TENDER SPECIFICATION

BHEL: PSSR: SCT: 1335

FOR

Handling at Site Stores / Storage yard, Transportation to Site of work, Erection, Testing and Commissioning of HP/Power cycle Piping, LP piping for SG&TG and its accessories, hangers & supports, valves, associated equipments/systems including supply and application of final painting for Unit-8 of 1x250MW Set

at

RAICHUR THERMAL POWER STATION

(For M/s. KPCL),

Shakthinagar, Raichur Dist,

Karnataka.

PART- I TECHNICAL BID

BOOK NO:

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
Power Sector – Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

INDEX SCT : 1335 - Raichur Power cycle Piping

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector, Southern Region
690, Anna Salai, Nandanam, Chennai – 35

Tender Specification No. BHEL: PSSR: SCT: 1335

Messrs Date:

Dear Sir,

SUB: Handling at site stores / storage yard, transportation to site of work, Erection, Testing and Commissioning of HP/Power cycle piping & LP piping for SG & TG and its accessories, hangers & supports, valves, associated equipments/systems including Supply & Application of Final Painting for **Unit # 8** of 1x250MW set at Raichur TPS, ShakthiNagar, Raichur, Karnataka.

Please find enclosed one set of non-transferable tender documents containing **238** - pages along with general conditions of contract Booklet and for the above work.

You are requested to go through the tender documents, GCC Booklet and offer your most competetitive rate and submit the tender documents duly filled in as per procedure indicated in the tender specification along with requisite EMD of **Rs.2,00,000/- (Rupees Two lakhs only)** in the form Demand Draft drawn in favour of M/s.Bharat Heavy Electrical Limited Chennai - 35. Bids with Deviations from the tender conditions will be rejected.

A SEPARATE LETTER SHALL BE FURNISHED INDICATING THAT THERE ARE NO DEVIATIONS FROM THE TENDER CONDITIONS (As in Page 8.)

The completed quotations shall reach the office of the under signed on or before **05.03.2009 at 15.00 Hrs**. The Technical bids will be opened on the same day **at 15.30** hrs. We shall separately intimate the date for opening the price bids only to those parties who are technically qualified. You are requested to depute your authorized representative at the time of opening.

ANY REVISION OF RATES / PRICES WHATSOEVER AFTER THE TIME AND DATE MENTIONED IN TENDER SPECIFICATION FOR SUBMISSION OF COMPLETED QUOTATIONS SHALL NOT BE ENTERTAINED UNLESS CALLED FOR SPECIFICALLY BY BHEL.

Kindly acknowledge the receipt of the tender documents and confirm your participation.

Kindly note that BHEL reserves the right to reject any or all tenders without assigning any reason.

Thanking you,

Yours faithfully,
For and on behalf of
BHARAT HEAVY ELECTRICALS LIMITED

ADDITIONAL GENERAL MANAGER / CONTRACTS

This Tender document is not transferable.
Place: Chennai -35

Encl: One set of Tender documents along with GCC Booklet.

BHARAT HEAVY ELECTRICALS LIMITED
(A government of India undertaking)
Power Sector: Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

SPECIAL INSTRUCTIONS TO BIDDERS

The Bidder must submit their bids as requested in a sealed cover prominently super scribing the Tender Specification number, due date and time of submission as mentioned in the TENDER NOTICE.

The following information shall be furnished by the Bidder along with their offer (Technical Bid cover)

01. Details of previous experience during the last seven years indicating contract value, duration, completion period and present engagement as per G.C.C.
02. Organization structure of the Company as per GCC.
03. Financial status of the firm enclosing balance sheet and profit and loss account for the past 3 years and certificate from the Company's Banker as per G.C.C
04. Turnover of the Company in last 3 financial years.
05. Latest Income Tax clearance certificate.

06. BIO DATA of key personnel presently in the Rolls of the company and proposed site organization for carrying out the work including deployment of Engineers and Supervisors.

07. Declaration sheets as per Appendix of Tender Specification.

08. Checklist and Schedule of General particulars as per Appendix in GCC.

09. T & P owned/deployment details as per G.C.C.

10. Technical manpower deployment details as per G.C.C

11. Other relevant details as per GCC and checklist.

12. These terms and conditions will be read and construed along with General Conditions of contract and incase of any conflict or inconsistency between the General conditions and the Terms and condition the tender specification, the provisions contained in the Term and conditions (NIT, Rate Schedule, Common conditions, Special Conditions including Appendices) shall prevail.

13. THE BIDDERS ARE REQUESTED TO FURNISH THE DOCUMENTS LIKE COPIES OF LOI'S, WORK ORDER'S ETC PERTAINING TO THE EXPERIENCE INDICATED IN QUALIFYING REQUIREMENTS, AS GIVEN BELOW.

14. Qualification Requirements

a) The bidders should have executed power cycle piping/HP piping works in a power plant of minimum one unit of capacity 110 MW or above in the last seven years.

b) The bidders should have a minimum average financial turn over of **Rs.237 Lakhs** in last three financial years ending on 31st March 2008.

The bidder must have earned profit in any one of the last three financial years ending on 31.03.2008 and should have positive net worth as on 31.03.2008.
Bidder should submit audited balance sheet and profit & loss account of the company for last three years ending on 31.03.2008 in support of above requirement.

c) Notwithstanding the above, BHEL reserves the right to reject any Tender or all the Tenders for the reasons whatsoever beyond our control and the decision of BHEL is final.

d) Approval of the agency by customer

LD / Penalty shall be leviable as per the applicable clauses of GCC.

15. TENDERERS HAVE TO FURNISH A DECLARATION SHEET INDICATING THAT THERE IS NO DEVIATION IN TENDER DOCUMENTS (AS IN PAGE 8) TENDERERS MAY FURTHER NOTE THAT THIS DECLARATION IS A PREREQUISITE FOR BHEL TO CONSIDER THEIR BIDS. BIDS SUBMITTED WITHOUT "NO DEVIATION DECLARATION" WILL BE REJECTED BY BHEL.

16. SAFETY PLAN

Bidder may further note that the submission of safety plan is a prerequisite for BHEL to consider their bids.

BHARAT HEAVY ELECTRICALS LIMITED
(A government of India undertaking)
Power Sector : Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

PROCEDURE FOR SUBMISSION OF SEALED BIDS

The Tenderers must submit their bids as required in two parts in separate sealed covers prominently super scribed as Part I "Technical Bid" and Part II "Price Bid" and also indicating on each of the covers the tender specification number and due date and time as mentioned in the Tender Notice.

Part I (Technical Bid) Cover I

Excepting Rate Schedule, all other schedules, data sheets and details called for in the specification shall be enclosed, in part I Technical Bid only.

Part II (Price Bid) Cover II

All indications of price shall be given in this part II Price Bid.

Tenderers are requested to quote their rates, only in the price bid (part II) provided by BHEL. Quoting of rates in any other form / formats will not be entertained.
These two separate cover I & II (Part I and Part II) shall together be enclosed in a third envelope (Cover III) along with requisite EMD as indicated and this sealed cover shall be super scribed and submitted to ADDITIONAL GENERAL MANAGER/Contracts at the above mentioned address before the due date as indicated. The Tenderers will be intimated separately in case any clarifications are required.

NOTE:
Tenderers are issued with 2 Nos. of Technical Bids, 2 Nos. of Price Bids and 2 Nos. of GCC booklet. Out of which one set of each document shall be retained by them for their reference. Balance one set shall be submitted along with their offer as per procedure indicated above.

EMD amount for this Tender is **Rs.2,00,000/- (Rupees Two Lakhs only).** This EMD amount shall be submitted in the form of either pay order or demand draft only drawn in favour of M/s. Bharat Heavy Electricals Limited, Chennai – 35.
EMD amount in the form of Bank Guarantee / fixed deposit receipt or in any other form will not be accepted.

ANY REVISION OF RATES / PRICES WHATSOEVER AFTER THE TIME AND DATE MENTIONED IN TENDER SPECIFICATION FOR SUBMISSION OF COMPLETED QUOTATIONS SHALL NOT BE ENTERTAINED UNLESS CALLED FOR SPECIFICALLY BY BHEL.

Additional General Manager/Contracts.

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector, Southern Region
690, Anna Salai, Nandanam, Chennai – 35

TENDER NOTICE

Sealed Tenders are invited from reputed contractors with sufficient previous experience in the under mentioned similar nature of work:

Tender Specification No. BHEL: PSSR: SCT: 1335

Description	EMD
Handling at Site Stores / Storage yard, Transportation to Site of Work, Erection, Testing and Commissioning of HP/power cycle piping For SG&TG and its accessories, hangers & supports, valves, associated equipments/ system including supply and application of final painting for Unit -8 of 1x250MW at Raichur Thermal Power Station Shakthinagar,raichur,Karnataka.	Rs.**2,00,000/-** (Rupees Two Lakhs only)

Cost of Tender Documents (Including all Taxes)	:	Rs.1040/	
Sale Starts on	:	12.02.2009	
Sale closes on	:	04.03.2009	
Due date and Time for Submission	:	05.03.2009	15.00 Hrs
Date and time for opening of Technical Bids	:	05.03.2009	15.30 Hrs.

Qualification Requirements

a) The bidders should have executed power cycle piping/HP piping works in a power plant of minimum one unit of capacity 110 MW or above in the last seven years.

b) The bidders should have a minimum average financial turn over of **Rs.237 Lakhs** in last three financial years ending on 31st March 2008.

The bidder must have earned profit in any one of the last three financial years ending on 31.03.2008 and should have positive net worth as on 31.03.2008.
Bidder should submit audited balance sheet and profit & loss account of the company for last three years ending on 31.03.2008 in support of above requirement.

c) Notwithstanding the above, BHEL reserves the right to reject any Tender or all the Tenders for the reasons whatsoever beyond our control and the decision of BHEL is final.

d) Approval of the agency by customer

LD / Penalty shall be leviable as per the applicable clauses of GCC.

Interested parties can get the Tender documents from the office of the Additional General Manager / Contracts on all working days(Between 10.00 AM to 4.30 PM) by remitting the cost of tender documents either by Cash (Cash remittance at BHEL Cash counter to be remitted before 3.30 PM) or A/c Payee Demand Draft drawn in favour of M/s. Bharat Heavy Electricals Limited, Chennai – 600 035. Money order, Cheques and Postal Orders will not be accepted.

Bharat Heavy Electricals Limited takes no responsibility for any delay, loss or non - receipt of tender documents sent by post and also reserves the right to reject any or all the tender without assigning any reason thereof.

TENDER NOT ACCOMPANIED BY THE PRESCRIBED EARNEST MONEY DEPOSIT ARE LIABLE TO BE SUMMARILY REJECTED.

ADDITIONAL GENERAL MANAGER/CONTRACTS

TENDER SPECIFICATION: BHEL: PSSR: SCT: 1335

CERTIFICATE FOR NO DEVIATION

I, Of M/s.

hereby certify that there is no deviation from the Tender conditions either technical or commercial and I am agreeing to all the terms and conditions mentioned in the Tender Specification.

SIGNATURE OF THE TENDERER

OFFER OF CONTRACTOR

ADDITIONAL GENERAL MANAGER/Contracts
Bharat Heavy Electricals Limited,
Power Sector : Southern Region
690, Anna Salai,
Nandanam,
Chennai – 600 035.

Sir,

I/We hereby offer to carry out the work detailed in Tender Specification **No.BHEL: PSSR: SCT: 1335** issued by Bharat Heavy Electricals Limited, Power Sector: Southern Region, in accordance with the terms and conditions thereof.

I/We have carefully perused the following documents connected with the above work and agree to abide by the same.

1. Instructions to Tenderer
2. General Conditions of Contract
3. Special conditions of Contract
4. Other Section, Appendices and Schedules

I/We have deposited/forwarded herewith the Earnest Money Deposit/ a sum of Rs.2, 00,000/- (Rupees Two Lakhs only) vide DD.No. . Dt. which shall be refunded should our offer not be accepted. Should our offer be accepted, I/We further agree to deposit such additional sum which along with the sum of Rs.2, 00,000/- (Rupees Two Lakhs only) mentioned above, to make up the Security Deposit for the work as provided for in the Tender Specification within the stipulated time as may be indicated by BHEL, Power Sector: Southern Region, Chennai – 600 035.

I/We further agree to execute all the works referred to in the said documents upon the terms and conditions obtained or referred to therein and as detailed in the appendices annexed thereto.

DATE: CONTRACTOR:
PLACE: ADDRESS:

Witness with their address

Signature Name Address

RAICHUR STAGE – III 1 X 250 MW UNIT – 8

PROJECT INFORMATION - GENERAL

01	**Project Title**	**RAICHUR THERMAL POWER PROJECT STAGE – III 1 X 250 MW UNIT NO. 8**
02	**Owner/Purchaser**	**Karnataka Power corporation Limited " Sudharsan Complex" , II Floor, No. 22/23, Seshadri Road, Bangalore – 560 009**
03	**Location**	**Raichur Thermal Power station is 18 Kms away from Raichur on Raichur – Hyderabad State Highway . It is situated 2.5 Kms away on the right bank of river Krishna.**
04	**Nearest Railway**	**Krishna, Raichur TPS siding for full wagon and Raichur railway station for smalls. Both the Railway stations are coming in South Central Railway - Broad Gauge .**
05	**Nearest Airport**	**Hyderabad**
06	**Site Elevation**	**351 Metres, AMSL**
07	**Ambient Air Temp**	
	a) Maximum	**45 °C**
	b) Minimum	**6 °C**
	c) Design dry bulb temp	**35 °C**
	d) Design wet bulb temp	**27 °C**
	e) Design ambient temp for electrical/air compressor equipment	**50 °C**

RAICHUR STAGE – III 1 X 250 MW UNITS – 8

PROJECT INFORMATION - GENERAL

08	**Relative Humidity**	
	a) Maximum during monsoon	**85%**
	b) Minimum	**20%**
	c) Average	**65%**
	Note : For the purpose of guaranteed efficiency of steam generator , the ambient air temperature shall be taken as 31 °C and relative humidity as 60% based on design coal firing with coal analysis.	
09	**Rainfall**	
	a) Annual average	**720 mm**
	b) Max. for one day	**115 mm**
	c) Maximum intensity	**38 mm/hr**
	d) Period	**June to September**
10	**Seismic Data**	
	a) Zone as per IS 1893	**Zone - 1**
	b) Coefficient (including importance factor and foundation factor)	**0.015**
11	**Wind Data**	
	Basic wind pressure as per IS : 875	**100 Kg/sq.m**
	Wind Velocity	**a) Maximum 70 Kmph** **b) Prevailing wind direction** **c) North – East, South – West** **South- East, West**
12	**Barometric Pressure**	**734 mm of Hg**
13	**Transport**	
	a) Name of the highway near which plant is located	**Raichur – Hyderabad State Highway**
	b) Railway (Gauge)	**Broad Gauge**
14	**Construction Power**	**415 V (+10% - 10%) , 3 Phase by customer free of cost**
15	**Construction water**	**By customer free of cost**

SECTION III

COMMON CONDITIONS OF CONTRACT – PIPING PACKAGE

3.1 SCOPE OF CONTRACT

3.1.1 The Intent of this specification is to provide services for executing the projects according to most modern and proven techniques and codes. The omission of specific reference to any method and equipment or material necessary for the proper and efficient services towards installation shall not relieve the contractor of the responsibility of providing such services, facilities to complete the project or portion of project awarded to him. The quoted rate shall deem to be inclusive of all such contingencies.

3.1.2 The contractor shall carry out the work in accordance with instructions/ drawings/ specification/ standard practices supplied by BHEL from time to time.

3.1.3 Provision of all types of labour, Supervisors, watch and ward as required, tools and tackles as required, consumables as required under various clauses of tender specification for handling transportation, erection, testing and commissioning.

3.1.4 Proper out-turn as per BHEL plan and commitment.

3.1.5 Completion of work in time.

3.1.6 Good quality and accurate workmanship for proper performance of equipment / systems.

3.1.7 Preservation of all components at all stages of pre-assembly / erection / testing and commissioning till unit is handed over.

3.2 FACILITIES TO BE PROVIDED BY BHEL:

3.2.1 OPEN SPACE:

Open space for building of temporary office shed and contractor's stores shed(s) will be provided free of hire charges. Contractor has to make his own arrangements for labour colony.

3.2.2 ELECTRICITY:

For construction purpose electricity will be provided at one single point free of charge. Further distribution shall be arranged by the contractor for construction at their cost.

3.2.3 WATER:

Water for construction purpose and drinking purpose will be provided by BHEL at one single point free of charge, as provided by Customer.

3.2.4 TOOLS & TACKLES:

All the tools and tackles required for the complete erection of components shall be arranged by the contractor, except the items specified and agreed upon by BHEL and the quoted rate shall be inclusive of such requirements.

3.2.5 CONSUMABLES:

Such of those consumables as indicated as “Consumables provided by BHEL” shall alone be provided to the contractor by BHEL free of charge**.** Other consumables, filler wires, electrodes, gas etc. are to be arranged by the contractor at his cost.

Quantity of Filler wire for TIG welding as received from the respective manufacturing units for **P91 material** (as specified in special conditions of contract) along with the components/equipments only shall be supplied by BHEL free of cost. Any excess requirement shall be arranged by the contractor/BHEL at contractor’s cost. Other indigenous alloy steel, stainless steel and carbon steel filler wires and all electrodes are to be arranged by the contractor at his cost.

3.2.6 CRANES

EOT crane of customer as per availability without **operator shall** be made available in the T.G. Hall free of hire charge for erection purposes on sharable basis as per the requirement as per BHEL engineer’s discretion.

The contractor has to arrange for trained operators for EOT Cranes within the quoted lump sum value. The operators engaged by the contractor shall be tested by BHEL before he is allowed to operate the crane.

As the above crane is likely to be deployed sometimes for various contractors the decision of BHEL engineers will be final with regard to allotment of crane.

The availability of crane is likely to be hampered from time to time due to routine preventive maintenance or breakdown maintenance. Contractor has to make alternative arrangement or plan / modify / alter his activities to suit the above conditions and the contractor will not be liable for any compensation or extension of time due to this non availability, for maintaining the schedule.

It shall be the responsibility of the contractor to arrange for all other lifting equipments / plant and machineries other tools and tackles required for satisfactory completion of work. The contractor shall indicate the list of T & P he proposes to use in the work along with his offer.

For the movement of cranes & trailor etc. of contractor during material handling it may become necessary to lay sleeper bed for obtaining safe approach for usage of equipment. It shall be the contractor's responsibility to lay necessary sleepers. Necessary sleepers shall be arranged by the contractor at his cost.

3.3 FACILITIES TO BE PROVIDED AND DEVELOPED BY THE TENDERER AT HIS COST.

3.3.1 CIVIL CONSTRUCTION:

It shall be the responsibility of the contractor to construct his own office shed, stores shed, with all facilities like electricity, water supply, sanitary arrangements in the area allotted to him for the purpose.

3.3.2 WATER DISTRIBUTION:

Distribution of water for construction purposes and as well as drinking purposes to various work-fronts shall be contractor's responsibility and at his cost.

3.3.3 ELECTRICITY DISTRIBUTION:

Any duty deposit involved in getting the Electricity shall be borne by the bidder. As regards contractor's office shed also all such expenditure shall be borne by the contractor.

Provision of distribution of electrical power from the given single central common point to the required places with proper distribution boards,

approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.

3.3.4 POSSESSION OF GENERATORS

As there are bound to be interruptions in regular power supply, power cut/ loadshedding in any construction site due to inherent power shortage in state on this account, suitable extension of time, if found necessary only be given and Contractor is not entitled for any compensation. It shall be the responsibility of the tenderer / contractor to provide, maintain the complete installation on the loadside of the supply with due regard to safety requirements at site. It shall be the responsibility of the contractor to have atleast (2 to 4) diesel operated welding generator sets to get urgent and important work to go on without interruptions. The consumables required to operate the generators are to be provided by tenderers. This may also be noted while quoting. However during welding of P91 materials, if main supply fails, BHEL will arrange suitable DG power supply only for P91 welding works only.

3.3.5 LIGHTING FACILITY:

Adequate lighting facilities such as flood lamps, low volt hand lamps and area lighting shall be arranged by the contractor at the site of construction, contractor's material storage area etc. at his cost.

3.3.6 POWER REQUIREMENT:

For the purpose of planning, contractor shall furnish along with tender the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

3.3.7 CONTRACTOR'S OBLIGATION ON COMPLETION:

On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work

3.4 GASES :

3.4.1 All required gases like Oxygen/ Acetylene/ argon/ Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non-availability of gases cannot be considered as reasons for not attaining the required progress.

3.4.2 In case of improper arrangement of above gases, BHEL reserves the right to procure the same from any source and for issues made, recover the cost from the contractor's bill at the market value plus BHEL departmental charges. Postponement of recoveries is not permissible

3.4.3 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

3.4.4 All the integral lube and control oil pipelines required TIG welding operations are to be purged with Nitrogen Gas / Argon Gas for the purpose of creating inert atmosphere in the pipelines during the process of TIG welding. Nitrogen, Argon gas required for this purpose shall have to be arranged by the contractor at his cost.

3.4.5 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

3.4.6 The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

3.5 ELECTRODES

3.5.1 All the other required electrodes, filler wires as above are to be approved by BHEL. It shall be the responsibility of the contractor to obtain prior approval of BHEL before procurement regarding suppliers, type of electrodes etc. On receipt of the electrodes at site it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes batch No. date of expiry etc.,

3.5.2 TIG welding wires for P 91 Welding as received from the respective manufacturing units along with the components / equipment only shall be supplied by BHEL free of cost. However, indigenous alloy steel, stainless steel, & carbon steel filler wires and all electrodes are to be arranged by the contractor at his cost. The utilization of the filler wires shall be duly accounted for exercising maximum care and ensuring economical usage for minimum wastage.

3.5.3 Storage of electrodes shall be done by the contractor in an air conditioned / controlled humidity room as per requirement.

3.5.4 All electrodes shall be dried in the electrode drying oven to the temperature and period specified by the BHEL Engineer before they are used in erection work and each HP Welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by the contractor.

3.5.5 All filler wires and electrodes shall be preserved by the contractor carefully to prevent deterioration of their properties. Special care shall be taken to preserve alloy steel and other special electrodes/filler wires. Contractor shall exercise maximum care in using these electrodes/filler wires to minimise wastage by maintaining a record of all usages.

3.5.6 Incase of improper arrangement of procurement of above electrodes BHEL reserve the right to procure the same from any source and recover the cost from the contractor's first, subsequent bill at market value plus departmental charges of BHEL. Postponement of such recovery is not permissible.

3.5.7 BHEL reserves the right to reject the use of any electrodes at any stages if found defective because of bad quality, improper storage, date of expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

3.6 TOOLS & TACKLES

3.6.1 BHEL will provide free of hire charges on sharing basis the tools and plants indicated in **Section VII Appendix - III** only. It may be noted that distribution of these equipments will be done by BHEL Engineers and the decision of the Engineer shall be final in this regard.

3.6.2 The Contractor shall be responsible for the safe and proper use of the above equipments issued to his. Day-to-day maintenance and operation of equipments shall be the contractor's responsibility and shall be as per instructions/standard practice of BHEL Engineer.

3.6.3 Any loss/damage to any or part of the above equipments shall be to contractor's account and the expenditure on this account will be recovered from contractor's bills in case contractor fails to make good the loss.

3.6.4 Necessary electrical / water / air connection required for operation of any of the above equipment shall be Contractor's account.

3.6.5 Non-availability of any of the above equipment either due to breakdown/routine maintenance or due to distribution pattern of BHEL shall not be quoted as reason for delay of work.

3.6.6 Monthly utilisation report of the above equipment shall be furnished by contractor for cost analysis purpose.

3.6.7 The contractor shall return the T & P issued to him by BHEL in good working condition as and when so desired by BHEL. (Completion or reduction in work load) for diversion for other work. If such return is delayed by contractor due to his fault without written consent of BHEL, hire charges as applicable according to BHEL policy will be levied from such time it was requisitioned by BHEL to the time of actual return and the amount so decided and arrived at, will be recovered from the contractor's bill.

3.6.8 All other T & P required for the satisfactory execution of work shall be arranged by contractor.

3.6.9 All the T & P arranged by contractor including electrical connections wherein required shall be reliable / proven / tested with necessary test certificate.

3.6.10 All instruments, measuring tools etc. are to be calibrated periodically as per the requirement of BHEL and necessary calibration certificates are to be submitted to BHEL before use.

3.6.11 The contractor has to return the T & P in good working condition and cost of any replacement required has to be borne by the contractor. Normal wear and tear will be taken into account.

3.6.12 Contractor shall have at all times experienced operators and technicians for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant BHEL rectifying the defect and charging the cost to the contractor.

3.6.13 If at any time it is noticed that contractor is not using any of the T & P or equipment properly according to the instructions of BHEL, BHEL will have

the right to withdraw any and all such equipment and any cost due to this shall be contractor's account.

3.6.14 All the T & P would be issued only at BHEL stores and it shall be the responsibility of the contractor to take delivery from BHEL stores, transport the same to site and return the same to BHEL stores in good condition after use.

3.6.15 All the T & P, lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be got approved by BHEL Engineer before they are actually put on use. Test certificates obtained from the statutory authority should be submitted before their usage.

3.6.16 For movement of cranes etc. It may become necessary to lay sleeper bed for obtaining leveled safe approach for usage of equipment. It shall be the responsibility of the contractor to lay necessary sleepers. The sleepers shall be arranged by the contractor at his cost.

3.6.17 Contractor shall make good any loss or damage to the equipments supplied to him and day to day maintenance and operations of equipments shall be borne by the contractor including all consumables like petrol, oil and air filters etc.

3.7 SUPERVISORY STAFF AND WORKMEN

3.7.1 The Contractor shall supply all the skilled workmen like Welders, Gas cutters, electricians, Riggers, Serangs, Erectors, carpenters, fitters etc. in addition to other skilled semi-skilled and unskilled workmen required for all the works of handling and transportation from site stores/storage yard to erection site, transportation, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserves the right to decide on the suitability of the workers and other personnel who will be employed by the contractor, BHEL reserves right to insist on removal of any employee of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him.

3.7.2 The supervisory staff employed by the contractor shall be qualified (Engineers – Graduates in Engineering and Supervisors – Diploma Holders) and experienced in the area of work. They shall ensure proper out-turn of work and discipline on the part of labour put on the job by the contractor and in general see that the works are carried out in safe and proper manner and in coordination with other labour and staff employed directly by BHEL or BHEL's client.

3.7.3 The Contractor shall also furnish daily labour report showing by classification the number of employees engaged in various categories of work and a progress report of work as required by BHEL Engineer. The contractor shall also give a summary report at the end of the month and plan of deployment for the consequent month as per the plan of activities as required by BHEL, to meet the overall contract requirement.

3.7.4 The work shall be executed under the usual conditions existing in major power plant construction and in conjunction with numerous other operations at site. The bidder and his personnel shall co-operate with other personnel other contractor coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

3.7.5 The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work, good workmanship and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerances given in the drawings/instructions given by BHEL Engineers from time to time. Wherever finish or tolerances are not specified in drawings/documents, BHEL Engineers instruction are taken as final.

3.7.6 The contractor shall employ the necessary number of qualified and approved full time electricians at his cost to maintain his temporary electrical installation till the completion of work.

3.7.7 It is the responsibility of the bidder to engage his workmen in shifts or on overtime basis for achieving the target set by BHEL and also during erection, commissioning and testing period. The contractor's quoted rate shall include all these contingencies.

3.7.8 If the contractor or his workmen or employees shall break, deface, injure or destroy any part of a building, road, kerb, fence, enclosure, water pipes, cables, drains, electric or telephone posts or wires, trees or any other property or to any part of the erected components etc. The contractor shall make the same good at his own expense or in default, BHEL may cause the same to be made good by other workmen or by other means and deduct the expenses (of which BHEL's decision is final) from any money due to the contractor.

3.7.9 The contractor shall provide at his cost watch & ward round the clock for the safety of the equipment under erection / in his stores at site. A technically qualified (Diploma in Technical safety) safety officer

should be employed by the contractor to handle all the safety requirements in work area.

3.8 SCOPE OF MATERIAL HANDLING AND SITE STORAGE AND OTHER RESPONSIBILITIES

3.8.1 While BHEL will endeavour to store/stack/identify materials properly in their open/closed storage yard/shed it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection, taking delivery of the same in time following the procedure indicated by BHEL and transport the material safely to pre-assembly yard/erection site in time according to programme.

3.8.2 The contractor shall identify necessary supervisor/labour for the above work in sufficient quantity as may be needed by BHEL for areas covering their scope.

3.8.3 It shall be contractor's responsibility to arrange necessary tractors, trailor or trucks/slings/tools and tackles/labour including operators Fuel lubricants etc., for loading from storage yard and on to transport equipment, move it to erection site/pre-assembly yard and unload the same at pre-assembly yard/ erection site and the quoted rate shall include the same.

3.8.4 All equipment so used by contractor shall be of proven quality and safe in operation as approved by BHEL site Engineers from time to time.

3.8.5 Any loss/damage to materials issued to contractor shall be made good by him or BHEL will arrange for replacement at cost recovery basis and decision of BHEL shall be final.

3.8.6 All welding filler wires is issued to contractor shall be preserved by him carefully to prevent deterioration of their properties. Special care shall be taken to preserve alloy steel and other special electrodes / filler wires. Contractors shall exercise maximum care in using these electrodes, filler wires to minimize wastage by maintaining a record of all usages.

3.8.7 All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

3.8.8 All the surplus damaged, unused materials, package materials / containers / special transporting frames, gunny bags etc. supplied by BHEL shall be returned to the BHEL Stores by the contractor and maintain records.

3.8.9 The contractor shall take delivery of the components and equipments and special consumables from the storage area after getting the approval of the

BHEL Engineer on standard indent forms to be specified by BHEL. At periodic/intervals of work, complete and detailed account of the equipment so erected and electrodes used shall be submitted to the BHEL Engineer.

3.8.10 The contractor shall follow monthly plan for erection and the same will be mutually agreed upon after discussion. The contractor shall arrange for Engineers, Supervisors and labour force and tools and plants and consumables to suit the above plan and execute the work accordingly.

3.8.11 The Contractor shall have total responsibility for all equipment and materials in his custody, stores, loose, semi-assembled, assembled or erected by him at site.

3.8.12 The contractor shall make suitable security arrangement including employment of security personnel to ensure the protection of all materials/equipments and works from theft, fire, pilferage and any other damage and loss.

3.8.13 The contractor shall ensure that the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are installed.

3.8.14 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and / or handling of the equipments without the specific written permission of the Engineer. The equipments from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipments at site.

3.8.15 The work covered under this scope of work is of highly sophisticated nature requiring best quality / precision workmanship engineering and construction management. He should also ensure successful and timely commercial operation of equipment installed. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.

3.8.16 All the necessary certificates and licenses required to carry out this scope of work are to arranged by the contractor then and there at no extra cost.

3.8.17 The contractor shall take all reasonable care to protect the materials and work till such time the erected equipment has been taken over by BHEL/their client. Wherever necessary suitable temporary fencing and lighting shall have to be provided by the contractor as a safety measure against accident and damage of property of BHEL. Suitable caution notices

shall be displayed where access to any part may be deemed to be unsafe and hazardous.

3.8.18 The contractor shall be responsible for taking all safety precautions during the construction and keeping the site safe at all times and the end of each working day. When the work is temporarily suspended he shall protect all construction materials, equipments and facilities from causing damage to existing property interfering with the operations of the station when it goes into services. The contractor shall comply with all applicable provisions of the safety regulations clean-up programme and other precautionary measures which the BHEL has in effect at the site.

3.8.19 All lifting tackles including wire ropes, slings, shackles etc. used by the contractor shall be got approved by BHEL Engineer at site before they are actually put on the work. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damage to other equipments and personnel. All piping shall be adequately supported and protected to prevent damage during handling and erection. The history cards for major equipments to be maintained by the contractor.

3.8.20 The contractor shall take delivery of equipment from storage yard/stores/sheds. He shall also make arrangements for verification of equipment, scrupulously maintain records and keep safe custody watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by BHEL's client. The stolen/lost/damaged goods shall have to be made good by the contractor at his own cost.

3.8.21 Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

3.9.0 CIVIL WORKS

3.9.1 Column foundation and foundation of other plants and necessary civil works shall be provided by the clients of BHEL. The dimension of the foundation and anchor bolt pits shall be checked by the contractor for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench mark etc. All adjustments of foundations surfaces, enlarging the pockets in foundations etc. as may be required for the erection of equipments plants shall be carried out by the contractor. All the materials like cements, including special cement like Conbextra, or its

equivalent, sand, etc. shall also be arranged by the contractor at his cost wherever necessary.

3.9.2 The contractor at his cost shall arrange for grouting of foundation bolt holes of column and equipment as specified in the drawings / specification or as advised by the Engineer of BHEL after preparing the foundation top surface for grouting, All the materials for grouting (sand, gravel & cement including special. Cement) shall be arranged by the contractor. The grouting has to be done up to basement level. The required consumables like Portland cement, gravel, sand etc., have to be provided by the contractor at his cost. Special cement like conbextra, GP2/shrinkomp or its equivalent if required shall be arranged by the contractor at his cost.

3.9.3 The contractor at his cost shall arrange for grouting of anchor points of T & P issued to him and also grouting of winches or any other supports required for T & Ps. Necessary grout materials are to be arranged by the contractor at his cost.

