 | 3 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 65 | U9146 | 31/62 | 114.3 x 6.02 | CS | | | | | | | 2 | 2 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 66 | U9146 | 31/62 | 273 x 9.27 | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 67 | U9148 | 32/62 | 406.4 x 9.53 | CS | 1 | 2 | 1 | | | | | | 0.635 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 68 | U9148 | 32/62 | 1.0" | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 69 | U9148 | 32/62 | 114.3 x 6.02 | CS | | | | | | | 4 | 4 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 70 | U9148 | 32/62 | 219.1 x 8.18 | CS | | | | | | | 2 | 2 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 71 | U9149 | 33/62 | 406.4 x 9.53 | CS | 1 | 2 | 1 | | | | | | 0.598 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 72 | U9149 | 33/62 | 1.0" | CS | | | | | | | 3 | 3 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 73 | U9149 | 33/62 | 114.3 x 6.02 | CS | | | | | | | 3 | 3 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 74 | U9150 | 34/62 | 406.4 x 9.53 | CS | 2 | 4 | 2 | 2 | | | | | 0.827 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 75 | U9151 | 35/62 | 406.4 x 9.53 | CS | 1 | 2 | | 1 | | | | | 0.113 | A11A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 76 | U9151 | 35/62 | 114.3 x 6.02 | CS | 15 | 30 | | 15 | | | | | 0.411 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | 77 | U9151 | 35/62 | 60.3 x 5.54 | CS | 19 | 38 | | 19 | | | | | 0.298 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 78 | U9151 | 35/62 | 88.9 x 5.49 | CS | 4 | 8 | | 4 | | | | | 0.074 | A11A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 79 | U9151 | 35/62 | 219.1 x 8.18 | CS | 8 | 16 | | 8 | | | | | 0.488 | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 80 | U9151 | 35/62 | 273 x 9.27 | CS | 4 | 8 | | 4 | | | | | 0.249 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 81 | U9152 | 36/62 | 60.3 x 5.54 | CS | 1 | 2 | | 1 | | 1 | | | 0.017 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 82 | U9153 | 37/62 | 114.3 x 6.02 | CS | 16 | 32 | | 16 | | | | | 0.332 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 83 | U9153 | 37/62 | 60.3 x 5.54 | CS | 12 | 24 | | 12 | | | | | 0.095 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 84 | U9153 | 37/62 | 219.1 x 8.18 | CS | 4 | 8 | | 4 | | | | | 0.156 | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 85 | U9153 | 37/62 | 273 x 9.27 | CS | 4 | 8 | | 4 | | | | | 0.484 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 86 | U9154 | 38/62 | 60.3 x 5.54 | CS | 2 | 4 | | | | 2 | | | 0.005 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 87 | U9154 | 38/62 | 3/4" | CS | | | | | | | 2 | 2 | | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 88 | U9154 | 38/62 | 168.3 x 7.11 | CS | 2 | 4 | | | | 2 | | | 0.025 | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 89 | U9154 | 38/62 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 90 | U9154 | 38/62 | 219.1 x 8.18 | CS | 2 | 4 | | | | 2 | | | 0.035 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 91 | U9154 | 38/62 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 92 | U9155 | 39/62 | 60.3 x 5.54 | CS | 18 | 36 | | | | | | | 0.596 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 93 | U9155 | 39/62 | 168.3 x 7.11 | CS | 2 | 4 | | | | | | | 0.051 | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 94 | U9156 | 40/62 | 114.3 x 6.02 | CS | 12 | 24 | | | | 6 | | | 0.069 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 95 | U9156 | 40/62 | 3/4" | CS | | | | | | | 6 | 6 | | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 96 | U9156 | 40/62 | 60.3 x 5.54 | CS | 8 | 16 | | | | 4 | | | 0.016 | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 97 | U9156 | 40/62 | 3/4" | CS | | | | | | | 4 | 4 | | D1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 98 | U9156 | 40/62 | 219.1 x 8.18 | CS | 4 | 8 | | | | 2 | | | 0.089 | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 99 | U9156 | 40/62 | 3/4" | CS | | | | | | | 2 | 2 | | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 100 | U9156 | 40/62 | 273 x 9.27 | CS | 4 | 8 | | | | 2 | | | 0.169 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 101 | U9156 | 40/62 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 102 | U9156 | 40/62 | 88.9 x 5.49 | CS | 2 | 4 | | | | 1 | | | 0.012 | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 103 | U9156 | 40/62 | 3/4" | CS | | | | | | | 1 | 1 | | B1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 104 | U9177 | 41/62 | 114.3 x 6.02 | CS | 1 | 2 | | 1 | | | | | 0.049 | A11A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 105 | U9177 | 41/62 | 1.0" | CS | | | | | | | 4 | 4 | | A11A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Natural Gas | 106 | U9157 | 42/62 | 406.4 x 9.53 | CS | 6 | 12 | | 6 | | | | | 2.098 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 107 | U9158 | 43/62 | 406.4 x 9.53 | CS | 1 | 2 | 1 | 1 | | | | | 0.147 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | 108 | U9159 | 44/62 | 406.4 x 9.53 | CS | 1 | 2 | 2 | | | | | | 0.581 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 109 | U9159 | 44/62 | 88.9 x 5.49 | CS | | | | | | | 2 | 2 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 110 | U9160 | 45/62 | 406.4 x 9.53 | CS | 1 | 2 | 1 | | | | | | 0.284 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 111 | U9160 | 45/62 | 3/4" | CS | | | | | | | 2 | 2 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 112 | U9160 | 45/62 | 1.0" | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 113 | U9161 | 46/62 | 406.4 x 9.53 | CS | 1 | 2 | | 1 | | | | | 0.159 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 114 | U9161 | 46/62 | 3/4" | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 115 | U9162 | 47/62 | 406.4 x 9.53 | CS | 3 | 6 | 1 | | | | | | 1.174 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 116 | U9163 | 48/62 | 60.3 x 5.54 | CS | 18 | 36 | | | | 2 | | | 0.677 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 117 | U9164 | 49/62 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.004 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 118 | U9164 | 49/62 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 119 | U9165 | 50/62 | 60.3 x 5.54 | CS | 21 | 42 | | 21 | | | | | 0.354 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 120 | U9167 | 51/62 | 323.8 x 9.53 | CS | 4 | 8 | 2 | 4 | | | | | 0.400 | A1A | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 121 | U9168 | 52/62 | 323.8 x 9.53 | CS | 10 | 20 | 2 | 10 | | | | | 2.172 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 122 | U9169 | 53/62 | 323.8 x 9.53 | CS | 1 | 2 | 1 | | | | | | 0.444 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 123 | U9169 | 53/62 | 3/4" | CS | | | | | | | 5 | 5 | | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 124 | U9169 | 53/62 | 1.5" | CS | | | | | | | 1 | 1 | | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 125 | U9169 | 53/62 | 219.1 x 8.18 | CS | | | | | | | 2 | 2 | | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 126 | U9170 | 54/62 | 323.8 x 9.53 | CS | 5 | 10 | 4 | | | | | | 2.246 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 127 | U9171 | 55/62 | 168.3 x 3.4 | SS | 20 | 40 | 6 | 20 | | | | | 0.659 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 128 | U9172 | 56/62 | 168.3 x 3.4 | SS | 8 | 16 | 5 | 8 | | | | | 0.411 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 129 | U9173 | 57/62 | 88.9 x 3.05 | SS | 1 | 2 | 1 | 1 | | | | | 0.005 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 130 | U9173 | 57/62 | 3/4" | SS | | | | | | | 1 | 1 | | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 131 | U9174 | 58/62 | 88.9 x 3.05 | SS | 1 | 2 | 1 | | | | | | 0.003 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 132 | U9174 | 58/62 | 3/4" | SS | | | | | | | 1 | 1 | | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 133 | U9175 | 59/62 | 168.3 x 3.4 | SS | 11 | 22 | 6 | | | 2 | | | 0.609 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |
| Natural Gas | 134 | U9176 | 60/62 | 168.3 x 3.4 | SS | 2 | 4 | 2 | 2 | | | | | 0.103 | B1K | 100 | 1 coat of F-15@75µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | 135 | U9147 | 61/62 | 406.4 x 9.53 | CS | 1 | 2 | | | | | | | 0.484 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 136 | U9147 | 61/62 | 273 x 9.27 | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 137 | U9147 | 61/62 | 114.3 x 6.02 | CS | | | | | | | 1 | 1 | | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Natural Gas | 138 | U9166 | 62/62 | 60.3 x 5.54 | CS | 2 | 4 | | 2 | | | | | 0.018 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 1 | U9178 | 1/31 | 114.3 X 6.02 | CS | 29 | 58 | | | | | | | 0.819 | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 2 | U9178 | 1/31 | 3/4" | CS | | | | | | | 5 | 5 | | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 3 | U9179 | 2/31 | 114.3 X 6.02 | CS | 29 | 58 | | 29 | | | | | 1.123 | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 4 | U9179 | 2/31 | 3/4" | CS | | | | | | | 8 | 8 | | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 5 | U9180 | 3/31 | 114.3 X 6.02 | CS | 34 | 68 | | 34 | | | | | 0.927 | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 6 | U9180 | 3/31 | 3/4" | CS | | | | | | | 5 | 5 | | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 7 | U9180 | 3/31 | 1.5" | CS | | | | | | | 4 | 4 | | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 8 | U9181 | 4/31 | 114.3 X 6.02 | CS | 10 | 20 | | | | 10 | | | 0.065 | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 9 | U9181 | 4/31 | 3/4" | CS | | | | | | | 8 | 8 | | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 10 | U9182 | 5/31 | 114.3 X 6.02 | CS | 6 | 12 | | 6 | | 6 | | | 0.075 | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 11 | U9182 | 5/31 | 3/4" | CS | | | | | | | 4 | 4 | | B1A,A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 12 | U9183 | 6/31 | 114.3 X 6.02 | CS | 2 | 4 | | 2 | | 1 | | | 0.025 | B1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 13 | U9184 | 7/31 | 114.3 X 6.02 | CS | 1 | 2 | | | | | | | 0.035 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 14 | U9184 | 7/31 | 3/4" | CS | | | | | | | 3 | 3 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 15 | U9184 | 7/31 | 1.5" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 16 | U9184 | 7/31 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 17 | U9185 | 8/31 | 114.3 X 6.02 | CS | 1 | 2 | | | | 1 | | | 0.013 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 18 | U9185 | 8/31 | 3/4" | CS | | | | | | 1 | 1 | | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 19 | U9185 | 8/31 | 60.3 x 5.54 | CS | | | | | | 1 | 1 | | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Naphtha | 20 | U9186 | 9/31 | 60.3 x 5.54 | CS | 13 | 26 | | 13 | | | | | 0.053 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 21 | U9186 | 9/31 | 60.3 x 3.91 | SS | 2 | 4 | | 2 | | | | | 0.003 | A1A | 65 | |
| Naphtha | 22 | U9187 | 10/31 | 60.3 x 5.54 | CS | 14 | 28 | | | | | | | 0.13 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 23 | U9187 | 10/31 | 60.3 x 3.91 | SS | 2 | 4 | 1 | | | | | | 0.006 | A1A | 65 | |
| Naphtha | 24 | U9188 | 11/31 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.068 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 25 | U9188 | 11/31 | 1.0" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 26 | U9189 | 12/31 | 60.3 x 5.54 | CS | 7 | 14 | | | | | | | 0.15 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 27 | U9189 | 12/31 | 0.5" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 28 | U9189 | 12/31 | 3/4" | CS | | | | | | | 9 | 9 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 29 | U9189 | 12/31 | 1.0" | CS | | | | | | | 5 | 5 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 30 | U9190 | 13/31 | 60.3 x 5.54 | CS | 2 | 4 | | 2 | | | | | 0.003 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 31 | U9190 | 13/31 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 32 | U9191 | 14/31 | 114.3 x 3.05 | SS | 14 | 28 | | 14 | | | | | 0.22 | A1K | 65 | |
| Naphtha | 33 | U9191 | 14/31 | 88.9 x 3.05 | SS | 1 | 2 | | 1 | | | | | 0.009 | A1K | 65 | |
| Naphtha | 34 | U9192 | 15/31 | 114.3 x 3.05 | SS | 13 | 26 | 19 | 13 | | | | | 0.515 | A1K | 65 | |
| Naphtha | 35 | U9193 | 16/31 | 114.3 x 3.05 | SS | 16 | 32 | 15 | | | | | | 0.508 | A1K | 65 | |
| Naphtha | 36 | U9193 | 16/31 | 3/4" | SS | | | | | | | 3 | 3 | | A1K | 65 | |
| Naphtha | 37 | U9193 | 16/31 | 1.0" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Naphtha | 38 | U9193 | 16/31 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Naphtha | 39 | U9194 | 17/31 | 114.3 x 3.05 | SS | 12 | 24 | | | | | | | 0.185 | A1K | 65 | |
| Naphtha | 40 | U9194 | 17/31 | 88.9 x 3.05 | SS | 1 | 2 | | | | | | | 0.002 | A1K | 65 | |
| Naphtha | 41 | U9195 | 18/31 | 114.3 x 3.05 | SS | 2 | 4 | 1 | 2 | | | | | 0.01 | A1K | 65 | |
| Naphtha | 42 | U9195 | 18/31 | 3/4" | SS | | | | | | | 2 | 2 | | A1K | 65 | |
| Naphtha | 43 | U9279 | 19/31 | 114.3 x 3.05 | SS | 2 | 4 | 2 | 1 | | | | | 0.012 | A1K | 65 | |
| Naphtha | 44 | U9279 | 19/31 | 3/4" | SS | | | | | | | 3 | 3 | | A1K | 65 | |
| Naphtha | 45 | U9196 | 20/31 | 60.3 x 3.91 | SS | 2 | 4 | 1 | 2 | | | | | 0.006 | A1K | 65 | |
| Naphtha | 46 | U9197 | 21/31 | 60.3 x 3.91 | SS | 2 | 4 | 1 | 2 | | 1 | | | 0.005 | A1K | 65 | |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Naphtha | 47 | U9198 | 22/31 | 60.3 x 5.54 | CS | 18 | 36 | | 18 | | | | | 0.36 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 48 | U9199 | 23/31 | 60.3 x 5.54 | CS | 8 | 16 | | 8 | | | | | 0.124 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 49 | U9200 | 24/31 | 60.3 x 5.54 | CS | 13 | 26 | | | | | | | 0.4 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 50 | U9201 | 25/31 | 60.3 x 5.54 | CS | 4 | 8 | | | | | | | 0.044 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 51 | U9201 | 25/31 | 3/4" | CS | | | | | | | 3 | 3 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 52 | U9201 | 25/31 | 1.0" | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 53 | U9202 | 26/31 | 60.3 x 5.54 | CS | 28 | 56 | | 28 | | | | | 0.450 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 54 | U9203 | 27/31 | 88.9 x 5.49 | CS | 8 | 16 | | 1 | | | | | 0.437 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 55 | U9204 | 28/31 | 88.9 x 5.49 | CS | 15 | 30 | | 15 | | | | | 0.560 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 56 | U9205 | 29/31 | 88.9 x 5.49 | CS | 16 | 32 | | 16 | | | | | 0.458 | A11A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 57 | U9206 | 30/31 | 60.3 x 5.54 | CS | 1 | 2 | | | | | | | 0.041 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 58 | U9206 | 30/31 | 0.5" | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 59 | U9206 | 30/31 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 60 | U9206 | 30/31 | 1.0" | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Naphtha | 61 | U9207 | 31/31 | 60.3 x 5.54 | CS | 3 | 6 | | 3 | | | | | 0.015 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Condensate | 1 | U9210 | 1/56 | 273 x 9.27 | CS | 5 | 10 | 5 | 5 | | | | | 1.097 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 2 | U9210 | 1/56 | 323.9 x 4.57 | SS | 1 | 2 | 1 | 1 | | | | | 0.063 | A1K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 3 | U9211 | 2/56 | 273 x 9.27 | CS | 3 | 6 | 2 | | | | | | 0.764 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 4 | U9212 | 3/56 | 273 x 9.27 | CS | 2 | 4 | 1 | 2 | | | | | 0.308 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 5 | U9212 | 3/56 | 3/4" | CS | | | | | | | 1 | 1 | | A1K | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 6 | U9213 | 4/56 | 273 x 9.27 | CS | 5 | 10 | | 5 | | | | | 0.891 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 7 | U9213 | 4/56 | 323.9 x 4.57 | SS | 2 | 4 | | 2 | | | | | 0.157 | A1A | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 8 | U9214 | 5/56 | 273 x 9.27 | CS | 1 | 2 | | 1 | | | | | 0.282 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 9 | U9214 | 5/56 | | CS | | | | | | | 2 | 2 | | A1K | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 10 | U9214 | 5/56 | 1.5" | CS | | | | | | | 2 | 2 | | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 11 | U9215 | 6/56 | 273 x 9.27 | CS | 7 | 14 | 3 | 7 | | | | | 0.840 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Condensate | 12 | U9215 | 6/56 | 323.9 x 4.57 | SS | 2 | 4 | | 2 | | | | | 0.060 | A1K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 13 | U9216 | 7/56 | 273 x 9.27 | CS | 2 | 4 | 2 | | | 2 | | | 0.097 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 14 | U9216 | 7/56 | 3/4" | CS | | | | | | | 2 | 2 | | A1K | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 15 | U9217 | 8/56 | 273 x 9.27 | CS | 3 | 6 | 1 | 3 | | 2 | | | 0.279 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 16 | U9217 | 8/56 | 3/4" | CS | | | | | | | 3 | 3 | | A1K | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 17 | U9218 | 9/56 | 273 x 9.27 | CS | 1 | 2 | | | | | | | 0.067 | A1A | 125 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 18 | U9218 | 9/56 | 323.9 x 4.57 | SS | 3 | 6 | | 1 | | | | | 0.480 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 19 | U9218 | 9/56 | 1.5" | SS | | | | | | | 2 | 2 | | A1A | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 20 | U9218 | 9/56 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A1K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 21 | U9218 | 9/56 | 88.9 x 5.49 | SS | | | | | | | 1 | 1 | | A1K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 22 | U9219 | 10/56 | 323.9 x 4.57 | SS | 2 | 4 | 1 | 2 | | | | | 0.066 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 23 | U9220 | 11/56 | 323.9 x 4.57 | SS | 1 | 2 | | 1 | | | | | 0.103 | A1K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 24 | U9220 | 11/56 | 3/4" | SS | | | | | | | 2 | 2 | | A1K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 25 | U9220 | 11/56 | 1.5" | SS | | | | | | | 2 | 2 | | A1A | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 26 | U9232 | 12/56 | 323.9 x 4.57 | SS | 1 | 2 | 1 | 1 | | 1 | | | 0.100 | A3K | 65 | |
| Condensate | 27 | U9233 | 13/56 | 323.9 x 4.57 | SS | 6 | 12 | 3 | | | | | | 0.901 | A3K | 65 | |
| Condensate | 28 | U9233 | 13/56 | 168.3 x 3.4 | SS | 3 | 6 | | | | | | | 0.100 | A3K | 65 | |
| Condensate | 29 | U9234 | 14/56 | 323.9 x 4.57 | SS | 4 | 8 | | 2 | | | | | 0.316 | A3K | 65 | |
| Condensate | 30 | U9234 | 14/56 | 3/4" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Condensate | 31 | U9234 | 14/56 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Condensate | 32 | U9234 | 14/56 | 168.3 x 3.4 | SS | 2 | 4 | | 2 | | | | | 0.072 | A3K | 65 | |
| Condensate | 33 | U9235 | 15/56 | 323.9 x 4.57 | SS | 1 | 2 | | 1 | | | | | 0.229 | A3K | 65 | |
| Condensate | 34 | U9235 | 15/56 | 3/4" | SS | | | | | | | 2 | 2 | | A1K | 65 | |
| Condensate | 35 | U9235 | 15/56 | 1.5" | SS | | | | | | | 2 | 2 | | A1A | 65 | |
| Condensate | 36 | U9236 | 16/56 | 323.9 x 4.57 | SS | 8 | 16 | 1 | 8 | | | | | 0.865 | A3K | 65 | |
| Condensate | 37 | U9236 | 16/56 | 168.3 x 3.4 | SS | 3 | 6 | 3 | 3 | | | | | 0.205 | A3K | 65 | |
| Condensate | 38 | U9236 | 16/56 | 60.3 x 3.91 | SS | 12 | 24 | 8 | 12 | | | | | 0.198 | A1K | 65 | |
| Condensate | 39 | U9237 | 17/56 | 323.9 x 4.57 | SS | 2 | 4 | 4 | | | | | | 0.435 | A3K | 65 | |
| Condensate | 40 | U9237 | 17/56 | 60.3 x 3.91 | SS | 6 | 12 | 12 | | | | | | 0.200 | A1K | 65 | |
| Condensate | 41 | U9238 | 18/56 | 323.9 x 4.57 | SS | 1 | 2 | 1 | 1 | | | | | 0.214 | A3K | 65 | |
| Condensate | 42 | U9238 | 18/56 | 1.0" | SS | | | | | | | 2 | 2 | | A1K | 65 | |
| Condensate | 43 | U9239 | 19/56 | 323.9 x 4.57 | SS | 2 | 4 | 1 | | | 1 | | | 0.203 | A3K | 65 | |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Condensate | 44 | U9239 | 19/56 | 3/4" | SS | | | | | | | 2 | 2 | | A1K | 65 | |
| Condensate | 45 | U9239 | 19/56 | 168.3 x 3.4 | SS | 1 | 2 | 1 | | | 1 | | | 0.014 | A3K | 65 | |
| Condensate | 46 | U9239 | 19/56 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Condensate | 47 | U9240 | 20/56 | 323.9 x 4.57 | SS | 4 | 8 | 2 | 4 | | 1 | | | 0.251 | A3K | 65 | |
| Condensate | 48 | U9240 | 20/56 | 168.3 x 3.4 | SS | 8 | 16 | 6 | 8 | | 1 | | | 0.295 | A3K | 65 | |
| Condensate | 49 | U9241 | 21/56 | 323.9 x 4.57 | SS | 1 | 2 | 1 | 1 | | 1 | | | 0.08 | A3K | 65 | |
| Condensate | 50 | U9241 | 21/56 | 3/4" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Condensate | 51 | U9241 | 21/56 | 168.3 x 3.4 | SS | 1 | 2 | 1 | 1 | | 1 | | | 0.018 | A3K | 65 | |
| Condensate | 52 | U9241 | 21/56 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Condensate | 53 | U9242 | 22/56 | 168.3 x 3.4 | SS | 2 | 4 | | 2 | | 1 | | | 0.054 | A3K | 65 | |
| Condensate | 54 | U9242 | 22/56 | 60.3 x 3.91 | SS | 8 | 16 | 2 | 8 | | | | | 0.061 | A1K | 65 | |
| Condensate | 55 | U9243 | 23/56 | 168.3 x 3.4 | SS | 2 | 4 | 1 | 2 | | | | | 0.012 | A3K | 65 | |
| Condensate | 56 | U9243 | 23/56 | 1.0" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Condensate | 57 | U9244 | 24/56 | 168.3 x 3.4 | SS | 1 | 2 | 2 | 1 | | | | | 0.087 | A3K | 65 | |
| Condensate | 58 | U9244 | 24/56 | 60.3 x 3.91 | SS | 6 | 12 | 12 | 6 | | | | | 0.175 | A1K | 65 | |
| Condensate | 59 | U9245 | 25/56 | 323.9 x 4.57 | SS | 1 | 2 | | | | | | | 0.219 | A3K | 65 | |
| Condensate | 60 | U9245 | 25/56 | 1.0" | SS | | | | | | | 1 | 1 | | A1K | 65 | |
| Condensate | 61 | U9245 | 25/56 | 60.3 x 3.91 | SS | | | | | | | 2 | 2 | | A1K | 65 | |