3.10.0 DRAWINGS AND DOCUMENTS

3.10.1 The detailed drawing specification available with BHEL Engineers will form part of this tender specification. These documents will be made available to the contractor during execution of work at site.

3.10.2 One set of necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan which shall be returned to BHEL Engineer at site after completion of work. Contractor's personnel shall take care of these documents given to them. Contractor shall maintain complete records of drawings and documents given to them time to time and maintain the latest drawings / documents in their custody. Contractor shall refrain from defacing the drawing / documents available with them.

3.10.3 The data furnished in various appendices enclosed with this Tender Specification, describes the equipment to be installed, tested and commissioned under this specification briefly. However, the changes in the design and in the quantity may be expected to occur as is usual in any such large scales of work.

3.10.4 Should any error or ambiguity be discovered in the specification, or information, the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.

3.10.5 Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimensions/details without specific approval of BHEL.

3.11.0 SITE CLEANLINESS AND SAFETY REQUIREMENTS

3.11.1 Contractor shall strictly follow all safety regulations/conditions as per **General Conditions of Contract** booklet enclosed with this tender.

3.11.2 Non-conformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractor as under:

Sl.No	Safety measures	Fine (Rs.)
01	Not wearing safety helmet	50/-
02	Not wearing safety belt	100/-
03	Grinding without goggles	50/-
04	Not using 24V supply for internal work	500/-
05	Electrical plugs not used for hand machines	100/-
06	Not slinging properly	200/-
07	Using damaged sling	200/-
08	Lifting cylinders without cage	500/-
09	Not using proper welding cable with lot of joints	200/-
10	Not removing small scrap from platforms	200/-
11	Gas cutting without taking proper precaution or not using sheet below gas cutting	200/-
12	Not maintaining elec. Winches which are being operated dangerously	500/-
13	Improper earthing of electrical T & Ps	500/-

3.11.3 The contractor should exclusively deploy one Safety Engineer along with a safety supervisor for effective implementation and co-ordination of safe working conditions.

3.11.4 CONTRACTORSHALL DEPLOY A SAFETY OFFICER EXCLUSIVELY TO HANDLE SAFETY REQUIREMENT.

SPECIFIC REQUIREMENTS FOR ISO 9001 - 2000

3.12.0 IMPORTANT NOTE

Contractors shall ensure that all their Staff/Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9001 – 2000 Standards.

Contractors shall ensure that the Quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.

Contractor shall ensure that all Inspection, Measuring and Testing equipment that are used, whether owned by the contractor or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments possessed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.

Contractors shall arrange for the inspection of the works at various stages as required by BHEL. Immediate corrective action shall be taken by the contractor for the non-conformances if any, observed and pointed out by BHEL.

3.13.0 INSPECTION / QUALITY ASSURANCE / QUALITY CONTROL STATUTORY INSPECTION

3.13.1 Various Inspection / quality control / quality assurance procedures/methods at various stages of erection and commissioning will be as per BHEL / Customer quality control procedure/codes/IBR and other statutory provisions and as per BHEL Engineer’s instructions.

3.13.2 Preparation of quality assurance log sheets and protocols with customer's Engineers, welding logs and other quality control and quality assurance documentation as per BHEL Engineer's Instructions is within the scope of work / specification.

3.13.3 The protocols between contractor and customer/BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of Installation, generally as per the requirement of Customer/BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

3.13.4 A Daily log Book should be maintained by every supervisor/Engineer of contractor on the job in Duplicate (One for BHEL and one for Contractor) for detailing and incorporating Alignment/clearance/centering/Leveling Readings and Inspection details.

3.13.5 All the Important Measurements shall be recorded in the Daily Log Book with sketches based on BHEL Drawings indicating Readings / Measurements actually Taken and Signed by BHEL/Customer / Contractor Representatives.

3.13.6 Approval Given by Customer/BHEL for welding, results tests etc. shall also be recorded in the log book.

3.13.7 Welding Details like number of joints, welder's Name Date of welding, Details of Repair, Heat Treatment, Etc. will be documented in welding Logs as per BHEL Engineer's Instructions. Welder's Performance Record shall be furnished every month. The performance Report of Welders shall indicate the percentage of Repair for each welder.

3.13.8 Heat Treatment details of Welds indicating minimum, Temperature Recorded, Heating Rate, Cooling Rate, soaking Time, Etc., shall also be Recorded and Documented by Contractor as per BHEL Engineer's Instructions. Welder's performance Record shall be furnished every month. The performance Report of Welders shall indicate the percentage of Repair for each welder.

3.13.9 All the Electrical/Technical Measuring and Testing Instruments/Gauges, Feeler Gauges, Height Gauges, Dial Gauges, Micrometers, Levels, Spirit Levels, Surface plates, straight Edges, vernier calipers and all measuring instruments shall be provided by the contractor for checking, Leveling, Alignment, centering etc of Erected Equipments at various stages. The Instruments/gauges/Tools etc. provided should be of Brand, Quality and Accuracy, Specified by BHEL Engineer and should have necessary

calibration and other certificates as per the Requirements of BHEL Engineer.

3.13.10 Total Quality is the Watch Ward of the work and standards, Procedures laid down by BHEL. We shall follow all the Instructions as per BHEL Drawings and Quality / Standards. Contractor shall provide for the services of quality Assurance Engineer.

3.13.11 The Welders performance will be reviewed from time to time as per the BHEL / IBR Standards and any welders not performing to the Standards set by BHEL/IBR Standards will be removed from working, Contractor shall arrange for the Alternate welders immediately.

3.13.12 All the welders shall carry identity cards as per the proforma prescribed by BHEL only Welders Duly authorized by BHEL / Boiler Inspector / Consultant shall be engaged on the work.

3.13.13 Contractor shall ensure speedy alignment and welding of all Equipment erected by him after placement. Also all alignments, Welding, NDT Test required for stage Inspection shall be completed as per Quality Assurance Procedures. All the Quality assurance procedures have to be complied with before effecting column erection, Ceiling Beams erection, drum lifting, further structural work, Hydraulic Test, Trial Run of Equipment, Pre-commissioning and any other tests required to be conducted for completing erection and commissioning.

3.14.0 STAGE INSPECTION BY FES / QA ENGINEERS

3.14.1 Apart from Day-to-Day Inspection by BHEL Engineers Stationed at site and also by Customer's Engineers, Stage Inspection of Equipment under Erection and commissioning at various stages of Erection and commissioning by TEAMS of Engineers, from Field Engineering Services of BHEL's manufacturing units and Quality Assurance Teams from Field Quality Assurance Unit/ Factory Quality Assurance and commissioning Engineers. Contractor shall arrange all labour, Tools and Tackles, etc. for such stage inspections free of cost.

3.14.2 Any modifications suggested by FES and QA Engineers Team shall be carried out. Claims of Contractor, if any shall be dealt as applicable.

3.14.3 Any minor rectifications of minor repairs of defective work found out during stage Inspection shall be rectified free of cost, by the contractor.

3.14.4 Any major Rectification or Major Repair / Major Rework of Defective work found out during stage Inspection verification / checking, But not attributable

to contractor shall also be carried out. Claims of contractor if any shall be dealt as possible.

3.15.0 STATUTORY INSPECTION

3.15.1 The scope includes getting the Approvals from the statutory authorities (Like Boiler Inspector and labour officers). This includes arranging for inspection visits of Boiler Inspector periodically as per BHEL Engineer's instructions, submitting documents, radiograph, etc. and following up the matter with them.

3.15.2 All fees connected with the contractors for testing his welders / men / workers and testing, inspection calibrating of his instruments and equipments, shall be paid by the contractor. It shall be the contractor's responsibility to obtain approval of statutory authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities. Any cost arising from this shall be the contractor's account. However, BHEL shall pay all other fees. (FEES FOR VISITS INSPECTION FEES, REGISTRATION FEES, ETC.) In case these inspections have to be repeated due to default / fault of the contractor and fees have to be paid again, the contractor shall have to bear the charges. These would be deducted from his bills.

3.16.0 COMPUTER FACILITIES TO BE PROVIDED BY THE CONTRACTOR

The system works with following environment:xp

Contractor shall provide 2 Nos of exclusive computer system with the following minimum configurations with qualified computer operators one for each computer for data entry and record keeping who assist BHEL engineers & supervisors in all planning & data entry activities. The contractor has to make his own separate arrangement for his requirements.

Sno	Features	Minimum Requirements
1	Processor	Intel Pentium 4, 3.0 GHz or above
2	Chipset	Intel 895 or higher Intel Chipset
3	RAM	512 MB DDR SDRAM
4	HDD	80 GB
5	FDD	1.44 MB
6	Optical Drive	48x or above Combo Drive
7	Monitor	17" VGA Color

8	Keyboard	Minimum 104 keys Windows keyboard
9	Mouse	2 Button Scroll Optical mouse
10	Ethernet	Integrated 10/100 Mbps NIC for LAN
11	Ports	Minimum 1 Parallel, 1 Serial, 2 USB
12	Software	Windows Office 2003 XP Professional
13	Accessories	Mouse pad & Dustcovers
14	UPS	1 kVA UPS with 1 hr. backup
15	Printer	A4 size Laser Printer - 20 ppm or above (with all cartridges & stationery)

HSE SPECIFIC REQUIREMENT

OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM

SUB CONTRACTOR TO ENSURE COMPLAINCE OF THE FOLLOWING **HEALTH** RELATED POINTS

01. Sub-contractor to identify nearest hospital for Health check up of his staff and workers and intimate BHEL site office & PSSR HQ.

02. To arrange for occupational health check up / screening of contractor's staff and workers engaged in sub contracting activities. In this, category of workmen such as welders, gas cutters, grinders, radiographers, crane operators are to be given exclusive attention in respect of health screening.

03. Sub-contractor to arrange an ambulance vehicle or emergency vehicle on a continuous basis to meet any emergency situation arising at site work in which his staff and workers are engaged.

04. To provide appropriate facilities for prompt first aid treatment of injuries and illness at work. One first Aider for each sub contractor to be provided. First Aider should undergo training on first aid.

05. To provide filtered drinking water at selected place in a clean container.

SUB CONTRACTOR TO ENSURE COMPLAINCE OF THE FOLLOWING **SAFETY** RELATED POINTS

01. Personnel protective equipment (PPES): Required number of following PPES (Confirming to Relevant is Standards) to be made available to workmen at site and ensured that they are used .

- Helmet
- Safety goggles
- Welding face shields
- Safety belts for working at heights
- Safety shoes
- Ear plugs
- Rubber gloves and mats for low tension (I.T) electrical works
- Gum boots & aprons
- Other items as required by BHEL site

02. Sub contractor to liaise with nearest fire station and inform contact telephone number and contact person to meet any emergency.

03. To provide appropriate fire fighting equipment at designated work place and to provide fire fighting training to selected persons in his group of workmen to meet emergencies.

04. To provide adequate number of 24 V power supply points to work in a constrained and enclosed space.

05. All power tapping points / switch boards /power & control cabling should fulfill required electrical safety aspects as per relevant is standard.

06 ELCH‘s (Earth leak circuit breakers) at all electrical distribution points to be provided.

07. Red and white caution tape of proper width (1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavated area, etc.

08. To provide sub-contractors company logo or clothing to all staff and workers for identification including identity cards with photographs approved by BHEL.

09. High pressure and structural welders to be identified with colour clothing and to display copy of welders certificate with photographs of welder at the work place. They also should be in possession of valid welding procedure.

10. To display safe handling procedure for all chemicals such as lube oil, grease, sealing compound, kerosene, diesel etc. At stores & respective work place.

11. Contractor should authorize a person at site to stop work if there is a unsafe work noticed as per his knowledge.

12. Fitness for use of erected scaffolding to be certified by the contractors approved scaffolder and the certificate should be displayed on the scaffolding itself. If the scaffolding is unsafe , the same will not be used. the certificate to be updated daily. The scaffolding to be made as per the relevant IS standard.

13. For making platform on the scaffolding , proper thickness and size of the plank of required quality wood to be used. The safe working load of the platform to be displayed on the scaffolding itself. Proper use of platform to be explained to the user.

14. All plant equipment should have inspection report before put in to use.

15. All T&Ps should be of reputed brand and having quality certificates.

16. All IMTE's should have valid calibration certificate from recommended institution / testing lab and these should be in place.

17. All lifting tackle and plant equipment should have safe working load certificate.

18. The right worker should be deployed for right job and the resume of site in charge, supervisors, and key workers to be submitted before commencement of work..

19. Sub-contractor should submit inspection / testing matrix of all T&Ps and to be approved by BHEL.

20. Sub-contractor to display safety slogan, safety board, caution boards wherever required in consultation with BHEL.

21. Sub-contractor to provide gas detectors of reputed make at desired locations.

22. Sub-contractor to conduct emergency mock drills, one drill per 6 months and submit report to BHEL.

23. Safe handling and storing of all equipment with adequate space to be ensured.

24. Sub contractor to deploy safety supervisor till the completion of the project.

25. Sub contractor to comply the safety reporting procedure of BHEL as practiced at present and also additional requirements that may arise out of future

improvements in the safety management system. This includes computation of safety indices such as frequency rate, severity rate & incident rate.

26. Sub contractor to identify probable emergency situations such as electric shocks to workmen, caving in of shored earth, fall from height, collapse of scaffolding fire etc., and should have clear action plan to overcome them. Sub contractor to take required guidance from BHEL in this regard.

27. Sub contractor to identify hazardous activities which he may carryout and should train his workmen in those activities with the relevant operation control procedures. Sub contractor to take required guidance from BHEL in this regard.

28. Safe work permit system to be followed while working in confined space / near electric systems.

SUB CONTRACTOR TO ENSURE COMPLAINCE OF THE FOLLOWING **ENVIRONMENT** RELATED POINTS

1. HOUSE KEEPING: Sub contractor to carry out daily house keeping of work areas / stores through a check list prepared in consultation with BHEL.

2. Sub contractor shall adopt pollution prevention / reduce /control approach in all his site activities. this shall include:

    a. Transporting of oil / chemicals from stores to site safely without causing spillage. in case of any spillage, the area shall be cleaned and the remnant spilled oil disposed off to a safe place, identified for such disposal.

    b. To use required containers / cans / safety gadgets /appliances for transporting and for usage of oil / chemicals at site.

3. Sub contractor shall arrange for segregation / collection of scraps and dispose off to the identified placement for scrap collection.

4. Sub contractor to adopt good erection practices / procedures with the objective of reduction of waste generation / rework

OTHER HSE REQUIREMENTS TO BE COMPLIED BY SUB CONTRACTOR

1. Sub contractor to clearly understand and accept the HSE policy of PSSR with a commitment to comply the requirements of the policy.

2. Sub contractors to arrange for daily meeting of their supervisors and work force before they disperse for their daily planned activities where in the relevant health , safety and environment aspects of the job and use of PPES are explained

3. Sub contractor to conduct monthly HSE meeting (internal) and submit the report to BHEL.

4. HSE slogans to be displayed in a proper board – hoarding at designated places in consultation with BHEL.

5. Sub contractor to submit a structured programme for training & occupational Health Screening of their work force at site after the Award of LOI.

NOTE: TO COMMON CONDITIONS OF CONTRACT:

IN CASE OF ANY DISCREPANCY BETWEEN CLAUSES IN COMMON CONDITIONS OF CONTRACT AND SPECIAL CONDITIONS OF CONTRACT, THE CLAUSES UNDER SPECIAL CONDITIONS OF CONTRACT ARE TO BE TAKEN INTO ACCOUNT AS VALID.

SECTION – VI

SPECIAL CONDITIONS OF CONTRACT – PIPING PACKAGE

6.0.0 BRIEF SCOPE OF WORK:

6.0.1 The scope of work under this specification covers, but not Limited to the following:

Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping/over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer of LP & HP piping and its associated items systems, hangers and supports, valves, misc. equipments and other equipments supplied for SG & TG packages for **RAICHUR TPS 1X 250 MW,** M/s KPCL, Shakthi Nagar, Raichur District, Karnataka .

6.0.2 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

6.0.3 Contractor shall erect all the equipments as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineers depending upon the availability of materials, fronts and other in puts etc., No claim for extra payment from contractor will be entertained on the grounds of deviation from the methods of erection adopted in erection of similar work in other projects.

6.0.4 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, technical and construction management skills . The contractor should ensure successful and timely operation of equipment installed. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel.

6.1.0 TRANSPORTATION FROM STORES / YARD

6.1.1 Loading at storage yard, transport to site, unloading at Pre-

assembly area / site/working area is in the scope of work. Required cranes for loading of materials at storage yard will be in the scope of contractor. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting of the components at site.

6.1.2 Contractor shall take delivery of the components and equipments from the storage area after getting the approval of BHEL Engineer on standard indent forms as specified by BHEL. Complete and detailed account of the equipments erected as well as the progress shall be submitted to the Engineer as directed.

6.1.3 All the piping / components shall be handled very carefully to prevent any damage or loss. The equipment from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

6.1.4 Contractor shall plan and transport equipments, components from storage yard to erection site in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed/work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area/site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

6.2.0 Erection

6.2.1 Brief list of System / sub-system to be erected by the contractor & approximate weight individual PGMAs and number of joints are given in the appendices and are meant for giving general idea to the tender only about magnitude of the work involved. The piping components are sent in parts for convenient transportation / layout requirements. They are to be cleaned, pre-assembled in stage by stage, welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers**.**

6.2.2 The contractor shall erect scaffolding / temporary platforms for erection as per the guidelines of relevant IS codes. These should be of adequate capacity and shall never be over loaded. These should be replaced when not found suitable during erection work and dismantled on work completion and removed from work site.

6.2.3 Normally the high pressure valves will have prepared edges for welding. But,if it becomes necessary the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the

corresponding tubes and pipes. All fittings like 'T' pieces, weld neck flanges, reducers etc. shall be suitably matched with pipes for welding. The valves will have to be checked, cleaned or overhauled in full or in part before erection, after chemical cleaning and during commissioning. Edge preparation becomes the part of erection work.

6.2.4 Adjustments like removal of ovalities in pipes and opening or closing the fabricated bends of high pressure piping within the reasonable quality limits to suit the layout shall be considered part of work and the contractor is required to carryout such work free of cost, as per instructions of BHEL, which shall include specific heat treatment procedures etc.

6.2.5 Only steel scaffolding materials with proper clamps should be used. Use of bamboo/casuarinas will not be permitted.

6.2.6 The contractor is strictly prohibited in using Piping or Auxiliary Components for any temporary supporting or scaffolding works or for using as bed for pre-assembly works etc. In case of such misuse a sum as determined by Engineer will be recovered from contractor's bills.

6.2.7 The hangers and supports for pipelines and pressure parts may be supplied in dismantled /knocked down condition. It is the responsibility of the contractor to assemble them as per approved drawings and install them in position as per site engineer instructions.

6.2.8 Contractor should obtain the formal statuatory clearance from Chief Inspector of Boilers / Karnataka to carry out erection & Welding of piping under IBR purview. Arrangement for the visit of Boiler inspector for field inspection, hydraulic test etc., is in the scope of contractor, and necessary drawing / details only will be given by BHEL. Inspection fee, if any shall be paid by BHEL.

6.2.9 Contractor shall arrange the necessary clearance from other statutory authorities as required for installation of the plant and equipment and render all assistance, service required in this regard. Inspection fee, if any will be paid by BHEL.

6.2.10 Carrying out piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall with in the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably

resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

6.2.11 All the works such as cleaning, inspection, edge preparation if required, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as many be applicable in such erection works and are necessary to complete the work with in the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.

6.2.12 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.

6.2.13 Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismount such instruments and re-erect whenever required prior to commissioning. Some time this may have to be handed over to store or instrumentation contractor.

6.2.14 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like TG/Boiler erection, Cabling, instrumentation etc., to commence their work from / on the equipments coming under this scope. Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the over all project schedule.

6.2.15 All dimensions / elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.

6.2.16 For pipes nominal size 2" and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement/ convenience as per site engineer's advice. Piping below size 2", valves, flanges, fittings etc. shall be supplied as commercially available. Hence fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.

6.2.17 Contractor should fabricate bends of </=2" diameter size from running meters of pipe.

6.2.18 Slope of 1:500 shall be maintained towards drain point unless otherwise specified.

6.2.19 Wherever drawings indicate site routing and site fabrication, such pipes(in general equal to 2" dia and less than 2" dia) will be issued in running meters as straight length. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. In some cases attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.

6.2.20 Fittings like bends, tees, elbow/bends, reducers, flanges etc., will be supplied as loose items.

6.2.21 Certain adjustments in length may be necessary while erecting pipelines and the contractor should remove the extra lengths / add extra lengths / to suit the final layout after preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work.

6.2.22 Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. For pipes below 2" diameter, shall be cleaned by sponge with air flushing.

6.2.23 Contractor shall arrange all equipments, alignment bolts, tools, consumables like welding electrodes (**all types except those specified in clause 6.7.35.2**), and argon gas cylinders etc. for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are in contractor's scope. Only filler wires as stipulated by manufacturing units and identified in relevant shipping list will be supplied to the contractor free of cost. Any excess requirement shall be arranged by the contractor/BHEL at contractor's cost. Argon / Nitrogen gas for stainless steel tubes purging during welding to be arranged by contractor with in the quoted rates.

6.2.24 Contractor shall use only bolted clamps for achieving alignment of piping, wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subjected to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc. by proper tools, and not by hammer. Any burrs left on the equipments / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect

surface and sub-surface cracks in these ground areas. (Also refer section 6.7.0)

6.2.25 Pipelines shall be cleaned off welding slag and burrs by hand files, wire bushes and flexible grinders wherever required and using cloth.

6.2.26 Flame cutting of piping shall be strictly done as per BHEL Engineer's instructions and in his presence only.

6.2.27 Wherever elbows of 45 deg or any other angle (>2" dia. pipe) are required, the same shall be cut from 90 deg. Elbow supplied and used. No extra cost shall be paid.

6.2.28 Flow nozzles, orifice, spray nozzles etc shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.

6.2.29 Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting for BHEL/Customer stores, transport to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.

6.2.30 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

6.2.31 All drains / vents / relief / escape / safety valve piping to various tanks/ sewage / drain canal / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.

6.2.32 Fixing / fitting / welding of thermo-wells, stubs, tapping points, root valves and instruments etc. on different lines / equipments (Which will be supplied by BHEL) is within the scope of work.

6.2.33 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor. Other supports namely Hangers, U-Clamps etc. shall be supplied by BHEL duly bent and threaded. Assembly and necessarily cutting work shall be carried out at site by contractor within the quoted rate.

6.2.34 For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold/Hot values and logging etc..

6.2.35 Wherever hanger and support materials of piping not received from manufacturing unit in time to suit the erection schedule , contractor shall erect the piping system on temporary supports to ensure progress of work within quoted rate. The required structural steel materials will be issued on free of charges by BHEL either from scrap /spare materials. The same shall be removed and returned to BHEL stores after erection of permanent supports.

6.2.36 All operating and approach platforms , cross over, canopies, ladder etc., shall have to be fabricated from raw materials supplied by BHEL and erected by contractor as per instruction of BHEL and shall be paid as per accepted tonnage rate for structural work.

6.2.37 Wherever pre-fabricated pipes/bends are supplied, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.

6.3.0 HYDRAULIC TEST FOR PIPING:

6.3.1 Hydraulic testing pumps for HP lines shall be provided by BHEL free of hire charges. The testing pumps will be issued to the contractor in working conditions. Installation, electrical connection, erection, testing and dismantling and returning to BHEL stores, etc, shall be carried out by the contractor as part of this work without any extra charges. In case any servicing of the test pump is to be done during the course of the test, the contractor shall provide the necessary labour for the same and spares will be arranged by BHEL.For LP lines contractor has to arrange Hydraulic Test pump/Hand Pump for HT at his cost.

6.3.2 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL. All thermowell points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded. Necessary blanks will be provided by BHEL.

6.3.3 All the tests shall be repeated till all the pipelines to satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted to the satisfaction of BHEL / Boiler Inspector / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost.

6.3.4 In general HT of piping shall be performed after all eventual pipe branches have been completed and valves installed. Should it be required to hasten

erection work, pressure tests may be performed by sections. For this scope of work, the erected pipe lines shall be hydraulically tested in as per site requirement segments. For conducting hydraulic test, both ends of pipe lines shall be blanked by welding of plates. Only one or two set of plates and structural materials for blanking required for one segment will be provided by BHEL free of charge. After completion of hydraulic test in one segment, the same plates are to be cut and removed and utilized / welded on the other segment of the pipe lines, to carry out the hydraulic test for the respective segments. No separate plates for blanking for each segment will be provided. After completion of Hydraulic test, the required edge preparations shall be carried out on the end of pipe lines and to be welded with the respective pipe lines. In such cases joint connection shall be checked during a final and additional test, if required. The contractor shall note this aspect and quote accordingly.

6.3.5 During hydraulic test, the pipes being tested shall be isolated from the equipments to which they are connected.

6.3.6 Openings on piping for pressure / temperature impulse connections shall be fully closed during the test to prevent dust or foreign matter from being introduced into the instrument piping inadvertently.

6.3.7 Test records shall be made of pressure testing for above piping system. These records shall contain the following information:

Date of test
Identification of piping tested
Test fluid
Test pressure
Approval of the Engineer.

6.4.0 Galvanized Steel Piping

6.4.1 Galvanized pipe shall be joined by screwing into socket and screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and while lead before joining. The exposed threaded portion on either side of the socket joint shall be applied with Zinc Silicate paste. All these consumables are in the scope of contractor and shall carry out within quoted rate.

6.4.2 GI pipe with flanged joints shall have screwed flanges. Flanged joints faces shall be painted with red lead and bolting up evenly on all sides with compressed asbestos gaskets in between two flanges.

6.4.3 Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be attached by screwing the pipe through the flange and pipe and flange shall be faced accurately. Required Teflon tapes are to be arranged by the contractor at his cost.

6.4.4 Required threading shall be done by the contractor at site as specified in the drawings. The pipes shall be cut only by hacksaw / machining. Required Teflon tapes are to be arranged by the contractor within quoted rate.

6.5.0 PRESERVATION / TOUCH UP PAINTING

6.5.1 Contractor shall carryout cleaning and preservation / touch up painting as a part of erection work for the materials / equipments under this tender specification right from pre-assy stage, during erection and after erection till the equipment is cleared for final painting, wherever deficiency in painting / rusting is noticed. The primer paint shall be matching shop primer. BHEL will supply the preservation paint & thinner on free of charges and required manpower, consumables, T & P etc shall be provided by the contractor within the quoted rate.

6.5.2 The contractor shall effectively protect the finished work from action of weather and from damage of defacement and shall cover the finished parts, then and there, for their protection.

6.6.0 PROGRESS OF WORK

6.6.1 Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.

6.6.2 Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.

6.6.3 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer**.**

6.6.4 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

6.6.5 During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

6.6.6 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the sit premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

6.6.7 The Contractor shall maintain a record in the form as prescribed by BHEL for all operations carried out on each weld and maintain a record indicating the number of welds, the name of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejections if any, percentage of rejection, etc. and submit copies of the same to the BHEL Engineer as required.

6.7.0 WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING & QUALITY REQUIREMENTS

6.7.1 The pressure parts, equipments and piping shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions. All the prepared / patched edges will have to be suitably protected to prevent rusting or foreign material ingression.

6.7.2 Welding of pressure parts, piping & fittings (under IBR code) shall be done by certified high pressure welders who posses valid certificate of CIB of the State in which the equipment is erected as per provision of IBR. The H.P. welder who possesses necessary certificate shall ensure re-validation as per relevant provisions of IBR and keep the certificate valid till the

completion of work. The services of such welders, the validity of whose certificates have expired shall not be utilized for high pressure works.

6.7.3 All welders including tack welders, structural and high pressure welder shall be tested as per ASME section IX / IBR and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid IBR certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification and performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.

6.7.4 Engineer may stop any welder from the work if his performance is unsatisfactory for any technical reason or if there is a high percentage of rejection in the joints welded by him. The welders having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.

6.7.5 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor’s expense. The Engineer prior to any repair being made shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the quality engineer.

6.7.6 The contractor shall carry out the root run welding of all HP / LP piping, valves by TIG welding method only. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall before and during welding have to purge the pipes with inert gas. All welded joints for temporary piping required for alkali flushing, acid cleaning and steam blowing should be got done by HP welders only. The root run should be done by TIG welding. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.

6.7.7 The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.

6.7.8 Only BHEL approved electrodes and filler wire will be used. All electrodes shall be baked and dried in the electric electrode-drying oven to the required temperature for the period specified by the Engineer before these are used in erection work. All welders shall have electrodes drying portable oven at the work spot. The electrodes brought to the site will have valid

manufacturing test certificate. The test certificate should have a co-relation with the lot number / batch number given on electrode packets. No electrodes will be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven will be also calibrated and test certificate from Govt. approved / accredited test house traceable to National / International standards will be submitted to BHEL before putting the oven in use. The contractor shall also arrange periodical calibration for the same. Separate ovens shall be used for baking and holding.

6.7.9 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld. He has to maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or other wise of the welds shall be final.

6.7.10 Pre -heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary, are part of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer and as specified in Engineering welding schedule, welding & heat treatment manuals and FQP . Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

6.7.11 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, compensating cables , thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress-relieving operations. The contractor should take a note of the following,

- Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL.

- All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost.

- The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of SR operations.

6.7.12 The contractor shall also be equipped for carrying out other NDT like LPI /MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required, will also have to be arranged by the contractor.

6.7.13 All arrangements for carrying out radiography work including radiography source & equipments and consumables, dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.

6.7.14 Contractor shall note that 100% radiography will be done at the initial stages on all the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radiographed shall not be less than the requirement of BHEL welding schedule / IBR / Customer's requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. For LP Piping, as per site engineer's instructions, NDT method and other tests to be carried out.

6.7.15 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including labour, supervisors/ Engineer required for the work as per directions of BHEL.

6.7.16 The contractor shall deploy required number of H.P. welders to carry out the H.P. weld joints. The welding works should not be held up due to shortage / want of I.B.R. /H.P. welders. The number of H.P. welders is to be increased, if necessary, as per directive of concerned engineers. If the contractors fail to provide sufficient H.P. welders, depending upon site requirement, BHEL will arrange the welders and the expenditure for the above will be recovered from the bills with overhead.

6.7.17 All charges for testing of welders (pre production test) including destructive and non-destructive tests, if conducted by BHEL or by the inspecting authority at site shall have to be borne by the contractor. Necessary pipe material and the welding material if any, will be arranged by BHEL and all testing facility will be made available by contractor.

6.7.18 All welded joints shall be subjected to acceptance by BHEL Engineer.

6.7.19 The technical particulars, specifications and other general details of work shall be in accordance with ASME/IBR /BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.

6.7.20 The Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR, enclosed. However percentage radiography shown in the respective drawings shall be final and binding on the contractors.

6.7.21 Low speed high contrast fine grain films (D7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5. to 2.00

6.7.22 All radiographs shall be free from mechanical, chemical or process marks to the extent they shall not confuse the radiographic image and noticed.

6.7.23 Penetrameter as per ASME/ISO shall be used for all exposures.

6.7.24 Lead numbers and letters (generally of 6mm size) are to be used for identification of radiographic contract No., joints identification, sources used welders identification, SFD used are to be noted down in the paper cover of radiography. Lead intensifying screens for front and back of the film shall be used as per the instructions of BHEL Engineer.

6.7.25 The weld joint is to be marked with permanent mark A, B, C, etc. to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the down stream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.

6.7.26 The contractor shall be fully equipped with radiography equipments, films, chemicals and other dark room facilities. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor's radiographers shall also be registered with BARC for film badge service.

6.7.27 Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work.

6.7.28 If the contractor does not carry out radiography work in time due to non-availability of film, chemical etc. BHEL shall get the work done through some other agency at the risk and cost of the contractor.

6.7.29 All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL/customer.

6.7.30 Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced immediately.

6.7.31 The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radiographed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.

6.7.32 Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radiographed and new film submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radiographed at contractor's cost.

6.7.33 For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.

6.7.34 The welded surface irrespective of place of welding shall be cleaned of slag and painted at the center with primer paint to prevent corrosion at no extra cost towards this. Paint for this purpose shall be provided by BHEL.

6.7.35 For erection & welding of SA335 P91 material please refer **"PROCEDURE FOR ERECTION & WELDING OF SA335 P91 MATERIALS"**
For Stainless Steel pipe welding procedure will be as per BHEL site Engineers directive.

6.7.35.1 **Facility to be provided by Bidder for P 91 Welding**

a) Required number of operators/Technician/Electrician for Installation, Commissioning & Operating continuously.

b) Ultrasonic Flaw Detector with recording device & complete accessories (Digital Type-Krautkramer model USN 50 or equivalent capable of storing calibration Data. All recordable indications will be stored in memory of digital Flaw detector and in PC (to be provided by the contractor) for review at later period.

c) EQUOTIP or MICRODUR make or equivalent portable Hardness Tester.

d) MPI/LPI kits with consumables

e) It is required that the bidder to arrange required cables & Switches including Fuel, Operator and other consumables within the quoted rate for the Diesel generator 250/500 KVA – 1 No. provided by BHEL on sharable basis (Standby supply only for P91 welding) .

f) **Consumables**

1. Glass Fibre Cloth -1mmx1000mm–Temp Rating 1260 Deg C

2. Glass fibre cord Dia 3mm (twisted) -------do-------

3. Ceramic Fibre Blanket -RT Grade, density 96 Kg/M3 –Temperature rating 1260 Degree c

4. Ceramic fibre rope-Fibre Glass Braided,Dia 12 mm --do**-**

5. K Type Thermocouple- 0,5 mm Dia

6**.** Heavy Duty TC connectors for K Type Thermocouple

7. All other consumables/equipments to carryout the work .

6.7.35.2 **Facility to be provided by BHEL for P91 Welding Works**

1. Required no of Induction heating M/C with accessories.

2. The following consumables
   2.1 Annealing cables
   2.2 Compensating cables

3. Welding Electrodes for P 91 Welding
4. Spot welding M/C for fixing Thermocouples.
5. Digital Temperature Indicator.
6. DG Power supply (250/500 MVA) – 1 no. (only standby supply for P91 welding . Contractor to provide necessary cables and switches)

The Induction Heating Equipments and other accessories shall be drawn from the BHEL stores, Transported and installed & commissioned wherever required. For routine maintenance & attending all type of break-down maintenance contractor shall deploy sufficient manpower, tools, and plant within the quoted price.

The contractor shall provide electrical cables & switches as required. All the equipments shall be protected by providing covers and sheds at site by the contractor with in the quoted rate.

6.8.0 TESTING, PRE–COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

6.8.1 The contractor shall carry out all the required tests and pre-commissioning and commissioning activities required for successful and reliable operation. These would include hydraulic test of piping, pre-boiler system detergent flushing/chemical cleaning , steam blowing, water washing etc. as instructed by BHEL using contractors own consumables, labour and scaffoldings etc.

6.8.2 All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests / activities may not have been listed in these specifications. Specialized test equipment, if any, shall be provided by BHEL/ its client free of hire charges. However contractor has to take proper care of the equipment issued to him.

6.8.3 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.

6.8.4 The scope of pre-commissioning activities cover installation of all necessary equipment including temporary piping, supports, valves, blanking, pumps, tanks, with access platforms valves, along with accessories required for hydro test, pre-boiler system detergent flushing/chemical cleaning , steam blowing or for any other tests on piping. The scope also covers the off site disposal of effluents.

6.8.5 All items / material required for conducting hydraulic test, pre-boiler system, detergent flushing/chemical cleaning, steam blowing etc., will be supplied by BHEL. However fabrication, servicing, erection, dismantling and returning of the same to stores are the responsibility of the contractor who is erecting the equipment / piping. The contractor may note that no separate payment shall be released for any temporary works that are to be carried

out for conducting pre-commissioning and commissioning tests. Bidders are advised to include expenses on temporary works along with the rates being quoted by them. Broadly the work on temporary systems will be as under erection etc. of all temporary piping including valves, tanks, effluent pumps, electrical control panel and cabling along with insulation and supports for steam blowing; chemical cleaning and effluent disposal are to be carried out as part of work. Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities. All the pumps, motors and electrical control panels/ switch gear, valves and actuators will be furnished to the contractor after due servicing.

The above is only a broad break up of the temporary works. The Engineer at site will make final break up. His decision will be final and binding by all the parties.

Dismantling and returning of the temporary equipment and piping shall be done by the agency.

6.8.6 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

6.8.7 Incase, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.

6.8.8 During Commissioning, opening / closing of valves, changing of gaskets, attending to leakage and adjustments of erected equipment may arise. The finally accepted price /rates shall also include all such work.

6.8.9 The contractor shall make all necessary arrangements including making of temporary closures on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost.

6.8.10 The valves, actuators etc. will have to be checked, cleaned or overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.

6.8.11 Incase any defect is noticed during various tests, trial runs and commissioning the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and re-alignment are necessary, the contractor at his cost shall do the same as per Engineer's instructions including repair, rectification and replacement work. The parts to be replaced shall be provided by BHEL.

6.8.12 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.

6.8.13 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.

6.8.14 At the time of each inspection, the contractor shall take note of the decisions/ changes proposed by the Engineer and incorporate the same.

6.8.15 Replacing / cleaning of filters of the erected equipments and piping system etc. during pre-commissioning / commissioning stage is within the scope of work.

6.8.16 Temporary lines for Steam blowing of Power Cycle piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding have to be arranged by the contractor at the rates specifically quoted / accepted for this work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.

6.8.17 During steam blowing operations the required manpower for fixing the target plates shall be arranged by the contractor as per the instructions of BHEL Engineer within the quoted rates. The manpower for the above operation may be required round the clock if necessary. The contractor

shall carry out the above operation as per the instructions of BHEL Engineer within the quoted rates.

6.8.18 During the initial stages of work, trenches for draining water may not be available for alkali flushing or mass flushing for discharging and draining the system and piping. Necessary low point drains and temporary piping for this will have to be erected by contractor from materials provided by BHEL.

6.8.19 After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification.

6.8.20 Contractor may have to replace old/damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement.

6.8.21 Main Steam Line & Hot Reheat Line Strainers bodies are erected first by other agency and the lines will be erected by piping contractor. After Hydraulic Test, the strainer elements are to be fixed, by other agency. During trial operation, if required, the strainers are to be removed for inspection of debris & cleaning. During all these operation piping contractor shall extend all assistance by providing necessary man power, T & P and required materials.

6.8.22 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.

6.8.23 During this period, though BHEL's and customer's staff will also be associated in the work, the contractor's responsibility is to make available resources in his scope till such time the commissioned units are taken by the customer.

6.8.24 Contractor shall cut / open works if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value. During commissioning opening of valves, changing of gaskets, attending to leakages, minor modification / rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning the same has to be rectified by the contractor at his cost.

6.8.25 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part commissioning assistance for a period of six months or till handing over of sets to customer, which ever is earlier.

6.8.26 It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including engineers/supervisors.

6.8.27 During commissioning any improvement or rectification due to design requirement is involved and if the contractor is asked to carry out the job, they shall be paid at man-day rates. For this purpose, daily labour report indicating therein nature of work carried out, consumables used, etc. shall be maintained by contractor, and got signed by BHEL Engineer every day. It is not obligatory on the part of BHEL to get the works done by the contractor. They can employ any other agency if they so desire at that time.

6.8.28 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.

6.8.29 Hanger adjustment / re adjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.

6.9 FINAL PAINTING

6.9.1 The scope of work shall also include supply and application of final painting as required and specified for the components and its auxiliaries and piping.

6.9.2 Before commencement of final painting contractor has to obtain written clearance from BHEL /Customer for effective completion of surface preparation.

6.9.3 Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of red oxide primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.

6.9.4 Required paints, thinner other consumable such as wire brush, brush etc shall have to be arranged by the contractor at their own cost.

6.9.5 In the case of steel fabricated items, raw steel after fabrication has to be cleaned and subsequent painting to be carried out.

6.9.6 All the exposed metal parts of the equipments including piping, structures, hangers etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats indicated in the Painting Specification **Section VII Appendix IV** which matches the shop primer paint used, after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL/Customer official.

6.9.7 Mostly the equipment / items/ components will be supplied with one coat of primer paint and one coat of finish paint. However during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour. Besides above two coats of approved primer paint is to be applied on all the bare / unpainted surfaces. The gas cut stubs would require being ground and rounded.

6.9.8 Paint shall be applied by brushing or by spray painting as per the instruction of BHEL Engineer. Spray painting gun and compressed air arrangement has to be made by the contractor himself. It shall be ensured that brush marks are minimum.

6.9.9 Before applying the subsequent coats the thickness of each coat shall be measured and recorded with BHEL / Customer. The instrument for checking the thickness of coat is to be procured by the contractor and should be calibrated after periodical intervals.

6.9.10 Primer & finish paint shall be of reputed paint supplier approved by BHEL. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. Paint manufacturers instructions shall be followed in method of application, handling, drying time etc.

6.9.11 The actual colour to be applied shall be approved by the customer before starting of actual painting work. The scope of painting includes application of colour bands, lettering the names of the systems equipments; tag Nos of

valves, marking the directions of flow and other data required by BHEL within the quoted rate.

6.9.12 All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and un coated spots. Each coat (Primer, intermediate, finish) shall have a minimum thickness of 40 microns and the dry film thickness of finish paint shall not be less than 120 microns. Necessary instrument for measuring the thickness of paint applied is to be arranged by the contractor.

6.9.13 No paint shall be applied when the surface temp is above 55 deg. Cen or below 10 deg. Cen, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.

6.9.14 The paints are to be purchased from BHEL / Customer approved agencies only. The tenderers have to keep in mind that paints of reputed makes like BERGER, ASIAN, SHALIMAR; JENSON & NICHOLSON are only permitted. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities. Finish coat paint No of coat and DFT shall be as indicated in the painting specification enclosed in this tender / relevant BHEL document/ customer's specifications. The painting specification which is forming part of this tender as **Section VII - Appendix IV** shall be used as guidelines to be followed.

6.10 TIME SCHEDULE

6.10.1 The contractor has to mobilize in all respects with in two weeks from the date of issue of fax letter of intent.

6.10.2 The entire work of erection testing and commissioning of Piping as detailed in the Tender specification shall be completed within **9** (**NINE)** months from the date of start of work of Piping and its auxiliaries at site as decided by BHEL. In case BHEL desires to advance the commissioning, contractor has to complete all the works within the quoted /accepted rates to suit the advanced commissioning.

6.10.3 During the total period of contract the contractor has to carryout the activities in a phased manner as required by BHEL Engineer and as per the programme of events / Targets fixed by BHEL / Customer.

6.10.4 The work under this scope of contract is deemed to be completed in all respects only when all the components / equipments are erected and trial runs, testing and commissioning of all the equipments are completed. The decision of BHEL in this respect shall be final and binding with contractor.

6.10.5 During the tenure of contract, if BHEL is not satisfied with the progress of work, BHEL have the right to withdraw any portion for work / balance work and get the same done either directly employing their own men or through other agency at your risk and cost. You shall not be entitled for any compensation whatsoever in this regard.

6.10.6 The work under the scope of this contract is deemed to be completed in all respects, only when the contractor has discharged all the responsibilities laid down in the contract. The decision of BHEL on completion date shall be final and binding on the contractor.

6.11 TERMS OF PAYMENT

6.11.1 The contractor shall submit his monthly on account bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas from the 25th of previous calendar month to 24th of the current month on verification of measurement of the work completed.

6.11.2 The payment of running bills normally will be released within 30 days of submission of running bill. Contractor has to make his own arrangement for making payment of impending labour wages and other dues in the meanwhile.

6.11.3 The contractor shall submit his RA bill once in a month at the end of each month. The RA bill,complete in all respects accompanied by BHEL Engineer's certificate /Jointly signed measurement book will be paid within 30 days of submission of the bill, subject to his completeness & correctness in all respects. The measurement will be taken by BHEL engineer as per relevant clause of GCC and certify regarding the actual work executed in the measurement book and bills for work. Subject to the deduction which BHEL may be authorized to make under the contract, the contractor shall, on certification of the engineer at site, be entitled for payment as explained here under.

6.11.4 For carrying out the work defined in these specifications the payment for the work done will be released pro-rata in following stages and percentage break-up of contract rates.

6.11.5 Release of payment in each running bill will be restricted to 85% of the value of work admitted as per the percentage break up for the stage of work completed as stipulated in BHEL drawings and specification. 10% of the value of work will be admitted after completion of mile stone activities.

6.11.6 The contractor shall make his own arrangement for making payment of impending labour wages and other dues in the meanwhile.

6.11.7 Total weights & quantities of various items /schemes of work indicated in various appendices and rate schedule are approximate. These are subject to variation of + or – 15% as per the final design & layout. The variation could be individual product group, main assemblies, or group/items of work, the relative or overall portion of various items of work. No claim for additional payment or revision of rates shall be entertained due to any kind of variation.

6.11.8 For Carrying out the work defined in the specifications, payment for work done will be released on pro-rata basis in the following stages and percentage break up of the contract rate.

STAGES OF PROGRESSIVE PAYMENT

I) Piping Package – Ref Appendix-II & IIA-IID Details of Quantities enclosed)

S No	Stages of Payment	P91 Material-Piping	PCP-(HP Piping)	LP & Misc Piping	Tanks/ Vessels/ pumps	Hangers & supports
1	Completion of Pre-assembly	15%	15%	15%	15%	35%
2	Placement in Position wherever pre-assembly is involved	20%	20%	20%	20%	-----
	or					
	Placement in position where pre-assembly is not involved	35%	35%	35%	35%	35%
3.	Completion of alignment, welding as required	38%	38%	37%	38%	38%
4.	Completion of UT/Radiography, NDT/heat treatment	10%	10%	10%	10%	----
5.	Removal of temporary support & hanger setting logging cold value before and after Hydro test.	----	-----	-----	------	10%
6	Completed Tonnage as per PGMA	1%	1%	2%	1%	1%
7	Completion of area cleaning, cutting/removal & return of scraps.	1%	1%	1%	1%	1%

Note: If any other PGMA is integral part of the above system, these are to be done by the contractor without any additional cost.

Remaining 10% of the contract rates will be paid on pro-rata basis common to all PGs shall be released on achievement of the following milestone events for the tonnage erected.

For Piping Package:

Sl No	Milestone	% of payment
1	Hydro test / (piping system/line) After completion of FQA log sheets	2%
2	Pre-boiler system chemical cleaning & steam flushing	1%
3	Completion of Flushing /steam blowing	1%
4.	Rolling & synchronization/ Safety valve floating	2%
5	Completion of final painting if applicable	0.5%
6	Full Load & trial operation	2%
7	Liquidation of pending points/ Re-conciliation of issued materials like T&P, consumables etc	0.5%
8	Completion of all contractual obligations and de-mobilization of site office on submission of final bill along with work completion certificate by BHEL	1%

The balance 5% thus remaining shall be paid after the guarantee period of 12 months. The Guarantee period will commence from the date of completion of handing over of unit to customer or six months from the date of first synchronisation, whichever is earlier, provided all erection, testing and commissioning works are completed in all respects. However, the above 5% payment can be released against submission of a matching Bank Guarantee

from a Nationalised/ Scheduled Bank in the Performa of BHEL valid for one year from the date of commencement of guarantee period.

6.12 <u>Terms of payment for Temporary lines for steam blowing and chemical cleaning pipes, supports etc.</u>

6.12.1 75% of the lumpsum value shall be made on successful completion of Steam Blowing/Chemical Cleaning**.**

6.12.2 20% of the lumpsum value shall be paid on reconciliation of material, T&P etc. issued for this work from BHEL stores.

6.12.3 The last 5% pertaining to steam blowing and chemical cleaning work shall be released along with the Final bill amount of piping work.

6.12.4 The 'Engineer' will certify regarding the actual work executed in the measurement books and bills, which shall be accepted by the contractor in measurement book.

6.12.5 Contractor shall submit shortage / damage reports on BHEL's standard materials management forms. No payment shall be released till the contractor submits these reports and are verified by the Engineer.

6.12.6 Subject to any deduction that BHEL may be authorized to make under the contract, the contractor on the certificate of the Engineer at site be entitled for payment as explained hereunder.

6.12.7 Field Quality assurance formats: It is the responsibility of the contractor to collect and fill up the relevant FQA Log Sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL/Customer in token of their acceptance.

6.12.8 No levy or payment or charge made or imposed shall be impeached by reasons for any clerical error or demanded or charged.

6.12.9 BHEL at discretion may further split-up or add / adjust the above percentage and effect payment to suit the site conditions and nature of work, cash flow requirements, according to the progress of work.

6.12.10 CONTRACTOR SHALL NOTE THAT THE FINAL BILL SHALL BE RELEASED ONLY ON PRODUCTION OF A CERTIFICATE ISSUED BY SITE IN CHARGE THAT THE CONTRACTOR HAS FULFILLED THE CONTRACTUAL/STATUTORY REQUIREMENT.

6.13 EXTRA CHARGES FOR MODIFICATION AND RECTIFICATION WORK

a) BHEL may consider payment for extra works on man day basis for such of those works which require major revamping / rework/rectification/modification which is totally unusual to normal erection or commissioning work which is not due to contractor's faulty erection.

b) The decision of BHEL in this regard shall be final and binding on the contractor. The contractor may submit his work claim bills (Specifically agreed by BHEL Engineer) along with the labour sheet duly certified by BHEL Engineer at site. But BHEL also got the option to get these work done through other agencies if they so desire.

6.13.1 All the extra work, if any, carried out should be done by a separate gang which should be identified prior to start of work for certification, of man hours. Daily labour sheets should be maintained and should be signed by contractor's representative and BHEL Engineer. Signing of the labour sheets does not necessarily mean the acceptance of extra works. Only those works which are identified as not usual to normal erection and certified so by the Project Manager, and accepted by designer/supplier or competent authority only will be considered for payment.

6.13.2 The decision of BHEL in this regard shall be final and binding on the contractor.

6.13.3 The following man hour rates will be applicable for modification/rectification work.

6.13.4 Average single man hour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, including consumables for carrying out any rework, re-vamping as may arise during the course of erection **Rs.40/-** man hour.

6.13.5 Average single man hour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals excluding consumables for carrying out any rework/revamping as may arise during the course of erection **Rs.25/-** per man hour.

6.14 EXTRA WORK DOES NOT INCLUDE

Nominal dressing of foundations, holes, bases, nuts and bolts, in case of abnormal conditions, this can be mutually discussed before starting of such work.

6.14.1 Extra works are broadly defined as below:

Design changes which will be intimated to the contractor after the start of erection and same refers to dismantling of erected components rectification of components which have been received in damaged conditions during transit, rectification of components wrongly manufactured at work, any other works which do not fall in the scope of this contract.

6.14.2 The decision of BHEL in this regard shall be final and binding on the contractor.

6.15.0 OVER RUN CHARGES

6.15.1 In case due to reasons not attributable to the contractor, the work gets delayed and completion time gets extended beyond **Nine (9) months** from the date of commencement of the work, the contractor shall be considered for ORC. Incase of ORC arises, the same will apply at **Rs.75000/- (Rupees seventy five thousand only)** per month for extension to the completion period beyond **9 months** for the total scope of work as stated above duly taking into account the balance work at the end of that period.

6.15.2 The period of overrun will have to be ascertained before the commencement of grace period.

6.15.3 During the period of over run targets will be fixed on month to month basis, which have to be adhered. In case of any shortfall due to the reasons attributable to the contractor, ORC amount will be proportionately reduced.

6.15.4 The payment of over run charges for the extended stay for
Reasons not attributable to the contractor will be subject to achieving the monthly programme of work as mutually agreed upon during extended stay.

6.16.0 PRICE ESCALATION

6.16.1 PVC applicable with the base index from the scheduled date of bid opening.

$$P1 = 0.75 \times PO \times \frac{(F1-FO)}{FO}$$

Applicable even when F1 is lesser than FO. (Price reduction as applicable).

FO = New all India average consumer price index published by Labour Bureau, Simla, Government of India for Industrial workers (Base 2001 = 100)applicable for the scheduled date of bid opening.

F1 = All India average consumer price Index published by labour Bureau, Simla, Government of India, for Industrial workers (Base 2001 = 100) applicable for the months under consideration.

P1 = Increase in the billing amount as per the escalation formulae for the particular month of billing.

PO = Billing amount calculated on the accepted contract rate.

6.16.2 Price escalation as per above formula will be calculated and paid (excluding payments towards extra works and overrun, if any) on month to month basis. BHEL however, reserves the right to freeze escalation for that such of duration of delays, from time to time which are entirely attributable to the contractor.

6.16.3 With the provision of price escalation as per the above no claim / compensation on account of any increase whatsoever, (irrespective of whether escalation are steep / unanticipated or not compensated by the above escalation provisions in full towards minimum wages, consumables, electrodes, gases or any other item / reasons) will be payable during the entire period of execution including extended period, if any.

6.17.0 TAXES

6.17.1 Value Added Tax (VAT) for the works

Price quoted shall be inclusive of VAT except service tax.

Notwithstanding the fact that this is only an erection service contract not involving any transfer of materials whatsoever and not attracting VAT liability, being labour oriented job work, for the purpose of VAT the contractor has to maintain the complete data relating to the expenditure incurred towards wages etc. in respect of the staff/workers employed for this work as also details of purchase of materials like consumables, spares etc., interalia indicating the name of the supplier, address and VAT Registration No. and VAT paid for the purchases etc.

The bidder shall get registered with **state** VAT authorities and the registration certificate shall be forwarded to BHEL immediately after commencement of work. Incase , the bidder had already registered under **respective state** VAT, they must quote their registration number and forward copy of Registration Certificate while submitting this tender. The bidder has to obtain VAT clearance certificate from the concerned authorities on completion of work and submit along with the final bill as one of the documents for contract closure.

In case the Bidder decides to include any VAT element along with the quoted price, they shall specify in the price bid,(1) The value of VAT included in the quote, (2) The rate of VAT adopted and (3) On what value, etc. as additional information. If no VAT element is included in the price, the same shall be indicated in the quote.

The bidder shall quote very competitive price after taking into consideration of above points.

6.17.2 SERVICE TAX

Price quoted shall be exclusive of Service Tax**.** The service tax as statutorily leviable and payable by the bidder under the provisions of service tax Law / Act shall be paid by BHEL as per bidder claim through various running bills. The bidder shall furnish proof of service tax registration with Central Excise Department specifying the name of services covered under this contract**.** Registration Certificate should also bear the endorsement for the premises from where the billing shall be done by the bidder on BHEL for this project. The bidder shall obtain prior consent of BHEL before billing the service tax amount.

6.17.3 OTHER TAXES &LEVIES

Any other taxes and duties (except VAT & Service Tax) viz. Entry Tax, Octroi, Seigniorage, Licenses, Deposits, Royalty, Stamp Duty, other charges / levies, etc. prevailing / applicable on the date of opening of technical bids and any variation thereof during the tenure of the contract are in the scope of bidder. In case BHEL is forced to pay any such taxes, BHEL shall have the right to recover the same from the bidder either from running bills or otherwise as deemed fit.

6.17.4 NEW LEVIES & TAXES

In case Government imposes any new levy / tax after award of the work during the tenure of the contract, BHEL shall reimburse the same at actuals

on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract.

6.17.5 STATUTORY VARIATIONS

Statutory variations are applicable only in the cases of Value Added Tax and Service Tax. The changes implemented by the Central / State Government in the VAT Act / Service Tax during the tenure of the contract viz. increase / decrease in the rate of taxes, applicability, etc. and its impact on upward revision / downward revision shall be paid/ adjusted from the date of respective variation. The bidder shall give the benefit of downward revision in favour of BHEL. No other variations shall be allowed during the tenure of the contract including extended period, if any.

6.17.6 DIRECT TAXES

BHEL shall not be liable towards Income Tax of whatever nature including variations thereof arising out of this contract as well as tax liability of the bidder and their personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act/Rules.

6.18.0 IMPORTANT CONDITIONS FOR PAYMENT

It may be noted that the first running bill will be released only on production of the following.

i. PF Regn. No.

ii. Labour License No.

iii. Workmen Insurance Policy No.

iv. Un Qualified Acceptance for Detailed L.O.I.

v. Initial 50% Security Deposit.

vi. Rs.100/- Stamp Paper for Preparation of Contract agreement.

6.18.1 All payments due to the contractor shall be made through ‘e-payment’ including return of EMD amount to unsuccessful tenderers.The tenderer has to furnish details of his bank account as certified by the concerned banker in the format furnished to enable e-payment

FORM TO BE FILLED BY VENDORS FOR REGISTERING FOR E-PAYMENT

Details of Bank Account of Contractor for remittance of e-Payment

1	NAME & ADDRESS OF THE CONTRACTOR / SUPPLIER	:
2	BANK A/C NO.	:
3	TYPE OF A/C (CC / CURRENT)	:
4	NAME OF THE BANK	:
5	NAME OF THE BRANCH	:
6	BRANCH CODE	:
7	BANKER'S ADDRESS (BRANCH)	:
8	MICR NO.	:
9	IFSC CODE	

Note : THE ABOVE DETAILS ARE TO BE FURNISHED IN THEIR LETTER HEAD BY THE CONTRACTOR / SUPPLIER, DULY ATTESTED BY THEIR BANKERS.

6.19.0 PROVIDEND FUND & MINIMUM WAGES

6.19.1 The contractor is required to extent the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of this letter of intent. Incase you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

6.19.2 The contractor shall ensure the payments of minimum labour wages to the workmen under him as per the rules applicable from time to time in the state.

6.19.3 The final bill amount would be released only on production of clearance certificate from PF/ESI and labour authorities as applicable.

6.20.0 OTHER STATUTORY REQUIREMENTS

1. The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no along with the first running bill.

2. The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. Incase of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contactor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

3. The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r 78 (1) (a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

4. The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act1948 (If applicable) to BHEL along with the Final Bill.

5. Incase of any dispute pending before the appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

6. Incase of any dispute prolonged/pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

6.21.0 FINAL SITE INSPECTION & TEST

The employer / owner shall maintain at site a joint protocol for recording actual measurement of work carried out at site, inspection and witnessing of various tests conducted by the contractor. The owner/employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner/employer without any extra cost to the owner / employer. The contractor shall take this into consideration while quoting his rates for various items/works. No cost whatsoever such duplication of inspection of work be entertained .

SECTION – VI- A
ERECTION WELDING PRACTIVE FOR SA 335 P91 MATERIAL
RAICHUR STAGE III (1 X 250 MW) – UNIT 8

1.0 SCOPE

1.1 This document details salient practices to be adopted during erection of SA335 P91 material.

2.0 MATERIAL

Materials shall be identified as follows: -

1. Colour Code: Brown & Red
2. Hard Stamping : Specification, Heat No. Size
3. Paint / Stencil: WO DU, as per the relevant drg & document.

2.1 When any defect like crack, lamination, deposit noticed during visual examination the same shall be confirmed by Liquid Penetrant inspection. If confirmed, it shall be referred to unit.

3.0 ERECTION

3.1 Edge Preparation and fit up

3.1.1 Cutting of P-91 material shall be done by band saw / hacksaw / machining / grinding only. Edge preparation (EP) shall be done only by machining. In extreme cases, grinding can be done with prior approval of Welding Engineer / Quality Assurance Engineer. During machining / grinding, care should be taken to avoid excessive pressure to prevent heating up of the pipe edges.

3.1.2 All Edge Preparations done at site shall be subjected to Liquid Penetrant Inspection (LPI). Weld build-up on Edge Preparation is prohibited.

3.1.3 The weld fit-up shall be carried out properly to ensure proper alignment and root gap. Neither tack welds nor bridge piece shall be used to secure alignment. Partial root weld of minimum 20 mm length by GTAW and fit-up by a clamping arrangement is recommended. Use of site manufactured clamps for fit up is acceptable. The necessary preheat and purging shall be done as per clause 4.1 and 3.2.2.

3.1.4 The fit-up shall be as per drawing. Root gap shall be 2 to 4 mm; root mismatch shall be within 1 – mm. Suitable Reference punch marks shall be made on both the pipes (at least on three axis)

a) At 200 mm from the EP for UT.
b) At 1000 mm from the EP for identifying weld during PWHT.

3.2.0 FIXING OF THERMOCOUPLE (T/C) AND HEATING ELEMENTS DURING PREHEATING AND PWHT

3.2.1 No Preheating is required for fixing T/C with resistance spot welding Following are the equipment / facilities for heating cycles

1. Heating methods : Induction heating
2. Thermo couples : Ni-Cr / Ni-A1 of 0.5 mm gauge size.
3. Temp. Recorders : 6 Points / 12 Points.

3.2.2 **ARRANGEMENT FOR PURGING** : -

Argon gas of 99.99% conforming to Gr 2 IS 5760 – 1998 shall be used for purging the root side of weld. The purging dam (blank) shall be fixed on either side of the weld bevel prior to pre-heating. The dam shall be fixed inside the pipe and it shall be located away from the heating zone. Purging is to be done for root welding (GTAW) followed by two filler passes of

SMAW in case of butt welds. Purging is not required in the case of nozzle and attachment welds, when they are not full penetration joints. The Argon to be used shall be dry.

The flow rate is to be maintained during purging is 10 to 26 litres / minute and for shielding during GTAW IS 8 to 14 litres / minute (A minimum flow rate as per welding Procedure specification shall be maintained).

Start purging from inside of pipe when root temperature reaches 220 deg. C. Provide continuous and adequate Argon Gas to ensure complete purging in the root area.
The minimum pre-flushing time for purging before start of welding shall be 5 minutes, irrespective of the size.

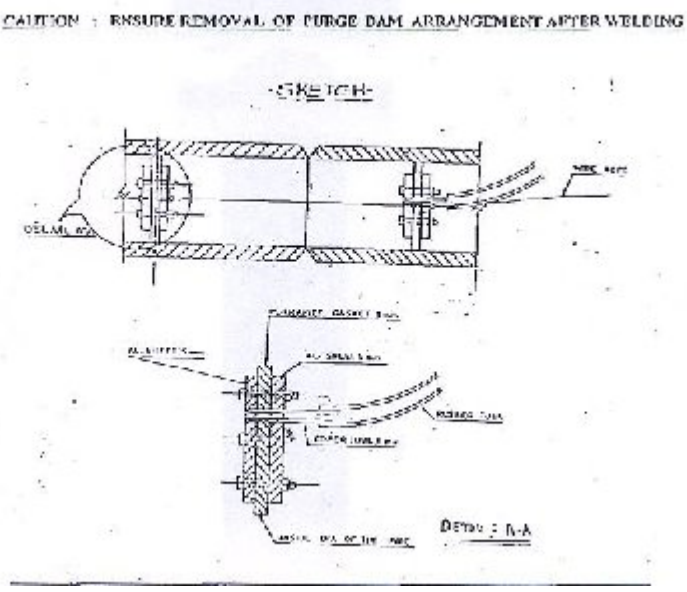
Wherever possible, solid purging gas chambers are to be used which can be removed after welding. If not possible, only water-soluble paper is to be used. Plastic foils that are water-soluble are NOT acceptable.

3.2.3 USING ALUMINIUM DAM ARRANGEMENT

In order to retain the Argon gas at the inside of the pipe near root area of the weld joint, the purging dams made of Aluminium (or other suitable material like mild steel) and permanent gaskets may be provided during the weld fit-up work as indicated in the sketch.

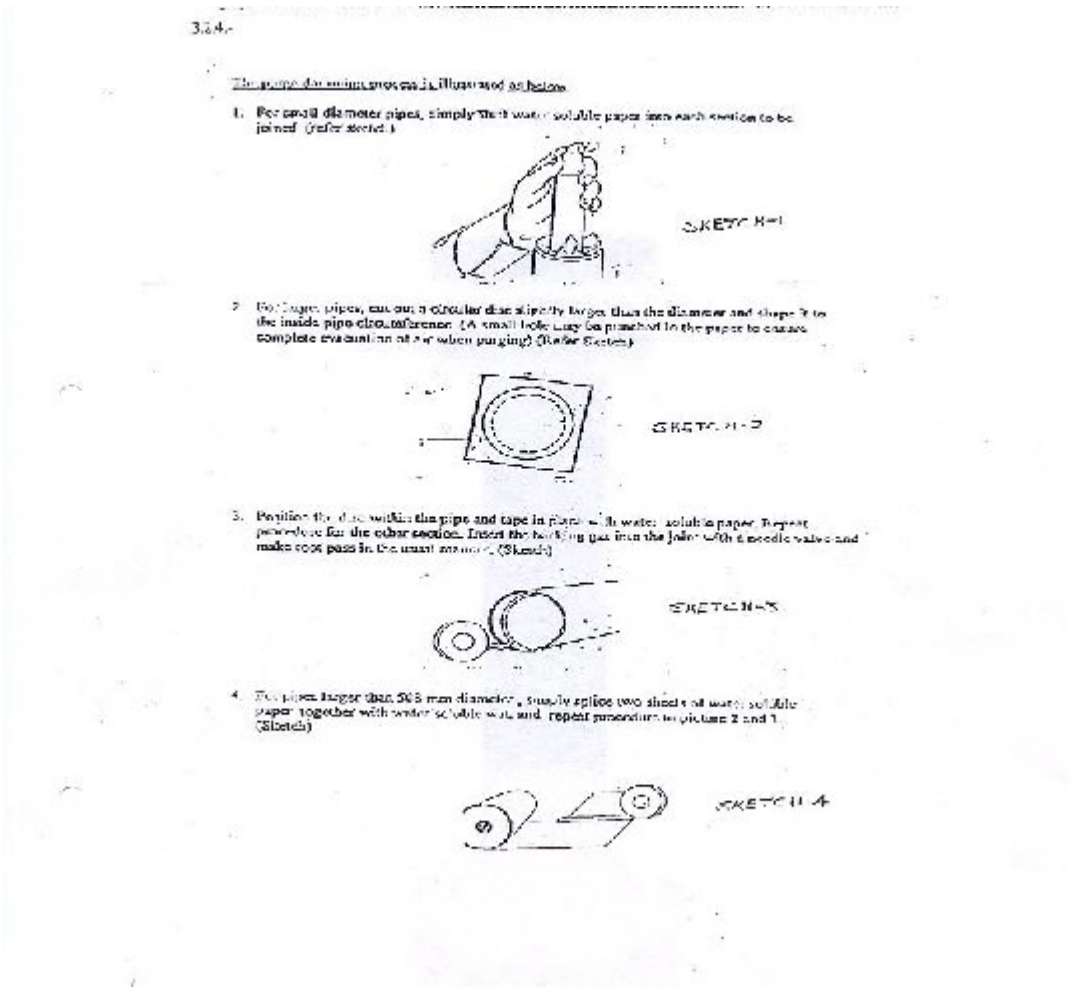
The Aluminium discs shall be firmly secured with a thin wire rope. After completion of the root welding followed by two filler passes, the disc may be pulled outwards softly.