| Condensate | 62 | U9246 | 26/56 | 60.3 x 3.91 | SS | 9 | 18 | 8 | 9 | | | | | 0.117 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 63 | U9247 | 27/56 | 60.3 x 3.91 | SS | 6 | 12 | 4 | 2 | | | | | 0.159 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 64 | U9247 | 27/56 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 65 | U9248 | 28/56 | 60.3 x 3.91 | SS | 13 | 26 | | 13 | | | | | 0.080 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 66 | U9249 | 29/56 | 60.3 x 3.91 | SS | 4 | 8 | | | | 1 | | | 0.037 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 67 | U9249 | 29/56 | 114.3 x 3.05 | SS | 1 | 2 | | | | 1 | | | 0.012 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 68 | U9249 | 29/56 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 69 | U9249 | 29/56 | 1.5" | SS | | | | | | | 2 | 2 | | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 70 | U9250 | 30/56 | 60.3 x 3.91 | SS | 7 | 14 | 6 | 7 | | | | | 0.117 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 71 | U9251 | 31/56 | 60.3 x 3.91 | SS | 7 | 14 | 14 | | | | | | 0.193 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 72 | U9252 | 32/56 | 60.3 x 3.91 | SS | 4 | 8 | 2 | 4 | | | | | 0.023 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 73 | U9253 | 33/56 | 60.3 x 3.91 | SS | 1 | 2 | | 1 | | | | | 0.022 | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 74 | U9253 | 33/56 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 185 | 1 coat of F-16@125µ DFT/Coat |
| Condensate | 75 | U9254 | 34/56 | 219.1 x 3.76 | SS | 2 | 4 | | | | | | | 0.033 | A3K | 70 | |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Condensate | 76 | U9254 | 34/56 | 3/4" | SS | | | | | | | 6 | 6 | | A3K | 70 | |
| Condensate | 77 | U9255 | 35/56 | 219.1 x 3.76 | SS | 4 | 8 | 2 | 4 | | | | | 0.07 | A3K | 70 | |
| Condensate | 78 | U9255 | 35/56 | 3/4" | SS | | | | | | | 4 | 4 | | A3K | 70 | |
| Condensate | 79 | U9256 | 36/56 | 219.1 x 3.76 | SS | 4 | 8 | 2 | 2 | | | | | 0.05 | A3K | 70 | |
| Condensate | 80 | U9257 | 37/56 | 114.3 x 3.05 | SS | 5 | 10 | | 5 | | 2 | | | 0.036 | A3K | 70 | |
| Condensate | 81 | U9258 | 38/56 | 114.3 x 3.05 | SS | 3 | 6 | 3 | 3 | | | | | 0.031 | A3K | 70 | |
| Condensate | 82 | U9259 | 39/56 | 114.3 x 3.05 | SS | 3 | 6 | 3 | | | | | | 0.045 | A3K | 70 | |
| Condensate | 83 | U9260 | 40/56 | 114.3 x 3.05 | SS | 4 | 8 | | 4 | | | | | 0.018 | A3K | 70 | |
| Condensate | 84 | U9261 | 41/56 | 168.3 x 3.4 | SS | 17 | 34 | | 17 | | | | | 0.389 | A3K | 70 | |
| Condensate | 85 | U9261 | 41/56 | 60.3 x 3.91 | SS | 20 | 40 | | 20 | | | | | 0.138 | A1K | 70 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 86 | U9262 | 42/56 | 168.3 x 3.4 | SS | 2 | 4 | | 2 | | | | | 0.038 | A3K | 70 | |
| Condensate | 87 | U9262 | 42/56 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 70 | |
| Condensate | 88 | U9263 | 43/56 | 168.3 x 3.4 | SS | 12 | 24 | 12 | 12 | | | | | 0.388 | A3K | 70 | |
| Condensate | 89 | U9263 | 43/56 | 60.3 x 3.91 | SS | 15 | 30 | 14 | 15 | | | | | 0.219 | A1K | 70 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 90 | U9264 | 44/56 | 168.3 x 3.4 | SS | 8 | 16 | 4 | 8 | | | | | 0.106 | A3K | 70 | |
| Condensate | 91 | U9264 | 44/56 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A1K | 70 | |
| Condensate | 92 | U9265 | 45/56 | 168.3 x 3.4 | SS | 2 | 4 | 4 | | | | | | 0.170 | A3K | 70 | |
| Condensate | 93 | U9265 | 45/56 | 60.3 x 3.91 | SS | 19 | 38 | 33 | | | | | | 0.607 | A1K | 70 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 94 | U9266 | 46/56 | 168.3 x 3.4 | SS | 1 | 2 | | 1 | | | | | 0.051 | A3K | 70 | |
| Condensate | 95 | U9266 | 46/56 | 3/4" | SS | | | | | | | 3 | 3 | | A1K | 70 | |
| Condensate | 96 | U9266 | 46/56 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A1K | 70 | |
| Condensate | 97 | U9267 | 47/56 | 168.3 x 3.4 | SS | 6 | 12 | | 2 | | | | | 0.142 | A3K | 70 | |
| Condensate | 98 | U9267 | 47/56 | 60.3 x 3.91 | SS | 3 | 6 | | 2 | | | | | 0.043 | A1K | 70 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 99 | U9268 | 48/56 | 60.3 x 3.91 | SS | 5 | 10 | 10 | 5 | | | | | 0.148 | A1K | 70 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 100 | U9269 | 49/56 | 168.3 x 3.4 | SS | 2 | 4 | 1 | | | 2 | | | 0.015 | A3K | 70 | |
| Condensate | 101 | U9269 | 49/56 | 60.3 x 3.91 | SS | 1 | 2 | 3 | 1 | | | | | 0.029 | A1K | 70 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 102 | U9272 | 50/56 | 168.3 x 3.4 | SS | 9 | 18 | | 5 | | | | | 0.207 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 103 | U9273 | 51/56 | 168.3 x 3.4 | SS | 6 | 12 | 3 | 6 | | | | | 0.180 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 104 | U9273 | 51/56 | 323.9 x 4.57 | SS | 2 | 4 | 2 | 2 | | | | | 0.318 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 105 | U9274 | 52/56 | 168.3 x 3.4 | SS | 3 | 6 | 2 | 3 | | | | | 0.110 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 106 | U9274 | 52/56 | 323.9 x 4.57 | SS | 2 | 4 | | 2 | | | | | 0.109 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 107 | U9275 | 53/56 | 168.3 x 3.4 | SS | 2 | 4 | 2 | | | 2 | | | 0.019 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Condensate | 108 | U9275 | 53/56 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 109 | U9276 | 54/56 | 168.3 x 3.4 | SS | 2 | 4 | 2 | 2 | | 2 | | | 0.032 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 110 | U9276 | 54/56 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 111 | U9277 | 55/56 | 323.9 x 4.57 | SS | 3 | 6 | 2 | 2 | | | | | 0.348 | A3K | 117 | 1 coat of F-15@75µ DFT/Coat |
| Condensate | 112 | U9278 | 56/56 | 219.1 x 8.18 | CS | 8 | 16 | | 8 | | | | | 0.267 | A1A | 125 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 1 | U9280 | 1/37 | 168.3 x 7.11 | CS | 2 | 4 | | 0 | | | | | 0.044 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 2 | U9280 | 1/37 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 3 | U9281 | 2/37 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.057 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 4 | U9281 | 2/37 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 5 | U9282 | 3/37 | 168.3 x 7.11 | CS | 7 | 14 | | 7 | | | | | 0.268 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 6 | U9283 | 4/37 | 88.9 x 5.49 | CS | 21 | 42 | | 21 | | | | | 0.646 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 7 | U9283 | 4/37 | 60.3 x 5.54 | CS | 6 | 12 | | 6 | | | | | 0.114 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 8 | U9284 | 5/37 | 88.9 x 5.49 | CS | 4 | 8 | | 4 | | | | | 0.035 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 9 | U9284 | 5/37 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 10 | U9285 | 6/37 | 88.9 x 5.49 | CS | 20 | 40 | | 40 | | | | | 0.367 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 11 | U9286 | 7/37 | 88.9 x 5.49 | CS | 15 | 30 | | | | | | | 0.774 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 12 | U9286 | 7/37 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.005 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 13 | U9287 | 8/37 | 88.9 x 5.49 | CS | 1 | 2 | | | | | | | 0.028 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 14 | U9287 | 8/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 15 | U9287 | 8/37 | 60.3 x 5.54 | CS | 1 | 2 | | 1 | | 1 | | | 0.022 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 16 | U9288 | 9/37 | 88.9 x 5.49 | CS | 4 | 8 | | 2 | | 3 | | | 0.036 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 17 | U9288 | 9/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 18 | U9288 | 9/37 | 60.3 x 5.54 | CS | 3 | 6 | | 2 | | 2 | | | 0.023 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 19 | U9288 | 9/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 20 | U9289 | 10/37 | 60.3 x 5.54 | CS | 2 | 4 | | 2 | | 1 | | | 0.005 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 21 | U9289 | 10/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 22 | U9290 | 11/37 | 88.9 x 5.49 | CS | 1 | 2 | | 1 | | 1 | | | 0.008 | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 23 | U9290 | 11/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 150 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 24 | U9291 | 12/37 | 60.3 x 5.54 | CS | 4 | 8 | | | | | | | 0.013 | A1A | 113 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 25 | U9291 | 12/37 | 3/4" | CS | | | | | | | 4 | 4 | | A1A | 113 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 26 | U9292 | 13/37 | 60.3 x 5.54 | CS | 5 | 10 | | 5 | | | | | 0.030 | A1A | 113 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 27 | U9293 | 14/37 | 60.3 x 5.54 | CS | 4 | 8 | | 4 | | 1 | | | 0.017 | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atom-Blowdown | 28 | U9294 | 15/37 | 60.3 x 5.54 | CS | 6 | 12 | | | | | | | 0.062 | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 29 | U9294 | 15/37 | 114.3 x 6.02 | CS | 1 | 2 | | | | 1 | | | 0.010 | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 30 | U9294 | 15/37 | 1 1/4" | CS | | | | | | | 1 | 1 | | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 31 | U9294 | 15/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 32 | U9295 | 16/37 | 60.3 x 5.54 | CS | 3 | 6 | | 3 | | 1 | | | 0.025 | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 33 | U9295 | 16/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 34 | U9296 | 17/37 | 60.3 x 5.54 | CS | 4 | 8 | | 4 | | | | | 0.007 | A1A | 148 | 1 coat of F-12@20µ DFT/Coat |
| Atom-Blowdown | 35 | U9279 | 18/37 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.190 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 36 | U9279 | 18/37 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 37 | U9297 | 19/37 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.008 | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 38 | U9297 | 19/37 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 39 | U9298 | 20/37 | 60.3 x 5.54 | CS | 6 | 12 | | 6 | | | | | 0.035 | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 40 | U9298 | 20/37 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 41 | U9299 | 21/37 | 60.3 x 5.54 | CS | 6 | 12 | | 6 | | 1 | | | 0.074 | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 42 | U9300 | 22/37 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | 1 | | | 0.043 | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 43 | U9300 | 22/37 | 60.3 x 5.54 | CS | | | | | | | 1 | 1 | | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 44 | U9301 | 23/37 | 168.3 x 7.11 | CS | 4 | 8 | | 3 | | | | | 0.150 | A1A | 114 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 45 | U9302 | 24/37 | 168.3 x 7.11 | CS | 5 | 10 | | 5 | | | | | 0.294 | A1A | 115 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 46 | U9303 | 25/37 | 168.3 x 7.11 | CS | 9 | 19 | | 9 | | | | | 0.666 | A1A | 115 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 47 | U9303 | 25/37 | 60.3 x 5.54 | CS | | | | | | | 2 | 2 | | A1A | 115 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 48 | U9303 | 25/37 | 60.3 x 5.54 | CS | 2 | 4 | | 2 | | | | | 0.045 | A1A | 115 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 49 | U9304 | 26/37 | 168.3 x 7.11 | CS | 3 | 6 | | 2 | | | | | 0.169 | A1A | 115 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 50 | U9304 | 26/37 | 60.3 x 5.54 | CS | 4 | 8 | | 4 | | | | | 0.051 | A1A | 115 | 1 coat of F-15@75µ DFT/Coat |
| Atom-Blowdown | 51 | U9305 | 27/37 | 88.9 x 5.49 | CS | 5 | 10 | | 5 | | 1 | | | 0.041 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 52 | U9306 | 28/37 | 88.9 x 5.49 | CS | 4 | 8 | | | | 2 | | | 0.016 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 53 | U9306 | 28/37 | 3/4" | CS | | | | | | | 4 | 4 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 54 | U9307 | 29/37 | 60.3 x 5.54 | CS | 22 | 44 | | | | | | | 0.817 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 55 | U9307 | 29/37 | 88.9 x 5.49 | CS | 1 | 2 | | | | 2 | | | 0.025 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 56 | U9308 | 30/37 | 60.3 x 5.54 | CS | 14 | 28 | | 14 | | | | | 0.124 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 57 | U9309 | 31/37 | 60.3 x 5.54 | CS | 18 | 36 | | 18 | | | | | 0.432 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 58 | U9310 | 32/37 | 60.3 x 5.54 | CS | 3 | 6 | | 2 | | 1 | | | 0.015 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atom-Blowdown | 59 | U9310 | 32/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 60 | U9311 | 33/37 | 114.3 x 6.02 | CS | 1 | 2 | | | | 1 | | | 0.015 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 61 | U9311 | 33/37 | 3/4" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 62 | U9311 | 33/37 | 1.5" | CS | | | | | | | 2 | 2 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 63 | U9312 | 34/37 | 60.3 x 5.54 | CS | 3 | 6 | | 3 | | 1 | | | 0.059 | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 64 | U9312 | 34/37 | 3/4" | CS | | | | | | | 1 | 1 | | A1A | 100 | 1 Coat of F-9 @ 75µ DFT/Coat |
| Atom-Blowdown | 65 | U9313 | 35/37 | 114.3 x 6.02 | CS | 4 | 8 | | 4 | | | | | 0.075 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 66 | U9313 | 35/37 | 168.3 x 7.11 | CS | 12 | 24 | | 24 | | | | | 0.273 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 67 | U9313 | 35/37 | 60.3 x 5.54 | CS | 6 | 12 | | 6 | | | | | 0.065 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 68 | U9314 | 36/37 | 114.3 x 6.02 | CS | 1 | 2 | | 1 | | | | | 0.010 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 69 | U9314 | 36/37 | 168.3 x 7.11 | CS | 10 | 20 | | 10 | | | | | 0.705 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 70 | U9314 | 36/37 | 60.3 x 5.54 | CS | 5 | 10 | | 5 | | | | | 0.074 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 71 | U9315 | 37/37 | 168.3 x 7.11 | CS | 9 | 18 | | 2 | | 1 | | | 0.943 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Atom-Blowdown | 72 | U9315 | 37/37 | 114.3 x 6.02 | CS | 1 | 2 | | 1 | | 1 | | | 0.007 | A1A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| PSV Vents | 1 | U9316 | 1/28 | 219.1 x 8.18 | CS | 4 | 8 | | 4 | | | | | 0.098 | A1AD | 365 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 2 | U9316 | 1/28 | 1.0" | CS | | | | | | | 2 | 2 | | A1AD | 365 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 3 | U9316 | 1/28 | 273 x 9.27 | CS | 12 | 24 | | 12 | | | | | 0.491 | A1AD | 363 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 4 | U9316 | 1/28 | 1.0" | CS | | | | | | | 6 | 6 | | A1AD | 363 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 5 | U9317 | 2/28 | 323.8 x 9.53 | CS | 4 | 8 | 4 | 4 | | | | | 0.581 | A1AD | 365 | 1 Coat of F-9 @ 75µ DFT/Coat |
| PSV Vents | 6 | U9317 | 2/28 | 355.6 x 9.53 | CS | 16 | 32 | 10 | 16 | | | | | 3.211 | A1AD | 365 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 7 | U9318 | 3/28 | 323.8 x 9.53 | CS | 10 | 20 | 4 | 10 | | | | | 3.046 | A1AD | 365 | 1 Coat of F-9 @ 75µ DFT/Coat |
| PSV Vents | 8 | U9319 | 4/28 | 355.6 x 9.53 | CS | 17 | 34 | 6 | 17 | | | | | 4.137 | A1AD | 363 | 1 Coat of F-9 @ 75µ DFT/Coat |
| PSV Vents | 9 | U9320 | 5/28 | 355.6 x 9.53 | CS | 16 | 32 | 7 | 16 | | | | | 4.782 | A1AD | 281 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 10 | U9321 | 6/28 | 323.8 x 9.53 | CS | 1 | 2 | | | | | | | 0.443 | A1AD | 365 | 1 Coat of F-9 @ 75µ DFT/Coat |
| PSV Vents | 11 | U9321 | 6/28 | 355.6 x 9.53 | CS | 4 | 8 | | | | | | | 0.325 | A1AD | 365 | 1 Coat of F-9 @ 75µ DFT/Coat |
| PSV Vents | 12 | U9322 | 7/28 | 323.8 x 9.53 | CS | 2 | 4 | 1 | 2 | | | | | 0.304 | A1AD | 365 | 1 Coat of F-9 @ 75µ DFT/Coat |
| PSV Vents | 13 | U9322 | 7/28 | 355.6 x 9.53 | CS | 5 | 10 | 5 | 5 | | | | | 0.699 | A1AD | 281 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 14 | U9324 | 8/28 | 273 x 9.27 | CS | 14 | 28 | | 14 | | | | | 0.551 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 15 | U9324 | 8/28 | 1.0" | CS | | | | | | | 7 | 7 | | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PSV Vents | 16 | U9325 | 9/28 | 323.8 x 9.53 | CS | 27 | 54 | | 27 | | | | | 6.157 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 17 | U9326 | 10/28 | 323.8 x 9.53 | CS | 3 | 6 | 3 | - | | | | | 0.874 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 18 | U9327 | 11/28 | 323.8 x 9.53 | CS | 26 | 52 | 29 | 26 | | | | | 6.748 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 19 | U9328 | 12/28 | 323.8 x 9.53 | CS | 17 | 34 | | | | | | | 5.257 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 20 | U9329 | 13/28 | 323.8 x 9.53 | CS | 16 | 32 | 10 | 16 | | | | | 1.983 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 21 | U9330 | 14/28 | 323.8 x 9.53 | CS | 6 | 12 | | 6 | | | | | 0.508 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 22 | U9331 | 15/28 | 273 x 9.27 | CS | 16 | 32 | | 16 | | | | | 0.637 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 23 | U9331 | 15/28 | 1.0" | CS | | | | | | | 8 | 8 | | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 24 | U9332 | 16/28 | 323.8 x 9.53 | CS | 17 | 34 | | 17 | | | | | 4.208 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 25 | U9333 | 17/28 | 323.8 x 9.53 | CS | 3 | 6 | 3 | | | | | | 0.664 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 26 | U9334 | 18/28 | 323.8 x 9.53 | CS | 26 | 52 | 32 | 26 | | | | | 8.072 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 27 | U9335 | 19/28 | 323.8 x 9.53 | CS | 15 | 30 | | | | | | | 4.433 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 28 | U9336 | 20/28 | 323.8 x 9.53 | CS | 16 | 32 | 11 | 16 | | | | | 2.773 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 29 | U9337 | 21/28 | 323.8 x 9.53 | CS | 6 | 12 | | 6 | | | | | 0.696 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 30 | U9338 | 22/28 | 273 x 9.27 | CS | 12 | 24 | | 12 | | | | | 0.478 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 31 | U9338 | 22/28 | 1.0" | CS | | | | | | | 6 | 6 | | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 32 | U9338 | 22/28 | 168.3 x 7.11 | CS | 4 | 8 | | 4 | | | | | 0.062 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 33 | U9338 | 22/28 | 1.0" | CS | | | | | | | 2 | 2 | | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 34 | U9339 | 23/28 | 323.8 x 9.53 | CS | 10 | 20 | | 10 | | | | | 1.891 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 35 | U9339 | 23/28 | 219.1 x 8.18 | CS | 3 | 6 | | 3 | | | | | 0.113 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 36 | U9340 | 24/28 | 323.8 x 9.53 | CS | 4 | 8 | 4 | | | | | | 0.994 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 37 | U9340 | 24/28 | 219.1 x 8.18 | CS | 9 | 18 | 13 | | | | | | 2.171 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 38 | U9341 | 25/28 | 323.8 x 9.53 | CS | 16 | 32 | 25 | 16 | | | | | 4.768 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 39 | U9341 | 25/28 | 219.1 x 8.18 | CS | 4 | 8 | 4 | 4 | | | | | 0.533 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 40 | U9342 | 26/28 | 323.8 x 9.53 | CS | 5 | 10 | | | | | | | 1.634 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 41 | U9343 | 27/28 | 323.8 x 9.53 | CS | 6 | 12 | 4 | 6 | | | | | 1.099 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 42 | U9343 | 27/28 | 219.1 x 8.18 | CS | 2 | 4 | 1 | 2 | | | | | 0.083 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| PSV Vents | 43 | U9344 | 28/28 | 323.8 x 9.53 | CS | 8 | 16 | | | 8 | | | | 0.576 | A1A | 180 | 1 coat of F-12@20µ DFT/Coat |