CAUTION : ENSURE REMOVAL OF PURGE DAM ARRANGEMENT AFTER WELDING :



3.2.4 USING OF WATER SOLUBLE PAPER

The dams can be made of water-soluble paper for creating the purging chamber. The advantage in such dam arrangement is that dissolving in water can flush the dams. The following are different methods used.



3.3.4.-

The [illegible] is illustrated as below

1. For small diameter pipes, simply [illegible] water soluble paper [illegible] each section to be joined. (refer sketch.)

SKETCH-1

2. For larger pipes, cut out a circular disc slightly larger than the diameter and shape it to the inside pipe circumference. (A small hole may be punched in the pipe to ensure complete evacuation of air when purging) (Refer Sketch)

SKETCH-2

3. Position the disc within the pipe and tape in place with water soluble paper. Repeat procedure for the other section. Insert the [illegible] gas from the [illegible] with a needle valve and make sure pass in the usual manner. (Sketch)

SKETCH-3

4. For pipes larger than 508 mm diameter, simply splice two sheets of water soluble paper together with water soluble wax and repeat procedure in pictures 2 and 3. (Sketch)

SKETCH-4

4.0 **WELDING / WELDERS QUALIFICATION**:

Only qualified welding procedures are to be used. Welders Qualified as per ASME Sec IX and IBR on P91 material shall only be engaged. Welders log book to be maintained and welders performance to be monitored by site welding engineer / Quality assurance engineer. The applicable WPS for P91 + P91 shall be WPS No.1034.

4.1 **PREHEATING**

Prior to start of pre heating ensure that surfaces are clean and free from grease, oil and dirt. Preheating temp shall be maintained at 220 deg C (min) by using Induction heating. The Temperature shall be ensured by using a Calibrated autographic recorder and two calibrated then no couples fixed at 0 deg and 180 deg positions on both pipes 50 mm away from the

EP. The thermocouple shall be welded with the condenser discharge portable spot welding machine. The preheating arrangements shall be inspected and approved by welding engineer / Quality Assurance Engineer. (Ref Fig – 1) Alternate arrangements shall be made during power failure. Two additional spare thermocouple to be fixed (as described above) for emergency use. Gas burners shall be employed to maintain the Temperature until the power resumes.

4.2 WELDING:-

Root Welding shall be done using GTAW process (as per WPS) five minutes after the start of argon purging. Filler wire shall be cleaned and free from rust or oil. Argon purging shall be continued minimum two filler passes of SMAW.

4.3 STORAGE OF WELDING CONSUMABLES

a. Welding consumables are received with proper packing and marking which includes the relevant batch number for easy identification.
b. Electrodes are stored in their original sealed containers / packages until issued and kept in dry and clean environment as per the instructions of electrode manufacturers, taking care of shelf life.
c. Welding filler wires are received with proper packing and marking which includes the relevant batch number for easy identification.
d. The filler wires are stored in their original packages until issue and kept in dry and clean environment.

4.3.1 The electrode GTAW wires issued to the welders should be controlled through issue slips. SMAW electrodes used must be dried in drying ovens with calibrated temperature Controller. The drying temp shall be as recommended by the electrode manufacturer. The drying Temp shall be 200 – 300 deg C for two hours if it is not specified by the manufacturer. Portable flasks shall be used by the welders for carrying electrodes to the place of use. The electrodes shall be kept at minimum 100 deg C in the

flask. Welding shall be carried out with short are and stringer bead technique only.

4.4 The inter-pass temperature shall not exceed 350 deg. C. After completion of Welding bring down the temp to 80 – 100 deg C and hold it at this temp for one hour minimum. The PWHT shall commence after completing one hour of soaking.

CAUTION :- No LPI / Wet MPI shall be carried out on weld before PWHT.

5.0 POST WELD HEAT TREATMENT

Arrangements :- A minimum of four thermocouples shall be placed such that at least two are no the weld and the other two on the base material on either side of the weld within the heating band at 180 degrees apart about 50mm from the weld joint. Two stand by thermocouple shall also be provided on the weld in case of any failure of the thermocouple. The width of the heated circumferential band on either side of the weld must be at lease 5 times the thickness of the weld. In case of fillet joints the heating band shall be six times the thickness of the base material. (Ref Fig – 2). An insulation of about 10mm thickness shall be provided between the cable and weld joint.

5.1 Obtain the clearance for post weld heat treatment cycle from QAE / Welding Engineer. The PWHT temp for P91 material shall be 760 $\pm$ 10 deg C and the soaking time shall be 2.5 minutes per mm of weld thickness, subject to a minimum of TWO Hours. All records shall be reviewed by Welding Engineer prior to PWHT clearance.

Heating shall be done by Induction heating only.

The rate of heating/cooling: - Thickness up to 50 mm – 110 deg C/hr.(max) (above 350 deg C) Thickness 50 to 75 mm – 75 deg C/hr.(max)

Thickness above 75 mm – 55 deg C/hr.(max)

Thickness = Actual thickness as measured.

5.2 INSULATION :

The width of the insulation band beyond the heating band shall be at least two times the heating band width on either side of the weldment.

The recording of time & temp shall be continuously monitored with a calibrated recorder right from preheating. This will be ensured at every one hour by site authorized personnel.

5.3 PREVENTIVE MEASURES DURING POWER FAILURE AND NON-FUNCTIONING OF EQUIPMENTS**.**

No interruption is allowed during welding and PWHT. Hence all the equipment for the purpose of power supply, welding, heating etc., shall have alternative arrangements. (diesel generator for providing power to the welding and heating equipments, standby welding and heating equipments, reserve thermocouple connections, gas burner arrangement for maintaining temp etc.) Following preventive measures shall be adopted until normal power supply or backup power supply through diesel generator is restored.

(a) During start of preheating **:**

In case of any power failure / interruption during preheating, the weld fit-up shall be insulated and brought to room temperature. After the electric supply resumes the joint shall be preheated as per

Clause No: 4.1. (Ref: Fig 3)

(b) During GTAW / SMAW: **-**

Use gas burner arrangement to maintain the temperature at 80 deg – 100 deg C up to a length of 50 mm on either side from weld center line along the complete circumference of the pipe. Root welding shall be continued after power is restored and preheating temperature is raised to 220 Deg. C. During the above period temperature shall be recorded through contact type Thermometer. (Ref: Fig 4)

(c) During cooling cycle after SMAW welding to holding temperature at 80 to 100 deg C for one hour (Ref: Fig 5)

Care shall be taken to avoid faster cooling rate by adequate insulation. The required temp 80 – 100 deg C shall be maintained by gas burner arrangements till power resumes / start of PWHT.

(d) During post weld heat treatment.

The following shall be followed

*** 1) During heating cycle**

The whole operation to be repeated from the beginning (Ref : Fig 6)

*** 2) During soaking**

Heat treat (soak) subsequently for the entire duration. (Complete period). (Ref : Fig 7)

The heating rate shall be as per the chart.

3) During cooling (above 350 deg C).

Reheat to soaking temperature and cool at the required rate. (Ref: Fig 8)

*** Temp should not be allowed to fall below 80 – 100 deg C. Gas burner arrangement shall be used to maintain the temperature.**

5.4 In all the above cases (a to d) the temp. Measurement on the weld joint by means of contact type calibrated temp. gauges shall be employed to record the temperature at regular Intervals of 15 minutes in the log book by Quality Assurance Engineer / Welding Engineer.

5.5 TEMPERATURE MONITORING:

The welding and heat treatment chart given in Figure 9 shall be followed for the following details. The actual PWHT chart shall be monitored for the following:

a) **Preheat**

b) **Inter pass Temperature (GTAW ÷ SMAW)**

c) **Controlled cooling and Holding at 80-100 Deg C for minimum one hour under insulation. Start PWHT after minimum one hour of soaking.**

d) **Heating to PWHT**

e) **Soaking at PWHT**

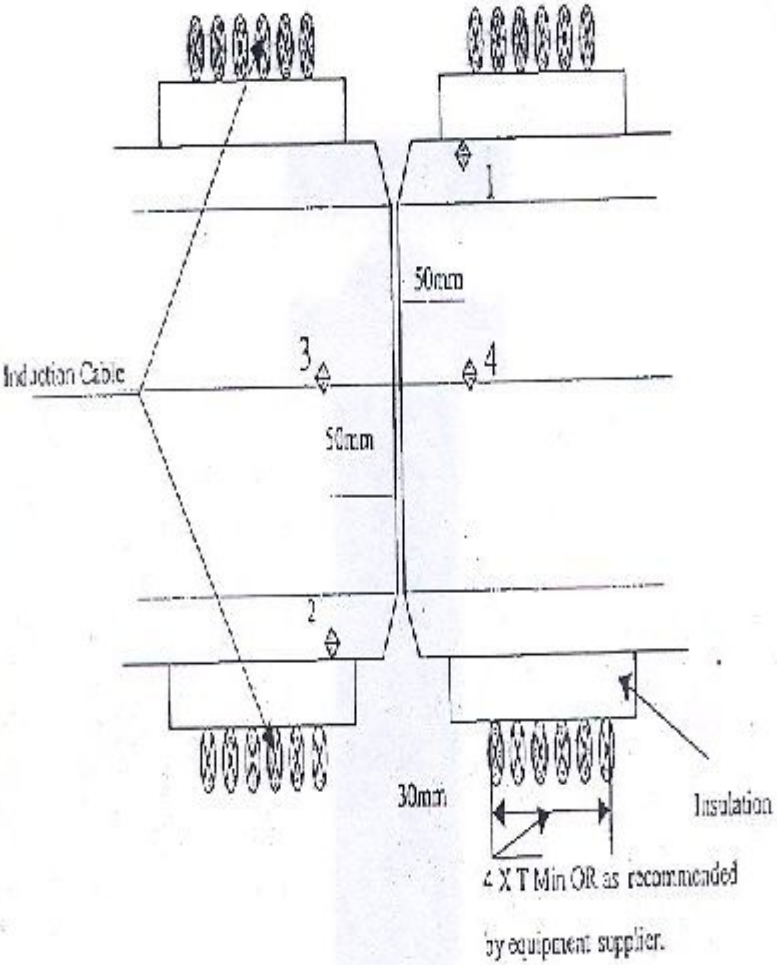
f) **Cooling to 350 Deg C**

g) **Cooling to Room Temperature (under insulation)**

5.6 CAUTION

THE PWHT TEMP. SHALL NOT DEVIATE FROM THE VALUES SPECIFIED IN THE CHART RANGE SINCE ANY DEVIATIONS TO THE SPECIFIED HOLDING TEMPERATURE RANGE, WILL ADVERSLY AFFECT THE MECHANICAL PROPERTIES OF THE WELDMENT AND MAY LEAD TO REJECTION OF THE WELDMENT. THE WELD JOINTS SHOULD BE KEPT DRY. UNDER NO CIRCUMSTANCES ANY WATER / LIQUID IS ALLOWED TO COME IN CONTACT WITH WELD AS WELL AS PREHEATED PORTION OF PIPE.

INDUCTION HEATING (for all Thickness)



1&2 Measurement TC, 3&4 Spare TC

THERMOCOUPLE (TC) PREHEATING ARRANGEMENT

Fig - 1

ARRANGEMENT FOR POST WELD HEAT TREATMENT

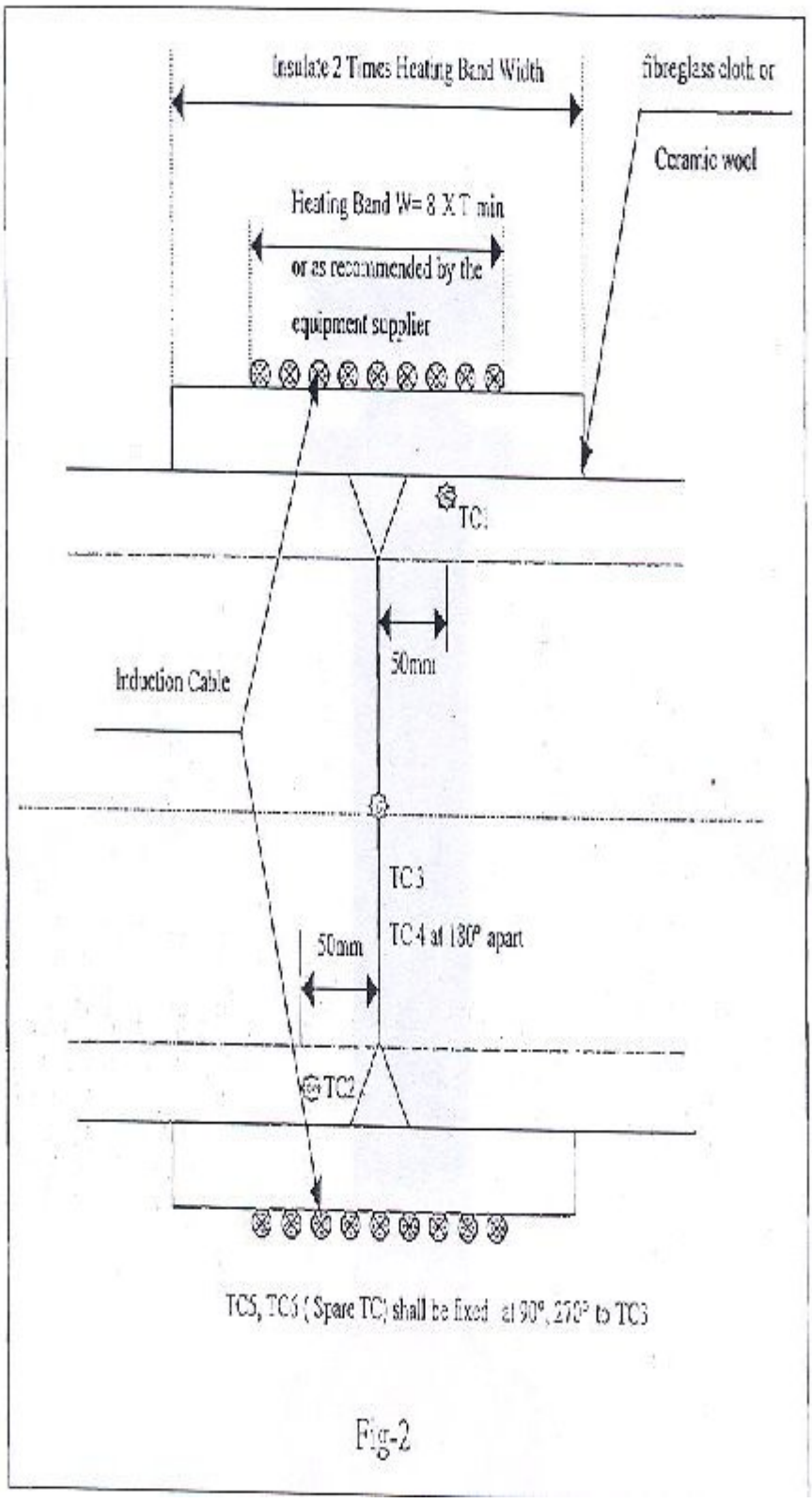
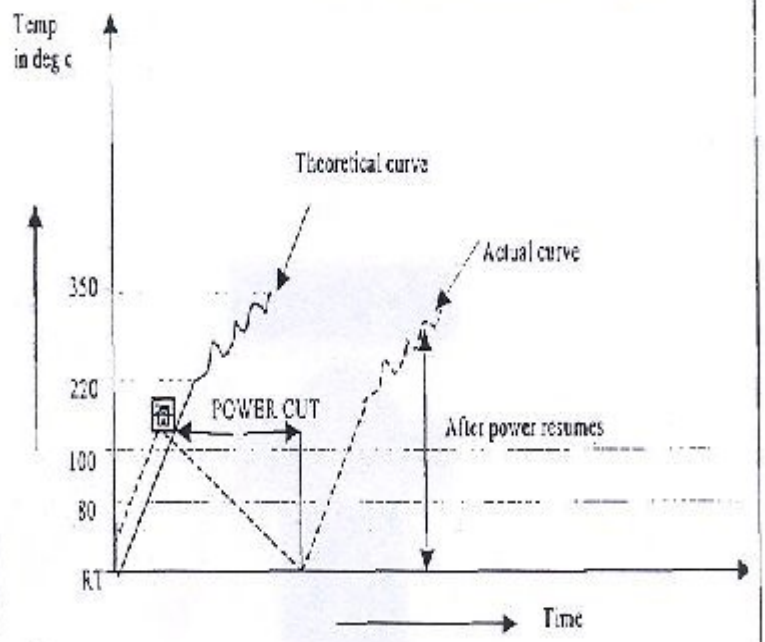


Fig-2

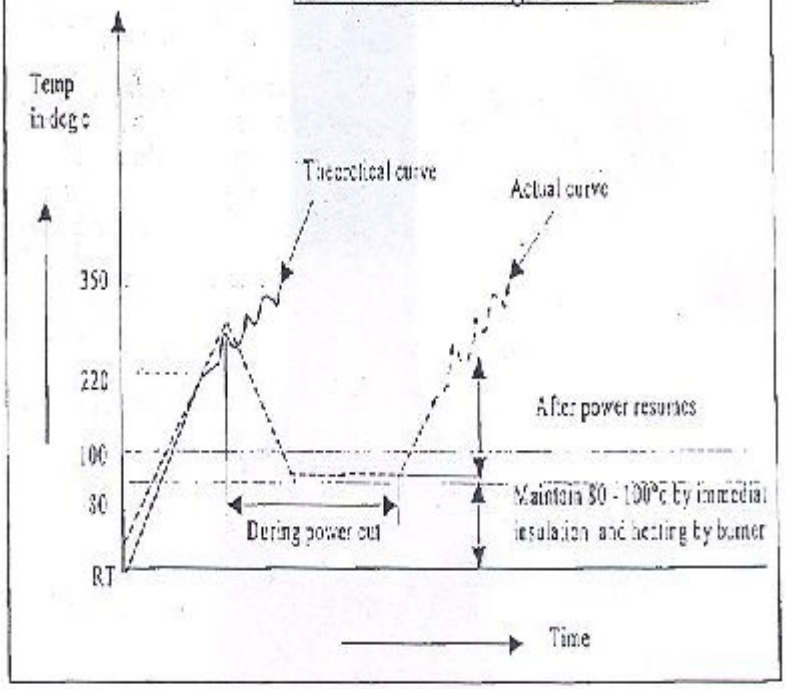
Power Failure during Preheating



Immediately cover the joint by insulation, if welding has not been started. Start preheat as per Cl.4.1 after power resumes

Fig - 3

Power Failure during GTAW/SMAW



Power Failure during cooling / holding

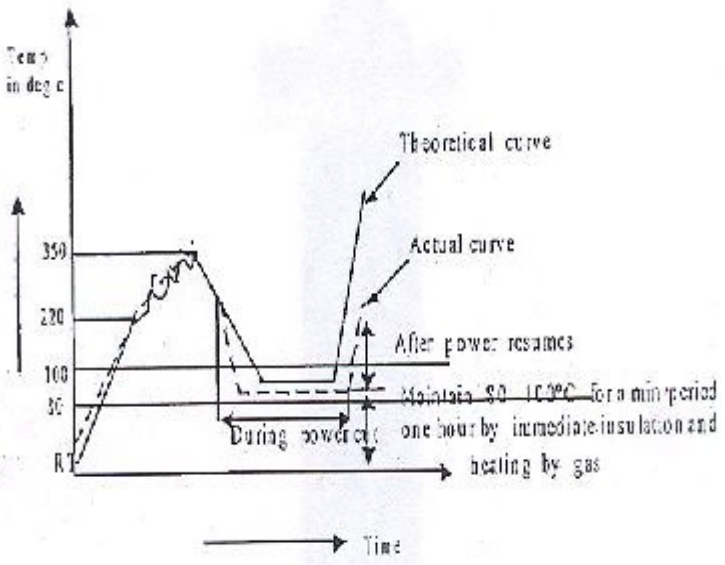


Fig - 5

Power Failure during PWHT heating cycle

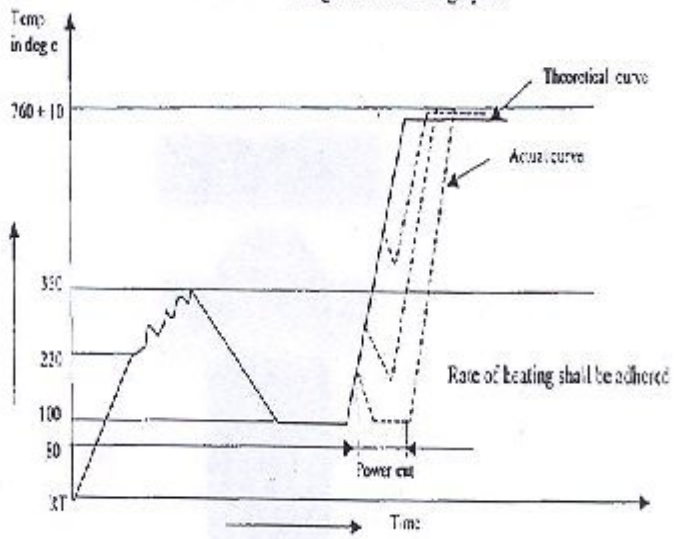


Fig - 6

Power Failure during PWHT soaking cycle

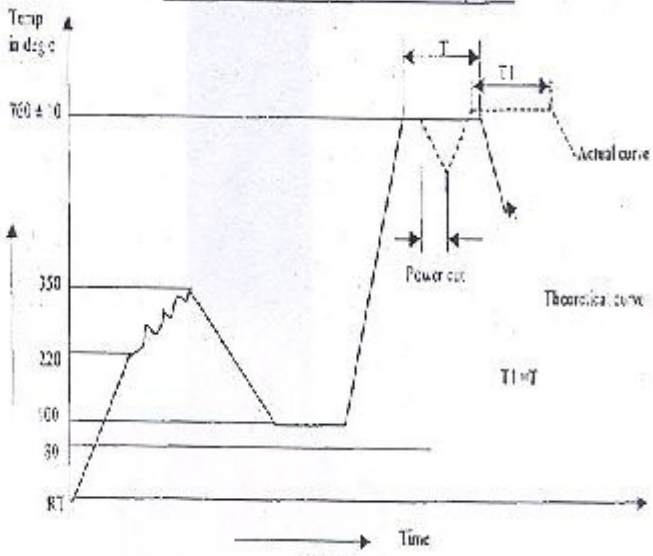


Fig - 7

Power Failure during PWHT cooling cycle

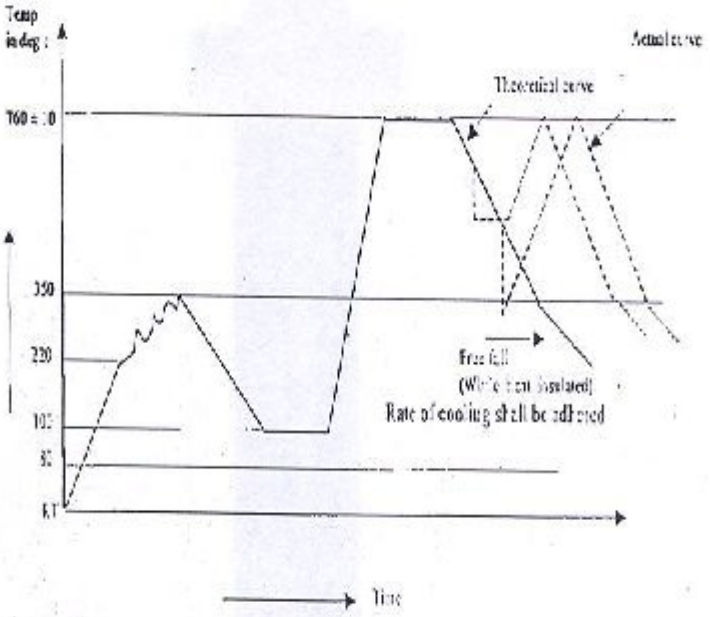


Fig - 8

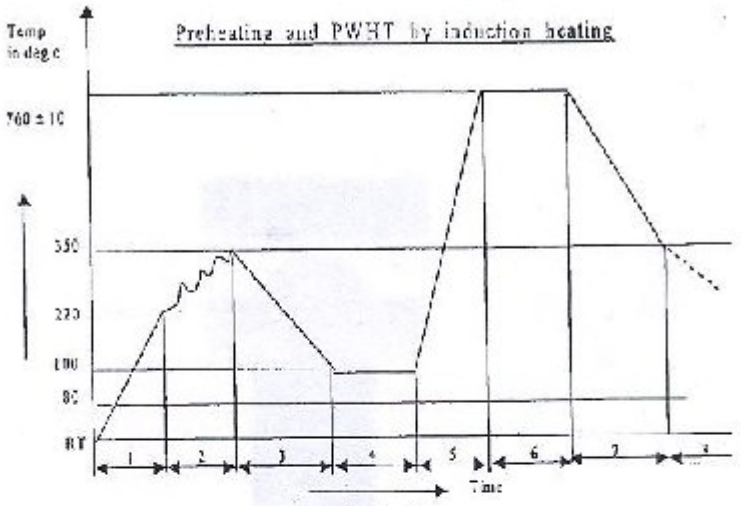


Fig -9

Stage	operation	Temp °c	Rate of cooling/Heating
1	Preheat	220° C	100 °C/hr.
2	Welding by GTAW+SMAW	220°C-450°C	
3	Cooling	80 - 100 °C	100 °C/hr
4	Holding at 80-100 °C for min 1 hr Holding shall continue till the start of PWHT		
5	Heating to PWHT	Reach 760 ±10 °C for P91 + P91	As per clause 5.1
6	Soaking at PWHT	760 ± 10°C at 2 Sminutes/mm (minimum 2 hrs)	
7	Cooling	Cooling to 350 °C	As per clause 5.1
8	Cooling	Cooling to Room temperature under insulation	

NOTE 1.Purging shall be ensured for minimum root and two further passes of SMAW.
2.Ensure removal of all purging dam arrangements after welding.
3.For electrodes details strictly follow WPS/PQRs.

5.7 CALIBRATION

All equipments like recorder, thermocouple, compensating cable, oven thermostat etc. should have valid calibration carried at BHEL approved labs. The calibration reports shall be reviewed and accepted by Calibration In-Charge at site prior to use.

6.0 NONDESTRUCTIVE EXAMINATION:

6.1 All NDE shall be done after PWHT only.

Prior to testing all welds shall be smoothly ground.

All welds (fillet & butt) shall be subjected to MPI (MPI shall be done by YOKE type only).

In addition to MPI, butt-welds and all full penetration welds shall be examined by UT.

LPI procedure shall be BHE: NDT : PB : PT : 01 – Rev 13 and

MPI procedure shall be BHE : NDT : PB : MT : 05 Rev 02

The penetrant materials (Dye Penetrant, Solvent cleaner & Developer) and medium (dry /wet particles) used in MPI shall be of BHEL approved brands only.

UT procedure shall be as per BHE:NDT:PB:UT21 – Rev 04 with additional requirements as in (a) through (c)

a. The calibration blocks used shall be of same material specification (P91) dia & thickness.
b. The UT equipment shall be calibrated prior to use and should be of 'digital type' – Krautkramer Model USN 50 of equivalent, capable of storing calibration date as well as ultrasonic test results as per UT-21 / Rev 04.
c. All recordable indications will be stored in memory of – either the digital flaw detector or a PC for review at a later period.
d. The equipment calibration data for specific weld as well as the hard copy of 'Static echo-trace pattern' – Showing the flaw – echo amplitude with respect to DAC, flaw depth, projection surface distance (probe position) and beam – path shall be attached to UT test report. This hard – copy of echo-trace with equipment calibration data will form part of test documentation.

e. The examination as well as evaluation will be performed by a qualified Level II personnel, and a test report will be issued. Any defect noticed during NDT shall be marked with marker.

7.0 REPAIR OF WELD JOINTS:

(A) WELD REPAIR AT ROOT:

On visual examination during root welding if it reveals any surface defects, the same shall be removed by grinding maintaining temperature 80 – 100 deg. C and rewelded with GTAW maintaining 220 deg. C before starting SMAW.

(B) WELD REPAIR ON COMPLETION:

Any defect observed on the weld shall be brought to the notice of Quality assurance engineer. The size and nature of defect shall be reviewed. Any repair on weld to be carried on their approval only.

If any defects are noticed on the fully completed weld while performing U.T. after completion of PWHT, the same may be assessed in order to find the seriousness of the defect and to locate where exactly the defect lies from the weld outside surface. The defect area shall be marked and repaired as below:

a) The weld shall be removed by grinding (gouging not permitted) such that the area for repair welding is free from sharp corners and provided with sufficient slope towards the weld face sides. Incase of cut & weld joints HAZ (=5 mm) will have to be removed by grinding.

b) Surface examination (MPI / LPI) on the ground and welded area to be performed to ensure a sound base metal before depositing weld layers using SMAW.

c) The temp. of the weld is to be maintained at preheat temp.

d) Carry out SMAW using the same procedure as that of welding.

e) All the specified precautions w.r.t to welding consumables, heating cycles, post weld heat treatment etc. as followed for original welding, shall be strictly adhered.

f) The NDE shall be conducted for the entire weld joint.

g) If any further defects are observed on the repaired weld, the same may be further reworked as mentioned above.

8.0 HARDNESS SURVEY

The equipment recommended to measure the hardness are EQUOTIP or MICRODUR make or equivalent portable equipment.

The equipment used for the hardness measurement shall be calibrated as recommended by the manufacturer and also on a P91 calibration block provided by PC.

The surface shall be cleaned and prepared as per hardness test instrument manufacturer's recommendation prior to hardness survey.

Hardness survey shall be done on each joint at three locations along the circumference. At each location three readings shall be taken on weld and parent metal. The readings on the parent metal shall be taken within 15 mm from the weld fusion line.

All the hardness values shall be recorded.

The max allowable hardness at weld and parent metal shall be 300 HV10. Joints having hardness above 300 HV shall be reheat treated and hardness shall be checked again. If hardness is still more refer to unit.

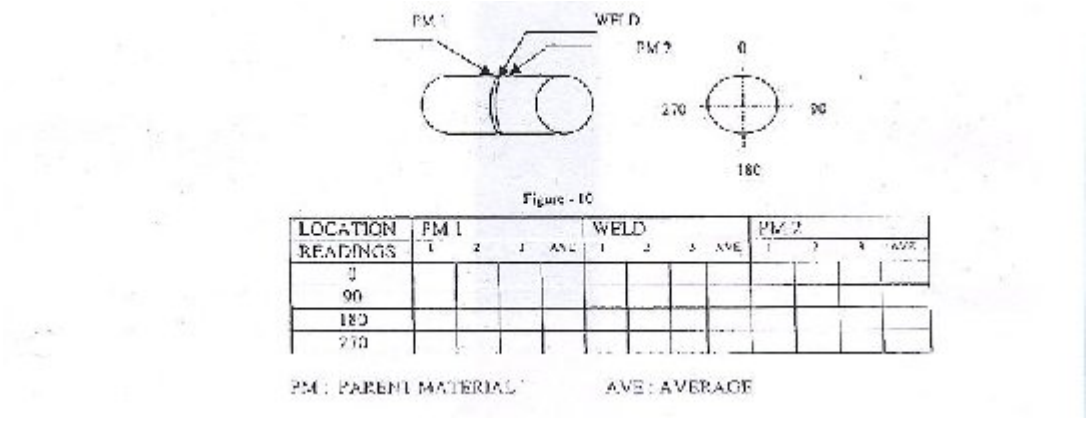


Figure - 10

LOCATION / READINGS	PM 1				WELD				PM 2			
	1	2	3	AVE	1	2	3	AVE	1	2	3	AVE
0												
90												
180												
270												

PM : PARENT MATERIAL AVE : AVERAGE

9.0 COMBINATION WELDING

For other combination of material like P22 with P91, and X22 with P91 the applicable WPS for the involving material shall be obtained from equipment supplier / WTC / PC and the same shall be used.

9.1 SOAKING TIME FOR COMBINATION WELDING

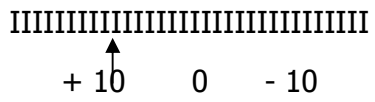
WPS No	Material	Temp.	Soaking time
1035 MS W0454	P91 + P22	745+15^{0}C	2.5 mts / mm minimum one hour
	P91 + X22	750 + 10^{0}C	2.5mts / mm minimum two hour for thickness Up to50 mm and minimum four hours for thickness above 50 mm.

However the precautions as required for P91 shall be fully taken care of.

10.0 DEMAGNETISATION

In case magnetization is noticed on the pipes, the following procedure shall be Followed during welding.

Use Residual field-indicator at one end of pipe and measure the residual field. Note reading and direction of field (+ ve or – ve & No units)



Indicator may show readings greater than + or – 10 Divisions. A small size electrode or gem clip will get attracted & stick to pipe.

Wrap insulated welding cable 5 turns – clockwise on the OD surface or pipe.

Wrapped cable to be 50 to 100 mm away from joint end.

One cable end connect to ÷ ve terminal of welding generator and the other to – ve terminal.

Complete electrical circuit & pass 400 amps current for 3 to 4 seconds.

Measure residual field now at the same end of pipe.

If demagnetization is effective the reading will come closer to 'O'

For eg. If it is formerly > + 10 Divisions, it may show – 5 Division.

The electrode or gem-clip will not stick to pipe – end.

If de-magnetization is NOT effective

The readings will be greater in the same direction

The gem clip / electrode will Still stick to pipe, Then repeat the following.

Now wrap the insulated cable (5 turns) in anti-clockwise direction pass current slightly excess of 400 Amps

Reduce the current gradually to 0 amps in one minute when current is on. Check for demagnetization using gem-clip / electrode. The gem-clip/electrode WILL NOT GET attracted.

If the reading is shifted to opposite direction, reverse the turns.

11.0 TRAINING

11.1 The personnel engaged in P91 piping fabrication shall be trained in the following areas.

a. Method and Care during fit-up
b. Argon gas root purging arrangement
c. Fixing of thermocouple and wires.
d. Arrangements for Pre/Post heating requirements and methods.
e. Adjustment of heating pads / cables at the time of controlling the temperature within specified tolerance limits during welding or PWHT in case of induction heating.
f. Good appreciation of the WPS requirements.
g. Handling of P91 welding consumables and re-drying conditions.
h. Special precautions during the power / equipment failure.
i. Weld joints of dissimilar thickness / material specification.
j. Weld defect control and weld repair system.

11.2 SPECIFIC TRAINING FOR WELDERS

a. The qualified welders who will be engaged in P91 welding shall be given training or pipe joints simulated with P91 welding and heating cycle conditions.
b. The acquaintance on welding positions, as applicable shall be given using P91 pipes and P91 welding consumables.
c. Welding techniques and instructions on Do's and Do Nots of P91 welding.
d. Welders only who are qualified on P91 welding alone shall be engaged. Whenever new welders have to be engaged they shall undergo all the training as above and shall be qualified with P91 material only.

11.3 CONTROL ON WELDERS

The welder during welding at site follow the following procedures.

The welder shall interact with the HT operator (Induction equipment operator) to ensure that preheat and interpose temperature during welding are maintained as per requirements.

The welder shall not mix the welding electrodes with that of the other welder. At the end of the shift, the unused electrodes shall be returned to the stores.

11.4 PERSONNEL / CONTRACTORS ENGAGED FOR HEATING CYCLES (HT Operator)

11.4.1 The Personnel / Contactor shall have adequate heat treat experience on P91 or similar material.

11.4.2 HT operator shall be aware of the following :

a. The equipment used and its working principle and operation.
b. The procedures to be followed in using heating equipments.
c. Procedure to be followed in case of power failure or equipment non-functioning so that heating cycle is not disrupted.
d. Calibration of equipments
e. Method of fixing thermocouples and compensating cables leading to HT recorder.
f. Fixing of heating pads or elements on the pipe joints and also in maintaining the temperature within the specified limits.

11.5 NDE PERSONNEL QUALIFICATIONS

All NDE personnel performing NDT like UT & MPI / LPI shall be qualified in accordance with BHEL Procedure meeting the requirements of recommended practice SNT – TC – 1A.

MPI & LPI shall be carried out by level I qualified personnel and shall be evaluated by level II qualified personnel. However UT examination and evaluation shall be done by level II qualified personnel.

11.6 LEVEL OF SUPERVISION

Site in-charge Shall be responsible for the completion of all activities from weld fit-up to final clearance of weld joints after satisfactory NDE and acceptance by BHEL/Customer / IBR.

12.0 DO's and DON'Ts during P91 welding, heat treatment and NDE at construction site.

12.1 DO's

a. Cutting by Band saw / Hack saw / Machining
b. Pipes Edge Preparation by machining. Machining shall be done without excessive pressure to prevent heating up of pipe.
c. Grinding may be done on exceptional cases after approval and taking adequate care to prevent overheating.
d. Thermocouple wire (hot/Cold junctions) shall be welded with condenser discharge portable spot-welding equipment.
e. Reserve Thermocouples shall be made available, incase of failure of connected thermocouple elements.
f. Ensure adequate Argon Gas for complete purging of air inside the pipe before starting GTAW root welding.
g. Ensure Preheating at 220 Deg. C minimum before GTAW root welding.
h. Start preheating only after clearance from Welding engineer / Quality assurance engineer for weld fit-up and alignment of the joint as well as fixing of Thermocouple connections (for Induction heating)
i. Do visual inspection on root weld maintaining weld preheating temp.
j. Continue Argon purging until the GTAW root welding followed by minimum two filler passes SMAW, is completed.
k. Perform partial root welding to facilitate fit-up if necessary.
l. Ensure that only one layer of root welding using TGS 2 CM filler wire (2 ¼ Cr 1 Mo) is deposit (wherever specified).

m. Ensure proper use of TIG wires as identified by colour coding or suitable hard punching.
n. Keep the GTAW wires in absolutely clean condition and free from oil, rust, etc.
o. Dry the SMAW electrodes before use.
p. Ensure the interpass temperature is less than 350 Deg.C.
q. Hold at 80-100 Deg. C for a period of Minimum 1 hour before the start of PWHT.
r. Record entire heating cycle on Chart through recorders.
s. Exercise control during grinding of weld and adjoining base metal while removing surface / sub-surface defects or during preparation for NDE.
t. Ensure no contract with moisture during preheat, welding, post heat and PWHT of weld joints.
u. Ensure removal of argon purging arrangements after welding.
v. Use short Arc only. The maximum weaving shall be limited to 1.5 times the dia of the electrode.

13.0 DON'Ts

a. Avoid Oxy-Acetylene flame cutting.
b. Avoid Weld-build up to correct the weld end-di or to set right the lip of the weld bevel.
c. Avoid Are strike on materials at the time of weld fit up or during welding.
d. Do not Tack weld the thermocouple wires with Manual Are/TIG welding.
e. NO GTAW root welding without thorough purging of root area.
f. Do not use Oxy-acetylene flame heating for any heating requirements.
g. Do not use Thermal chalks on the weld groove.
h. Do not stop argon purging till completion of GTAW root welding and two layers of SMAW.
i. No Tack welding or Bridge piece welding is permitted.

j. Do not use unidentified TIG wires or electrodes.

k. Do not exceed the maximum interpass temperature indicated in WPS

l. Do not allow moisture, rain, water, cold wind, cold draft etc. to come in contact with the weld zone or heating zone during the entire cycle from preheat to PWHT.

m. Do not exceed the limits of PWHT soaking temperature.

n. Do not Interrupt the Welding / heating cycle except for unavoidable power failures

o. Do not use uncalibrated equipment for temperature measurement during heating, welding, post weld, heat treating etc.,

14.0 NDE Consumables

Technically approved Brands by BHEL HPBP.

1. Liquid Penetrant, Penetrant Remover (Solvent cleaner) and Aerosol Developer from the same manufacturer considered as a family group.

VENDOR	BRAND		
	PENNETRANT	PENNETRANT REMOVER	DEVELOPER
ITW SIGNODE INDIA LTD.,	SPETCHECK SKL-SP	SPOT CHECK SKC-1	SPOT CHECK SKD-S2
P.MET CO.,	FLAW CHECK a. PP - 15 b. PP – 110	FLAW CHECK a. PP - 21 b. PP – 120	FLAW CHECK a. PD – 31A b. PD – 131A
CHECK MATE CHEMICALS (P) LTD.,	CHECK MATE SUPER PT 97	CHECK MATE SUPER CL 96	CHECK MATE SUPER DV 98
PRADEEP METAL TREATMENT CHEMICAL (P) LTD.,	FLAW GUIDE GP	FLAW GUIDE GP	FLAW GUIDE GP
FERROCHEM	CRACK CHECK FC 911	CRACK CHECK FC 911	CRACK CHECK FC 911

2. Dry Magnetic powder:

a. MAGNAFLUX – PRODUCT GREY; 8A – RED

b. FERROCHEM PRODUCT NO : 266

c. K-ELECTRONICS PRODUCT – RD – 200 (SPECIAL)

3. Non-fluorescent magnetic ink:

(Prepare bath as instructed by supplier)

a. MAGNAFLUX – Product 9C RED with MX/MG carrier II oil vehicle.

b. FERROCHEM – PRODUCT NO: 146 A with oil vehicle (with high flash point 92^0C)

c. SARDA MAGNA CHECK INK with oil vehicle (with high flash point 92^0C)

4. Fluorescent magnetic ink:

(Prepare bath as instructed by supplier)

a. MAGNAFLUX – Product 14A with MX/MG carrier II oil vehicle.

b. MAGNA FLUX – Product 14 AM - Prepared bath of 14A and MG/MX carrier II ready to use without measuring and Mixing in aerosol container with MS/MG carrier II oil vehicle.

15.0 DOCUMENTATIONS

The documentation shall be as per the customer approved BHEL Quality Plan.

SCOPE AT A GLANCE
SECTION VII – APPENDIX I
SITE FACILITIES

PROJECT: Raichur –unit 8 RATING: 1 X 250MW

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.1.0	**ESTABLISHMENT**			
1.1.1	**FOR CONSTRUCTION PURPOSE:**			
A	Open space for office	Yes		
B	Open space for storage	Yes		
C	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
D	Bidder's all office equipments, office / store / canteen consumables		Yes	
E	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
F	Fire fighting equipments like buckets, extinguishers etc		Yes	
G	Fencing of storage area, office, canteen etc of the bidder		Yes	
1.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
A	Open space			
B	Living accommodation		Yes	
1.2.0	**ELECTRICITY**			
1.2.1	Electricity For construction purposes (to be specified whether chargeable or free)			
1.2.1.1	Single point source	Yes	-	Free of charge
1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	
1.2.2	Electricity for the office, stores, canteen etc of the bidder which include:		-	
1.2.2.1	Distribution from single point including supply of matreials and service		Yes	

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	
1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
1.2.2.4	Living facilities for office use including charges		Yes	
1.2.2.5	Demobilization of the facilities after completion of works		Yes	
1.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc on the above lines. (in case BHEL provides this facility, the scope should be given without ambiguity)		Yes	
1.3.0	**WATER SUPPLY**			
1.3.1	**For construction purposes:**			
1.3.1.1	Making the water available at single point	Yes		
1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.2	**Water supply for bidder's office, stores, canteen etc**			
1.3.2.1	Making the water available at single point	Repeated Not Applicable		
1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.4.0	**TRANSPORTATION**			
1.4.1	For construction purposes:		Yes	
1.4.1.1	For the site personnel of the bidder		Yes	
1.4.1.2	For the bidder's euipments and consumables (T&P, consumables etc)		Yes	
1.5.0	**LIGHTING**			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.5.1	For construction work (supply of all the necessary materials) 1. At office storage area 2. At the preassembly area 3. At the construction site /area		Yes	
1.5.2	For construction work (execution of the lighting work/ arrangements) 1. At office storage area 2. At the preassembly area 3 At the construction site /area		Yes	
1.5.3	Providing the necessary consumables like bulbs, switches, etc during the course of construction		Yes	
1.5.4	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
1.6.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
1.6.1	Telephone, fax, internet, intranet, e-mail etc		Yes	
1.7.0	**COMPRESSED AIR SUPPLY**			
1.7.1	Supply of Compressor and all other equipments required for compressor and compressed air system including pipes, valves, storage systems etc		Yes	
1.7.2	Installation of the above system and operation and maintenance of the same .		Yes	
1.7.3	Supply of the all the consumables for the above system during the contract period		Yes	

SCOPE AT A GLANCE

PROJECT: Raichur –unit 8 RATING: 1 X 250MW

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.1.0	Engineering works for construction:			
2.1.1	Providing erection drawings for all the equipments covered under this scope	Yes		
2.1.2	Drawings for construction methods		yes	
2.1.3	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	
2.1.4	Shipping lists etc for reference and planning the activities	Yes		
2.1.5	Preparation of site erection schedules and other input requirements		Yes	
2.1.6	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	
2.1.7	Weekly erection schedules based on Sl No 2.1.5	Yes	Yes	
2.1.8	Daily erection / work plan based on Sl No 2.1.7	Yes	Yes	
2.1.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.	-	Yes	
2.1.10	Preparation of preassembly bay	-	Yes	
2.1.11	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself	-	Yes	
2.1.12	Arranging the materials required for preassembly	-	Yes	

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.0	SUGGESTED LIST OF TOOLS AND PLANTS (BHEL should indicate the proposed number of items considered as free issue)			
2.2.1	250 T crawler crane			
2.2.2	250 T tyre mounted crane		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.3	100 -135 T crawler crane			
2.2.4	150T range crane(on sharable basis)			
2.2.5	100 T crawler crane			
2.2.6	100T tyre mounted crane			
2.2.7	75 T crawler crane			
2.2.8	75 T tyre mounted crane			
2.2.9	60T Kroll tower crane			
2.2.10	18 T crawler crane			
2.2.11	18/20 T tyre mounted crane one			
2.2.11 A	8T Escort crane One No (1)			
2.2.12	30T gantry crane			
2.2.13	15 T gantry crane			
2.2.14	10T gantry crane			
2.2.15	30T tractor trailer			
2.2.16	20T trailer			
2.2.17	10 T trailer / truck			
2.2.18	Electrical winches 15 T with / wire ropes Drum lifting (2 Nos)			
2.2.19	Electrical winches 10T with / without wire ropes			
2.2.20	Electrical winches 5 T with / without wire ropes			
2.2.21	Electrical winch 3 T with or without wire rope			
2.2.22	Electrical winches with/without wire ropes			
2.2.23	Pneumatic winches 1 T with / without wire rope			
2.2.24	Welding generators			
2.2.25	Welding rectifiers			
2.2.26	Welding transformers air cooled			
2.2.27	Welding transformers oil cooled			
2.2.28	Chain pulley block 10T		TO BE ARRANGED BY THE BIDDE	
2.2.29	Chain pulley block 5 T			
2.2.30	Chain pulley block 3T			

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.31	Chain pulley block 1T /2T			
2.2.32	Pulling & lifting machines 5T			
2.2.33	Pulling & lifting machine 3T			
2.2.34	Pulling and lifting machine 2T / 1T			
2.2.35	Multi sheave pulley block 200 T (4) Drum Lifting			
2.2.36	Multi sheave pulley block 100 T (As Required)			
2.2.37	Multi sheave pulley block 50T			
2.2.38	Multi sheave pulley block 30T			
2.2.39	Multi sheave pulley block 20T			
2.2.40	Multi sheave pulley block 5T			
2.2.41	Single sheave shackle pulley bloc 20T			
2.2.42	Single heave shackle pulley block 10T			
2.2.43	Single sheave shackle pulley block 5 T			
2.2.44	25 V transformer with sufficient spare bulbs			
2.2.45	Gas cutting torches with regulators			
2.2.46	Torque wrench			
2.2.47	Pipe vice			
2.2.48	Bench vice			
2.2.49	Anvil			
2.2.50	Baking oven for welding electrodes			
2.2.51	Portable drying oven for baked welding electrodes			By Bidder
2.2.52	GQA grinding machine		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.53	FF2 grinding machine			
2.2.54	Angle grinders AG7			
2.2.55	Tig welding sets			
2.2.56	Air conditioners 1.5 T			
2.2.57	Sheet bending machine			
2.2.58	Sheet rolling m/c			
2.2.59	Sheet grooving m/c			
2.2.60	Pedestal drilling m/c			
2.2.61	Drilling m/c 31 mm			
2.2.62	Drilling m/c 20mm			
2.2.63	Drilling m/c 10 mm			
2.2.64	Hand drilling m/c 6 mm			
2.2.65	D shackles 30 T			
2.2.66	D shackles 20T			

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.67	D shackles 15 T Drum lifting			
2.2.68	D shackles 10T			
2.2.69	D shackles 5T/3T			
2.2.70	Wire rope sling 6x36 12mmx6m			
2.2.71	Wire rope slings 12mmx10m			
2.2.72	Wire rope slings 16mmx4m			
2.2.73	Wire rope slings 16mmx6m			
2.2.74	Wire rope slings 16mmx10m			
2.2.75	Wire rope sling 19mmx15 m			
2.2.76	Loose wire rope 16mm			
2.2.77	Loose wire rope 19 mm			
2.2.78	Loose wire rope 25mm			
2.2.79	Loose wire rope 32mm		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK EXCEPT EOT CRANE,HT PUMP 600/400 BAR AND ACID CLEANING PUMPS	
2.2.80	Wire rope clamps for the above sizes sufficient quantity			
2.2.81	Manila ropes of sufficient quantity in different sizes			
2.2.82	Hydraulic jacks 250/200T			
2.2.83	Hydraulic jacks 100T			
2.2.84	Hydraulic jacks 50T			
2.2.85	Hydraulic jacks 25 T			
2.2.86	Hydraulic jacks 10T			
2.2.87	Tower crane 50T			
2.2.88	Derricks 30T with 70 M high with all necessary accessories 2 nos			
2.2.89	EOT cranes in TG hall ♦ Main hook - 105 MT ♦ Aux hook - 15 MT	Yes		
2.2.90	Sleepers both wooden and concrete for movement of cranes at site			
2.2.91	Concrete blocks for pre assembly works at site			
2.2.92	15 T snatch pulley blocks Drum lifting			
2.2.93	Hydro test pump 600 bar/400 bar (ONE No.)	Yes		
2.2.94	Hydro test pump 250 bar -			
2.2.95	Hand operated hdro test pump			
2.2.96	Hydrc filling pump 100m head with ~ 15 LPSec			
2.2.97	Pressure gauges 400 bar			
2.2.98	Pressure gauges 600 bar			
2.2.99	Pressure gauges 100 bar			
2.2.100	Acid cleaning pumps with all accessories including switch gears	yes		

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.101	Stress relieving / preheating equipments including transformers, controllers, heating pads and insulating materials and consumables		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.102	Hydraulic pipe bending machines to suit up to 80mm dia and 11 mm thick			
2.2.103	Electric driven pipe chamfering machines up to 100 mm dia tubes with necessary cutting tools and other consumables			
2.2.104	Electric driven pipe chamfering m/c to suit pipes from dia 100 mm to 500/600 mm			
2.2.105	Theodolite 1 min accuracy			
2.2.106	Dumpy level			
2.2.107	6 point temp. recorder			
2.2.108	Radiographic equipments with suitable isotopes/ x ray machines			
2.2.109	MPI test kit			
2.2.110	Ultrasonic flaw detector			
2.2.111	Dye penetrant test kits (as required)			
2.2.112	Moving platforms Sky Claimber			
2.2.113	Passenger cum goods lift (1)			
2.2.114	Dip Lorries			
2.2.115	Rails and sleepers for dip lorries, both supply and installation		To be arranged by the bidder as required for work	
2.2.116	Calibrated steel tapes of different sizes			
2.2.117	Plumb bobs			
2.2.118	Micro meters of different sizes both inside and out side			
2.2.119	Vernier calipers of different sizes			
2.2.120	Surface plate			
2.2.121	Straight edges of different lengths			
2.2.122	Feeler gauges of different lengths			
2.2.123	Inside and out side callipers			
2.2.124	Bolt heating equipments including thermo couples			
2.2.125	Dial gauges with magnetic base			
2.2.126	Magnifying glass			
2.2.127	Piano wires			

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.128	Precision water level micrometer			
2.2.129	Parallel blocks			
2.2.130	Taper wedges			
2.2.131	Micro jacks			
2.2.132	Lead wires			
2.2.133	Dial bore micro meter			
2.2.134	Thermo meters of different ranges			
2.2.135	Depth gauges			
2.2.136	“GO & “NO GO” gauges			By Bidder
2.2.137	Drill sets			By Bidder
2.2.138	Taps and die sets		To be arranged by the bidder as required for the work	
2.2.139	Spirit levels			
2.2.140	Master spirit level			
2.2.141	Spring balance			
2.2.142	Hg manometer			
2.2.143	Vibro meter			
2.2.144	Noise level meter			
2.2.145	Litmus paper			
2.2.146	Portable gas purity meter			
2.2.147	Dead weight tester			
2.2.148	Temp bath for calibration			
2.2.149	250V/500V megger			
2.2.150	½.5/5.0 KV motorised megger			
2.2.151	Ammeter and voltmeters			
2.2.152	HV test kit			
2.2.153	Double kelvin Bridge			
2.2.154	DC bridge			
2.2.155	Mano meters			
2.2.156	Auto transformers			
2.2.157	CT(100/5A)			
2.2.158	Purge test kits			
2.2.159	Multi meters			
2.2.160	Variac 3phase 10 A			
2.2.161	Phase sequence meter			
2.2.162	Dual beam osciiloscope continuity tester			By Bidder
2.2.163	Rheostats			
2.2.164	Milli seconds syn timer			
2.2.165	Ultra violet recorder			
2.2.166	Tong tester			
2.2.167	Hardness tester			
2.2.168	Bolt stretching device			
2.2.169	Reamers of various sizes			

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.170	Vacuam cleaner			
2.2.171	Sand blasting machine with accessories			
2.2.172	Spray painting equipments			
2.2.173	Oil filtration units			
2.2.174	Bearing pullers of different sizes			
2.2.175	Bearing scrappers			
2.2.176	Slip gauges			
2.2.177	Elko meter to measure paint thickness			
2.2.178	MIG welding machines			
2.2.179	Files of different sizes			
2.2.180	Socket wrenches			
2.2.181	Spanner and pipe wrenches sets			
2.2.182	Hammers of different sizes (soft &hard)			
2.2.183	Allen keys sets			
2.2.184	Fire proof tarpaulins			
2.2.185	Steel scaffolding materials			
2.2.186	Pipe cutters			
2.2.187	Magnetic base for drilling machines			
2.2.188	Vibrator for grouting			
2.2.189	Mixing m/c (grouting and concreting)			By Bidder
2.2.190	Tube expanding machine ie drives – hydraulic or pneumatic ( )			By Bidder
2.2.191	Tube expanders(expansion and flaring)			By Bidder
2.2.192	Mercury plumb bob		Yes	
2.2.193	Band saw machines		Yes	
2.2.194	Copper rods		Yes	
2.2.195	Needle vibrators		Yes	
2.3.0	All consumables including :		Yes	
	Ordinary cement		Yes	
	Grouting cement		Yes	
	Any special cement		-	
	Sand, bricks etc		Yes	
	TIG wires		Yes	
	Electrodes		Yes	
	Brazing rod, flux etc		Yes	
	Soldering		Yes	
	DA, oxygen, argon		-	
	Nitrogen required for chemical cleaning	Yes		
	Nitrogen required for construction			

Sl.No	Description PART II ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
	Paints along with thinner, brushes, cleaning materials etc for preservation of components		Yes	
	Paints including thinner, brushes, cleaning materials etc for final painting, as per specifications		yes	
2.4.0	**WELDING**		Yes	
2.4.1	All welding works		Yes	
2.4.2	All radiography and other testing works like DPI, MPI, UT,		Yes	
2.4.3	All connected works like preheating, post heating, stress relieving,		Yes	
2.4.4	Providing certified either IBR or as per other relevant welders for the works. BHEL will not provide materials, test certificates etc for the above purpose unless specifically stated .		-	
2.4.5	To submit the welders to BHEL/client's approval (preproduction test) before putting them on regular work. Required materials for preproduction test to be arranged by BHEL.		Yes	
2.4.6	The accessories required for the welders to be arranged by the bidder			
2.5.0	**CHEMICAL CLEANING**		-	
2.5.1	Supply of pumps, motor, starters, cables, piping and other materials required for the operation	Yes		As required
2.5.2	Servicing the required equipments and commissioning		Yes	
2.5.3	Chemicals required for the operation including Nitrogen gas	Yes		
2.5.4	Handling equipments / consumables for the chemical cleaning works		Yes	
2.5.5	Effluent disposal system		Yes	
2.5.6	Services for the effluent disposal		**Yes**	

Note : * All the tools and plants required for this scope of work, except the Tools & Plants provided by BHEL are to be arranged by the contractor within the quoted rates. The list is suggestive in nature. Any additional T & P required to be arranged by the contractor

SCOPE AT A GLANCE

PROJECT: Raichur-unit 8 RATING: 1 X 250MW

Sl.No	Description **PART III** **ERECTION TESTING & COMMISSIONING**	Scope / to be taken care by		Remarks
		BHEL	**Bidder**	
3.1.0	**SCOPE OF WORK**			
3.1.0.1	Handling at site stores/ storage yard		Yes	
3.1.0.2	Transportation within the site		Yes	
3.1.0.3	Erection testing & commissioning		Yes	
3.1.0.4	Final painting of erected materials including supply of paints, thinners etc		Yes	
3.1.0.5	Carrying out P.G.test	-	-	
3.1.1.0	**HANDLING & TRANSPORTATION**			
3.1.1.1	Stores/storage yard to preassy area/ erection site		Yes	
3.1.1.2	Pre assembly area to site of installation		Yes	
3.1.1.3	Erection site to pre assembly area / stores/ storage area if required		Yes	
3.1.1.4	Touch up painting wherever required till final painting.(please refer the relevant clause for supply of paints, thinners etc)		Yes	
3.1.1.5	Preparation storage at site for proper stacking of materials		Yes	
3.1.2	ERECTION TESTING & COMMISSIONING			
3.1.2.1	Erection drawings/documents/working instructions etc	Yes	-	
3.1.2.2	Welding schedules	Yes	-	
3.1.2.3	Engineering drawings for construction methods		yes	
3.1.2.4	Organising the resources required for erection, testing &commissioning of the materials covered under the scope and executing the work as per instruction of BHEL engineer	-	Yes	
3.1.2.5	Final painting of all the materials erected	-	Yes	
3.1.2.6	Demobilization of the erection site		Yes	
3.1.2.7	Cleaning of / upkeep of erection / preassembly /storage areas		Yes	
3.1.2.8	Return of excess materials drawn to BHEL stores/ customer		Yes	

Sl.No	Description **PART III** **ERECTION TESTING & COMMISSIONING**	Scope / to be taken care by		Remarks
		BHEL	**Bidder**	
3.1.2.9	Reconciliation of all the consumables, T&P drawn from BHEL / customer ' s store		Yes	
3.1.2.10	Filling up quality log sheets		Yes	
3.1.2.11	Providing all temporary arrangements like platforms, scaffoldings etc for execution		Yes	
3.1.2.12	Assistance for P.G test	yes	-	
3.1.3	**CIVIL WORKS**			
3.1.3.1	Taking over of foundations		Yes	
3.1.3.2	Checking, chipping and correcting final dimensins of the foundations if required		Yes	
3.1.3.3	Placement, erection of embedded parts integral for the scope of work and coordination with customer's civil/other agencies for embedments		Yes	
3.1.3.4	Bolt grouting with grout as specified		Yes	
3.1.3.5	Final grouting of all the equipments covered under this scope		Yes	
3.1.4	**STATUTORY CLEARANCES**			
3.1.4.1	Labour Licence		Yes	
3.1.4.2	Provident fund		Yes	
3.1.4.3	Insurance what ever comes under bidder's scope		Yes	
3.1.4.4	Workmen compensation		Yes	
3.1.4.5	Minimum wages		Yes	
3.1.4.6	Sales tax		Yes	
3.1.4.7	Local laws governing the works like electrical inspectorate, factory inspectorate, etc		Yes	
3.1.4.8	Professional tax		Yes	
3.1.4.9	Safety rules and regulations		Yes	
3.1.4.10	Approval from competent authority for installation like IBR etc		Yes	
3.1.5	**SUBMISSION OF REPORTS**			
3.1.5.1	Man power deployment category wise and area wise		Yes	
3.1.5.2	Deployment of tools and plant , area wise		Yes	
3.1.5.3	Consumables used		Yes	
3.1.5.4	Erection log		Yes	
3.1.5.5	Erection data PGMADU wise		Yes	
3.1.5.6	Data on joints welded as per log sheet/ welding schedule		Yes	

Sl.No	Description **PART III** **ERECTION TESTING & COMMISSIONING**	Scope / to be taken care by		Remarks
		BHEL	**Bidder**	
3.1.5.7	Materials management reports as per instruction of BHEL		Yes	
3.1.5.8	Meeting between BHEL and bidder at BHEL office every day for monitoring the progress	Yes	Yes	

SECTION - VII APPENDIX - II

PROJECT: RAICHUR 1 X 250 MW

HP/POWER CYCLE PIPING & LP PIPING PACKAGE

WEIGHT SCHEDULE - SUMMARY

SL NO	DESCRIPTION	Approx. WT in MT
01	Piping - P 91	87.0
02	HP Piping	635.0
03	LP Piping	149.0
04	SS Piping	7.0
05	Hangers & supports including tanks & vessels , Pumps	237.0
06	Chemical cleaning piping incl misc items	30.0
06	Steam blowing piping incl misc items	30.0
	TOTAL WEIGHT OF ABOVE (in MT)	1175.0

OVERALL WEIGHT - PIPING **1175.0**

NOTE :

1. The detailed weight schedule for above is enclosed in appendices II A to II D for reference.

2. The weight indicated above is approximate and liable to vary. However the total tonnage will be + or - 15% of total weight . The payment will be made to the contractor for the tonnage actually erected at the respective category as per the quoted/accepted tonnage rate.

3. There may be variation or addition of PGMAs, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted/accepted rate in the respective category.

4. The temporary piping , pumps, tanks, dummy plates & other misc components etc., for testing , commissioning activities like Hydro testing, chemical cleaning & steam blowing will be issued as and where conditions in cut pieces. The scope includes cutting and edge preparation and erection as per the site condition & dismantling after the process and to return to stores with identification marks as instructed by BHEL engineer. The quoted rates shall be inclusive of all these activities.