| Bearing CW | 1 | U9345 | 1/19 | 406.4 x 9.53 | CS | 2 | 4 | | 2 | | 1 | | | 0.75241 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 2 | U9346 | 2/19 | 406.4 x 9.53 | CS | 1 | 2 | | | | | | | 0.03768 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 3 | U9346 | 2/19 | 60.3 x 5.54 | CS | 9 | 18 | | | | | | | 0.40018 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 4 | U9346 | 2/19 | 168.3 x 7.11 | CS | 5 | 10 | | | | | | | 0.8196 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 5 | U9347 | 3/19 | 60.3 x 5.54 | CS | 2 | 4 | | | | | | | 0.08976 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 6 | U9347 | 3/19 | 168.3 x 7.11 | CS | 10 | 20 | | | | | | | 0.47617 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 7 | U9347 | 3/19 | 88.9 x 5.49 | CS | 4 | 8 | | | | | | | 0.01078 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 8 | U9348 | 4/19 | 406.4 x 9.53 | CS | 6 | 12 | 1 | 6 | | | | | 0.79255 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 9 | U9348 | 4/19 | 1" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 10 | U9348 | 4/19 | 60.3 x 5.54 | CS | 8 | 16 | | 8 | | | | | 0.11961 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 11 | U9349 | 5/19 | 406.4 x 9.53 | CS | 1 | 2 | | 1 | | | | | 0.4492 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 12 | U9349 | 5/19 | 1 1/2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 13 | U9349 | 5/19 | 3/4" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 14 | U9349 | 5/19 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.08201 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 15 | U9349 | 5/19 | 1 1/2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 16 | U9349 | 5/19 | 3/4" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 17 | U9360 | 6/19 | 60.3 x 5.54 | CS | 22 | 44 | | 22 | | | | | 0.27454 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 18 | U9360 | 6/19 | 168.3 x 7.11 | CS | 6 | 12 | | 6 | | | | | 0.34371 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 19 | U9360 | 6/19 | 2" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 20 | U9361 | 7/19 | 60.3 x 5.54 | CS | 2 | 4 | | 2 | | | | | 0.05877 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 21 | U9361 | 7/19 | 219.1 x 8.18 | CS | 10 | 20 | | 10 | | | | | 1.26356 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 22 | U9361 | 7/19 | 6" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 23 | U9361 | 7/19 | 168.3 x 7.11 | CS | 14 | 28 | | 14 | | | | | 0.47074 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 24 | U9361 | 7/19 | 1 1/2" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 25 | U9361 | 7/19 | 3/4" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 26 | U9362 | 8/19 | 88.9 x 5.49 | CS | 14 | 28 | | 14 | | | | | 0.11918 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^{0}$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 27 | U9350 | 9/19 | 406.4 x 9.53 | CS | 5 | 10 | 2 | 5 | | | | | 1.64572 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 28 | U9350 | 9/19 | 60.3 x 5.54 | CS | 6 | 12 | | 6 | | | | | 0.21905 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 29 | U9351 | 10/19 | 60.3 x 5.54 | CS | 17 | 34 | | 17 | | | | | 0.44538 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 30 | U9351 | 10/19 | 168.3 x 7.11 | CS | 4 | 8 | | 4 | | | | | 0.47535 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 31 | U9352 | 11/19 | 60.3 x 5.54 | CS | 3 | 6 | | 3 | | | | | 0.08467 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 32 | U9352 | 11/19 | 219.1 x 8.18 | CS | 3 | 6 | | 3 | | | | | 0.46165 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 33 | U9352 | 11/19 | 168.3 x 7.11 | CS | 9 | 18 | | 9 | | | | | 0.43112 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 34 | U9352 | 11/19 | 88.9 x 5.49 | CS | 10 | 20 | | 10 | | | | | 0.10662 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 35 | U9353 | 12/19 | 406.4 x 9.53 | CS | 1 | 2 | | 1 | | | | | 0.26495 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 36 | U9353 | 12/19 | 8" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 37 | U9353 | 12/19 | 2" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 38 | U9353 | 12/19 | 168.3 x 7.11 | CS | 1 | 2 | | | | | | | 0.14172 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 39 | U9354 | 13/19 | 406.4 x 9.53 | CS | 3 | 6 | 2 | | | | | | 1.70429 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 40 | U9354 | 13/19 | 8" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 41 | U9354 | 13/19 | 6" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 42 | U9354 | 13/19 | 168.3 x 7.11 | CS | 4 | 8 | | | | | | | 0.60005 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 43 | U9354 | 13/19 | 3" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 44 | U9354 | 13/19 | 1.5" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 45 | U9355 | 14/19 | 168.3 x 7.11 | CS | 2 | 4 | | | | 2 | | | 0.21855 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 46 | U9355 | 14/19 | 406.4 x 9.53 | CS | 1 | 2 | 1 | | | 1 | | | 0.38492 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 47 | U9355 | 14/19 | 12" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 48 | U9356 | 15/19 | 114.3 x 6.02 | CS | 3 | 6 | | | | 6 | | | 0.03309 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 49 | U9356 | 15/19 | 1.5" | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^{0}$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 50 | U9356 | 15/19 | 3/4" | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 51 | U9357 | 16/19 | 114.3 x 6.02 | CS | 3 | 6 | | | | 6 | | | 0.03309 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 52 | U9357 | 16/19 | 1.5" | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 53 | U9357 | 16/19 | 3/4" | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 54 | U9358 | 17/19 | 219.1 x 8.18 | CS | 1 | 2 | | 1 | | | | | 0.02358 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 55 | U9358 | 17/19 | 88.9 x 5.49 | CS | 4 | 8 | | 4 | | | | | 0.01142 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 56 | U9359 | 18/19 | 168.3 x 7.11 | CS | 1 | 2 | | 1 | | 1 | | | 0.05207 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 57 | U9378 | 19/19 | 406.4 x 9.53 | CS | 1 | 2 | 1 | | | | | | 0.55916 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 58 | U9378 | 19/19 | 168.3 x 7.11 | CS | 4 | 8 | | | | | | | 0.62836 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 59 | U9378 | 19/19 | 1.5" | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 60 | U9378 | 19/19 | 2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 61 | U9378 | 19/19 | 4" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 62 | U9363 | 1/15 | 114.3 x 6.02 | CS | 5 | 10 | | | | 10 | | | 0.05705 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 63 | U9363 | 1/15 | 3/4" | CS | | | | | | | 7 | 7 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 64 | U9363 | 1/15 | 1/1/2" | CS | | | | | | | 5 | 5 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 65 | U9364 | 2/15 | 114.3 x 6.02 | CS | 2 | 4 | | 2 | | | | | 0.06578 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 66 | U9364 | 2/15 | 88.9 x 5.49 | CS | 12 | 24 | | 12 | | | | | 0.04223 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 67 | U9365 | 3/15 | 168.3 x 7.11 | CS | 6 | 12 | | 6 | | | | | 0.36039 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 68 | U9365 | 3/15 | 60.3x5.54 | CS | 8 | 16 | | 8 | | | | | 0.10349 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 69 | U9365 | 3/15 | 406.4 x 9.53 | CS | 8 | 16 | | 8 | | | | | 1.28914 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 70 | U9365 | 3/15 | 219.1 x 8.18 | CS | 6 | 12 | | 6 | | | | | 0.81049 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 71 | U9366 | 4/15 | 114.3 x 6.02 | CS | 6 | 12 | | 6 | | | | | 0.27992 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 72 | U9366 | 4/15 | 88.9 x 5.49 | CS | 2 | 4 | | 2 | | | | | 0.01206 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^{0}$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 73 | U9367 | 5/15 | 88.9 x 5.49 | CS | 3 | 6 | | 3 | | | | | 0.01623 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 74 | U9367 | 5/15 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.04067 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 75 | U9367 | 5/15 | 60.3x5.54 | CS | 9 | 18 | | 9 | | | | | 0.15605 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 76 | U9368 | 6/15 | 60.3x5.54 | CS | 4 | 8 | | 4 | | | | | 0.13823 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 77 | U9368 | 6/15 | 168.3 x 7.11 | CS | 5 | 10 | | 5 | | | | | 0.53885 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 78 | U9368 | 6/15 | 406.4 x 9.53 | CS | 4 | 8 | | 4 | | | | | 1.92113 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 79 | U9369 | 7/15 | 168.3 x 7.11 | CS | 9 | 18 | | 9 | | | | | 0.31188 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 80 | U9369 | 7/15 | 219.1 x 8.18 | CS | 4 | 8 | | 4 | | | | | 0.5975 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 81 | U9369 | 7/15 | 114.3 x 6.02 | CS | 1 | 2 | | 1 | | | | | 0.02427 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 82 | U9369 | 7/15 | 60.3x5.54 | CS | 1 | 2 | | 1 | | | | | 0.00736 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 83 | U9370 | 8/15 | 88.9 x 5.49 | CS | 2 | 4 | | | | 2 | | | 0.01308 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 84 | U9370 | 8/15 | 168.3 x 7.11 | CS | 2 | 4 | | | | 2 | | | 0.17209 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 85 | U9371 | 9/15 | 88.9 x 5.49 | CS | 5 | 10 | | 5 | | | | | 0.0137 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 86 | U9372 | 10/15 | 88.9 x 5.49 | CS | 6 | 12 | | | | | | | 0.03616 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 87 | U9372 | 10/15 | 168.3 x 7.11 | CS | 8 | 16 | | | | | | | 1.21321 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 88 | U9372 | 10/15 | 60.3x5.54 | CS | 5 | 10 | | | | | | | 0.20401 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 89 | U9372 | 10/15 | 406.4 x 9.53 | CS | 1 | 2 | | | | | | | 0.03768 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 90 | U9373 | 11/15 | 168.3 x 7.11 | CS | 3 | 6 | | | | | | | 0.20514 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 91 | U9373 | 11/15 | 3/4" | CS | | | | | | | 7 | 7 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 92 | U9373 | 11/15 | 1/1/2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 93 | U9373 | 11/15 | 2" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 94 | U9373 | 11/15 | 4" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 98 | U9374 | 12/15 | 406.4 x 9.53 | CS | 2 | 4 | 2 | | | 2 | | | 0.79846 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 96 | U9374 | 12/15 | 12" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 97 | U9375 | 13/15 | 406.4 x 9.53 | CS | 3 | 6 | 2 | | | | | | 1.35549 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 98 | U9375 | 13/15 | 6" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 99 | U9375 | 13/15 | 8" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 100 | U9376 | 14/15 | 406.4 x 9.53 | CS | 2 | 4 | | 2 | | | | | 0.8331 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 101 | U9376 | 14/15 | 8" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 102 | U9376 | 14/15 | 3/4" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 103 | U9376 | 14/15 | 1/1/2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 104 | U9376 | 14/15 | 219.1 x 8.18 | CS | 1 | 2 | | 1 | | | | | 0.27036 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 105 | U9376 | 14/15 | 6" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 106 | U9376 | 14/15 | 168.3 x 7.11 | CS | 1 | 2 | | 1 | | | | | 0.02679 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 107 | U9376 | 14/15 | 3/4" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 108 | U9376 | 14/15 | 1/1/2" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 109 | U9377 | 15/15 | 406.4 x 9.53 | CS | 2 | 4 | 1 | 2 | | | | | 0.29537 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 110 | U9377 | 15/15 | 1" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 111 | U9377 | 15/15 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.02908 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 112 | U9377 | 15/15 | 3/4" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 113 | U9379 | 1/12 | 88.9 x 5.49 | CS | 4 | 8 | | | | 4 | | | 0.0217 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 114 | U9380 | 2/12 | 88.9 x 5.49 | CS | 10 | 20 | | 10 | | | | | 0.1799 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 115 | U9380 | 2/12 | 168.3 x 7.11 | CS | 1 | 2 | | | | 1 | | | 0.16782 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 116 | U9381 | 3/12 | 114.3 x 6.02 | CS | 7 | 14 | | 7 | | | | | 0.29308 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 117 | U9381 | 3/12 | 323.8 x 9.53 | CS | 4 | 8 | | 4 | | | | | 1.32161 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 118 | U9382 | 4/12 | 114.3 x 6.02 | CS | 5 | 10 | | | | 10 | | | 0.06969 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^{0}$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 119 | U9382 | 4/12 | 3/4" | CS | | | | | | | 9 | 9 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 120 | U9382 | 4/12 | 1/1/2" | CS | | | | | | | 5 | 5 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 121 | U9383 | 5/12 | 114.3 x 6.02 | CS | 5 | 10 | | | | 10 | | | 0.06647 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 122 | U9383 | 5/12 | 3/4" | CS | | | | | | | 9 | 9 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 123 | U9383 | 5/12 | 1/1/2" | CS | | | | | | | 5 | 5 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 124 | U9384 | 6/12 | 88.9 x 5.49 | CS | 8 | 16 | | 8 | | | | | 0.05346 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 125 | U9384 | 6/12 | 114.3 x 6.02 | CS | 2 | 4 | | 2 | | | | | 0.05855 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 126 | U9384 | 6/12 | 168.3 x 7.11 | CS | 2 | 4 | | 2 | | | | | 0.11885 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 127 | U9384 | 6/12 | 323.8 x 9.53 | CS | 2 | 4 | | 2 | | | | | 0.2952 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 128 | U9385 | 7/12 | 168.3 x 7.11 | CS | 4 | 8 | | | | | | | 0.57042 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 129 | U9385 | 7/12 | 1/1/2" | CS | | | | | | | 4 | 4 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 130 | U9385 | 7/12 | 323.8 x 9.53 | CS | 3 | 6 | | | | | | | 0.55319 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 131 | U9385 | 7/12 | 1" | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 132 | U9386 | 8/12 | 168.3 x 7.11 | CS | 2 | 4 | | | | | | | 0.34824 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 133 | U9386 | 8/12 | 3" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 134 | U9387 | 9/12 | 168.3 x 7.11 | CS | 2 | 4 | | | | | | | 0.33912 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 135 | U9387 | 9/12 | 88.9 x 5.49 | CS | 2 | 16 | | | | | | | 0.0073 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 136 | U9387 | 9/12 | 323.8 x 9.53 | CS | 6 | 12 | | | | | | | 2.65968 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 137 | U9387 | 9/12 | 273.0 x 9.27 | CS | 2 | 4 | | | | | | | 0.1832 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 138 | U9388 | 10/12 | 114.3 x 6.02 | CS | 1 | 2 | | | | 4 | | | 0.01244 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 139 | U9388 | 10/12 | 3/4" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 140 | U9388 | 10/12 | 1/1/2" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 141 | U9389 | 11/12 | 323.8 x 9.53 | CS | 4 | 8 | | 4 | | | | | 0.11136 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 142 | U9389 | 11/12 | 3/4" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 143 | U9389 | 11/12 | 88.9 x 5.49 | CS | 4 | 8 | | 4 | | | | | 0.01845 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 144 | U9389 | 11/12 | 3/4" | CS | | | | | | | 4 | 4 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 145 | U9417 | 12/12 | 323.8 x 9.53 | CS | 2 | 4 | | | | | | | 0.20354 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 146 | U9417 | 12/12 | 3/4" | CS | | | | | | | 4 | 4 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 147 | U9417 | 12/12 | 1/1/2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 148 | U9390 | 1/27 | 323.8 x 9.53 | CS | 10 | 20 | 10 | | | | | | 3.6 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 149 | U9391 | 2/27 | 323.8 x 9.53 | CS | 6 | 12 | | 6 | | | | | 1.3 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 150 | U9392 | 3/27 | 323.8 x 9.53 | CS | 2 | 4 | | 2 | | | | | 0.28 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 151 | U9392 | 3/27 | 1/1/2" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 152 | U9392 | 3/27 | 3/4" | CS | | | | | | | 2 | 2 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 153 | U9393 | 4/27 | 323.8 x 9.53 | CS | 3 | 6 | | 3 | | | | | 0.6 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 154 | U9393 | 4/27 | 1" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 155 | U9393 | 4/27 | 3/4" | CS | | | | | | | 4 | 4 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 156 | U9394 | 5/27 | 323.8 x 9.53 | CS | 1 | 2 | 1 | 1 | | | | | 0.3 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Bearing CW | 157 | U9395 | 6/27 | 323.9 x 4.57 | SS | 2 | 4 | 2 | 2 | | | | | 0.1 | A3K | 65 | |
| Bearing CW | 158 | U9396 | 7/27 | 323.9 x 4.57 | SS | 2 | 4 | | 2 | | | | | 0.12 | A3K | 65 | |
| Bearing CW | 159 | U9396 | 7/27 | 1/1/2" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 160 | U9396 | 7/27 | 3/4" | SS | | | | | | | 6 | 6 | | A3K | 65 | |
| Bearing CW | 161 | U9396 | 7/27 | 355.6 x 4.78 | SS | 2 | 4 | | | | | | | 0.127 | A3K | 65 | |
| Bearing CW | 162 | U9396 | 7/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 163 | U9397 | 8/27 | 323.9 x 4.57 | SS | 1 | 2 | | | | | | | 0.1 | A3K | 65 | |
| Bearing CW | 164 | U9397 | 8/27 | 1" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 165 | U9397 | 8/27 | 355.6 x 4.78 | SS | 2 | 4 | | | | | | | 0.08 | A3K | 65 | |
| Bearing CW | 166 | U9397 | 8/27 | 3/4" | SS | | | | | | | 4 | 4 | | A3K | 65 | |
| Bearing CW | 167 | U9398 | 9/27 | 323.8 x 9.53 | SS | 2 | 4 | | 1 | | | | | 0.14 | A3K | 65 | |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 168 | U9398 | 9/27 | 355.6 x 4.78 | SS | 2 | 4 | | | | | | | 0.14 | A3K | 65 | |
| Bearing CW | 169 | U9399 | 10/27 | 323.9 x 4.57 | SS | 3 | 6 | | 3 | | | | | 0.23 | A3K | 65 | |
| Bearing CW | 170 | U9399 | 10/27 | 60.3 x 3.91 | SS | 9 | 18 | | 9 | | | | | 0.16 | A3K | 65 | |
| Bearing CW | 171 | U9399 | 10/27 | 219.1 x 3.76 | SS | 3 | 6 | | 3 | | | | | 0.141 | A3K | 65 | |
| Bearing CW | 172 | U9399 | 10/27 | 168.3 x 3.4 | SS | 1 | 2 | | 1 | | | | | 0.025 | A3K | 65 | |
| Bearing CW | 173 | U9400 | 11/27 | 323.9 x 4.57 | SS | 2 | 4 | | 2 | | | | | 0.147 | A3K | 65 | |
| Bearing CW | 174 | U9400 | 11/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 175 | U9401 | 12/27 | 323.9 x 4.57 | SS | 4 | 8 | 4 | 4 | | | | | 0.18 | A3K | 65 | |
| Bearing CW | 176 | U9401 | 12/27 | 60.3 x 3.91 | SS | 12 | 24 | 14 | 15 | | | | | 0.21 | A3K | 65 | |
| Bearing CW | 177 | U9402 | 13/27 | 323.9 x 4.57 | SS | 5 | 10 | | 2 | | | | | 0.52 | A3K | 65 | |
| Bearing CW | 178 | U9402 | 13/27 | 60.3 x 3.91 | SS | 5 | 10 | | 2 | | | | | 0.05 | A3K | 65 | |
| Bearing CW | 179 | U9402 | 13/27 | 219.1 x 3.76 | SS | 5 | 10 | | 4 | | | | | 0.201 | A3K | 65 | |
| Bearing CW | 180 | U9402 | 13/27 | 168.3 x 3.4 | SS | 2 | 4 | | | | | | | 0.131 | A3K | 65 | |
| Bearing CW | 181 | U9403 | 14/27 | 323.9 x 4.57 | SS | 1 | 2 | | | | | | | 0.034 | A3K | 65 | |
| Bearing CW | 182 | U9403 | 14/27 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 183 | U9403 | 14/27 | 114.3 x 3.05 | SS | 1 | 2 | | | | | | | 0.004 | A3K | 65 | |
| Bearing CW | 184 | U9403 | 14/27 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 185 | U9403 | 14/27 | 1 1/2" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 186 | U9404 | 15/27 | 323.9 x 4.57 | SS | 1 | 2 | | 1 | | | | | 0.06 | A3K | 65 | |
| Bearing CW | 187 | U9404 | 15/27 | 3/4" | SS | | | | | | | 3 | 3 | | A3K | 65 | |
| Bearing CW | 188 | U9404 | 15/27 | 219.1 x 3.76 | SS | 2 | 4 | | 2 | | | | | 0.053 | A3K | 65 | |
| Bearing CW | 189 | U9404 | 15/27 | 3/4" | SS | | | | | | | 4 | 4 | | A3K | 65 | |
| Bearing CW | 190 | U9404 | 15/27 | 1 1/2" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 191 | U9405 | 16/27 | 323.9 x 4.57 | SS | 1 | 2 | | | | | | | 0.23 | A3K | 65 | |
| Bearing CW | 192 | U9405 | 16/27 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 193 | U9406 | 17/27 | 323.9 x 4.57 | SS | 4 | 8 | 2 | 4 | | | | | 0.36 | A3K | 65 | |
| Bearing CW | 194 | U9407 | 18/27 | 323.9 x 4.57 | SS | 2 | 4 | 2 | | | | | | 0.44 | A3K | 65 | |
| Bearing CW | 195 | U9407 | 18/27 | 60.3 x 3.91 | SS | 5 | 10 | 10 | | | | | | 0.142 | A3K | 65 | |
| Bearing CW | 196 | U9408 | 19/27 | 219.1 x 3.76 | SS | 2 | 4 | | 2 | | | | | 0.102 | A3K | 65 | |
| Bearing CW | 197 | U9408 | 19/27 | 168.3 x 3.4 | SS | 3 | 6 | | 3 | | | | | 0.096 | A3K | 65 | |
| Bearing CW | 198 | U9408 | 19/27 | 323.9 x 4.57 | SS | 6 | 12 | | 6 | | | | | 0.421 | A3K | 65 | |
| Bearing CW | 199 | U9408 | 19/27 | 60.3 x 3.91 | SS | 4 | 8 | | | | | | | 0.041 | A3K | 65 | |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing CW | 200 | U9409 | 20/27 | 219.1 x 3.76 | SS | 2 | 4 | | 2 | | | | | 0.06 | A3K | 65 | |
| Bearing CW | 201 | U9409 | 20/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 202 | U9409 | 20/27 | 323.9 x 4.57 | SS | 2 | 4 | | 2 | | | | | 0.135 | A3K | 65 | |
| Bearing CW | 203 | U9409 | 20/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 204 | U9409 | 20/27 | 1 1/2" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 205 | U9410 | 21/27 | 219.1 x 3.76 | SS | 1 | 2 | | | | | | | 0.015 | A3K | 65 | |
| Bearing CW | 206 | U9410 | 21/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 207 | U9410 | 21/27 | 1 1/2" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 208 | U9410 | 21/27 | 114.3 x 3.05 | SS | 1 | 2 | | | | | | | 0.006 | A3K | 65 | |
| Bearing CW | 209 | U9410 | 21/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 210 | U9410 | 21/27 | 1 1/2" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 211 | U9411 | 22/27 | 168.3 x 3.4 | SS | 2 | 4 | | 2 | | | | | 0.074 | A3K | 65 | |
| Bearing CW | 212 | U9411 | 22/27 | 219.1 x 3.76 | SS | 2 | 4 | | 2 | | | | | 0.083 | A3K | 65 | |
| Bearing CW | 213 | U9411 | 22/27 | 60.3 x 3.91 | SS | 4 | 8 | 6 | 2 | | | | | 0.072 | A3K | 65 | |
| Bearing CW | 214 | U9412 | 23/27 | 219.1 x 3.76 | SS | 2 | 4 | | 2 | | | | | 0.094 | A3K | 65 | |
| Bearing CW | 215 | U9412 | 23/27 | 3/4" | SS | | | | | | | 2 | 2 | | A3K | 65 | |
| Bearing CW | 216 | U9412 | 23/27 | 1 1/2" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 217 | U9412 | 23/27 | 323.9 x 4.57 | SS | 1 | 2 | 1 | | | | | | 0.222 | A3K | 65 | |
| Bearing CW | 218 | U9412 | 23/27 | 60.3 x 3.91 | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Bearing CW | 219 | U9413 | 24/27 | 60.3 x 3.91 | SS | 8 | 16 | 4 | 8 | | | | | 0.067 | A3K | 65 | |
| Bearing CW | 220 | U9413 | 24/27 | 323.9 x 4.57 | SS | 6 | 12 | 3 | 6 | | | | | 0.281 | A3K | 65 | |
| Bearing CW | 221 | U9414 | 25/27 | 323.9 x 4.57 | SS | 8 | 16 | 6 | | | | | | 1.52 | A3K | 65 | |
| Bearing CW | 222 | U9414 | 25/27 | 60.3 x 3.91 | SS | 3 | 6 | 1 | | | | | | 0.1 | A3K | 65 | |
| Bearing CW | 223 | U9415 | 26/27 | 323.9 x 4.57 | SS | 1 | 2 | 2 | 1 | | | | | 0.154 | A3K | 65 | |
| Bearing CW | 224 | U9415 | 26/27 | 60.3 x 3.91 | SS | 8 | 16 | 12 | 8 | | | | | 0.215 | A3K | 65 | |
| Bearing CW | 225 | U9416 | 27/27 | 60.3 x 3.91 | SS | 1 | 2 | 1 | 1 | | | | | 0.01 | A3K | 65 | |
| Bearing CW | 226 | U9416 | 27/27 | 3/4" | SS | | | | | | | 1 | 1 | | A3K | 65 | |
| Nitrogen System | | | | 3/4" S160 | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Nitrogen System | | | | 1" XS | CS | | | | | | | 12 | 12 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Nitrogen System | | | | 2" XS | CS | 70 | 70 | | 74 | | 2 | | | 2.81 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |

| System | Sl. No. | Drg No. | Sheet No. | Pipe Size | Matl | Pipe Cutting | Pipe EP | Pad Weding FW | Elbow Welding BW | Elbow Welding SW | RDCR Welding BW | Stub Drilling | Stub Drilling SW | Weight (Tons) | Matl Spec | Design Temp in $^0$C | Paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrogen System | | | | 4" XS | CS | | | | | | 2 | | | 0.015 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Nitrogen System | | | | 3/4" S80S | SS | | | | | | | | | | A3A | 65 | |
| Nitrogen System | | | | 1" S40S | SS | | | | | | | | | | A3A | 65 | |
| Nitrogen System | | | | 1.5" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Plant Air | | | | 3/4" S160 | CS | | | | | | | 3 | 3 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Plant Air | | | | 1" XS | CS | | | | | | | 17 | 17 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Plant Air | | | | 2" XS | CS | 70 | 70 | | 100 | | 1 | | | 2.8 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Plant Air | | | | 4" XS | CS | 2 | 2 | | 6 | | 2 | | | 0.092 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Plant Air | | | | 6" XS | CS | 15 | 15 | | 40 | | 2 | | | 1.804 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Plant Air | | | | 1.5" | CS | | | | | | | 1 | 1 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Instrument air | | | | 3/4" S160 | SS | | | | | | | 3 | 3 | | A3K | 65 | |
| Instrument air | | | | 1" XS | SS | | | | | | | 12 | 12 | | A3K | 65 | |
| Instrument air | | | | 2" XS | SS | 80 | 80 | | 110 | | 2 | | | 2.28 | A3K | 65 | |
| Instrument air | | | | 4" XS | SS | | | | | | 3 | | | 0.009 | A3K | 65 | |
| Instrument air | | | | 1.5" | SS | | | | | | 3 | 2 | 2 | | A3K | 65 | |
| Service Water | | | | 3/4" S160 | CS | | | | | | | 5 | 5 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Service Water | | | | 1" XS | CS | | | | | | | 10 | 10 | | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Service Water | | | | 1.5" XS | CS | | | | 8 | | 1 | 1 | 1 | 0.352 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Service Water | | | | 2" XS | CS | 6 | 6 | | 22 | | 6 | | | 0.208 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Service Water | | | | 4" STD | CS | 70 | 70 | | 72 | | 2 | | | 5.53 | A3A | 65 | 1 Coat of F-9 @ 75µ DFT/Coat + 1 Coat of P-6@ 40µ DFT/Coat |
| Potable water | | | | 2" XS | CS Galvanised | 75 | NPT Threading | | | | | | | 2.4 | J2A | 65 | |