SECTION - VII APPENDIX - II A

PROJECT: RAICHUR 1 X 250 MW

PCP & LP PIPING(6913) - BHEL PIPING CENTRE SCOPE

WEIGHT SCHEDULE

PGMA	DESCRIPTION	WT. IN MT	TOTAL	Category
80-301	MS FROM BOILER STOP VALVE TO ESV	81.0		P91
80-304	MS HEADER TO HPBP VALVE	6.0		P91
	P91 - TOTAL		87.0	
80-303	MS HEADER TO AUX PRDS	8.7		HP PIPING
80-307	HP & LP BYPASS WARM UP	1.1		HP PIPING
80-310	HRH FROM REHEATER TO INTERCEPTOR VALVE	125.5		HP PIPING
80-311	HRH FROM INTERCEPTOR VALVE TO TURBINE	11.7		HP PIPING
80-312	LPBP VALVE UPSTREAM & DOWNSTREAM	28.9		HP PIPING
80-320	CRH FROM TURBINE TO REHEATER	60.2		HP PIPING
80-321	HPBP VALVE TO CRH PIPING	5.2		HP PIPING
80-322	CRH PIPING TO DEAERATING HEATER	5.0		HP PIPING
80-324	CRH HEADER TO AUX.PRDS	1.0		HP PIPING
80-330	EXTRACTION STEAM TO LP HEATER-1	6.8		HP PIPING
80-331	EXTRACTION STEAM TO LP HEATER-2	3.4		HP PIPING
80-332	EXTRACTION STEAM TO LP HEATER-3	4.6		HP PIPING
80-335	EXTRACTION STEAM TO DEAERATING HEATER	12.9		HP PIPING
80-336	EXTRACTION STEAM TO HP HEATER NO.1	2.9		HP PIPING
80-337	EXTRACTION STEAM TO HP HEATER-2	1.6		HP PIPING
80-340	AUX STEAM HEADER	1.2		HP PIPING
80-341	AUX STEAM HEADER INTERCONN BETWEEN UNITS	9.0		HP PIPING
80-345	AUX STEAM TO DEAERATING HEATER	1.4		HP PIPING
80-346	AUX STEAM TO SJAE - SG SCOPE	1.0		HP PIPING
80-348	AUX STEAM TO GLAND SEALS - SG SCOPE	0.5		HP PIPING

80-369	HP DRAIN FLASH TANK VENT TO SYSTEM	1.6		HP PIPING
80-373	AUX STEAM HEADER SV EXHAUST	1.2		HP PIPING
80-375	UNLISTED SV EXHAUSTS - TG SCOPE	4.6		HP PIPING
80-398	TURBINE WASHING STEAM	3.7		HP PIPING
80-420	BOILER FEED PUMP SUCTION	8.5		HP PIPING
80-421	BOILER FEED PUMP RECIRCULATION	7.6		HP PIPING
80-423	BOILER FEED PUMP TO HPH INCLUDING BYPASS	43.1		HP PIPING
80-424	BFD BETWEEN HTRS & GROUP PROTECTION VLV	18.0		HP PIPING
80-425	BFD FROM FINAL HPH TO SG TP	64.0		HP PIPING
80-430	SPRAY WATER TO HPBP	1.3		HP PIPING
80-431	SPRAY WATER TO AUX PRDS	2.3		HP PIPING
80-432	SPRAY WATER TO BOILER DESH UPTO SG TP	3.1		HP PIPING
80-449	TG CYCLE PIPING DRAINS & VENTS	7.3		HP PIPING
80-452	HP PIPING DRAINS - SG SCOPE	3.0		HP PIPING
80-453	LP PIPING DRAINS - SG SCOPE	2.0		HP PIPING
80-992	IMPORTED ELECTRODES	0.3		HP PIPING
	HP PIPING - TOTAL		464.2	
80-473	DM WATER SYSTEM PIPING	5.0		SS PIPING
80-601	LP DOSING PIPING	1.5		SS PIPING
	SS PIPING - TOTAL		6.5	
80-381	HP HEATER VENTS - TG SCOPE	0.9		LP PIPING
80-382	LP HEATER VENTS	1.5		LP PIPING
80-385	VENT FROM UNLISTED PPG/EQPT TO COND	2.3		LP PIPING
80-387	CONDENSATE PUMP VENT	1.1		LP PIPING
80-388	CONDENSER AIR EVACUATION PIPING	3.3		LP PIPING
80-400	CONDENSATE SUCTION	3.2		LP PIPING
80-401	CD FROM PUMP TO LPH1/DC INLET TEE&RECIR	10.0		LP PIPING
80-402	CD FROM LPH1/DC INLET TEE TO TG TP	6.3		LP PIPING
80-407	CONDENSATE FOR SEALING OF VACUUM	1.3		LP PIPING

80-408	CONDENSATE DUMP FROM HEADER	2.2		LP PIPING
80-411	CONDENSATE/MAKE-UP TO CONDENSER	2.0		LP PIPING
80-412	CONDENSATE TRANSFER	4.0		LP PIPING
80-413	UNLISTED CONDENSATE	1.1		LP PIPING
80-440	CONDENSER DRAINS	0.2		LP PIPING
80-442	GLAND STEAM COOLER DRAINS	0.3		LP PIPING
80-443	LP HEATER-1 TO CONDENSER	1.5		LP PIPING
80-444	LP HEATER-2/3/4/5 DRAINS&DRIP PUMP INCL	3.0		LP PIPING
80-446	DEAERATING HEATER OVER FLOW AND DRAIN	2.9		LP PIPING
80-447	HP HEATER DRAINS	9.2		LP PIPING
80-463	TG AUX COOLING WATER	21.0		LP PIPING
80-612	SERVICE AIR FOR INDIVIDUAL UNITS	4.0		LP PIPING
80-616	INSTRUMENT AIR FOR INDIVIDUAL UNIT	2.5		LP PIPING
80-673	LUBE OIL PIPING SYSTEM	4.5		LP PIPING
	LP PIPING - TOTAL		88.3	
80-921	H&S FOR LIGHT UP STEAM LINE	32.0		H & S INCL TANKS/VESSELS/PUMPS
80-922	H&S FOR LIGHT UP - NON STEAM LINES	18.0		H & S INCL TANKS/VESSELS/PUMPS
80-923	H&S FOR STEAM BLOWING	140.0		H & S INCL TANKS/VESSELS/PUMPS
80-924	H&S FOR SYNCHRONISATION-STEAM LINES	5.0		H & S INCL TANKS/VESSELS/PUMPS
80-925	H&S FOR SYNCHRONISATION-NON STEAM LINES	8.0		H & S INCL TANKS/VESSELS/PUMPS
80-933	H & S FOR LP PIPING	10.0		H & S INCL TANKS/VESSELS/PUMPS
80-934	STANDARD HANGER COMPONENTS	3.0		H & S INCL TANKS/VESSELS/PUMPS
	H& S - TOTAL		216.0	
	OVERALL TOTAL - PCP	862.0	862.0	

SECTION - VII APPENDIX - II B
PROJECT: RAICHUR 1 X 250 MW
SG INTEGRAL PIPING (0389) - BHEL PIPING CENTRE SCOPE
PROJECT: RAICHUR 1 X 250 MW , SG INTEGRAL PIPING (0389)
WEIGHT SCHEDULE

PGMA	DESCRIPTION	WT. IN MT	TOTAL	Category
80342	Aux Steam To Scaph	2.5		HP PIPING
80343	Aux Steam To Sootblowers	0.7		HP PIPING
80351	Aux Steam To Unlisted Users-Sg Scope	4.8		HP PIPING
80364	Cbd Tank Vent To System	0.6		HP PIPING
80365	Cbd Tank Vent/Sv Exhaust To Atmosphere	0.6		HP PIPING
80366	Ibd Tank Vent To Atmosphere	7.1		HP PIPING
80395	Aux Steam To Fo Atomising	0.4		HP PIPING
80418	Ecection Materials For Instruments	0.3		HP PIPING
80450	Cbd And Emergency Drum Drain	2.6		HP PIPING
80451	Boiler Integral Piping Drains	1.0		HP PIPING
80452	Hp Piping Drains-Sg Scope	2.2		HP PIPING
80453	Lp Piping Drains-Sg Scope	2.0		HP PIPING
80454	Scaph Drains	1.2		HP PIPING
80455	Drain From Ulisted Eqpt/Vessel-Sg Scop	1.6		HP PIPING
80901	Sd Valves&Specialities-Boiler Lightup	1.5		HP PIPING
80905	Bhel Valves-Boiler Lightup	8.5		HP PIPING
80992	Imported Electrodes	0.2		HP PIPING
	HP PIPING -TOTAL		37.8	
80600	Hp Dozing	0.5		SS PIPING
	SS PIPING - TOTAL		0.5	
80460	Sg Aux Cooling Water Unit System	26.5		LP PIPING
80471	Boiler Wash Water To & From Unit	8.6		LP PIPING

80480	Fire Water-Other Areas	6.8		LP PIPING
80612	Service Air For Unit	4.7		LP PIPING
80616	Inst Air For Unit	6.1		LP PIPING
	LP PIPING - TOTAL		52.7	
80921	H&S For Boiler Lightup-Steam Lines	0.7		H & S INCL TANKS/ VESSELS/PUMPS
80922	H&S For Boiler Lightup-Nonsteam Lines	2.0		H & S INCL TANKS/ VESSELS/PUMPS
80924	H&S For Synchronisation-Steam Lines	0.7		H & S INCL TANKS/ VESSELS/PUMPS
80926	H&S For Temp Piping-Acid And Alkali	2.7		H & S INCL TANKS/ VESSELS/PUMPS
80927	H&S For Temp Piping-Steam Blowing	3.5		H & S INCL TANKS/ VESSELS/PUMPS
81003	Cont Blow Down Expander-1500 Mm Od	2.5		H & S INCL TANKS/ VESSELS/PUMPS
81009	Inter Blow Down Expander-2500 Mm Od	6.6		H & S INCL TANKS/ VESSELS/PUMPS
81018	Mixing Tanks For Chemical Dozing	1.0		H & S INCL TANKS/ VESSELS/PUMPS
81019	Metering Tanks For Chemical Dozing	1.0		H & S INCL TANKS/ VESSELS/PUMPS
81120	Hp Dozing Pump	0.3		H & S INCL TANKS/ VESSELS/PUMPS
	H&S,TANKS /VESSELS/PUMPS TOTAL		21.0	
80399	Steam Blowing - Temporary piping	30.0	30.0	SB TEMP PPG
80604	Acid Cleaning - Temporary piping	30.0	30.0	ACID CLNG PPG
	OVERALL WEIGHT-SG INTEGRAL PIPING	172.0	172.0	

SECTION - VII APPENDIX - II C

PROJECT: RAICHUR 1 X 250 MW

BHEL PEM SCOPE - BOUGHT OUT ITEMS

SL NO	DESCRIPTION	QTY (NOS.)	Approx. WT in MT	
01	Globe valves & RGLV	2		LP PIPING
02	Cast steel valves	2		LP PIPING
03	Steam traps	22	4.0	LP PIPING
04	Air traps	10		LP PIPING
05	Ball valves	177		LP PIPING
06	Flow elements	14		LP PIPING
07	Rotameters	3	4.0	LP PIPING
08	Aux. PRDS	1		LP PIPING
09	LP Chemical dosing system	1		LP PIPING
	LP PIPING - TOTAL		8.0	
10	Control valves	21	12.0	HP PIPING
	HP PIPING TOTAL		12.0	
	PEM - TOTAL WEIGHT		20.0	

SECTION - VII APPENDIX - II D

PROJECT: RAICHUR 1 X 250 MW

TG VALVES - BHEL TRICHY SCOPE

SL NO	DESCRIPTION	Approx. WT in MT	
80-913	Power cycle piping valves including root valves etc..	110.0	HP PIPING
80-917	TG Valves(Pem Engineered)	6.0	HP PIPING
80-918	Extraction QC non-return valves (Hardwar engineered)	5.0	HP PIPING
	HP PIPING TOTAL	121.0	
	Total weight - TG valves	121.0	

SECTION VII APPENDIX - III

List of Tools & Plants to be made available by BHEL to contractor on free of hire charges on sharable basis

S.No	Description	Qty
01	Induction Heating Machine With Complete Accessories	As Reqd.
02	Spot Welding Machine	1 No
03	EOT Cranes at TG Hall 125/30 T	1 No
04	Chemical Cleaning Pumps with Accessories	As Reqd.
05	Hydro test pump (400-600 Kg /cm2)	1 No
06	Diesel generator set - 250 KVA/500 KVA - (only for standby supply for P91 welding)	1 No.

Note :

1) All the above T&Ps shall be given to contractor on sharable basis and the allotment is made by BHEL/Site in Charge, on need basis.

2) For handling at stores and transportation, contractor shall make his own arrangements.

3) EOT crane (without operator) – since this crane is arranged from customer by BHEL allotment will be made only on need basis. Contractor has to plan his activities item wise where the EOT crane is required to be used and submit to BHEL for approval. In case the erection can be carried out by using other T&Ps, contractor shall make his own arrangement. The decision of BHEL site –in charge on this will be final and binding. The contractor has to arrange for trained operator for EOT Crane.

4) For DG set provided by BHEL (as standby supply for P91 welding) contractor has to arrange operator, fuel, lubricants, power cables etc., at his cost.

5) Consumables for P91 welding, BHEL will provide the facility indicated in Section – VI. Other consumables and facility required to complete the work shall be arranged by the contractor within the quoted rate.

6) Filling pump for hydro test shall be arranged by the contractor if required. For testing of LP lines necessary HT pumps/Hand pumps are to be arranged by the contractor.

7) In case of non-availability of these equipments, due to any reason i.e., unavoidable breakdown, major overhaul or any other reason etc., the contractor should make arrangement at his own cost to meet the erection targets. No extra claim will be admitted due to non-availability of any of the above equipments. No delay in execution of work shall be accepted on this account.

8) The day-to-day and routine maintenance for the BHEL T&Ps will be carried out by the contractor at his own cost. However, BHEL shall supply spare parts free of charges for normal wear and tear only.

9) Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor.

Apart from the above, any other tools and plants required for satisfactory completion of the work has to be arranged by the contractor**.**

SECTION VII

APPENDIX – IV

Painting schedule

Section - VII Appendix - IV

KARNATAKA POWER CORPORATION LTD	
1X250 MW – UNIT-8 RAICHUR TPS	
PAINTING	SHEET [illegible]

1.0 GENERAL

1.1 This section covers the painting requirements for the power plant equipment, structures, piping etc. and any other surfaces required to be painted.

2.0 CODES AND STANDARDS

Painting of equipment shall be carried out as per the specification indicated below and in conformance to the relevant IS specification for the materials and workmanship.

The following Indian Standards may be referred to for carrying out the painting job.

IS:5	: Colours for ready mixed paints and enamels
IS:1303	: Glossary of terms relating to paints
IS:2379	: Colour code for identification of pipelines
IS:1477	: Code of practice for painting of ferrous metals in buildings (Parts I & II)
IS:2524	: Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS:2395	: Code of practice for painting of concrete, masonry and plaster surfaces (Parts I & II)
IS:2338	: Code of practice for finishing of wood and wood based materials (Parts I & II)
IS:6278	: Code of practice for white washing and colour washing
IS:3140	: Code of practice for painting asbestos cement building products
IS:158	: Ready mixed paint, brushing, bituminous black, lead free, acid, alkali, water and heat resisting
IS:2074	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS:104	: Ready mixed paint, brushing, Zinc Chrome, priming

IS:2932 : Enamel, synthetic, exterior (a) undercoating (b) finishing

3.0 PREPARATION OF SURFACES

All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tools and scrapping with steel wire brushes shall be adopted to clean the surfaces. However, in certain locations where power tool cleaning cannot be carried out, hand

scraping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER / OWNER REPRESENTATIVE. The sheet steel of electrical and instrumentation panels shall be pre-treated through chemical cleaning (7 tank) process of fresing, degreasing, rinsing, derusting, rinsing, phosphating and rinsing. However in case mechanical cleaning is also required, the Contractor shall carry out the same to get a smooth finish.

4.0 PRIMER PAINT

After the surface is prepared, one coat of Zinc Phosphate/ Red oxide primer conforming to IS:2074 shall be applied. After this first coat is dried up completely, second coat of red oxide primer shall be applied. Primer shall be applied by brushing to ensure a coat free from colour 'holiday'. The dry film thickness of each coat shall be minimum 30 microns.

5.0 FINISH PAINT

Synthetic enamel paint conforming to IS:2932 shall be used for finish coats. The colour/shade shall be as approved by the OWNER. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet surfaced cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.

6.0 SUGGESTED COLOUR CODES FOR PAINTING

SL. NO	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admiralty Grey	632		
2.0	Boiler casing, ESP and ducting	Nut Brown	413		
3.0	Crane				
3.1	Crane structures	Golden Yellow	308		
3.2	Trolley and hook	Crimson	310		
4.0	Fans, pumps, motors, compressors	Light Grey	631		
5.0	Tanks (without insulation and cladding)				
5.1	Outdoor	Aluminium			
5.2	Indoor	Light grey	631		
6.0	Vessels & all other proprietary	Light grey	631		

SL NO	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
	equipment (without insulation & cladding)				
7.0	Switchgear	Light grey	631	-	-
8.0	Control & relay panels	Light grey	631/70 28 of IS 1650	-	-
9.0	Fabrics	Golden Yellow	356		
10.0	Generator & exciter	Light grey	631	-	-
11.0	Transformers	Aluminium	-	-	-
12.0	Machinery guards	Signal red	537	-	-
13.0	Piping (without insulation and cladding)				
13.1	Water System				
	Boiler feed	Sea green	217	-	-
	Condensate	Sea green	217	Light brown	410
	D M Water	Sea green	217	Light orange	557
	Soft water	Sea green	217	French blue	166
	Bearing cooling water	Sea green	217	French blue	166
	Potable & filtered water	Sea green	217	French blue	166
	Service & clarified water	Sea green	217	French blue	166
	Raw water	Sea green	217	White	-
	Cooling water	Sea green	217	French blue	166
13.2	Air System				
	Station air	Sky blue	101	-	-
	Control air	Sky blue	01	White	-
13.3	Oil system				
	Fuel oil	Light brown	410	French	166
	Light oil	Light Brown	410	Brilliant green	221
	Lubricating oil	Light brown	410	Light grey	631
	Transformer oil	Light brown	410	Light orange	557
13.4	Gas system				

1X250 MW – UNIT- 8 RAICHUR TPS

PAINTING

SL NO	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
	Carbon dioxide	Canary yellow	309	Light grey	631
	Hydrogen	Canary yellow	309	Signal red	537
3.5	Fire services	Fire red	536	-	
3.6	Ash slurry pipes	Black	-	-	-
3.7	Vacuum pipes	Sky blue	101	Black	
3.8	Fuel pipes (pulverised coal)	Light brown	410	-	-
3.9	Drainage	Black	-	-	-

Notes:

1. This colour code basically refers to IS:2379 for piping with necessary modifications.

2. Where band colour is specified, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

SECTION VII

APPENDIX – V

WELDING SCHEDULE

ERECTION WELDING SCHEDULE

- ERECTION WELDING SCHEDULE - TYPICAL FOR 250 MW IS ENCLOSED FOR TENDER PURPOSE .
- AS ENGG IS STILL IN PROGRESS FOR RAICHUR 250 MW, FINAL DOCUMENT WILL BE RELEASED AT THE TIME OF EXECUTION AT SITE .
- THE VARIATION IN QUANTUM OF WELDING MAY BE + 20% .

ERECTION WELDING SCHEDULE

BOI

PROJECT : TYPICAL FOR 250 MW

CUST No. :

ASSY. DRG No. :

PGMA : 80-301

PGMA DESC : MAIN STEAM PIPING FROM BOILER STOP VALVE TO EMERGENCY STOP VALVE

S. No.	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AT IES)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P91(A) / SA335P91(A) SA182F91(A)	323.9	31 / 33	77	31 (W)	--	R12MoCrVNb E9015-B9 E9015-B9 E9015-B9	TIG ARC ARC ARC	Ø2.40 Ø2.50 Ø3.20 Ø4.00	15430gms 1772Nos 9544Nos 12393Nos	
2	SA182F22CL3(A) / SA182F22CL3(A)	D230	59	6	59 (W)	--	R12MoCrVNb E9018-B3 E9018-B3 E9018-B3	TIG ARC ARC ARC	Ø2.40 Ø2.50 Ø3.15 Ø4.00	1500gms 273Nos 488Nos 2438Nos	
3	SA335P22(A) / SA182F22CL3(A)	33.4	9.09	--	TOK	25.15	E9018-B3	ARC	Ø3.15	383Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-999-53172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CED/APE.	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		25/05/09	4-80-301-59Bad	00

SHEET 1 of 1

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-304

CUST. No.

PGMA DESC : HIGH PRESSURE BYPASS VALVE UPSTREAM PPG

ASSY. DRG. NO.

SL No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (ATTEST)	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P91(A) / SA335P91(A)	219.1	25	2	25 97	--	PT2WCr.1Mo.	TIG	Ø2.50	3780gms	
							E9015-B9	ARC	Ø2.50	420No's	
							E9015-B9	ARC	Ø3.20	840No's	
							E9015-B9	ARC	Ø4.00	1890No's	
2	SA335P22(A) / SA182F22CL3(A)	33.4	6.09	--	106	1.250	E9018-B3	ARC	Ø3.15	24No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-50173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/09	4-80-304-60883 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-303

CUST. No. :

PGMA DESC : MAIN STEAM PPG TO HIGH AUX.PROS PPG

ASSY. DRG. NO. :

SL No	MATERIAL SPECN / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A) / SA234WP22(A)	168.3	27.5	14	27.5 W	--	RT2¼Cr1Mo	TIG	Ø2.50	630.0gms	
							E9018-B3	ARC	Ø2.50	196No's	
							E9018-B3	ARC	Ø3.15	336No's	
							E9018-B3	ARC	Ø4.00	280No's	
2	SA335P22(A) / SA234WP22(A)	219.1	36	30	36 W	--	RT2¼Cr1Mo	TIG	Ø2.50	1770 Gms	
							E9018-B3	ARC	Ø2.50	540No's	
							E9018-B3	ARC	Ø3.15	750No's	
							E9018-B3	ARC	Ø4.00	1950No's	
3	SA335P22(A) / SA234WPF1(A)	323.9	9.53	14	9.53 W	--	RT1Cr½Mo	TIG	Ø2.50	1456.0gms	
							E8018-B2	ARC	Ø2.50	336No's	
							E8018-B2	ARC	Ø3.15	518No's	
4	SA106GrB(A) / SA234WPB(A)	323.5	6.35 / 12.7	5	6.35 W	--	RT½Mo	TIG	Ø2.50	535.0gms	
							E7018-1	ARC	Ø2.50	120No's	
							E7018-1	ARC	Ø3.15	240No's	
5	SA335P22(A) / SA234WPP22CL1(A)	10260	51	2	51 W	--	RT2¼Cr1Mo	TIG	Ø2.50	210.0gms	
							E9018-B3	ARC	Ø2.50	56No's	
							E9018-B3	ARC	Ø3.15	90No's	
							E9018-B3	ARC	Ø4.00	344No's	
6	SA335P22(A) / SA182F22CL3(A)	33.4	9.09	--	10A	1.05	E9018-B3	ARC	Ø2.50	20No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4 80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHN.	DESIGN/AFB	CHK/AFB. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-303-66884 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGNA : 60-307

CUST. No. :

ASSY. DRG. NO. :

PGNA DESC. : HP & LP BYPASS WARM UP PIPING

SL no.	MATERIAL SPECN 1 (ST) / MATERIAL SPECN 2 (ST)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC/GAS/TIG	SIZE (in mm)	QUANTITY	REMARKS
1	SA335P22(A)	60.3	5.54	15	5.54$\bar{V}$	--	RT2½Cr1Mo	TIG	Ø2.50	239gms	
	SA182F22CL3(A)			--	6S	0.76	E9018-B3	ARC	Ø2.50	282Nos	
2	SA335P22(A)	60.3	12.5	57	12.5$\bar{V}$	--	RT2½Cr1Mo	TIG	Ø2.50	519gms	
	SA234WP22CL1(A) SA182F22CL3(A)						E9018-B3	ARC	Ø2.50	241Nos	
							E9018-B3	ARC	Ø3.15	359Nos	
3	SA335P22(A)	33.4	4.55	8	4.55$\bar{V}$	--	RT2½Cr1Mo	TIG	Ø2.50	38gms	
	SA182F22CL3(A)			--	5S	0.21	E9018-B3	ARC	Ø2.50	33Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, HL STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING NO.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/00	4-80-307-67393 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80-310

CUST. No. :

ASSY. DWG. NO. : | PGMA DESC : HOT REHEAT PIPING

Sl. No.	MATERIAL SPECN.1 (AT) / MATERIAL SPECN 2 (AT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A)	558.8	28.58	93	28.58 ▽	--	RT2½Cr1Mo	TIG	Ø2.50	18050gms	
			30				E9018-B3	ARC	Ø2.50	3990No's	
	SA335P22(A) SA234WP22CL1(A)	558	32				E9018-B3	ARC	Ø3.15	5555No's	
			45				E9018-B3	ARC	Ø4.00	10970No's	
2	SA335P22(A)	457.2	22.2	11	22.2 ▽	--	RT2½Cr1Mo	TIG	Ø2.50	1727gms	
	SA335P22(A) SA234WP22CL1(A)		25				E9018-B3	ARC	Ø2.50	374No's	
							E9018-B3	ARC	Ø3.15	61No's	
							E9018-B3	ARC	Ø4.00	572No's	
3	SA335P22(A)	829	35	2	35 ▽	--	RT2½Cr1Mo	TIG	Ø2.50	436gms	
	SA335P22(A) SA234WP22CL1(A)						E9018-B3	ARC	Ø2.50	94No's	
							E9018-B3	ARC	Ø3.15	136No's	
							E9018-B3	ARC	Ø4.00	224No's	
4	SA335P22(A)	33.4	4.55	1	4.55 ▽	--	RT2½Cr1Mo	TIG	Ø2.50	7gms	
	SA182F22CL3(A)			--	5%	8.18	E9018-B3	ARC	Ø2.50	35No's	
5	THERMOWELL AISI 321	63.5	13	8	130	--	Er Ni Cr3	TIG	Ø2.50	69gms	
	SA182F22CL3(A)						ENI Cr Fe2	ARC	Ø2.50	112No's	
							ENI Cr Fe2	ARC	Ø3.15	56No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. 4-80-999-9372 AND 4-80-999-9370 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.	REV
A.AROKIARAJ	P.SANKAR	R.SEETHAGIRI		29/09/08	4-80-310-66898 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-312

CUST. No.:

ASSY. DRG. No.:

PGMA DESC : LOW PRESSURE BYPASS PIPING

SL No	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	NDT SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTCH)	ARC / GAS / DC	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A) / SA335P22(A) SA234WP22CL1(A)	508.0	28	42	75	---	RT2¼Cr1Mo	TIG	Ø2.50	7294gms	
							E9018-B3	ARC	Ø2.50	1595No's	
							E9018-B3	ARC	Ø3.15	9646No's	
							E9018-B3	ARC	Ø4.00	3948No's	
2	SA335P22(A) / SA335P22(A)	609.6	20	4	20	---	RT2¼Cr1Mo	TIG	Ø2.50	784gms	
							E9018-B3	ARC	Ø2.50	168No's	
							E9018-B3	ARC	Ø3.15	276No's	
							E9018-B3	ARC	Ø4.00	204No's	
3	SA335P22(A) / SA182F22CL3(A)	33.4	4.55	---	5	1.2	E9018-B3	ARC	Ø2.50	14No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD.	CUD./APD. – QA	DATE	DRAWING No.:	REV.
A.ARUKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-312-66943 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 00-320

CUST. No. :

ASSY DRG. NO :

PGMA DESC : COLD REHEAT PIPING

SL No	MATERIAL SPECN (ATT) / MATERIAL SPECN (ATT)	PIPE SIZE OD (mm)	PIPE SIZE THK (mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (M.M)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A) / SA335P22(A) / SA234WP22CL1(A) / SA234WP11CL1(A)	711.2	25	16	25W	--	R12¼CrIMo	TIG	Ø2.50	3696.0gms	
							E9018-B3	ARC	Ø2.50	592Nos	
							E9018-B3	ARC	Ø3.15	1412Nos	
							E9018-B3	ARC	Ø4.00	1880Nos	
2	SA335P22(A) / SA335P22(A)	168.3	10.97	1	10.97W	--	R12¼CrIMo	TIG	Ø2.50	97.0gms	
							E9018-B3	ARC	Ø2.50	15Nos	
							E9018-B3	ARC	Ø3.15	23Nos	
3	SA335P22(A) / SA234WP22CL1(A) (END CAP)	168.3	7.11	2	7.11W	--	R12¼CrIMo	TIG	Ø2.50	96.0gms	
							E9018-B3	ARC	Ø2.50	50Nos	
							E9018-B3	ARC	Ø3.15	18Nos	
4	SA106GrC(A) / SA106GrC(A) / SA234WPC(A) / SA234WP22CL1(A)	711	20	19	20W	--	R1½Mo	TIG	Ø2.50	4708.8gms	
							E7018-A1	ARC	Ø2.50	1016Nos	
							E7018-A1	ARC	Ø3.15	1677Nos	
							E7018-A1	ARC	Ø4.00	1220Nos	
5	SA106GrC(A) / SA234WPC(A) / SA234WP11CL1(A) / SA234WP22CL1(A)	457.2	12.7 / 14.27 / 22.2	33	12.7W	--	R1½Mo	TIG	Ø2.50	4939.0gms	
							E7018-A1	ARC	Ø2.50	1722Nos	
							E7018-A1	ARC	Ø3.15	1648Nos	
							E7018-A1	ARC	Ø4.00	396Nos	
6	SA106GrC(A) / SA106GrC(A) / SA234WPC(A)	457.2	36	2	2.7W	--	R1½Mo	TIG	Ø2.50	259.0gms	
							E7018-A1	ARC	Ø2.50	86Nos	
							E7018-A1	ARC	Ø3.15	112Nos	
							E7018-A1	ARC	Ø4.00	24Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		25/09/08	4-80 320-67028	C0
					SHEET: 01 of 02	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80 3E0

COST. No. :

ASSY. DRG. NO

PGMA DESC : COLD REHEAT PIPING

S No	MATERIAL SPECN 1 (ATT) / MATERIAL SPECN 2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTES.)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
7	SA106GrC(A) / SA234WPC(A) / SA106GrB(A)	406.4	14.6	2	14.6W	--	RT½Mo E7018-A1 E7018-A1 E7018-A1	TIG ARC ARC ARC	Ø2.50 Ø2.50 Ø3.15 Ø4.00	284.3gms 60Nos 100Nos 36Nos	
8	SA106GrB(A) / SA234WPB(A)	168.3	7.11	2	7.11W	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	98.0gms 30Nos 22Nos	
9	THERMOWELL AISI 321 / SA105(A)	63.5	13	1	13W	--	Er Ni Cr3 ENi Cr Fe3 ENi Cr Fe3	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	13.0gms 14Nos 7Nos	
10	SA106GrC(A) / SA105(A)	33.4	4.55	--	5B	2.52	E7018-1	ARC	Ø2.50	28Nos	
11	THERMOWELL AISI 321 / SA182F22CL3(A)	63.5	13	4	13W	--	Er Ni Cr3 ENi Cr Fe2 ENi Cr Fe2	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	40.0gms 56Nos 28Nos	
12	SA335P22(A) / SA182F22CL3(A)	33.4	4.55	--	5B	2.52	E9018-B3	ARC	Ø2.50	28Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD/APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		28/03/08	4-80-320-67028 SHEET 36 of 52	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 60-821

COST. No. :

PGMA DESC : BOP PRESSURE BYPASS VALVE DOWN STREAM PIPING

ASSY. DRG. NO. :

Sl No	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WT. SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (ATTFS1)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A) / VALVE	273	36	2	38	--	RT2¼Cr1Mo	TIG	Ø2.50	558.0gms	
							E9018-B3	ARC	Ø2.50	40Nos	
							E9018-B3	ARC	Ø3.15	66Nos	
							E9018-B3	ARC	Ø4.00	133Nos	
2	SA335P22(A) / SA234WP22CL1(A)	273	25	2	25	--	RT2¼Cr1Mo	TIG	Ø2.50	572.0gms	
							E9018-B3	ARC	Ø2.50	40Nos	
							E9018-B3	ARC	Ø3.15	86Nos	
							E9018-B3	ARC	Ø4.00	70Nos	
3	SA234WP22CL1(A) / ORIFICE PLATE	406.4	29	2	29	--	RT2¼Cr1Mo	TIG	Ø2.50	268.0gms	
							E9018-B3	ARC	Ø2.50	60Nos	
							E9018-B3	ARC	Ø3.15	100Nos	
							E9018-B3	ARC	Ø4.00	154Nos	
4	SA335P22(A) / SA234WP22CL1(A)	406.4	22.2	2	22.2	--	RT2¼Cr1Mo	TIG	Ø2.50	276.0gms	
							E9018-B3	ARC	Ø2.50	50Nos	
							E9018-B3	ARC	Ø3.15	100Nos	
							E9018-B3	ARC	Ø4.00	88Nos	
5	SA234WP22CL1(A) / ORIFICE PLATE	457.2	22.22	2	22.2	--	RT2¼Cr1Mo	TIG	Ø2.50	314.0gms	
							E9018-B3	ARC	Ø2.50	58Nos	
							E9018-B3	ARC	Ø3.15	112Nos	
							E9018-B3	ARC	Ø4.00	104Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDART DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93102 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CED	DESIGN/APD.	QSD./APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	P.SESHAGIRI		29/09/08	4-80-821-67016 SHEET: 1 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

CUST. No:

ASSY. DRG. NO. :

PGMA : 80-321

PGMA DESC : HIGH PRESSURE BYPASS VALVE DOWN STREAM PIPING

SL No.	MATERIAL SPECN 1 (A/T) / MATERIAL SPECN 2 (A/T)	PIPE SIZE OD (mm)	PIPE SIZE THK (mm)	TOTA No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (M)	RECOMMENDED ELECTRODE / WPS SPECN (ATTEST)	ARC / GAS / IC	SIZE (mm)	QUANTITY	REMARKS
6	SA335P22(A) / SA335P22(A)/ SA234WP22CL1(A)	457.2	25	6	25W	--	RT2½CrIMo	TIG	Ø2.50	930gms	
							E9018-B3	ARC	Ø2.50	204No's	
							E9018-B3	ARC	Ø3.15	336No's	
							E9015-B3	ARC	Ø4.00	402No's	
7	THERMOWELL AISI 321 / SA182F22CL3(A)	63.5	13	2	13W	--	Er NI Cr3	TIG	Ø2.50	20.0gms	
							ENI Cr Fe2	ARC	Ø2.50	28No's	
							ENI Cr Fe2	ARC	Ø3.15	14No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/98.	4-80-321-07016 SHEET 2 of 2	CU

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 20-322

CUST. NO. : | PGMA DESC. : CRH PIPING TO DEAERATING HEATER

ASSY. DRG. NO. :

SL. No.	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATT'EST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	273.0	9.27	27	9.27V	--	RT½Mo	TIG	Ø2.50	2403.0gms	
							E7018-1	ARC	Ø2.50	540No's	
							E7018-1	ARC	Ø3.15	297No's	
2	SA106GrB(A) / SA234WPB(A)	508.0	12.70 / 9.09	15	12.7V	--	RT½Mo	TIG	Ø2.50	2475.0gms	
							E7018-1	ARC	Ø2.50	570No's	
							E7018-1	ARC	Ø3.15	945No's	
							E7018-1	ARC	Ø4.00	270No's	
3	SA106GrB(A) / SA234WPB(A)	219.1	8.35 / 6.35	2	6.35V	--	RT½Mo	TIG	Ø2.50	142.3gms	
							E7018-1	ARC	Ø2.50	74No's	
4	SA106GrC(A) / SA106GrC(A)	323.9	36	2	5.27V	--	RT½Mo	TIG	Ø2.50	96.0gms	
							E7018-A1	ARC	Ø2.50	48No's	
							E7018-A1	ARC	Ø3.15	78No's	
							E7018-A1	ARC	Ø4.00	174No's	
5	THERMOWELL AISI 321 / SA105(A)	63.0	15	1	7.50	--	Cr Ni Cr3	TIG	Ø2.50	10.0gms	
							ENi Cr Fe3	ARC	Ø2.50	14No's	
							ENi Cr Fe3	ARC	Ø3.15	7No's	
6	SA106GrB(A) / SA105(A)	33.4	4.55	--	5S	3.32	E7018-1	ARC	Ø2.50	204No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-20-322-67037 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80--324

CUST. No.