**ANNEXURE - II (C)**

**Ref : OS/19-20/7887/Non-IBR Piping/33/56** **Date : 26.09.2019**

## LIST OF REFERENCE DRAWINGS & DOCUMENTS

**Sub : Pre-fabrication of Non-IBR Piping for HPCL, Visakhapatnam against S.O. 7887 inside the premises of BHEL, HPVP, Visakhapatnam**

| Sl. No. | S.O. No. | Description | Drg. / Doc. No. | Sheet No. | Rev. No. |
|---|---|---|---|---|---|
| 1 | | Technical Specification | TS 7887-1 | 6 Sheets | 0 |
| 2 | | Product Standard For Welding, Inspection & Testing for BOP Piping | GT 57124 | 6 Sheets | 3 |
| 3 | | Job Specification for NDE requirements of Piping | B016-6-44-0016 | 21 Sheets | 2 |
| 4 | | Manufacturing Quality Plan | CQP:2493 | 1 Sheet | 0 |
| 5 | | Painting Schedule | PY-AQ-3-M104-2001-01 | 3 Sheets | 0 |
| | | Isometric Drawings for Refinery Gas system | 1-80-557-U9094 | - | 0 |
| 6 | | | 1-80-557-U9095 | - | 0 |
| 7 | | | 1-80-557-U9096 | - | 0 |
| 8 | | | 1-80-557-U9097 | - | 0 |
| 9 | | | 1-80-557-U9098 | - | 0 |
| 10 | | | 1-80-557-U9099 | - | 0 |
| 11 | | | 1-80-557-U9100 | - | 0 |
| 12 | | | 1-80-557-U9101 | - | 0 |
| 13 | | | 1-80-557-U9102 | - | 0 |
| 14 | **7887** | | 1-80-557-U9103 | - | 0 |
| 15 | | | 1-80-557-U9104 | - | 0 |
| 16 | | | 1-80-557-U9105 | - | 0 |
| 17 | | | 1-80-557-U9106 | - | 0 |
| 18 | | | 1-80-557-U9107 | - | 0 |
| 19 | | Assembly / Spools Drawings for Reniery Gas System | 3-80-557-U9221 | - | 0 |
| 20 | | | 3-80-557-U9222 | - | 0 |
| 21 | | | 3-80-557-U9223 | - | 0 |
| 22 | | | 3-80-557-U9224 | - | 0 |
| 23 | | | 3-80-557-U9225 | - | 0 |
| 24 | | | 3-80-557-U9226 | - | 0 |
| 25 | | | 3-80-557-U9227 | - | 0 |
| 26 | | | 3-80-557-U9228 | - | 0 |
| 27 | | | 3-80-557-U9229 | - | 0 |
| 28 | | | 3-80-557-U9230 | - | 0 |
| 29 | | | 3-80-557-U9231 | - | 0 |

Note : The drawings mentioned above are sample drawings and are indicative of scope of work for one of the Piping systems. Actual scope of work for different systems may vary as per the relevant detailed drawings issued at the time of fabrication.

**ANNEXURE - III**

**Ref : OS/19-20/Non-IBR Piping/33/56** **Date : 26.09.2019**

## GENERAL TERMS & CONDITIONS

**1. TECHNICAL DELIVERY CONDITIONS :**

The work should conform to the technical data given in our drawings, GMS, Shipping List Specifications, QAP, WPS etc.

**2. PARTY'S SCOPE :** The scope of the party shall be as follows :

a) All welding equipments, baking oven, tools, jigs and fixtures, measuring instruments duly calibrated, handling facilities, testing facilities etc.
b) All materials other than those mentioned under “Free Issue Materials", which are required for completion of the work.
c) All consumables such as electrodes, gases, grinding wheels etc.

**Note : Electrodes of specification mentioned in the drawings / WPS and of BHEL approved brands only shall be used**.

**3. REVISION OF DRAWINGS :** There may be minor changes in the drawings during execution. In such a case, party should accommodate the same without any extra claim.

**4. WELDING QUALIFICATION :** Qualification of required number of Welders is party’s responsibility at their cost.

**5. X–RAY :** All welding shall be of X-ray quality where specified on drawings. Inspection would specify the quantum of X-ray based on drawings / code requirement. Party should strictly follow the WPS and QAP supplied by BHEL during welding. Getting the welds radiographed and getting them cleared by inspection is the responsibility of the party.

**6. RECTIFICATIONS / REJECTIONS :** Any rectification due to defective work, if required, shall be done by the party free of charge with a suitable technology approved before hand by BHEL in writing. The cost of material, if any used for rectification work / rejection work, will be estimated by BHEL and the same shall be debited to party's account. In case any rectification / rework is to be carried out due to defective material supplied by BHEL, the replacement material and consumables will be supplied by BHEL free of Cost.

**7. SECURITY DEPOSIT :** Vendors shall have to submit a Bank Guarantee for **10%** of the order value in case of HPVP site or **25%** of the material cost in case of Vendor works towards Security Deposit and safe custody of materials within one week from the date of issue of Order. The BG shall be valid for the contract period with a claim period of 3 months. This Bank Guarantee shall be released to the contractor after completion of work and on acceptance of the same by BHEL / Owner and on submission of Performance BG for 10 % of the order value covering for the defects liability period. If PBG is not submitted, 10% of the order value shall be deducted towards PBG from final bill.

**8. RAW MATERIAL ISSUE** : Raw materials shall be issued with appropriate processing allowance and invisible wastage over the theoretical requirement of raw materials **(Plates, Sheets, Sections and Pipes).**

**9. TRANSFER / RETURN OF LEFT OVER MATERIAL :** Party should maintain proper records for receipt & use of all free issue materials. The left over materials & scrap as per the material accounting statement shall be returned to HPVP stores along with finished job. Material Transfer Vouchers (MTV) from one order to another or from one vendor to another and Material Return Vouchers should be submitted immediately after transfer / return. The material reconciliation statement shall be submitted by the contractor after verification and certification by BHEL along with the final bill **within 30 days from the date of completion of work**. Otherwise, recovery for the balance materials shall be made from any of their pending bills without further intimation.

**Contd…2**

**10**. **MATERIAL RECONCILIATION :** Orders issued to the vendors have to be completed in all respects including Material Accounting within a maximum of **180 days** from the **date of issue of the first material** from BHEL - HPVP stores. This is a statutory requirement under Central Excise Rules and must be strictly complied with.

**Maximum of 0.5 %** on the requirement of materials **(Plates, Sections and Pipes)** is admitted towards **process allowance and invisible wastage**.

Scrap quantity is permissible upto a **maximum of 1% on Structurals (Beams, Channels, Angles, Rods, Pipes etc.), 2% on Sheets, 3% for Plates** on the theoretical requirement of materials.

**If wastage and scrap is beyond the above limits**, it should be fully justified with cutting diagrams etc. which are to be approved in advance by BHEL. **Otherwise, the cost of raw materials beyond approved limits will be recovered from the contractor as per BHEL recovery rates including applicable taxes & duties**.

Material reconciliation including return of balance materials, off-cuts is to be completed within 20 days from the date of completion of the order. The material reconciliation statement shall be submitted by the contractor after verification and certification by BHEL-HPVP along with the final bill **within 30 days from the date of completion of work**. Otherwise, recovery for the balance materials shall be made from any of their pending bills without further intimation,

Repeated occurrence of inordinate delays in returning and settling the material accounting will entail BHEL the right to terminate the contract forthwith or impose a temporary suspension on further loading at the discretion of BHEL.

**11. SCRAP & OFFCUT NORMS :**

| Sl. No. | Description | Scrap Size (in mm) | Off-Cut (in MM) |
|---|---|---|---|
| 1. | CS/AS Sheets & Plates | Below 500 × 250 | 500 × 250 & above |
| 2. | Rolled sections Rod, angles etc (other than -tubes, pipes) | Below 1000 | 1000 & above |
| 3. | Tubes & Pipes | Below 500 | 500 & above |
| 4. | Universal column | Below 1000 | 1000 & Above |
| 5. | SS Sheets & Plates | Below 500 × 250 | 500 × 250 & above |
| 6. | SS Structural, Rods, Tubes, Pipes | Below 250 | 250 & above |
| 7. | Non – ferrous : sheets & plates, rods & tubes | Below 500 × 250 (S & PL), Below 250 (Rods & Tubes) | 500 × 250 & above, 250 & above |
| 8. | Big size Scrap | (2500 & above) × (150 to 249) | - |

**12. INSPECTION :** Party shall contact our Quality Control Dept. for stages of inspection before commencement of job and should strictly follow the stages of inspection as per QAP.

**13. WORKMANSHIP GUARANTEE :** The vendors should give workmanship guarantee for fabricated items for a period of 18 months from the date of last delivery of the order. Any defects due to incomplete work, faulty workmanship found in the fabricated items after delivery during the defects liability period shall be rectified / replaced by the vendor free of cost. Otherwise, the expenditure incurred towards the same will be recovered from the pending bills of vendors.

Contd…3

**14. WORK PROGRESS :** The fabricator shall furnish a weekly report on the progress of work along with the status of availability of free issue materials and requirement of further materials, if any.

Outsourcing dept. personnel will visit vendor's works from time to time to assess and review the work progress. Free access shall be provided to BHEL or its inspection agency at all reasonable times of the day / night.

In case the progress is not satisfactory or supplies are delayed abnormally beyond the contractual delivery date, BHEL-HPVP, Visakhapatnam reserves the right to cancel the order in part or full or get the balance job in as is where is condition completed elsewhere by another agency at the risk and cost of Fabricator. The value of the work carried out by the party will be assessed by BHEL and the same shall be final. No compensation will be given to the fabricator in case of cancellation of order or diversion of balance job even if the jobs have been processed partly.

**15. DELIVERY :** Finished items should be handed over to the Logistics dept. on party's delivery challans along with Job completion certificate / Final Inspection Report from inspection agency / HPVP-QC department..

**16. PENALTY :** If delivery exceeds the stipulated delivery schedule, penalty 1/2 % of the total value of order per week or part there of subject to a maximum of 10% on the total value of the order will be levied. However, time taken for the following will not be considered as delay on the part of the Sub-Contractor.

1) Intermediate operations, if any, carried out by BHEL.
2) Waiting time for BHEL / Third party Inspection beyond a normal time of 3 days.

**17. PAYMENT TERMS :**

**100**% payment will be made against delivery of the finished items duly inspected & cleared by Inspection authority along with all inspection documents to Logistics dept. Payment shall be made within 45 days from the date of submission of RA Bill.

RA Bills are not allowed for orders of value less than Rs. 5 lakhs. RA Bills are allowed for Order values of more than 5 lakhs and in such cases, the first bill value shall be restricted to a maximum of 50 % of the order value and a minimum of 50% of the total DUs of the order.

Vendors shall have to submit the bills in the formats specified by HPVP-Outsourcing and the bills submitted in the specified format along with necessary supporting documents are only admitted for processing. The following documents shall be submitted along with the Final Bill :

1. No Claim Certificate from the contractor
2. No Dues Certificate from BHEL
3. Work Completion Certificate from BHEL
4. Material Reconciliation Statement submitted by the Contractor and certified by concerned authority of BHEL (if applicable)
5. Workmanship Guarantee certificate from the contractor

**18**. **SECRECY** : All the documents of BHEL inclusive of Drawings. GMS and Standards made available to the fabricator should be kept in strict confidence and under no circumstance be made available to others or allow others to make use of them. Such documents shall be returned to BHEL on demand after completion of the job. This secrecy clause is binding on the employees of the fabricators also. Violation of the same may lead to suspension of business with the vendor and necessary legal action.

Contd…4

**19.** **SUB-LETTING :** In general, sub-letting of jobs will not be permitted. But in special circumstances, this may be allowed. In such case, the party should obtain written approval from BHEL-HPVP, Visakhapatnam before sub-letting.

**20.** **FACTORY RULES AND REGULATIONS** : Party shall abide by all the rules and statyutoay regulations in force from time to time as per factories act. It shall be party's responsibility to ensure the safety of their workmen and fulfilling the ESI, PF and other relevant statutory regulations.

**21**. **SAFETY :**

a) Contractor shall adhere to safe construction practices, guard against hazardous & unsafe working conditions and shall comply with the safety rules of BHEL and local authorities. He shall maintain First Aid facilities for all his employees and labour. Contractor's responsibility includes supply of welder kit, all safety items such as safety belts, white and colour glasses, goggles, safety helmets, safety shoes etc.

b) Contractor and his employees shall follow all fire & safety, security regulations of BHEL.

**22**. **HOUSE KEEPING :**

During execution of work, the contractor at all times keep the working place and storage area clean and free from accumulation of waste materials, rubbish etc.,

**23**. **ACCIDENT / DAMAGE / CONDUCT ETC. :**

Contractor will be held responsible for any disorderly conduct / misconduct, indiscipline, theft, smoking etc., on the part of his men. He will ensure summarily eviction of such men from his premises failing which BHEL would remove them from the factory on his responsibility. Any damage to and or loss of equipment, machinery, building etc., to BHEL or BHEL employees, visitors or other contractors resulting from his own or any of his men's negligence shall be liable to be made good by him. Contractor shall be solely responsible for any accident in which you or your men or your equipment may be involved during the execution of contract on account of any reason what so ever.

**24**. **TERMINATION OF CONTRACT** :

In the event of any failure on the part of the contractor, BHEL reserves the right to terminate the contract by giving a notice of 2 weeks for any of the following lapses and contractual violations :

a) Failure to make labour payments in time as per the rules
b) Failure to progress the job according to the agreed schedule
c) Failure to mobilize adequate man power, tools & tackles and consumables in time
d) Failure to adhere to Quality Standards of BHEL
e) Refused to co-operate with other agencies working in the same area
f) Failure to resolve labour disputes like strikes etc., within 7 days of occurrence
g) Failure to comply with statutory regulations applicable at BHEL

BHEL shall also be free to intervene and take necessary remedial measures. All costs incurred with interest and overheads shall be recovered from contractor by such foreclosing or off-loading any part of the contract work.

**25.** **DISPUTES** : Executive Director of BHEL- HPVP Unit will be the final authority for any disputes arising out of this contract. The disputes / arbitration / settlement of contractual or legal issues shall be under the Jurisdiction of Visakhapatnam Court.

**26.** For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract / PO/WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and / or local content in respect of this procurement, same shall be applicable.

**ANNEXURE – IV**

Ref : OS/19-20/7887/Non-IBR Piping/33/56 Date : 26.09.2019

## Acceptance to Tender Terms & Conditions

I / We hereby confirm that the Tender documents, Drawings, Quality documents etc. have been studied in detail and we have fully understood the scope of work.

I / We accept to all the Terms and Conditions of the Tender Enquiry and the prices quoted are in accordance with the same.

I / We give our acceptance to participate in reverse auction in case BHEL decides to opt for reverse auction for this tender.

Tender documents duly signed on all the pages by the Owner / authorized representative of the bidder are attached herewith.

**Signature of the bidder with stamp**

**ANNEXURE – V**

Ref : OS/19-20/7887/Non-IBR Piping/33/56 Date : 26.09.2019

## GENERAL TERMS AND CONDITIONS OF RA (REVERSE AUCTION)

BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders have to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non – consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of the business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. **The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.**

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers / contractors (as available on ww.bhel.com)."

As a reminder to the bidders, system will flash following message (**in RED Colour**) during the course of 'online sealed bid'.

"Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL"

**Signature of the Bidder with Stamp**

**ANNEXURE – GST**

## GST COMPLIANCE FOR INDIGENOUS SUPPLIERS

1. In Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GSTIN which should be clearly mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.
2. Supplier shall mention their GSTIN in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per P0, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.
3. All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
4. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
5. All documents like Test Certificate, LR copy, Guarantee/Warrantee certificate, work completion certificate, any other document mentioned in PO, shall be sent along with the vehicle/consignment where ever applicable. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
6. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the suppliers, within the calendar month notified by BHEL.
7. For any such delay in availing of tax credit for reasons attributable to supplier (as mentioned above), interest (calculated @ SBI Base Rate + 6%) along with penalty if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.
8. Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this Debit note will be issued by BHEL indicating the respective supply invoice number.
9. This is to inform that GST portion of invoice, shall be released only upon Vendor declaring such invoice in his GSTR-1 and receipt of goods and Tax invoice by BHEL and Confirmation of payment of GST thereon by vendor on GSTN portal. Alternatively, BG of appropriate value may be obtained from vendor which shall be valid At least one month after the confirmation of date of payment of GST by vendor on GSTN portal and receipt of Tax invoice and receipt of goods, whichever is later. Above is subject to receipt of goods/service and tax invoice thereof along with vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.
10. In case vendor delays declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.

***Note** : The above will be followed strictly for processing vendor payments to ensure GST Compliance.*

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## DETAILS OF WELDING, INSPECTION & TESTING FOR BALANCE OF PLANT PIPING

### 1.0.0 WELDING DETAILS :

1.1.0 To reduce number of welding procedure qualifications required, base metals have been assigned, P-NUMBERS, and GROUP NUMBERS. The assignments are based on comparable base metal characteristics such as composition, weld quality and mechanical properties (as per ASME SEC-IX)

All fusion faces shall be as per plant standard HY06205599 for butt welds; Fillet welds shall be as per Drg. No.3-38101-00033.

Selection of P-Number and Group Number for the materials shall be as per Table-1.

For electrodes, heat treatment and other details, refer relevant Welding Procedure Specification (WPS) as given in Table-2.

Table-2 lists out WPS number for welding between the various combinations of group numbers / P- Numbers.

### 1.2.0 STEP BY STEP PROCEDURE :

STEP-1: Select material of two components to be welded.

STEP-2: Identify the P-NUMBER for the each component from Table-1.

STEP-3: Follow appropriate WPS from Table-2.

### 1.3.0 EXAMPLE :

Welding shall be done between material A106 GrB. (CS) and A132 TP321 (SS). Service natural gas. Pipe thickness is 8.0 mm.

STEP-1 : Welding is between CS & SS materials.

STEP-2 : P-NUMBER for A106 Gr. B is P1 and for A312 TP321 is P8.
i.e., welding between P1 & P8

STEP-3 : From Table-2 for t > or =5.0 use WPS NO WE 315 for root weld,
WE 046 for the remaining passes.

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## TABLE-1

| MATERIAL | P- NUMBER | GROUP NO. |
|---|---|---|
| SA 106 Gr.B | 1 | 1 |
| SA 234 WPB | | |
| SA 672 Gr.B60 | | |
| SA 105 Gr.II | 1 | 2 |
| SA 216 WCB | | |
| | | |
| SA 182 F304 | 8 | 1 |
| SA 182 F321 | | |
| SA 312 TP304 | | |
| SA 240 TP304 | | |
| SA 403 WP321 | | |
| SA 403 WP304 | | |
| SA 312 TP321 | | |
| SA 312 TP316 | | |
| SA 351 CF8 | | |
| | | |
| SA 335 P11 | 4 | 1 |
| SA 182 F11 | | |
| SA 234 WP11 | | |
| SA 387 Gr12 | | |
| SA 217 WC6 | | |
| SA 335 P22 | 5 | 1 |
| SA 182 F22 | | |
| SA 217 WC9 | | |
| SA 234 WP22 | | |

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## TABLE-2

| Sr no. | WELDING BETWEEN | GROUP | THICKNESS (mm) | WPS NO. | REMARK |
|---|---|---|---|---|---|
| 1 | CS to CS (P1 to P1) | 1 & 2 | Up to 5.0 | WE 301 | Only GTAW |
| | | | > 5.0 to (=)18.0 | WE 003 | GTAW + SMAW |
| | | | > 18.0 to (=) 38.0 | WE 004 | GTAW + SMAW |
| | | | > 38.0 to (=) 200.0 | WE 001 | SMAW |
| 2 | SS to SS (P8 to P8) | 1 | Up to 5.0 | WE 313-ER 347 WE 314-ER 308L | Only GTAW (WPS SELECTION BASED ON FILLER METAL USE.) |
| | | | > 5.0 to (=) 50.0 | WE313+WE042/ 045 | GTAW + SMAW (WE 045 instead of 042 for E347 Electrode) |
| 3 | CS to SS (P1 to P8) | 1 &2 to 1 | Up to 5.0 | WE 315 | Only GTAW |
| | | | > 5.0 to (=) 38.0 | WE 315 + WE 046 | GTAW + SMAW |
| 4 | P11 to P11 ( P4 to P4) | 1 | Up to 5.0 | WE 312 | Only GTAW |
| | | | > 5.0 to (=) 50.0 | WE 343 | GTAW + SMAW |
| 5 | CS to P11 (P1 to P4) | 1&2 to 1 | Up to 5.0 | WE 311 | Only GTAW |
| | | | > 5.0 to (=) 50.0 | WE 345 | GTAW + SMAW |
| 6 | CS to P22 (P1 to P5) | 1&2 to 1 | > 4.8 to(=) 28.0 | WE 024 | SMAW |
| 7 | P22 to P22 (P5 to P5) | 1 | > 5.0 to (=) 200.0 | WE 159 | GTAW + SMAW |
| 8 | P11 to P22 (P4 to P5) | 1 | > 4.8 to (=) 28.0 | WE 023 | SMAW |

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## 2.00 INSPECTION & TESTING :

### 2.1.0 PIPING CLASSIFICATION:

For rationalizing the testing and inspection procedure, piping may be classified into following groups based on the critical nature of the service conditions.

**GROUP-A**: **IBR purview piping** like

a. Main Steam Lines
b. Auxiliary Steam Lines
c. Boiler Feed Water Lines

**GROUP-B:** **Non-IBR piping** like

a. Natural Gas Lines
b. Refinery Gas Lines
c. Naphtha Lines
d. Natural Gasoline Lines
e. HSD Lines
f. LSHS Lines
g. Furnace Oil Lines
h. Polished Water Lines
i. Condensate Lines
j. DM Water Lines.
k. Instrument Air Lines
l. Lube oil Lines.

**GROUP-C :** **Utility piping** like

a. Cooling Water Lines
b. Service Water Lines
c. Plant / Service Air Lines
d. Nitrogen lines

### 2.2.0 HYDRAULIC TESTING:

Hydraulic testing shall be conducted for all the lines except the atmospheric lines vents, flares & drains at a pressure of **1.5 times of the design pressure**.

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## 2.3.0 INSPECTION (FOR WELD JOINTS) :

2.3.1 For Alloy steel piping. 100% radiography shall be conducted.

**2.3.2 (a) Group-A piping**:

Inspection of IBR piping shall be done as per IBR class 360-D with latest amendments.
For IBR class-1 pipes (steam pressure>17.6 ATA or Temp 218$^{o}$C )

1. Radiography for pipe bore 102 mm and above:

   10% welds/welder with min 2 welds/welder selected at random

2. Radiography for pipe bore 38 mm upto 102 mm:

   2% of welds/welder with min. of 1 weld /welder selected at random

3. 100% DP test shall be conducted for all fillet welds

**For IBR Class-II pipes (Design parameters less than class-I)**

1. On completion of first 10 welds / welder, one of the weld shall be cut or a separate specimen be prepared for visual examination and bend test
2. 2% of the remainder welds / welder cut for test purpose or a separate test specimen be prepared for visual examination and bend test
3. 10% DP test shall be conducted for fillet welds

**2.3.2. (b) Group-B piping:**

1) 100% visual inspection
2) 20% DP check for fillet welds.
3) Radiography for 10% of butt welds with min. of two welds / welder

**2.3.2. (c) Group-C piping:**

1) 100% visual inspection.
2) 10% DP check for fillet welds.
3) Radiography for 2% of butt welds with min of one welds / welder

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**RECORD OF REVISIONS**

| Rev. No. | Date | Revision Details | Revised By | Approved By |
|---|---|---|---|---|
| 00 | 08.04.93 | First issue. | --- | --- |
| 01 | 10.10.95 | WPS Changed from WE 14 to WE 13. | --- | --- |
| 02 | 23.07.97 | 100% RT for alloy steel pipe incorporated. | --- | --- |
| 03 | 15.12.11 | Table-2 Updated. | Kishor | K.Srinivas. |

Ref. Doc.

# JOB SPECIFICATION FOR NON DESTRUCTIVE EXAMINATION REQUIREMENTS OF PIPING

**PROJECT : VRMP**

**OWNER : HPCL**

**PMC : EIL**

**JOB NO. : B016**

| Rev. No | Date | Purpose | Prepared by | Checked by | Approved by |
|---|---|---|---|---|---|
| 2 | 10.05.2017 | REVISED & ISSUED FOR TENDER | KKJ | AKB | MI |
| 1 | 01.03.2017 | REVISED & ISSUED FOR TENDER | DG | AKB | MI |
| 0 | 09/02/2017 | ISSUED FOR TENDER | KPR | AKB | MI |



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**Abbreviations:**

| | | |
|---|---|---|
| AS | : | Alloy Steel |
| ASME | : | American Society of Mechanical Engineers |
| ASTM | : | American Society for Testing & Materials |
| CS | : | Carbon Steel |
| DP/LP | : | Dye/Liquid Penetrant |
| IBR | : | Indian Boiler Regulations |
| MP | : | Magnetic Particle |
| PMS: | | Piping Material Specification |
| SS | : | Stainless Steel |


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## CONTENTS





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## 1.0 GENERAL

### 1.1 Scope

This specification covers the general requirements for non-destructive examination of shop & field fabricated piping.

### 1.2 Related Codes & Engineering Standards

Referred codes / standards are as follows. Latest editions of the Codes/Standards referred to shall be followed.

a) ASME Boiler & Pressure Vessel Codes, Section V & VIII (Div.1) including addenda.

b) ASME B31.3

c) ASME B16.5

d) ASME B16.34

e) Standard Piping Material Specification, 6-44-0005

f) Welding Specification Charts for Piping Classes, 6-77-0005

g) Standard Specification for Fabrication & Erection of Piping 6-44-0012

h) ASTM E10

i) Welding Specification for Fabrication of Piping, 6-77-0001

j) Design Guide for Radiography Requirements, 8-77-0010

k) Indian Boiler Regulations (IBR)

## 2.0 VISUAL EXAMINATION

**2.1** Weld shall be visually inspected wherever accessible in accordance with the following requirements:

| | | |
|---|---|---|
| a) | Internal misalignment | 1.5 mm or less |
| b) | Cracks or lack of fusion | not permitted |
| c) | Incomplete penetration | Depth shall not exceed the lesser of 0.8mm or 0.2 times thickness of thinner component joined by butt-weld. The total length of such imperfections shall not exceed 38 mm in any 150 mm of weld length. |
| d) | Surface porosity and exposed slag inclusions (For nom. wall thickness 4.7 mm and less) | not permitted |


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| | | |
|---|---|---|
| e) | Concave root surface<br><br>(Suck up) | For single sided welded joints, concavity of the root surface shall not reduce the total thickness of joint, including reinforcement, to less than the thickness of the thinner of the components being joined. |
| f) | Weld ripples irregularities | 2.5 mm or less. |
| g) | Lack of uniformity in bead width | 2.5 mm or less. |
| h) | Lack of uniformity of leg length | 2.5 mm or less. |
| i) | Unevenness of bead | 2.0 mm or less. |
| j) | Weld undercutting | 0.8 mm or 1/4 thickness of thinner components joined by butt weld, whichever is less. (shall be smooth finished) |
| k) | Overlap | 1.5 mm or less |
| l) | Bead deflection | 2.5 mm or less |

m) External weld reinforcement and internal weld protrusion (when backing rings are not used) shall be fused with and shall merge smoothly into the component surfaces. The height of the lesser projection of external weld reinforcement or internal weld protrusion from the adjacent base material surface shall not exceed the following limits:

| Wall thickness of thinner component joined by butt weld (mm) | Weld reinforcement or internal weld protrusion (mm) max |
|---|---|
| 6.4 and under | 1.6 |
| Over 6.4 -12.7 | 3.2 |
| Over 12.7 -25.4 | 4.0 |
| Over 25.4 | 4.8 |

n) Throat thickness of fillet welds:

Nominal thickness of the thinner component x 0.7 or more.

o) Flattening

Flattening of a bend, as measured by difference between the nominal outside diameter and minimum or maximum diameter at any cross section shall not exceed 5 % of the nominal outside diameter of pipe.

p) Reduction of wall thickness

Reduction of wall thickness of a bend, as measured by difference between the nominal thickness and minimum thickness shall not exceed 10 % of the nominal wall thickness of pipe.