ASSY. DRG. NO. | PGMA DESC : CRH HEADER TO AUX PRDS

SL No	MATERIAL SPECN / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE T-K (in mm)	TOTAL No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (AS TEST)	ARC/GAS/TIG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	114.3	6.02	41	6.02▽	---	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	1127.0gms 86 Nos	
2	SA106GrB(A) / SA234WPB(A)	168.3	7.11	19	7.11▽	---	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	901.0gms 255Nos 153Nos	
3	SA234WPB(A) / VALVE	88.9	5.49	2	5.49▽	---	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	43.0gms 30Nos	
4	SA106GrB(A) / SA515Gr70(A) FLANGE	168.3	7.11	-- --	6b 7b	0.52 0.52	E7018-1	ARC	Ø2.50	19Nos	
5	SA106GrB(A) / SA105(A)	33.4	4.55	--	5b	1.20	E7018-1	ARC	Ø2.50	14Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGF/APD	CHD./APD QA	DATE	DRAWING No.:	REV.
A.AROKIARAJ	P.SANKAR	R SESHAGIRI		29/09/06	4-80-324-67033 SHEET: 1 of 1	00

ERECTION WELDING SCHEDULE

BDGI

PROJECT : TYPICAL FOR 250 MW

PGMA 80-331

CUST. SR. :

PGMA DESC : EXTRACTION STEAM TO LP HEATER 2

ASSY. DRG. NO. :

SL No	MATERIAL SPECN 1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (ATTEST)	ARC/ GAS/ T.G.	SIZE (mm)	QUANTITY	REMARKS
1	SA672E70CL22(A)	609.6	9.53	22	9.53▽	--	RT½Mo	TIG	Ø2.50	470Bgmx	
							E7018-1	ARC	Ø2.50	1012Nos	
	SA234WPB(A)	610.0	60				E7018-1	ARC	Ø3.15	1660Nos	
							E7018-1	ARC	Ø4.00	1232Nos	
2	SA106GrB(A)	508.0	9.53	2	9.53▽	--	RT½Mo	TIG	Ø2.50	334gmx	
	SA234WPB(A)		12.7				E7018-1	ARC	Ø2.50	76Nos	
							E7018-1	ARC	Ø3.15	120Nos	
							E7018-1	ARC	Ø4.00	36Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4 80-331-66986 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-332

CUST. No. :

PGMA DESC : STEAM EXTRACTION TO HPH-3

ASSY. DRG. NO. :

S. No	MATERIAL SPECN. (ATT) / MATERIAL SPECN. (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK. (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF PIPE (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTCH)	ARC / GAS / TIG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	508.0	12.7	17	12.7▽	--	RT½Mo	TIG	Ø2.50	2835.0gms	
							E7018-1	ARC	Ø2.50	646No's	
							E7018-1	ARC	Ø3.15	671No's	
							E7018-1	ARC	Ø4.00	306No's	
2	SA234WPB(A) / SA105(A)/ NOZZLE	406.4	12.7	1	12.7▽	--	RT½Mo	TIG	Ø2.50	131.0gms	
							E7018-1	ARC	Ø2.50	30No's	
							E7018-1	ARC	Ø3.15	30No's	
							E7018-1	ARC	Ø4.00	14No's	
3	SA106GrB(A) / SA234WPB(A)	406.4	9.53	2	9.53▽	--	RT½Mo	TIG	Ø2.50	284.0gms	
							E7018-1	ARC	Ø2.50	80No's	
							E7018-1	ARC	Ø3.15	84No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	K.SESHAGIRI		26/05/08	4 80-332-66907 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 60-335

CUST. No. | PGMA DESC : EXTRACTION STEAM TO REGENERATING HEATER

ASSY. DRG. NO.

SL No.	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE T/K (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC/GAS/T.I.G.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	406.4	9.53	41	9.53V	--	RT½Mo	TIG	Ø2.50	4752.0gms	
							E7015-1	ARC	Ø2.50	1080Nos	
							E7018-1	ARC	Ø3.15	1692Nos	
2	SA106GrB(A) / SA234WPB(A)	508	9.53 / 12.7	21	12.7V	--	RT½Mo	TIG	Ø2.50	3060.0gms	
							E7018-1	ARC	Ø2.50	512Nos	
							E7018-1	ARC	Ø3.15	1512Nos	
							E7018-1	ARC	Ø4.00	432Nos	
3	SA106GrB(A) / SA515Gr70(A) (FLANGE) (ENDCAP)	219.1	8.18	--	8S	2.064	E7018-1	ARC	Ø2.50	42Nos	
				--	9S	2.064	E7018-1	ARC	Ø3.15	40Nos	
4	THERMOWELL AISI 321 / SA105(A)	63.5	13	3	13V	--	Er NI Cr3	TIG	Ø2.50	30.0gms	
							ENI Cr Fe3	ARC	Ø2.50	42Nos	
							ENI Cr Fe3	ARC	Ø3.15	21Nos	
5	SA106GrB(A) / SA105(A)	21.3	3.73	--	1S	0.468	E7018-1	ARC	Ø2.50	5Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD/APD. - QA	DATE	DRAWING No.	REV.
A.ARUKIARAJ	P.SANKAR	P.SESHAGIRI		29/06/98	4-80-335-67355 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-336

CUST. No :

PGMA DESC : EXTRACTION STEAM PIPING TO HPH-5

ASSY. DRG. NO. :

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AS TEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A) / SA234WP22CL1(A)	323.9	9.53	40	9.53▽	--	RT2½Cr1Mo	TIG	Ø2.50	415.0gms	
							E9018-B3	ARC	Ø2.50	96Nos	
							E9012-B3	ARC	Ø3.15	480Nos	
2	SA335P22(A) / SA234WP22CL1(A)	273	9.27	2	9.27▽	--	RT2½Cr1Mo	TIG	Ø2.50	174.0gms	
							E9018-B3	ARC	Ø2.50	42Nos	
							E9018-B3	ARC	Ø3.15	60Nos	
3	THERMOWELL AISI 321 / SA182F22CL3(A)	63.5	13	3	13▽	--	Er NI Cr3	TIG	Ø2.50	30.0gms	
							ENI Cr Fe2	ARC	Ø2.50	42Nos	
							ENI Cr Fe2	ARC	Ø3.15	21Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-83-999-93172 AND 4-83-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/09	4-80-336-66945	00

SHEET 1 of 1

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : BG-337

COST. No. :

ASSY. DRG (NO. :

PGMA DESC : EXTRACTION STEAM TO HPH-6

Sl No	MATERIAL SPECN / MATERIAL SPECN	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AS TESTED)	TIG/ GAS/ TIG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	273	9.27	2	9.27V	--	RT½Mo	TIG	Ø2.50	868.0gms	
							E7018-1	ARC	Ø2.50	420Nos	
							E7018-1	ARC	Ø3.15	630Nos	
2	SA106GrB(A) / SA234WPB(A)	114.3	6.02	2	6.02V	--	RT½Mo	TIG	Ø2.50	54.0gms	
							E7018-1	ARC	Ø2.50	42Nos	
3	SA106GrB(A) / SA105(A)	55.4	4.55	--	5A	0.839	E7018-1	ARC	Ø2.50	10Nos	
4	THERMOWELL AISI 321 / SA105(A)	63.5	13	2	13V	--	Er Ni Cr3	TIG	Ø2.50	20.0gms	
							ENi Cr Fe3	ARC	Ø2.50	28Nos	
							ENi Cr Fe3	ARC	Ø3.15	14Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO 4-80 999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD./APD	QA	DATE	DRAWING NO.	REV.
A.ARUKTARAJ	P.SANKAR	R.SESHADRI			29/09/96	4-80-337-66946 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-340

CUST. No. :

ASSY. DRG. NO. :

PGMA DESC : AUX STEAM HEADER

SL No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	TIG/ ARC/ GAS/ DC	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A) SA515Gr70(A) (END CAP)	273	6.35	41	6.35▽	--	RT½Mo	TIG	Ø2.50	3648.0gms	
							E7018-1	ARC	Ø2.50	820No's	
							E7018-1	ARC	Ø3.15	389No's	
2	SA106GrB(A) / SA234WPB(A)	219.1	6.35	26	6.35▽	--	RT½Mo	TIG	Ø2.50	1360gms	
							E7018-1	ARC	Ø2.50	592No's	
3	SA106GrB(A) / SA234WPB(A)	168.3	7.11	7	7.11▽	--	RT½Mo	TIG	Ø2.50	371.0gms	
							E7018-1	ARC	Ø2.50	165No's	
							E7018-1	ARC	Ø3.15	63No's	
4	SA106GrB(A) / SA234WPB(A) SA515Gr170(A) (END CAP)	114.3	8.02 13.49	10	8.02▽	--	RT½Mo	TIG	Ø2.50	286.0gms	
							E7018-1	ARC	Ø2.50	210No's	
5	SA106GrB(A) / SA234WPB(A) SA515Gr170(A) (END CAP)	323.9	9.53	11	6.35▽	--	RT½Mo	TIG	Ø2.50	1144.0gms	
							E7018-1	ARC	Ø2.50	284No's	
							E7018-1	ARC	Ø3.15	407No's	
6	SA106GrB(A) / SA105(A)	21.3	3.73	--	4S	0.134	E7018-1	ARC	Ø2.50	1No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-340-67354 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : BC 341

CUST. No. :

ASSY. DRG. NO

PGMA DESC : LT AUX STEAM INTER CONN STEAM HDR
FT AUX STEAM INTER CONN STEAM HDR

SL No.	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)/ (END CAP)	273.0	6.35	33	6.35V	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	4845.0gms 1100Nos 495Nos	
2	SA106GrB(A) / SA234WPB(A)/ (END CAP)	114.3	6.02	8	6.02V	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	213.0gms 168Nos	
3	SA106GrB(A) / SA234WPB(A)/ (END CAP)	219.1	6.35	9	6.35V	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	646.0gms 536Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, IHE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD	CHD/APD. - QA	DATE	DRAWING No:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-341-67618	00
					SHEET 1 of 1	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-345

CUST. No. :

PGMA DESC : AUX STEAM TO DEAERATING HEATER

ASSY. DRG. NO. :

S. No.	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC / GAS / DC	SIZE (in mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	273.0	6.35	14	6.35▽	--	RT½Mo	TIG	Ø2.50	1246.0gms	
							E7018-1	ARC	Ø2.50	280Nos	
							E7018-1	ARC	Ø3.15	184Nos	
2	SA106GrB(A) / SA234WPB(A)	457.0	9.53 / 12.7	2	9.53▽	--	RT½Mo	TIG	Ø2.50	2150.0gms	
							E7018-1	ARC	Ø2.50	475Nos	
							E7018-1	ARC	Ø3.15	742Nos	
3	SA234WPB(A) / VALVE	219.1	6.35	2	6.35▽	--	RT½Mo	TIG	Ø2.50	142.0gms	
							E7018-1	ARC	Ø2.50	74Nos	
4	SA106GrB(A) / SA234WP9(A)	114.3	6.02	11	6.02▽	--	RT½Mo	TIG	Ø2.50	282.8gms	
							E7018-1	ARC	Ø2.50	231Nos	
5	SA106GrB(A) / SA105(A)	21.3	3.73	--	4Δ	0.067	E7018-1	ARC	Ø2.50	1Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-059 93178 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHADRI		29/05/08	4-80-345-67356 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PGMA: 80-348

CUST. No.:

PGMA DESC: AUX STEAM TO GLAND SEALS 5G SCOPE

ASSY. DRG. NO.:

SL No.	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (A TEST)	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A) / SA234WPB(A)	114.3	6.02	29	6.02V	--	RT½M6	TIG	Ø2.50	772.0gms	
							E7018-1	ARC	Ø2.50	609No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P SANKAR	R.SESHAGIRI		29/09/08	4-80-348-67464 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-373

CUST. No.

ASSY. DRG. NO. :

PGMA DESC : AUX STEAM HEADER BY EXHAUST PIPING

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC / GAS / TIG	SIZE (in mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/ SA234WPB	323.9	9.53	9	9.53V	--	RT½Mo	TIG	Ø2.50	963.0gms	
							E7018-1	ARC	Ø2.50	210No's	
							E7018-1	ARC	Ø3.15	155No's	
2	SA106GrB / SA106GrB/ SA234WPB	273.0	9.35	9	6.35V	--	RT½Mo	TIG	Ø2.50	801.0gms	
							E7018-1	ARC	Ø2.50	180No s	
							E7018-1	ARC	Ø3.15	59No's	
3	SA106GrB / SA106GrB/ SA234WPB	219.1	6.35	2	6.35V	--	RT½Mo	TIG	Ø2.50	142.0gms	
							E7018-1	ARC	Ø2.50	74No's	
4	SA106GrB / IS:2062Fe410B (FLANGE)	219.1	6.35	-- / --	6b / 7b	0.70 / 0.70	E7018-1	ARC	Ø2.50	28No's	
5	SA106GrB / IS:2062Fe410B (FLANGE)	273.0	6.35	-- / --	6b / 7b	2.60 / 2.60	E7018-1	ARC	Ø2.50	91No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-92172 AND 4-80-999-92173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.	REV.
A.ARUNARAJ	P.SANKAR	R.SESHADRI		29/09/09	4-80-373-67350 SHEET 1 of 1	00

DDO:

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-375

CUST. No. :

PGMA DRSC : EXT.STEAM TO DEA-SAFETY VALVE EXHAUST
LP & IP HEATERS SV VENTS
DRAINATOR SV VENTS

ASSY. DRG. NO. :

S. No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB	273.0	6.35	12	6.35V	--	RT½Mo	TIG	Ø2.50	1088.0gms	
	SA106GrB / SA234WPB						E7018-1	ARC	Ø2.50	240No's	
							E7018-1	ARC	Ø3.15	132No's	
2	SA106GrB / SA106GrB	355.6	9.53	7	9.53V	--	RT½Mo	TIG	Ø2.50	805.0gms	
							E7018-1	ARC	Ø2.50	169No's	
							E7018-1	ARC	Ø3.15	287No's	
3	SA106GrB / SA106GrB / SA234WPB	323.9	9.23	10	9.23V	--	RT½Mo	TIG	Ø2.50	1040.0gms	
							E7018-1	ARC	Ø2.50	240No's	
							E7018-1	ARC	Ø3.15	370No's	
4	SA106GrB / SA106GrB / SA234WPB	219.1	6.35	2	6.35V	--	RT½Mo	TIG	Ø2.50	142.0gms	
							E7018-1	ARC	Ø2.50	74No's	
5	SA106GrB / SA106GrB / SA234WPB	168.3	7.11	14	7.11V	--	RT½Mo	TIG	Ø2.50	742.0gms	
							E7018-1	ARC	Ø2.50	210No's	
							E7018-1	ARC	Ø3.15	154No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHKD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.ARGKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-375-67357 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PGMA: 80 375

CUST. No.:

ASSY DRG. NO.:

PGMA DESC: EXT.STEAM TO DEA-SAFETY VALVE EXHAUST
HP & LP HEATERS SV VENTS
DEAERATOR SV VENTS

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOIN'S	WELD SPCN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELEC MODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
6	SA106GrB / SA234WPB	114.3	6.02	16	6.02	--	RT1½Mo E7018-1	TIG	Ø2.50	48Dgnix	
								ARC	Ø2.50	336Nos	
7	SA106GrB / IS2062Fe410B (FLANGE)	273.0	6.35	--	6A	4.29	E7018-1	ARC	Ø2.50	151Nos	
				--	7A	4.29					
8	SA106GrB / S2062Fe410B (FLANGE)	168.3	7.11	--	7A	1.05	E7018-1	ARC	Ø2.50	32Nos	
				--	8A	1.05	E7018-1	ARC	Ø3.15	8Nos	
9	SA106GrB / IS2062Fe410B (FLANGE)	114.3	6.02	--	6A	0.718	E7018-1	ARC	Ø2.50	28Nos	
				--	7A	0.718					

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-83-999-93172 AND 4-83-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/95	4-80-375-67357 SHEET: 2 of 2	00

DDG1

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PGMA: 80-420

CUST. No.:

ASSY DRG NO.:

PGMA DESC : BOILER FEED PUMP SECTION

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/SA234WPB	355.6	7.92 9.53	6	7.92V	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	1344.0gms 243Nos 243Nos	
2	SA106GrB / SA234WPB/FLANGE	355.6	9.53	-- --	10b 11b	10.0 10.0	E7018-1	ARC	Ø3.15	420Nos	
3	SA106GrB / SA234WPB	273.0	6.35	117	6.35V	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	1041.0gms 234Nos 126?Nos	
4	SA106GrB / SA234WPB	219.1	6.35	3	6.35V	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	213.0gms 11?Nos	
5	SA106GrB / SA234WPB SA515Gr.70 (END CAP)	168.3	7.11	6	7.11V	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	318.0gms 90Nos 66Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/08/08	4-80-420-67018 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW | PGMA: 90-420

CUST. No.: | PGMA DESC: BOILER FEED PUMP SUCTION

ASSY. DRG NO.:

S. NO.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in M)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
6	SA106GrB / SA234WPB/ SA515Gr.70 FLANGE	60.3	5.54	8 -- --	5.54V 5A 6A	-- 1.40 1.40	RT1%Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	76gms 96Nos	
7	SA106GrB / SA515Gr.70 FLANGE	88.9	4.55	-- --	5E 6A	0.944	E7018-1	ARC	Ø2.50	25Nos	
8	SA106GrB / SA105	21.3	3.73	--	4A	0.48	E7018-1	ARC	Ø2.50	3Nos	
9	SA106GrB / FLANGE	273.0	6.35	-- --	6A 7A	18.0 18.0	E7018-1	ARC	Ø2.50	343Nos	
10	SA106GrB / FLANGE	219.1	6.35	-- --	6A 7A	10.3 10.3	E7018-1	ARC	Ø2.50	187Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.:	REV.
A.ARUKIARAJ	P.SANKAR	R.SUSHAGIRI		29/08/08	4-80-420-67018 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-421

CUST. No. :

ASSY. DRG. NO. :

PGMA DESC : BOILER FEED RECIRCULATION PIPING

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED CONTROL / WPS SPECN (ATTESD)	ARC/ GAS/ T.C.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrC(A) / SA106GrC(A) SA234WPC(A)	114.3	13.49	118	13.46▽	--	R**½Mo	TIG	Ø2.50	4012.8gms	
							E7018-1	ARC	Ø2.50	1298Nos	
							E7018-1	ARC	Ø3.15	770Nos	
2	SA106GrC(A) / SA106GrC(A)	114.3	17.12	6"	17.12▽	--	RT½Mo	TIG	Ø2.50	192.8gms	
							E7018A1(A)	ARC	Ø2.50	72Nos	
							E7018A1(A)	ARC	Ø3.15	84Nos	
							E7018A1(A)	ARC	Ø4.00	18Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. RA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-421-07019 SHEET: 1 of 1	00

BHEL

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80--423

CUST. No. :

PGMA DESC : BOILER FEED PUMP TO EPH INCLUDING BYPASS

ASSY. DRG. NO.

Sl No.	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA 106GrC(A) / SA234WPC(A)	711.0	32	47	32(W)	--	RT½Mo	TIG	Ø2.50	3834.0gms	
							E7018-A1	ARC	Ø2.50	540Nos	
							E7018-A1	ARC	Ø3.15	1551Nos	
							E7018-A1	ARC	Ø4.00	3085Nos	
2	SA106GrC(A) / SA234WPC(A)	366.0	40	38	40(W)	--	RT½Mo	TIG	Ø2.50	4256.0gms	
							E7018-A1	ARC	Ø2.50	1064Nos	
							E7018-A1	ARC	Ø3.15	1710Nos	
							E7018-A1	ARC	Ø4.00	4560Nos	
3	SA234WPC(A) / PUMP NOZZLE	219.1	28	3	28(W)	--	RT½Mo	TIG	Ø2.50	192.0gms	
							E7018-A1	ARC	Ø2.50	51Nos	
							E7018-A1	ARC	Ø3.15	75Nos	
							E7018-A1	ARC	Ø4.00	102Nos	
4	SA234WPC(A) / H.P HEATER NOZZLE	406.4	61	1	61(W)	--	RT½Mo	TIG	Ø2.50	333.0gms	
							E7018-A1	ARC	Ø2.50	90Nos	
							E7018-A1	ARC	Ø3.15	150Nos	
							E7018-A1	ARC	Ø4.00	813Nos	
5	THERMOWELL AISI 321 / SA105(A)	83.5	13	5	137	--	Er Ni Cr3	TIG	Ø2.50	50.0gms	
							EN: Cr Fe3	ARC	Ø2.50	70Nos	
							ENI Cr Fe3	ARC	Ø3.15	35Nos	
6	SA106GrC(A) / SA105(A)	33.4	9.09	--	105	6.33	E7018-1	ARC	Ø3.15	132Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-9272 AND 4-80-999-9273 SHALL BE REFERRED.

PREPARED	DESIGN/CHKD.	DESIGN/APPD.	CUST./APPD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4 80-423-67245 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-424

CUST. No. :

ASST. DRG. NO. :

PGMA DESC : BFD FROM HPH-5 TO HPH-6 & BYPASS

Sl. No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	10 % OF LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrC(A) / SA234WPC(A)	368	60	68	40W	--	RT½Mo	TIG	Ø2.50	7616.0gms	
							E7018-A1	ARC	Ø2.50	804Nos	
							E7018-A1	ARC	Ø3.15	3966Nos	
							E7018-A1	ARC	Ø4.00	8160Nos	
2	SA234WPC(A) / H.P HEATER NOZZLE	406.4	61	3	6W	--	R1½Mo	TIG	Ø2.50	333.0gms	
							E7018-A1	ARC	Ø2.50	68Nos	
							E7018-A1	ARC	Ø3.15	150Nos	
							E7018-A1	ARC	Ø4.00	913Nos	
3	THERMOWELL AISI 321 / SA105(A)	63.5	13	8	13W	--	2.5 Ni Cr3	TIG	Ø2.50	80.0gms	
							ENi Cr Fe3	ARC	Ø2.50	84Nos	
							ENi Cr Fe3	ARC	Ø3.15	42Nos	
4	SA106GrC(A) / SA105(A)	33.4	9.09	--	10b	4.41	E7018-A1	ARC	Ø3.15	84Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.:	REV
A.AROKIARAJ	P.SANKAR	R.SESHACHARI		29/05/08	4-80-424 67246 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80 425

CUST. No. :

ASSY. DRG. NO. :

PGMA DESC : RHT FROM APH-6 TO ECONOMISER

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECV	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AS TEST)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrC(A)	368	40	70	40 W	--	RT½Mo	TIG	Ø2.50	2849.0gms	
	SA234WPC(A)						E7018-A1	ARC	Ø2.50	1960Nos	
							E7018-A1	ARC	Ø3.15	3150Nos	
							E7018-A1	ARC	Ø4.00	6400Nos	
2	SA106GrC(A)	219.1	30	14	30 W	--	RT½Mo	TIG	Ø2.50	896.0gms	
	SA234WPC(A)						E7018-A1	ARC	Ø2.50	238Nos	
							E7018-A1	ARC	Ø3.15	350Nos	
							E7018-A1	ARC	Ø4.00	476Nos	
3	SA234WPC(A)	168.3	26	2	26 W	--	RT½Mo	TIG	Ø2.50	90.0gms	
	FLOW CONTROL VALVE						E7018-A1	ARC	Ø2.50	28Nos	
							E7018-A1	ARC	Ø3.15	48Nos	
							E7018-A1	ARC	Ø4.00	40Nos	
4	THERMOWELL MSF 32 / SA105(A)	85.5	13	3	13 W	--	Er NI Cr3	TIG	Ø2.50	30.0gms	
							ENi Cr Fe3	ARC	Ø2.50	42Nos	
							ENi Cr Fe3	ARC	Ø3.15	21Nos	
5	SA106GrC(A) / SA105(A)	33.4	9.09	2	9.09 W	--	RT½Mo	TIG	Ø2.50	7.7gms	
				--	10b	5.67	E7018-1	ARC	Ø2.50	28Nos	
							E7018-1	ARC	Ø3.15	107Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93179 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHKD.	DESIGN/APD.	CHD./APD - QA	DATE	DRAWING NO.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-425-67247 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80-410

CUST. No. :

ASST. DRG. NO. : | PGMA DESC : BOILER FEED SPRAY WATER PPC TO SPRT VALVE

SL No.	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrC(A) / SA234WPC(A)	114.3	13.49	18	13.49Ⓥ	--	RT½Mo	TIG	Ø2.50	812.0gms	
							E70S-1	ARC	Ø2.50	198No's	
							E7018-1	ARC	Ø3.15	270No's	
2	SA106GrC(A) / SA234WPC(A)	88.9	11.13	6	11.13Ⓥ	--	RT½Mo	TIG	Ø2.50	101.0gms	
							E7018-1	ARC	Ø2.50	48No's	
							E7018-1	ARC	Ø3.15	66No's	
3	SA335P22(A) / SA234WP2CL1(A)	88.9	12.79	16	12.79Ⓥ	--	RT2¼Cr1Mo	TIG	Ø2.50	368.0gms	
							E9018-B3	ARC	Ø2.50	128No's	
							E9018-B3	ARC	Ø3.15	160No's	
							E9018-B3	ARC	Ø4.00	88No's	
4	SA106GrC(A) / SPRAY & FLOW CONTROL VALVE	114.3	20	4	20Ⓥ	--	RT½Mo	TIG	Ø2.50	124.0gms	
							E7018-A1	ARC	Ø2.50	48No's	
							E7018-A1	ARC	Ø3.15	56No's	
							E7018-A1	ARC	Ø4.00	24No's	
5	SA106GrC(A) / SA234WPC(A)	88.9	15.24	13	15.24Ⓥ	--	RT½Mo	TIG	Ø2.50	312.0gms	
							E7018-1	ARC	Ø2.50	104No's	
							E7018-1	ARC	Ø3.15	130No's	
							E7018-1	ARC	Ø4.00	65No's	
6	SA182F22CL3(A) / VALVE	60.3	2.8	2	12.5Ⓥ	--	RT2¼Cr1Mo	TIG	Ø2.50	23.0gms	
							E9018-B3	ARC	Ø2.50	32No's	
							E9018-B3	ARC	Ø3.15	16No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD	CHD/APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-430-07111	00
					SHEET 1 of 1	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-431

CUST. No. :

ASSY DRG NO. :

PGMA DESC : SPRAY WATER TO AUX PRDS

SL No.	MATERIAL SPECN. (ATT) / MATERIAL SPECN. (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTES.)	ARC / GAS / T.G.	SIZE (in mm)	QUANTITY	REMARKS
1	SA105GrB(A) / SA234WPB(A)	88.9	5.49	2	5.49▽	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	35.0gms 30Nos	
2	SA106GrB(A) / SA105(A) SA234WPB(A)	48.3	3.68	50 --	3.68▽ 6b	-- 1.970	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	490.0gms 280Nos	
3	SA106GrB(A) / SA105(A)	21.3	3.73	--	4b	0.291	E7018-1	ARC	Ø2.50	2Nos	
4	SA335P22(A) / SA335P22(A)	33.4	4.55	6 --	4.55▽ 5b	-- 1.259	RT2¼Cr1Mo E9018-B3	TIG ARC	Ø2.50 Ø2.50	31.0gms 53Nos	
5	SA106GrB(A) / SA105(A)	33.4	4.55	15 --	4.55▽ 5b	-- 5.246	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	93.8gms 133Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-53072 AND 4-80-999-53173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4 80-431-67537 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 60 432

CUST. No.

PGMA DESC : BOARY WATER PPG FOR SH&RH ATTEMPERATION

ASSY. DRG. NO :

SL No.	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC / GAS / BG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrC(A)	219.1	28	114	28 W	--	RT½Mo	TIG	Ø2.50	816.0gms	
	SA106GrC(A)/ SA234WPC(A)		30				E7018-A1	ARC	Ø2.50	238No's	
							E7018-A1	ARC	Ø3.15	350No's	
							E7018-A1	ARC	Ø4.00	476No's	
2	SA106GrC(A)	168.3	21.95	3	21.95 W	--	RT½Mo	TIG	Ø2.50	147.0gms	
	SA106GrC(A)/ SA234WPC(A)						E7018-A1	ARC	Ø2.50	42No's	
							E7018-A1	ARC	Ø3.15	72No's	
							E7018-A1	ARC	Ø4.00	39No's	
3	SA106GrC(A)	88.9	15.24	4	15.24 W	--	RT½Mo	TIG	Ø2.50	73.5gms	
	SA106GrC(A)/ SA234WPC(A)						E7018-A1	ARC	Ø2.50	32No's	
							E7018-A1	ARC	Ø3.15	38No's	
4	THERMOWELL AISI 321 / SA105(A)	63.5	13	2	13 ?	--	Ni Cr Fe3	TIG	Ø2.50	50.0gms	
							ENi Cr Fe3	ARC	Ø2.50	20No's	
							ENi Cr Fe3	ARC	Ø3.15	35No's	
5	SA106GrC(A) / SA105(A)	33.4	6.35	--	6N	0.165	E7018-1	ARC	Ø2.50	3No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO 4-80-999-93172 AND 4-80 999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80 432-67112 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

BHEL

PROJECT : TYPICAL FOR 250 MW

PGMA : 80 432

CUST. No. :

PGMA DESC : SPARY WATER PPG FOR SH&RH ATTEMPERATION

ASSY. DRG. NO. :

SL No.	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC/ GAS/ BS.	SIZE (mm)	QUANTITY	REMARKS
6	SA106GrC(A) / SA105(A)	21.3	4.78	--	5b	0.057	E7018-1	ARC	ø2.50	1No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No	REV.
A AROKIARAJ	P SANKAR	R.SESHAGIRI		29/09/98	4-80-432-67112 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-449

CUST. No. :

PGMA DESC : TG CYCLE PPC DRAINS AND VENTS

ASSY. DRG. NO. :

Sl. No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB	168.3	7.11	3	7.11▽	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	159.0gms 45Nos 27Nos	
2	SA106GrB / SA106GrB/ SA234WPB	114.3	6.02	72	6.02▽	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	1815.0gms 1512Nos	
3	SA106GrB / SA106GrB/ SA234WPB	88.9	5.49	314	5.49▽	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	6154.0gms 4082Nos	
4	SA106GrB / SA106GrB/ SA105	60.3	5.54	160 --	5.54▽ 6L	-- 51.54	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	1296.0gms 1485Nos	
5	SA106GrB / SA106GrB/ SA105	48.3	5.08	35 --	5.08▽ 6L	-- 8.567	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	540.0gms 204Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.:	REV
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-449-07616 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : BO-449

CUST. No.

PGMA DESC : TG CYCLE PPG. DRAINS AND VENTS

ASSY. DRG. NO. :

SL No.	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
5	SA106GrB	33.4	4.55	745	4.55▽	--	RT½Mo	TIG	Ø2.50	4768.0gms	
	SA106GrB/ SA105			--	5A	140.915	E7018-1	ARC	Ø2.50	5275Nos	
7	SA312TP304H	33.4	4.55	55	4.55▽	--	RT½Mo	TIG	Ø2.50	352.0gms	
	SA182TP304H			--	5A	5.25	E7018-1	ARC	Ø2.50	353Nos	
8	SA106GrC	33.4	9.09	134	9.09▽	-	RT½Mo	TIG	Ø2.50	483.0gms	
	SA106GrC/ SA105			--	5A	19.53	E7018-1	ARC	Ø2.50	209Nos	
9	SA106GrB	21.3	3.73	27	3.73▽	--	RT½Mo	TIG	Ø2.50	365.0gms	
	SA106GrB/ SA105			--	4A	2.007	E7018-1	ARC	Ø2.50	15Nos	
10	SA106GrB	48.3	5.08	--	6A	2.42	E7018-1	ARC	Ø2.50	63Nos	
	IS2062Fe410B (FLANGE)				7A						

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGNED	DESIGN/APD.	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHADIRI		23/09/08	4 80-449 67616 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA A0-452

CUST. No.

ASSY. DWG. NO. :

PGMA DESC : HIGH PRESSURE PIPING DRAINS

SL No.	MATERIAL SPECN MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AWS)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA335P22(A) SA335P22(A)	60.3	12.5	226	12.5▽	....	RT2¼Cr1Mo E90C1B-B3	TIG ARC	Ø2.50 Ø2.50	2698gms 2860Nos	
2	SA335P22(A) SA234WP22CL1(A)	33.4	6.35	6	6.35▽	--	RT2¼Cr1Mo E90C1B-B3	TIG ARC	Ø2.50 Ø2.50	54.0gms 42Nos	
3	SA335P22(A) SA182F22CL3(A)	33.4	9.09	52	9.09▽ 10.05	-- 5.36	RT2¼Cr1Mo E90C1B-B3	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	198gms 728Nos 54Nos	
4	SA106GrC(A) SA234WPC(A) SA105(A)	33.4	9.09	36	9.09▽ 10.05	-- 5.25	RT½Mo E7018-A1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	150.0gms 504Nos 108Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/98	4-80-452-67553 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-453

CUST. No. :

PGMA DESC : LP PIPING DRAINS SC SCOPE

ASSY. DRG. NO. :

S. No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AWS/ISI)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB(A)	33.4	4.55	143	4.55 ▽	--	RT½Mo	TIG	Ø2.50	310.0gms	
	SA106GrB(A)/ SA105(A)				5b	3.394	E7018-1	ARC	Ø2.50	343Nos	
2	SA106GrB(A) / SA105(A)	21.3	3.73	--	4b	0.536	E7018-1	ARC	Ø2.50	74Nos	
3	SA335P22(A) / SA335P22(A)	48.3	5.08	11	5.08▽	--	R12%Cr1Mo E9018-B3	TIG ARC	Ø2.50 Ø2.50	108gms 88Nos	
4	SA335P22(A) / SA182F22CL3(A)	60.3	5.54	36	5.54▽	--	RT2¼Cr1Mo	TIG	Ø2.50	498.0gms	
					8b	1.33	E9018-B3	ARC	Ø2.50	380Nos	
5	SA106GrB(A) / SA105(A)	60.3	5.54	21	5.54▽	--	RT½Mo	TIG	Ø2.50	265gms	
					8b	1.70	E7018-1	ARC	Ø2.50	235Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93178 AND 4-80-999-93179 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.ARUKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-453-67565	00
					SHEET 1 of 8	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW PGMA : 80-403

CUST. No. PGMA DESC : LP PIPING DRAINS - BG 3000B

ASSY. DRG. NO. :

Sl. No.	MATERIAL SPECN. / MATERIAL SPCN.?	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
6	SA335P22(A)	33.4	4.55	65	4.55V	--	RT2(CrMo	TIG	Ø2.50	372.0gms	
	SA182F22CL3(A)				5b	1.20	E9018-B3	ARC	Ø2.50	314Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO 4-80-999-9017B AND 4-80-999-9017B SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD	CHD/ACD - QA	DATE	DRAWING No.	REV
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4 80-453-97565 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PCMA : 80-601

CUST. No.