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**2.2** Welds having any of imperfections which exceed the limitations specified in various clauses of 2.1 shall be repaired by welding, grinding or overlaying etc. Number of times of repair welding for the same weld, however shall conform to applicable notes to Table 1- Note 6(b)b.5.

## 3.0 NON DESTRUCTIVE EXAMINATION

**3.1** The type and extent of weld examination shall be in accordance with Table-1. All visual and supplementary methods of girth weld examination shall be in accordance with ASME B31.3 & the requirements of this standard specification.

**3.2** Welds between dissimilar materials shall be examined by method & to the extent required for the material having the more stringent examination.


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## 4. TABLE-1 (with applicable notes)

TABLE 1 : CLASS, TYPE & EXTENT OF WELD EXAMINATION

INSPECTION CLASS: I

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P.NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH-MENT WELD | FAB. BRANCH WELD (NOTE 1) | FAB. WELDS OF MITRES / REDUC. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| I | CATEGORY 'D' FLUID SERVICE | CARBON STEEL | 1 | 0 TO 186 | 150# UPTO 10.55 KG/CM$^2$ | **A3A, A3Y, J2A, J3A, A4Y, A5Y** | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | AUSTENIC S.S. | 8 | - 29 TO 186 | | **A3K** | | | | | | |
| | | HDPE | --- | - 20 TO 50 | | **A1Z, A4Z, A5Z.** | b) LP (NOTE 4, 6,9,) | --- | --- | --- | 5% | 10% |
| | | CURPO NICKEL | 34 | - 29 TO 60 | | | | | | | | |

**REMARKS FOR ABOVE TABLE:**

1. LP TEST NOT APPLICABLE TO NON-METALLIC CLASSES.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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## TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

### INSPECTION CLASS: II

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG. C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH-MENT WELD | FAB. BRANCH WELD (NOTE 1) | FAB. WELDS OF MITRES/ REDUC. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| II | a) ALL SERVICES COVERED UNDER INSPECTION CLASS-I, BUT, EXCEEDING CATAGORY 'D' PR./T EMP LIMITATIONS.<br><br>b) ALL SERVICES OTHER THAN THOSE COVERED UNDER INSPECTION CLASS-I BUT NON-TOXIC, NOT SUBJECTED TO SEVERE CYCLIC CONDITIONS.<br><br>c) TOXIC, NON-LETHAL & FLAMMABLE.<br><br>d) FLAMMABLE / NON FLAMMABLE & TOXIC / NON-TOXIC; NOT SUBJECT TO SEVERE CYCLIC CONDITIONS | CARBON STEEL | 1 | - 29 TO 427 | 150# TO 600# | **A1A, B1A, D1A A6A, B6A, A7A, A8A, A9A, B9A, D9A, A10A, A11A, A13A, B13A, A15A, A20A, A32A, B32A, A98A, B98A, B5Y, D5Y, A75A, A93A** | a) VISUAL<br><br>b) RADIOGRAPHY (NOTE 5,6)<br><br>c) MP / LP (NOTE 4,6,10,11)<br><br>d) HARDNESS | 100%<br><br>5%<br><br>---<br><br>NOTE 7 | 100%<br><br>---<br><br>5%<br><br>NOTE 7 | 100%<br><br>---<br><br>---<br><br>NOTE-7 | 100%<br><br>---<br><br>5%<br><br>NOTE-7 | 100%<br><br>20%<br><br>20%<br><br>NOTE-7 |
| | | LTCS | | -45 TO 204 | | **A4A, B4A, D4A** | | | | | | |
| | | AUSTENITIC STAINLESS STEEL OTHER THAN SS321/347 | 8 | -29 TO 500 | | **A1K, B1K,D1K, A29N, A6K, B6K, A1M, B1M,B3M, A1N, B1N, B6N, B98M, A99K, A98M,D6N A23K,B1K,B23K, A75K,B75K** | | | | | | |

**REMARKS FOR ABOVE TABLE:**

1. EXTENT OF HARDNESS TEST FOR A11A IS 100%.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.
3. NOTE- 7 FOR HARDNESS IS NOT VALID FOR P. NO. 8.


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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| III | FIRE WATER AND IBR SERVICES. | CARBON STEEL (FIRE WATER) | 1 | - 29 TO 427 | 150# TO 600# | A33A, A33Y | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | CARBON STEEL (IBR) | | | | A2A, B2A, D2A, A22A | b) RADIOGRAPHY (NOTE 5,6) | 10% | --- | --- | --- | 50% |
| | | | | | | | c) LP / MP (NOTE 4,6,11) | --- | 10% | --- | 10% | --- |
| | | | | | | | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |

**REMARKS FOR ABOVE TABLE:**

1. FOR IBR SERVICE A2A, A22A, B2A & D2A NOTE- 8 IS ALSO APPLICABLE.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.
3. FOR A33A, A33Y FIRE WATER SERVICE, NOTE-12 IS ALSO APPLICABLE.


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## TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

### INSPECTION CLASS: III (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| III (CONTD) | ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS. | C - 0.5 Mo STEEL. | 3 | ABOVE -29 | 150# TO 600# | | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | 0.5 Cr - 0.5 Mo STEEL | | | | | | | | | | |
| | | 1 TO 3 Cr Mo. STEEL. | 4,5A | | | **A1D, B1D, D1D B1E, B21D,D21D** | b) RADIOGRAPHY (NOTE 5,6) | 20% | --- | --- | --- | 50% |
| | | C - 0.5 Mo STEEL (IBR). | 3 | | | | c) LP / MP (NOTE 4,6,11) | --- | 20% | --- | 20% | --- |
| | | 1 - 3 Cr Mo STEEL (IBR) | 4,5A | | | **D2D** | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |

**REMARKS FOR ABOVE TABLE:**

1. FOR IBR SERVICE D2D NOTE- 8 IS ALSO APPLICABLE.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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## TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

### INSPECTION CLASS: III (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| III (CONTD) | ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS. | 3.5 Ni STEEL | 9B | - 80 TO 120 | 150# TO 600# | | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | | | | | | b) RADIOGRAPHY (NOTE 5,6) | 10% | --- | --- | --- | 50% |
| | | | | | | | c) LP / MP (NOTE 4,6,10,11) | --- | 10% | --- | 10% | --- |
| | | | | | | | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |

**REMARKS FOR ABOVE TABLE:**

1. NOTE- 7 FOR HARDNESS IS NOT VALID FOR P. NO. 9B.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| III (CONTD) | ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS. | ALUMINIUM & ALUMINIUM BASE ALLOY | 21 TO 25 | ALL | 150# | | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | COPPER & COPPER BASE ALLOY | 31 | | | | b) RADIOGRAPHY (NOTE 5,6) | 20% | --- | --- | --- | 50% |
| | | ALUMINIUM BRONZE | 35 | | | | c) LP / MP (NOTE 4,6,10,11) | --- | 20% | --- | 20% | --- |
| | | OTHER NON FERROUS ALLOYS | --- | | | | | | | | | |


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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| III (CONTD) | SPECIAL SERVICES (NACE, CAUSTIC) | CARBON STEEL | 1 | ALL | 150# TO 600# | **A16A, B16A, D16A, A19A, B19A, D19A, A27A, B27A, B63A, A64A, B64A, A79A,A67A, B67A,D67A** | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | | | | | | b) RADIOGRAPHY (NOTE 5,6) | 20% | --- | --- | --- | 50% |
| | SPECIAL SERVICES ( O, H) | CARBON STEEL | | | 150# TO 300# | **A5A, B5A, A56A, A95A, B95A, A99A, B99A,B59A, B62A, A59A** | c) LP / MP (NOTE 4,6,10,11,13) | --- | 20% | 10% | 20% | --- |
| | | | | | | | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |
| | SPECIAL SERVICES (NACE, CAUSTIC) | AUSTENITIC STAINLESS STEEL | 8 | | 150# TO 600# | - | | | | | | |

**REMARKS FOR ABOVE TABLE:**

1. EXTENT OF HARDNESS TEST FOR CLASSES A5A, B5A, A95A, B95A, A99A & B99A IS 10% & FOR CLASSES A16A, B16A, D16A, A19A, B19A, D19A, A27A, B27A, B63A, A64A, B64A, A67A, B67A, D67A, A59A, B59A & B62A IS 100%.

2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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## TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

## INSPECTION CLASS: IV

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| IV | ALL SERVICES OTHER THAN SPECIAL SERVICES (O,H) | CARBON STEEL | 1 | ALL | ABOVE 600# | **E1A, F1A, E9A, F9A, E19A, F19A, F67A, G1A** | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | | | | | | b) RADIOGRAPHY (NOTE 5,6) | 100% | --- | --- | --- | 100% |
| | | CARBON STEEL (IBR) | | | | **E2A, F2A.** | | | | | | |
| | | | | | | | c) LP / MP (NOTE 4,6,10,11) | --- | 100% | 10% | 100% | --- |
| | | | | | | | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |

**REMARKS FOR ABOVE TABLE:**

1. FOR IBR SERVICE E2A & F2A NOTE- 8 IS ALSO APPLICABLE.
2. EXTENT OF HARDNESS TEST FOR CLASSES E19A, F19A & F67A IS 100%.
3. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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## TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

### INSPECTION CLASS: IV (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| IV (CONTD) | ALL GENERAL SERVICES. | C - 0.5 Mo STEEL | 3 | ALL | ABOVE 600# | -- | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | | 5 Cr - 9 Cr Mo STEEL | 5B | | 150# TO 600# | A4F, A4G, B3F, B4F, B4G. | b) RADIOGRAPHY (NOTE 5,6) | 100% | --- | --- | --- | 100% |
| | | CLADDED PIPE | | | ALL | A24N, A74N, B24N, B73N, B74N, D24N, D74N, E24N, E74N, F24N, F74N | c) LP / MP (NOTE 4,6,10,11) | --- | 100% | 10% | 100% | --- |
| | | KILLED CARBON STEEL | 1 | UPTO - 45 | ABOVE 600# | -- | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |
| | | 1 TO 3 Cr STEEL (IBR) | 4,5A | ALL | | F2D | | | | | | |

**REMARKS FOR ABOVE TABLE:**

1. FOR IBR SERVICE F2D NOTE- 8 IS ALSO APPLICABLE.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: IV (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH -MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| IV (CONTD) | SPECIAL SERVICES ( O, H ) | CARBON STEEL | 1 | ALL | ALL | **D5A, E5A, F5A, D53A, F53A, E63A, D64A, E64A, F64A, E58A, G5A, G64A, D59A** | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS | 0.5 TO 9 CR Mo STEEL | 3, 4, 5A, 5B, 5 | ALL | ALL | -- | b) RADIOGRAPHY (NOTE 5,6) | 100% | --- | --- | --- | 100% |
| | SPECIAL SERVICES (NACE, O, H, CAUSTIC) | | | | | **B5D, D5D, E5D, D5E, E5E, F5D, B25D, F95E, B26D, D26D, E26D, B95D, D99D, B53D, F55E, F56D, G5E, G56E** | | | | | | |
| | SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS | 13 CR STEEL (TYPE 410SS) | 6 | | | -- | c) LP / MP (NOTE 4,6,10,11,13) | --- | 100% | 10% | 100% | --- |
| | SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS. | 3.5 NI STEEL | 9B | | | -- | d) HARDNESS | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 | NOTE 7 |
| | SPECIAL SERVICES (NACE, O, H, CAUSTIC) | | | | | -- | | | | | | |
| | SPECIAL SERVICES (NACE, O, H, CAUSTIC) | NI ALLOYS | 41, 42, 43 | | | -- | | | | | | |
| | ALL SERVICES | | 45 | | | -- | | | | | | |

**REMARKS FOR ABOVE TABLE:**

1. NOTE-7 FOR HARDNESS IS NOT VALID FOR P.NO.9B.
2. EXTENT OF HARDNESS TEST FOR CLASS D5A, E5A, F5A AND G5A IS 10% & FOR CLASSES D53A, D59A, F53A, E63A, D64A, E64A, F64A, E58A & G64A IS 100%.
3. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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## TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

### INSPECTION CLASS: IV (CONTD.)

| INSPN. CLASS | SERVICE | MATERIAL (NOTE 3) | P. NO. | TEMP. DEG.C | PRESS. CLASS B16.5/ B16.34 | APPLICABLE PIPING CLASS | TYPE OF EXAMINATION | TYPE OF WELD EXAMINED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GIRTH BUTT WELD | SOCKET WELD (NOTE 2) | ATTACH-MENT WELD | FAB. BRANCH WELDS (NOTE 1) | FAB. WELDS OF MITRES / REDUC.) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| IV (CONTD) | SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS. | AUSTENITIC STAINLESS STEEL | 8 | ALL | ALL | -- | a) VISUAL | 100% | 100% | 100% | 100% | 100% |
| | LOW TEMP. SERVICE | | | BELOW - 45 | 150# 300# & 600# | A2K, B2K, D2K, K29M | b) RADIOGRAPHY (NOTE 5,6) | 100% | -- | -- | -- | 100% |
| | GENERAL SERVICES | | | ALL | ABOVE 600# | | | | | | | |
| | HIGH TEMP. SERVICES | | | > 500 | ALL | B4K, B5K, B99M | c) LP / MP (NOTE 4,6,10,11) | -- | 100% | 10% | 100% | -- |
| | SPECIAL SERVICES (O,H) | | | ALL | ALL | B5M, B25M, D25M, B25Q, G5M, E95M, F95M, E96M, B98K, G56K | d) HARDNESS | - | - | - | - | - |

**REMARKS FOR ABOVE TABLE:**

1. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.


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**Applicable Notes to Table-1**

1. Branch welds shall consist of the welds between the pipe & reinforcing element (if any), nozzles & reinforcing element and the pipe & nozzle under the reinforcing element. Reinforcing element to be interpreted as pads, saddles, weldolets, sockolets etc.

2. Seal welds of threaded joints shall be given the same examination as socket welds.

3. Unless specifically stated, all materials shall be for "Non-IBR" service.

4. Magnetic Particle & the Liquid Penetrant method of examination shall be in accordance with Section V of the ASME Boiler and Pressure Vessel Code, Article VII and VI respectively. The entire area of the accessible finished weld surface shall be examined. Selected root runs, subject to a maximum of 10%, before finished weld, may also be examined, at the discretion of the engineer-in-charge.

   a) Wherever MP / LP testing is specified, either MP or LP test may be used. But wherever only MP test is specified, LP method of examination may be used only if MP examination is impracticable in the field as concurred by EIL site-in charge.

   b) "Random 5%" of Liquid Penetrant / Magnetic Particle test shall mean testing, by applicable test, one weld for each twenty welds or less made by the same welding procedure. "Random 10%" shall mean testing, by applicable test, one weld for each ten welds or less made by the same welding procedure. Similarly "Random 20%" shall mean testing, by applicable test, one weld for each five welds or less made by the same welding procedure.

   c) When Liquid Penetrant examination is specified, the surface shall be free of peened discontinuities.

   d) Inspection shall be performed in the welds excluding those for which radiography has been done.

   e) Girth weld, branch weld, attachment weld & socket weld of 3-1/2% Ni steel shall be Liquid Penetrant tested only when welded with austenitic material where MP test has been specified.

5. Radiography:

   a) "Random 5%, 10% or 20% radiography" shall mean examining not less than one from each 20 welds or less in case of "Random 5% radiography", 10 welds or less in case of "Random 10% radiography", one from each five welds or less in case of "Random 20% radiography" made by the same welding procedure. Irrespective of percentage, no. of welds to be radiographed shall be minimum 1. However first two welds made by each welder shall also be radiographed in case of "Random radiography". Welds selected for examination shall not include flange welds and shall be radiographed for their entire length. However, where it is impossible or impracticable to examine the entire weld length of field welds for either random or 100% radiography, and if the same impossibility is agreeable to EIL site-in-charge, then a single 120 deg. exposure of the weld length may be given a Magnetic Particle test or Liquid Penetrant test. However in such cases for ferro-magnetic materials, only MP test shall be acceptable for classes higher than 600#.

   b) In-process examination shall not be substituted for any required radiographic examination.


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c) Number of radiographs per one circumferential weld shall be as per ASME Sec.V Articles 2 and 22.

6. When radiography or other non-destructive inspection is specified, acceptance criteria for repairs or defects shall be as follows:

a) In case of 100% examination, any unacceptable weld shall be repaired and reinspected.

b) If required random examination reveals a defect requiring repair, then:

b.1 Two additional examinations of same type shall be made of the same kind of item (if welded joint, then by the same welding procedure or operator or both).

b.2 If the group of items examined as required by b.1 above is acceptable, the items requiring repair shall be repaired or replaced and reexamined as required and all items represented by this additional examination shall be accepted.

b.3 If any of the items examined as required by b.1 above reveals a defect requiring repair, two further comparable items shall be examined for each defective item found by examination.

b.4 If all the items examined as required by b.3 are acceptable, the items requiring repair shall be repaired or replaced and reexamined as required, and all items represented by this further examination shall be accepted.

b.5 Number of times repair welding could be done for the same weld before acceptance shall be as follows:

| **Material** | **No. of times repair welding is allowed** |
|---|---|
| C.S. upto 300 # | 3 or less |
| C.S. above 300 # | 2 or less |
| Killed steel | 2 or less |
| Low alloy steel | 2 or less |
| Austenitic S.S. | 2 or less |
| 3.5 Ni steel | 2 or less |
| Al & Al base alloy | 2 or less |
| Cu & Cu base alloy | 2 or less |
| Others | 2 or less |

b.6 Welds not found acceptable for allowed number of times of repair as per b.5 above shall be replaced and reexamined.


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b.7 If any of the items examined as required by b.4 above reveals a defect requiring repair, all items represented by these examinations shall be either :

- repaired or replaced and reexamined as required.
- fully examined and repaired or replaced as necessary, and reexamined as necessary.

7. Hardness Test:

a) Hardness test shall be in accordance with ASTM specification E10. Hardness tests of the heat affected zone shall be made at a point as near as practicable to the edge of the weld. One test per weld shall be performed.

b) Hardness test where specifically called out in Table-1 of this specification or in PMS, shall be carried out irrespective of thickness and to the extent (%age) as mentioned therein.

c) All welds which are given heat treatment shall be hardness tested. Hardness test shall be performed after final heat treatment.

d) A minimum of 10% of welds, hot bends, and hot formed components in each furnace heat treated batch and 100% of those which are locally heat treated shall be hardness tested.

e) Hardness test requirement not covered in this specification shall be as per ASME B31.3.

f) The hardness limit applies to the weld and heat affected zone. Following hardness values shall be maintained:

| **Base Metal Group** | **Maximum Hardness (BHN/RC)** |
|---|---|
| CS | 238BHN/RC22 |
| CS (NACE) , Caustic, Amine, H2 | 200BHN |
| Cr Upto 2% | 225BHN |
| Cr 2.25%-10% | 241BHN |
| 18/8 SS (NACE) | RC22 |

g) In case hardness values are mentioned in both Welding Specification Charts for Piping Classes, (6-77-0005) & table given in Note-7(f), the lower of the two values shall be applicable.

8. For IBR service lines, following IBR requirements shall apply in addition to the notes 4, 5, 6, 7, 12 and Table 1. In case of conflict between above notes and these requirements, the more stringent ones shall apply. IBR piping shall be erected of IBR inspector approved material and


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construction procedure. Erected piping shall be hydrotested, inspected and approved by IBR inspector.

a) Piping over 102 mm (4") bore:

10% of welds made by each welder on a pipeline with a minimum of two welds per welder, selected at random, shall be subjected to radiography.

b) Piping 102 mm (4") bore and under, but not less than 38 mm (1-1/2") bore:

Two percent of welds made by each welder on a pipeline with a minimum of one weld per welder, selected at random, shall be subjected to radiography or may be cut for visual examination and tests.

c) Piping less than 38 mm (1.5") bore:

Special tests are not normally required but 2% of welds by each welder on a pipe line may be cut out from the pipeline for the visual examination and bend tests.

d) Retests:

If any test specimen is unsatisfactory, two further weld specimens for retests shall be selected from the production welds and subjected to tests. In the event of failure of any retest specimens, the production welds carried out by this welder subsequent to the previous test shall be given special consideration.

9. For fabricated fittings LP test shall be done on the final pass of welding only, in addition to visual examination.

10. For mitres and fabricated reducers, LP / MP test shall be done on root pass in addition to radiography applicable to circumferential joint of respective piping class.

11. For branch connections, LP/MP test shall be done on root pass and final pass.

12. 10% of the butt weld joints shall be radiographed, however, 50% of these butt weld joints shall be field weld joints.

13. All joints including butt weld joints for NACE classes A16A, B16A, D16A, A27A, A64A, B27A, B63A, B64A, D53A, D64A, E63A, E64A, F64A, A67A, B67A, D67A, F67A & G64A etc. classes shall be wet fluorescent magnetic particle tested. Percentage of wet fluorescent magnetic particle testing of butt weld joints shall be 100% and this testing shall be in addition to radiography.

14. For lined specs, testing (MP/LP/Radiography etc.) shall be performed before lining.


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| MANUFACTURER'S NAME & ADDRESS<br>**BHEL-VISAKHAPATNAM & Approved Subcontractors** | **MANUFACTURING QUALITY PLAN**<br>**ITEM:** Prefabricated Piping<br>Cat B2 & C as per ICP approved | QP NO: CQP:2493 REV 00<br>Date: 21.08.2019<br>Page 1 of 1 | PROJECT: HPCL Vizag Captive Power Plant 75 MW<br>**BHEL Hyderabad PO No: I17ID00248**<br>Internal SO NO:7887<br>Main Customer: HPCL<br>Consultant: Engineers India Ltd<br>Customer LOA: 17000406-HP-46004/Ak dated 15.02.2018<br>EIL Job No: B016 |
|---|---|---|---|

| SL No | COMPONENT & OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENTS | ACCEPTANCE NORMS | FORMAT OF RECORD | | AGENCY | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | M | C | N | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | D | | | | |
| **1.0** | **RAW MATERIALS & BOUGHT OUT ITEMS SHALL BE PROCURED FROM BHEL APPROVED VENDORS. RAW MATERIAL SHALL BE AS PER DRAWING** | | | | | | | | | | | | |
| 1.1 | MS/CS/SS Pipes (Seamless & Welded) | Chemical Analysis, Mechanical tests, Heat treatment, NDT | A | TC verification | 100% | Respective Material specification and technical specification | | Mfg TC | √ | P | V | V | |
| 1.2 | Fittings/forgings (Tees, Elbows, reducers etc) | Chemical Analysis, Mechanical tests, Heat treatment, NDT | A | TC verification | 100% | Respective Material specification and technical specification | | Mfg TC | √ | P | V | V | |
| **2.0** | **IN PROCESS CONTROL** | | | | | | | | | | | | |
| 2.1 | Welding Qualification | Procedure Qualification, Personnel Qualification | B | Review of documents | 100 % | BHEL Hyderabad standard GT 57 124 Rev 03 ASME Sec V Add RT & DPT internal procedure | | WPS/PQR<br>WQR | | P | V | R | |
| 2.2 | Weld Inspection | Surface Quality | B | Visual | 100 % | | | - | | P | V | W | |
| 2.3 | Butt joints | Soundness | B | RT | 10% | | | R | | P | V | ~~V~~ R | |
| 2.4 | Fillet Joints | Soundness | B | DPT | 20% | | | R | | P | V | V | |
| 2.5 | Dimensional inspection | Length, offset, EP, Location/ Height of stubs/ Orientation | B | Measurement | 100% | Drawings | | R | | P | W | R W | |
| **3.0** | **FINAL INSPECTION** | | | | | | | | | | | | |
| 3.1 | Verification of completion | Overall dimensions, orientations, review of records, Identification: WO, DU No; | B | Verification & Visual | 100 % | Drawing & In-process records | | R | | P | V | V | |
| 3.2 | Painting & Preservation | Appearance<br>DFT<br>End capping | C | Visual<br>Measurement | 100 %<br>Random | As per painting schedule PY-AQ-3-M104-2001-01 | | R | | P | V | R | |
| 3.3 | Data folder | Records identified with Tick Mark | B | Compilation of records | 100 % | As required by this QP | | R | | P | V | – | |

EIL comments.
1. PWHT /SR/Solution annealing shall be done as per EIL piping class.
2. Painting shall be done as per EIL spec for painting
3. Hydro test of spool to be done
4. Approved with comments.

Approved with comments

| Prepared By | Reviewed & Approved By | LEGEND: P: PERFORM TC: Test Certificate; WPS: Welding procedure specification; PQR: Procedure Qualification Record; WQR: Welder Qualification Record; RT: Radiographic testing; DPT: Dye Penetrant Examination; DFT: Dry film thickness; M: BHEL/Approved subcontractor; C: BHEL QC/ND/Authorized inspection agency; N:M/s TUV-India Pvt Ltd; A: Critical; B: Major; R-Report/Record as applicable; V: Verification of documents for witnessed marked items; W: Witness<br>Items marked with ✓ (TICK) in column 'D", certificates shall be included in Documentation. | Approved By |
|---|---|---|---|
| V. Sampath Kumar | B. Roy | | EIL Signature & Stamp |

| | |
|---|---|
| PE&SD | **BHARAT HEAVY ELECTRICALS LIMITED**<br>R.C.PURAM, HYDERABAD - 502032.<br>**PROJECT ENGINEERING & SYSTEMS DIVISION**<br>PIPING & LAYOUTS ENGINEERING |

DOCUMENT

# PAINTING SCHEDULE-
# PE&SD PIPING SCOPE OF SUPPLY

PROJECT

**1X75 MW, CPP PACKAGE, at HPCL VIZAG for**
**VISAKH REFINERY MODERNISATION PROJECT (VRMP)**

**PE&SD MECH WONO: 1-0-851-412-00**

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| 00 | 29.03.18 | FIRST ISSUE | FRK | SVNR | GS |
| **REV** | **DATE** | **DETAILS OF REVISION** | **PREPARED** | **CHECKED** | **APPROVED** |

| PROJECT | DOCUMENT TITLE | DOCUMENT NO | REV |
|---|---|---|---|
| **1X75 MW, CPP PACKAGE, at HPCL VIZAG for VISAKH REFINERY MODERNISATION PROJECT (VRMP)** | **PAINTING SCHEDULE** | **PY-AQ-3-M104-2001-01** | **00**<br>29.03.18 |

**TABLE 1 : Painting scheme for Pipes & Pipe Fittings**

| Sl.No. | Description | Surface Preparation & Surface Profile (At Shop) | Initial Coat-Primer (At Shop) | Finish Coat (Post- Erection/ Field) | Total DFT | Remarks | Ground / Finish Colour (Post- Erection/ Field) |
|---|---|---|---|---|---|---|---|
| 1 | CS and AS -Thermally Uninsulated Piping Components<br>Design temp -16 to 80° C<br>**(Pipes,Pipe fittings, Flanges, Valves, Strainer)** | SSPC-SP-10;<br>1 coat of F-9 @ 65-75µ DFT/coat | 1 coat of P-6 @ 40 µ DFT/coat | 2 coats of F-6B @ 100 µDFT/coat<br>+<br>1 coat of F-2@ 40µ DFT/coat<br>(2x100 + 40= 240) | 345-355 | a) No over coating on F-9 is allowed<br><br>b) F-12 shall be ambient Temperature curing type | Refer Annexure-1 |
| 2 | CS and AS -Thermally Uninsulated Piping Components<br>Design temp 81 to 400° C<br>**(Pipes,Pipe fittings, Flanges, Valves, Strainer)** | SSPC-SP-10;<br>1 coat of F-9 @ 65-75µ DFT/coat | None | 2 coats of F-12 @ 20µDFT/coat<br>2x20=40 | 105-115 | | Refer Annexure-1 |
| 3 | CS and AS -Thermally Uninsulated Piping Components<br>Design temp 401° C and above<br>**(Pipes,Pipe fittings, Flanges, Valves, Strainer)** | SSPC-SP-10;<br>1coat of F-12@ 20-25µ DFT/coat | None | 2 coats of F-12 @ 20-25µ DFT/coat<br>(2x20=40) | 60 | This system is suitable up to 540 $^{o}$ C | Refer Annexure-1 |
| 4 | CS, LTCS and Low AS -Thermally Insulated Piping Components-**(Pipes,Pipe fittings, Valves, Steam Traps and Flanges)**<br>Design temp -45 to 125 ° C | SSPC-SP-10;<br>1coat of F-15 @75µ DFT/coat | None | 2 coats of<br>F-15 @75µ DFT/coat | 225 | | Refer Annexure-1 |
| 5 | CS, LTCS and Low AS -Thermally Insulated Piping Components-**(Pipes,Pipe fittings, Valves, Steam Traps and Flanges)**<br>Design temp 126 ° C to 450 ° C | SSPC-SP-10;<br>1 coat of F-12 @20µ DFT/coat | None | 2 coats of<br>F-12 @20µ DFT/coat | 60 | This system is suitable up to 540 $^{o}$ C for low alloy steels | Refer Annexure-1 |
| 6 | SS and AS -Thermally Insulated Piping Components-<br>**(Pipes,Pipe fittings, Valves, Steam Traps and Flanges)**<br>Design temp -45 to 125 ° C | SSPC-SP-7;<br>(15-25µ surface profile)<br>1 coat of F-15 @75 µ DFT/coat | None | 2 coats of<br>F-15 @75µ DFT/coat | 225 | | Refer Annexure-1 |
| 7 | SS and AS -Thermally Insulated Piping Components-<br>**(Pipes,Pipe fittings, Valves, Steam Traps and Flanges)**<br>Design temp 126 ° C to 550 ° C | SSPC-SP-7;<br>(15-25µ surface profile)<br>1 coat of F-16 @125µ DFT/coat | None | 1 coat of<br>F-16 @125µ DFT/coat | 250 | | Refer Annexure-1 |
| 8 | Pipe hangers | SSPC-SP-10;<br>1 coat of F-9 @ 65-75µ DFT/coat | 1 coat of P-6 @ 40 µ DFT/coat | 2 coats of F-6B @ 100 µDFT/coat<br>+<br>1 coat of F-2@ 40µ DFT/coat<br>(2x100 + 40= 240) | 345-355 | | Refer Annexure-1 |
| 9 | Structural steel for pipe supports | SSPC-SP-10;<br>1 coat of F-9 @ 65-75µ DFT/coat | None | 2 coats of F-12 @ 20µDFT/coat<br>2x20=40 | 105-115 | | Refer Annexure-1 |
| 10 | Repair of Pre- Erection/ Pre- Fabrication or Shop primer after Erection/ Welding<br>Design temp -90 to 400° C | SSPC-SP-3 | 1 Coat of F-9 | None | 65-75 | | Refer Annexure-1 |
| 11 | Repair of Pre- Erection/ Pre- Fabrication or Shop primer after Erection/ Welding<br>Design temp 401 to 550° C | SSPC-SP-3 | 1 Coat of F-12 | None | 20 | | Refer Annexure-1 |

Note-1: The application and repair of pre-erection/pre-fabrication or shop primer given in above tables shall be done for all the items to be painted. In case the damages of primer are severe and spread over large area, entire primer shall be removed by blasting to achieve SSPC-SP-10 and surfaces to be primed again with F-9 or F-12 as applicable.

**Legend**
**P: Primer Coat**
**F: Finish Coat**

| Description | Technical Name | Type and Composition |
|---|---|---|
| P-6 | Epoxy Zinc Phosphate Primer | Two component polyamine cured epoxy resin medium, pigmented with zinc phosphate. |
| F-2 | Acrylic Polyurethane finish paint | Two-pack aliphatic isocynate cured acrylic finish paint (free of alkyd/polyester resins). |
| F-6B | Epoxy high Build Coating | Polyamide cured epoxy resin medium suitably pigmented |
| F-9 | Inorganic Zinc Silicate Coating | A two pack air drying self curing solvent based inorganic zinc silicate coating with minimum 80% zinc content on dry film.<br><br>The final cure of the dry film shall pass the MEK rub test as per ASTM D4752. |
| F-12 | Heat Resistant Silicone Aluminium paint Suitable upto 540 Deg C Dry Temp | Single pack silicone resin based medium with Aluminium flakes. |
| F-15 | Two component Epoxy phenolic coating cured with Polyamine adduct hardener | Two pack ambient temperature curing epoxy phenolic coating system suitable for application under insulation of CS/SS piping |
| F-16 | Ambient temperature curing PolySiloxane/ inert polymeric coating suitable for under insulation for CS and SS. | Suitable for high temperature service and under insulation coating for CS, alloy steel and SS |

**NOTES:**

1) All coating system including surface preparation, primer, and finish coat for Piping shall be done at field only
2) If the Pre-erection/Pre-fabrication & Shop Primer is completed, the same shall not be repeated again in the field.
3) Method of Surface preparation: Blast cleaning (Grit Blasting), no Sand blasting is permitted.