PCMA DESC : LOW PRESSURE DOSING PIPING.

ASSY DRG. NO. :

Sl No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA 312 TP304H / SA 312 TP304H	33.4	4.55	50	4.55 V	--	RT347 E-347	TIG ARC	Ø2.40 Ø2.50	364gms 300 Nos.	
2	SA 312 TP304H / SA 182 F304H	33.4	4.55	--	5	6.715	E 347	ARC	Ø2.50	170Nos.	
3	SA 312 TP304H / SA 312 TP304H	33.4	6.35	8	6.35 V	--	RT347 E-347	TIG ARC	Ø2.40 Ø2.50	5[illegible] gms 40Nos.	
4	SA 312 TP304H / SA 182 F304H	21.3	3.73	--	4	6.937	E-347	ARC	Ø2.50	7 Nos.	
5	SA 312 TP304H / SA 182 F304 FLANGE	33.4	4.55	-- --	4 5	0.315 0.315	E-347	ARC	Ø2.50	9Nos.	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-599-93172 AND 4-80-599-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD	CHD./APD - QA	DATE	DRAWING No	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		23/09/00	4-80-601-67461 SHEET 1 of 1	00

BHEL

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-381

CUST. No. :

PGMA DESC : HP HEATER VKN.3 TG SCOPE

ASSY. DRG. NO. : --------

S. No.	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPCCN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC / GAS / TIG	SIZE (in mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/ SA234WPB/ SA105	60.3	5.54	66	5.54▽	--	RT½Mo	TIG	Ø2.50	2352.0gms	
				--	36	6.630	E7018-1	ARC	Ø2.50	760Nos	
2	SA106GrB / SA105GrB/ SA234WPB/ SA105	33.4	4.55	10	4.55▽	--	RT½Mo	TIG	Ø2.50	82gms	
				--	36	0.839	E7018-1	ARC	Ø2.50	60Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80 995-93172 AND 4-80 959-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD	CPE/APD. - QA	DATE	DRAWING No.	REV.
A ARCHIARAJ	P SANKAR	R SESHAGIRI		29/09/98	4-80-381 67541 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PCMA: 80-282

CUST. No.

PCMA DESC: LOW PRESSURE HEATER NO-1 VENT TO CONDENSER

ASSY. DRG. No.

SL No	MATERIAL SPECN.1 (ATT) / MATERIAL SPECN.2 (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AT 891)	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/SA234WPB	88.9	5.49	13	5.49V	--	RT%Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	265.0gms 195Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD TRS. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P SANKAR	R.SESHAGIRI		29/09/08	4 80 282 67113 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

CUST. No.:

ASSY. DRG. NO.:

PGMA: 80-395

PGMA DESC: UNIT FLASH TANK DRAIN AND VENT PIPING & TURBINE GLANDS STEAM EXHAUST TO ATMOSPHERE

Sl No.	MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	AFFIX SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/ SA234WPB	406.4	9.53 / 7.92	3	7.92√	--	RT½Mo / E7018-1 / E7018-1	TIG / ARC / ARC	Ø2.50 / Ø2.50 / Ø3.15	395.0gms / 90Nos / 14Nos	
2	SA106GrB / SA106GrB/ SA234WPB	114.3	6.02	7	6.02√	--	RT½Mo / E7018-1	TIG / ARC	Ø2.50 / Ø2.50	187.0gms / 14Nos	
3	SA106GrB / SA106GrB/ SA234WPB	219.1	6.35	76	6.35√	--	RT½Mo / E7018-1	TIG / ARC	Ø2.50 / Ø2.50	1136gms / 592Nos	
4	SA106GrB / SA105	33.4	4.55	--	5A	0.209	E7018-1	ARC	Ø2.50	34Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD IRG NO. 4 80 999-93172 AND 7-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHE./APD - QA	DATE	DRAWING No:	REV
A.ARCKIARAJ	P.SANKAR	R.SESHAGIRI		23/09/08	4 80-395-67324 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80-387

CUST. No. : | PGMA DESC : CONDENSATE PUMP VENT

ASSY. DRG. NO : ----

SL. NO.	MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC / GAS / TIG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB	60.3	5.54	10	5.54Ø BS	3.789	R70S6	TIG	Ø2.50	12.5gms	
	SA106GrB/ SA234WPB						E7018-1	ARC	Ø2.50	152 No's	
2	SA106GrB	26.7	2.87	--	3S	0.75	E7018-1	ARC	Ø2.50	3No's	
	SA105										
3	SA106GrB	21.3	3.73	15	3.73Ø BS	--	R70S6	TIG	Ø2.50	135.0gms	
	SA105			--	4S	1.941	E7018-1	ARC	Ø2.50	14No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. A 80-999-99172 AND 4-80-999-99173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD/APD - QA	DATE	DRAWING No	REV
A.AROKIARAJ	P.SANKAR	R.SESHADIRI		25/09/08	4-80-387-67552	0C

SHEET: 1 of 1

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80-388

CUST. No. :

ASSY. DRG. NO. : | PGMA DESC : CONDENSER AIR EVACUATION PIPING

SL No	MATERIAL SPECN.1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	CAL. ENERGY PER WELD (in KJ)	RECOMMENDED ELECTRODE / WIRE SPECN.	MMAW / GAS / TIG	SIZE (mm)	QUANTITY	P.MARKS
1	SA106GrB	323.9	6.35	32	9.53V	--	RT½Mo	TIG	Ø2.50	3434.0gms	
	SA106GrB/ SA234WPB		9.53				E7018-1	ARC	Ø2.50	788No's	
							E7018-1	ARC	Ø3.15	544No's	
2	SA106GrB	168.3	7.11	25	7.11V		RT½Mo	TIG	Ø2.50	1325.0gms	
	SA106GrB/ SA234WPB						E7018-1	ARC	Ø2.50	375No's	
							E7018-1	ARC	Ø3.15	225No's	
3	SA106GrB	219.1	6.35	--	6A	1.377	E7018-1	ARC	Ø2.50	50Nos	
	SA515Gr70 (FLANGE)			--	7A	1.377					
4	SA106GrB	168.3	7.11	--	7B	1.05	E7018-1	ARC	Ø2.50	60Nos	
	SA515Gr70 (FLANGE)			--	8B	1.05					

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO 4-80 999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DES.GN/APD	CHD./APD.	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R SESHADRI	QA	29/08/08	4-80 386-67372 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 00-400

CUST. No. :

ASSY. DRG. NO. : PGMA DESUCONDENSATE EXTRACTION PUMP SUCTION PIPING

SI No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE O.D (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (CERTIFIED)	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA234WPB	355.6	7.92 / 9.53	20	7.92▽	--	RT½Mo	TIG	Ø2.50	2220.0gms	
							E7018-1	ARC	Ø2.50	540No's	
							E7018-1	ARC	Ø3.15	540No's	
2	SA106GrB / SA234WPB/ SA299 (ENDCAP)	508.0	12.7 / 15.09	3	12.7▽	--	RT½Mo	TIG	Ø2.50	543.0gms	
							E7018-1	ARC	Ø2.50	114No's	
							E7018-1	ARC	Ø3.15	183No's	
							E7018-1	ARC	Ø4.00	42No's	
3	SA106GrB / SA234WPB	323.9	6.35	3	6.35▽	-	RT½Mo	TIG	Ø2.50	321.0gms	
							E7018-1	ARC	Ø2.50	72No's	
							E7018-1	ARC	Ø3.15	51No's	
4	SA106GrB / SA105/ (FLANGE)	60.3	5.54	10	5.54▽	-	RT½Mo	TIG	Ø2.50	226.0gms	
				--	6b	0.568					
				--	7b	0.568	E7018-1	ARC	Ø2.50	285No's	
5	SA106GrB / SA105/ (FLANGE)	33.4	4.55	--	5b	0.315	E7018-1	ARC	Ø2.50	9No's	
				--	6b	0.315					
6	SA106GrB / SA105	21.3	3.73	--	4b	0.24	E7018-1	ARC	Ø2.50	4No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHKD.	DESIGN/APD.	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/05	4-80-400-00925 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 00-430

CUST. No. :

PGMA DESC: CONDENSATE EXTRACTION PUMP SUCTION PIPING

ASSY. DRG. NO. : 3

SL No.	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (CERTIFIED)	ARC/GAS/FR.	SIZE (mm)	QUANTITY	REMARKS
7	SA106GrB / (FLANGE)	355.6	9.53	-- / --	10K / 11K	6.714 / 6.714	E7018-1	ARC	Ø3.15	283Nos	
8	SA106GrB / (FLANGE)	323.9	9.53	-- / --	10K / 11K	3.053 / 3.053	E7018-1	ARC	Ø3.15	120Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.	REV
A.AROKIARAJ	P SANKAR	R SESHAGIRI		29/09/08	4-80-400-56925 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 50-40

CUST. No

ASSY. DRG NO. :

PGMA DRG : CONDENSATE DISCHARGE PIPING FROM C.E PUMP TO L.P.HEATER NO-1

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	IDIA / LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB	323.9	9.53	70	9.53▽	--	RT½Mo	TIG	Ø2.50	7260gms	
	SA106GrA/ SA234WPB		12.7		12.7▽		E7018-1	ARC	Ø2.50	1680No's	
			--				E7018-1	ARC	Ø3.15	2590No's	
2	SA105GrB	273.0	6.35	39	6.35▽	--	RT½Mo	TIG	Ø2.50	3471gms	
	SA234WPB/ SA515GR70 (END CAP)		9.27				E7018-1	ARC	Ø2.50	783No's	
			12.7		12.7▽		E7018-1	ARC	Ø3.15	629No's	
3	SA106GrA	219.1	6.35	3	6.35▽	--	RT½Mo	TIG	Ø2.50	213gms	
	SA106GrB/ SA234WP9						E7018-1	ARC	Ø2.50	111No's	
4	SA106GrB	323.9	8.53	--	8A	2.036	E7018-1	ARC	Ø2.50	40No's	
	(FLANGE)			--	9A	2.036	E7018-1	ARC	Ø3.15	38No's	
5	SA106GrB	219.1	6.35	--	6A	2.064	E7018-1	ARC	Ø2.50	72No's	
	(FLANGE)			--	7A	2.064					

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDART DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-995-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD/APD - QA	DATE	DRAWING No:	REV.
A.ARGKIARAJ	T.SANKAR	R.SESHAGIRI		29/09/06	4-80-401-67074 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 350 MW

PGMA: 80-402

CUST. No.:

ASSY. DRG. NO.:

PGMA DESC: CONDENSATE DISCHARGE PIPING LP HEATER # 2 TO DEAERATOR & CONDENSATE DISCHARGE PIPING LP HEATER # 1 TO DEAERATOR

SL No	MATERIAL SPECN/ (ATT) / MATERIAL SPECN/S (ATT)	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	TYPE/ GAS/ ETC.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/ SA234WPB	323.9	9.53 / 12.7	90	9.53∇	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	4360.0gms 2160No's 3530No's	
2	SA106GrB / SA106GrB/ SA234WPB	273.0	6.35	22	6.35∇	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	1956gms 440No's 242No's	
3	SA106GrB / IS:2062Fe410B (FLANGE)	323.9	9.53	-- --	6△ 7△	2.04 2.04	E7018-1	ARC	Ø2.50	72No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93173 AND 4-80-999-93175 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-402-67110 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA 90-407

CUST. No :

ASSY. DRG. NO. : ------

PGMA DESC : CONDENSATE FOR SEALING OF VACUUM

SL No.	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (mm)	PIPE SIZE THK (mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ TIG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA234WPB	73.0	5.16	10	5.16▽	--	RT½Mo	TIG	Ø2.50	155.0gms	
							E7018-1	ARC	Ø2.50	120Nos	
2	SA106GrB / SA105	21.3	3.73	62	3.73▽	--	RT½Mo	TIG	Ø2.50	63.5gms	
				--	4A	5.35	E7018-1	ARC	Ø2.50	38Nos	
3	SA106GrB / SA106GrB/ SA105	26.7	3.91	--	4A	0.6	E7018-1	ARC	Ø2.50	4Nos	
4	SA105GrB / SA106GrB/ SA105	33.4	4.55	80	4.55▽	--	RT½Mo	TIG	Ø2.50	486gms	
				--	5A	24.9	E7018-1	ARC	Ø2.50	674Nos	
5	SA106GrB / SA106GrB/ SA105	48.3	5.08	11	5.08▽	--	RT½Mo	TIG	Ø2.50	108.3gms	
				--	5A	8.65	E7018-1	ARC	Ø2.50	164Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/AFD.	CED/AFD. - BA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/98	4-80-407-67432	00
					SHEET 1 of 2	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-407

CUST. No. .

PGMA DESC : CONDENSATE FOR SEALING OF VACUUM

ASSY DRG. NO. : --

SL No	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE t (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	AR/GAS/BG	SIZE (mm)	QUANTITY	REMARKS
6	SA312TP304H	33.4	3.66	6	3.66✓	--	RT347	TIG	ø2.40	25 Rgms	
	SA182F304H			--	4Δ	0.630	E347	ARC	Ø2.50	58Nos	
							E347	ARC	Ø3.15	19Nos	
7	SA312TP304H	48.3	3.68	8	3.66✓	--	RT347	TIG	ø2.40	41.0gms	
	SA182F304H			--	4Δ	0.910	E347	ARC	Ø2.50	73Nos	
							E347	ARC	Ø3.15	48Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-9378 AND 4-80-999-9373 SHALL BE REFERRED

PREPARED	DESIGN/CHK.	DESIGN/APD.	CHD./APD	QA	DATE	DRAWING No.:	REV.
A ARUKIARAJ	P SANKAR	R.SESHAGIRI			29/09/98	4-80-407 67433	00
						SHEET 2 of 2	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 8C-/C8

CUST. No. :

PGMA DESC : CONDENSATE EXCESS RETURN PUMP TO CST

ASSY DRG. NO. :

S. No	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (mm)	PIPE SIZE THK (mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (m m)	RECOMMENDED ELECTRODE / WPS SPECN.	ARC / GAS / TIG	SIZE (mm)	CLASS	REMARKS
1	SA106Gr.B / SA234WPD/ SA515Gr.70 (END CAP)	168.3	7.11	07	7.11	--	RT1/Mo	TIG	Ø2.50	2021.1g/m	
							E7018-1	ARC	Ø2.50	85No's	
							E7018-1	ARC	Ø3.15	62No's	
2	SA106Gr.B / SA106Gr.B/ SA234WPB	168.3	7.11	--	TS BS	0.529 0.529	E7018-1 E7018-1	ARC ARC	Ø2.50 Ø3.15	16No's 5No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-90-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-408-67115	00
					SHEET: 1 of 1	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 00-411

CUST. No. :

ASSY. DRG. NO. :

PGMa DESC : CONDENSATE/MAKE-UP TO CONDENSER

SL No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB SA234WPB	114.3	4.50	60	4.5$\bar{V}$	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	1596.0gms 960Nos	
2	SA312TP321 / SA312TP321 SA403WP304H	48.3	5.08	37	5.1$\bar{V}$	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	369.5gms 256Nos	
3	SA312TP304H / SA312TP304H SA403WP304H	33.4	3.38	34	3.4$\bar{V}$	--	RT½Mo	TIG	Ø2.50	569.0gms	
4	SA312TP304H / SA312TP304H SA403WP304H	168.3	5.40	2	3.4$\bar{V}$	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	108.0gms 54Nos	
5	SA106GrB / SA106GrB SA234WPB	88.9	5.49	26	5.5$\bar{V}$	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	509.5gms 390Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-959-93172 AND 4-80-959-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD./APD.	CHD./APD. - QA	DATE	DRAWING No.	REV
R.SANKAR	R.SRISHAGIRI		07/10/08	4-80 411-67558 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

DDDI

PROJECT : TYTICAL FOR 250 MW

PGMA : 80-411

CUST NO :

PGMA DESC : CONDENSATE/MAKE-UP TO CONDENSER

ASSY. DRG. NO. :

S. No	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (AWS/ESC)	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
6	SA312TP304H / SA312TP304H SA403WP304H	168.3	7.11	55	7.1▽	--	RT½Mo E7018-1 L70IB-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	3465.9gms 975No's 715No's	
7	SA106GrB / SA106GrB SA234WPB	114.3	6.02	132	6.0▽	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	3511.2gms 2772No's	
8	SA312TP304H / SA312TP304H SA403WP304H	114.3	6.02	12	6.0▽	--	RT½Mo E7018(A)	TIG ARC	Ø2.50 Ø2.50	315.2gms 252No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93177 AND 4-80-999-93178 SHALL BE REFERRED

PREPARED	DESIGN/CHD/APD.	CHD/APD - QA	DATE	DRAWING No.	REV.
R.SANKAR	P.SESHAGIRI		07/10/08	4-80 411-67558 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-413

CUST. No. :

PGMA DESC : LP BYPASS SPRAY AND CEP MIN. RECIRCULATION PIPING

ASSY. DRG. NO :

SL No.	MATERIAL SPECN / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECn	ARC/ GAS/ DIA.	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA105GrB/ SA234WPB	219.1	8.18	27	8.18▽	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	1917.0gms 959Nos	
2	SA106GrB / SA234WPB	168.3	7.11	24	7.11▽	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	1972.0gms 350Nos 254Nos	
3	SA106GrB / SA234WPB	114.3	6.02	12	6.02▽	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	320gms 25Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SRSHAGIRI		29/09/08	4-80-413-67116 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-440

CUST No. :

PGMA DESC : CONDENSER HOTWELL DRAIN PIPING

ASSY. DRG. NO. :

SL NO	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	FIELD WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA234WPB	114.3	6.02	15	6.02V	--	8018-B2 / E7018-1	TIG / ARC	Ø2.50 / Ø2.50	3.99Kgs / 3.5Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-90-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD.	CNS./APD. - QA	DATE	DRAWING No.	REV.
A.ARGHARAJ	P.SANKAR	R.SESHAGIRI		29/09/09	4 80-440-67542 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-442

CLIENT. No.

ASSY. DRG. NO :

PGMA DRSC : CLEAND STEAM CONDENSER DRAIN TO LP DRAIN FLASH TANK

Sl. No.	MATERIAL SPECN.) / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE Thk (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB/ SA234WPB	88.9	5.49	33	5.49V		RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	125.0gms 595Nos	
2	SA106GrB / SA106GrB/ SA234WPB	60.3	5.54	2	5.54V	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	25.0gms 20Nos	
3	SA106GrB / VALVE/ AIR STRAP	33.4	4.55	2 --	4.55V SA	-- 0.2099	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	13.0gms 13Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APR.	CHD/APR. - QA	DATE	DRAWING NO:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80 442-67333 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : BC-443

CUST. No.

PGMA DESC : LP HEATER : DRAIN PIPING TO LPD FLASH TANK THROUGH DRAIN COOLER

ASSY. DWG. NO.

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/ GAS/ TIG.	SIZE (mm)	QUANTITY	REMARKS
1	SA106Gr.B / SA106Gr.B/ SA234WPB	273.0	6.35	15	6.35V	--	RT½Mo	TIG	Ø2.50	1335.0gms	
							E7018-1	ARC	Ø2.50	500Nos	
							E7018-1	ARC	Ø3.15	155Nos	
2	SA106Gr.B / SA106Gr.B/ SA234WPB	219.1	6.35	71	6.35V		RT½Mo	TIG	Ø2.50	149'gms	
							E7018-1	ARC	Ø2.50	777Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. A-82-999-93172 AND A 82-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/04	A 80-443-67109 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : BC 444

CUST. No. :

PGMA DESC : LDH&E DRAIN PIPING TO DFH&T & LDDF TANK

ASSY. DRG. NO. :

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA106GrB / SA234WPB /	273.0	9.27	4	9.27	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	548.0gms 65Nos 120Nos	
2	SA106GrB / SA234WPB / SA515GR70 (END CAP)	273.0	6.35	75	6.35		RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	2225.0gms 300Nos 275Nos	
3	SA106GrB / SA106GrB / SA234WPB	219.1	6.35	55	6.35	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	2485.0gms 295Nos	
4	SA106GrB / SA234WPB / SA515GR70 (END CAP)	168.3	7.11	43	7.11	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	2279gms 645Nos 387Nos	
5	SA106GrB / SA106GrB / SA234WPB	114.3	6.02	2	6.02	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	54.0gms 42Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD	CED/APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHADRI		29/09/08	4-80-444-67020 SHEET 1 OF 2	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW | PGMA: 80-444

CUST. No.:

PGMA DESC: LPH#3 DRAIN PIPING TO LPH#2 & LPDF TANK

ASSY. DRG. NO.:

S. No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (mm)	PIPE SIZE THK (mm)	NO. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE: SPECN	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
6	SA106GrB / SA106GrB/ SA234WPB	219.1	8.18	4	8.18W	--	RT½Mo	TIG	Ø2.50	200.0gms	
							E70'18-1	ARC	Ø2.50	6&Nos	
							E70'18-1	ARC	Ø3.15	22Nos	
7	SA106GrB / SA106GrB/ SA234WPB	88.9	5.49	2	5.49W	--	RT½Mo	TIG	Ø2.50	40.0gms	
							E7018-1	ARC	Ø2.50	3&Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. 4-80-999-9217Z AND 4 80 999 9213 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD/APD. - QA	DATE	DRAWING No.	REV.
A.ARGKIARAJ	P SANKAR	R.SESHAGIRI		23/03/06	4-80-444-67020 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

DOC1

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-446

CUST. No. :

ASSY. DWG NO. :

PGMA DESC : DEAERATOR DRAIN PIPING TO UNIT FLASH TANK
DEARRATOR OVER FLOW PIPNG TO UNIT FLASH TANK

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106Gr3 / SA106GrB/ SA234WPB	114.3	6.02	100	6.02$\bar{V}$	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	2660.0gms 210Nos	
2	SA106Gr3 / SA106GrB SA234WPB	219.1	8.18	12	8.18$\bar{V}$	--	RT½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.50 Ø2.50 Ø3.15	270.0gms 18?Nos 24?Nos	
3	SA106GrB / SA106GrB/ SA234WPB	88.9	5.49	2	5.49$\bar{V}$	--	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	40.0gms 30Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD /APD :- QA	DATE	DRAWING No.:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		24/09/08	4-80-446 67219 SHEET 1 of 1	CO

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-447

CUST. No. :

PGMA DESC : LP HEATER-5 DRAIN TO DEAERATOR AND SPDFT & HP HEATER-8 TO HP HEATER-5 DRAINATOR & SPDFT

ASSY. DRG. NO :

SL No	MATERIAL SPECN 1 / MATERIAL SPECN 2	PIPE SIZE OD (mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	AFTER SPECN.	TOTAL LENGTH OF PIPE (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrC / SA106GrC SA234WPC	219.1	8.18	65	8.18▽	--	RT½Mo	TIG	Ø2.50	4550 Gms	
							E7018-1	ARC	Ø2.50	1105Nos	
							E7018-1	ARC	Ø3.15	1170Nos	
2	SA106GrB / SA106GrB/ SA234WPB	219.1	8.18	70	8.18▽	--	RT½Mo	TIG	Ø2.50	4970.0gms	
							E7018-1	ARC	Ø2.50	259Nos	
3	SA106GrB / SA106GrB/ SA234WPB	273.0	9.27	9	9.27▽	--	RT½Mo	TIG	Ø2.50	783.0gms	
							E7018-1	ARC	Ø2.50	180Nos	
							E7018-1	ARC	Ø3.15	270Nos	
4	SA106GrB / SA234WPB/ SA515GR70 (END CAP)	168.3	7.11	25	7.11▽	--	RT½Mo	TIG	Ø2.50	1325.0gms	
							E7018-1	ARC	Ø2.50	375Nos	
							E7018-1	ARC	Ø3.15	225Nos	
5	SA106GrC / SA106GrC SA234WPC	114.3	6.02	8	6.02▽	--	RT½Mo	TIG	Ø2.50	214.0gms	
							E7018-1	ARC	Ø2.50	168Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD/APD	RA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI			26/03/08	4-80-447-57021 SHEET 1 of 2	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 00 447

COST No. :

PGMA DESC. : HP HEATER-5 DRAIN TO DEAERATOR AND EPDFT

ASSY. DRG. NO : HP HEATER-6 TO HP HEATER-5 DEAERATOR & EPDFT

S. No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/ GAS/ IC	SIZE (mm)	QUANTITY	REMARKS
6	SA106GrB / SA234WPB	88.9	5.49	2	5.49▽	--	RT½Mo E7018-1	MG ARC	Ø2.50 Ø2.50	39.6gms 30Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CLD.	DESIGN/APD.	CLD./APD. - QA	DATE	DRAWING NO.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		26/09/08	4 00 447-57021 SHEET 2 of 2	00

ERECTION WELDING SCHEDULE

PROJECT	TYPICAL FOR 250 MW	PGMA	80-463
CUST. No.		PGMA DESC :	TG AUX COOLING WATER
ASSY DRG. No.	----		

Fl No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE Thk (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
1	IS:3589 (BL) / SA234WPB	406.4	9.53 6.0	7	6.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	720Nos 50Nos	
2	IS:3589 (BL) / IS:3589 (BL)	355.6	7.92 6.0	14	6.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	378Nos 238Nos	
3	IS:3589 (BL) / IS:3589 (BL)	323.9	6.0	46	6.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	1104Nos 690Nos	
4	IS:3589 (BL) / IS:3589 (BL)	273.1	6.0	66	6.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	1320Nos 594Nos	
5	API5LGrB / IS:3589 (BL)	219.1	6.0	33	6.0▽	--	E7018	ARC	Ø2.50	1221Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-53172 AND 4-80-999-53173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-463-67501 SHEET 1 of 8	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW | PGMA : 80-463

CUST. No. :

PGMA DESC : TG AUX COOLING WATER

ASSY. DRG. NO. : ----

S. No	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
6	IS:1239 (BL) / IS:1239 (BL)	N250	5.4	260	5.4▽	--	E6013	ARC	Ø2.50	3903No's	
								ARC	Ø3.15	2340No's	
7	IS:1239 (BL) / IS:1239 (BL)	NB100	5.4	234	5.4▽	--	E6013	ARC	Ø2.50	4704No's	
8	IS:1239 (BL) / IS:1239 (BL)	NB80	4.8	166	4.8▽		E6013	ARC	Ø2.50	2656No's	
9	IS:1239 (BL) / IS:1239 (BL)	NB50	4.5	144	4.5▽	--	E6013	ARC	Ø2.50	1584No's	
10	IS:1239 (BL) / IS:1239 (BL)	NB40	4.0	187	4.0▽	--	E6013	ARC	Ø2.50	1309No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93177 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/APD	CHD./APD. -- QA	DATE	DRAWING No.	REV
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		26/06/08	4-80-463-87601 SHEET 2 of 8	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

CUST. No.

M&SV. DRG. NO. :

PGMA : 60-463

PGMA DESC : TG AUX COOLING WATER

SL No	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPANS	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG.	SIZE (mm)	QUANTITY	REMARKS
11	IS:3589 (Gr.) / SA234WPB / SA106GrB	168.3	7.11	33	7.11	--	E7018	ARC	Ø2.50	485Nos	
								ARC	Ø3.15	297Nos	
12	IS:3589 (Gr.) / SA234WPB / SA106GrB	114.3	5.4 6.02	10	6.02	--	E7018	ARC	Ø2.50	153Nos	
13	IS:3589 (Gr.) / SA234WPB / SA106GrB	508.0	6.35	48	6.53	--	E7018	ARC	Ø2.50	1824Nos	
								ARC	Ø3.15	144Nos	
14	IS:3589 (Gr.) / SA234WPB / SA106GrB	457.0	7.92 9.53	16	7.92	--	E7018	ARC	Ø2.50	612Nos	
								ARC	Ø3.15	398Nos	
15	IS:3589 (Gr.) / SA234WPB / SA106GrB	355.6	6.35 7.92 9.53	61	6.35	--	E7018	ARC	Ø2.50	1647Nos	
								ARC	Ø3.15	1037Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO. 4-80-999-93172 AND 4-80-999-53173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD./APD - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	4-80-462-07601 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-463

COST. No. :

PGMA DESC : TG AUX COOLING WATER

ASSY DRG NO. :

SL No.	MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ T.G.	SIZE (mm)	QUANTITY	REMARKS
16	IS:3589 (BL) / SA234WPB SA106GrB	323.9	6.35 / 8.53	136	6.35▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	326 Nos 254 Nos	
17	IS:3589 (BL) / SA234WPB SA106GrB	273.0	6.35 / 9.27	198	6.35▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	396 Nos 179 Nos	
18	IS:3589 (BL) / SA234WPB SA106GrB	219.1	6.35 / 8.18	123	6.35▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	65 Nos 144 Nos	
19	IS:3589 (BL) / IS:2062 Gr A 410A (REDUCER)	610.0	8 / 10	73	8.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	328 Nos 525 Nos	
20	IS:3589 (BL) / IS:2062 Gr A 410A (REDUCER)	355.6	6.0	1	6.0▽	-	E7018	ARC ARC	Ø2.50 Ø3.15	2 Nos 1 Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRL NO 4 80 999 93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHK	DESIGN/APD	QUA./APD. - QA	DATE	DRAWING NO.	REV.
A.ARGHAMAJ	P.SANKAR	R.SASHADRI		29/09/09	4-80-463-67601 SHEET 4 of 3	(0)

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PGMA: 90-463

CUST. No.:

PGMA DESC : TG AUX COOLING WATER

ASSY. DRG. NO.: ----

Sl. No	MATERIAL SPECN. / MATERIAL SPECN.	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/ GAS/ TIG	SIZE (mm)	QUANTITY	REMARKS
21	IS:3589 (BL) / IS:2062Fe410A (REDUCER)	219.1	6.0	3	6.0▽	-	E7018	ARC	Ø2.50	120Nos	
22	IS:3589 (BL) / IS:2062Fe410A (REDUCER)	508.0	9.53	3	9.53▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	114Nos 90Nos	
23	IS:3589 (BL) / IS:2062Fe410A (REDUCER)	323.9	6.0	2	6.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	48Nos 30Nos	
24	IS:3589 (BL) / IS:2062Fe410A (REDUCER)	273.0	6.0	2	6.0▽	--	E7018	ARC ARC	Ø2.50 Ø3.15	40Nos 20Nos	
25	IS:1239 (BL) / IS:1239 (BL)	NB65	4.5	91	4.5▽	--	E6013	ARC	Ø2.50	819Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD	DESIGN/MFG.	CHD./APD - QA	DATE	DRAWING No.	REV.
A.ARGKIARAJ	P.SANKAR	R.SESHADRI		29/09/08	4-80-463-67601 SHEET 5 of 8	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW | PGMA: 60-450

CUST. No.:

ASSY DRG. NO.: PGMA DRSC - TG AUX COOLING WATER

SL No.	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD S-CON.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/ GAS/ TIG.	SIZE (mm)	QUANTITY	REMARKS
26	IS 1239 (BL) / IS:1239 (BL)	NB25	4.0	64	4.07	--	E6013	ARC	Ø2.50	384Nos	
27	IS:1239 (BL) / IS:1239 (BL)	NB15	4.0	15	4.07	--	E6013	ARC	Ø2.50	80Nos	
28	IS:3589 (BL) / SA105/FLANGE	NB350	6.35	--	6B 7B	40.702 40.702	E6013	ARC	Ø2.50	1424Nos	
29	IS:3589 (BL) / SA105/FLANGE	NB350	6.35	--	6B 7B	8.937 8.937	E6013	ARC	Ø2.50	313Nos	
30	IS:3589 (BL) / IS:2062Fe410B (FLANGE)	NB300	6.35	--	6B 7B	8.14 8.14	E7018	ARC	Ø2.50	285Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO 4-80-999-93172 AND A 80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD	DESIGN/APD	CUS./APD - GA	DATE	DRAWING No	REV
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		20/09/96	4-80-463-67501	00
					SHEET: 6 of 6	

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : HD-493

CUST. No. :

ASSY. DRG. NO : - --

PGMA DESC : TG AUX COOLING WATER

S. No	MATERIAL SPECN. / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in ")	RECOMMENDED ELECTRODE / WIRE SPECN	ARC/ GAS/ T.G.	SIZE (mm)	QUANTITY	REMARKS
31	IS:3589 (DL) / IS:2062Fe410B (FLANGE)	NB250	6.0	--	6A	75.47	E7018	ARC	Ø2.50	2842No's	
				--	7A	75.47					
32	IS:3589 (BL) / IS:2062Fe410B (FLANGE)	NB100	5.62	--	5A	45.24	E7018	ARC	Ø2.50	984No's	
				--	7A	45.24					
33	IS:3589 (BL) / IS:2062Fe410B (FLANGE)	NB65	4.5	--	5A	2.652	E7018	ARC	Ø2.50	790No's	
				--	6A	2.652					
34	IS:1239 (BL) / IS:2062Fe410B (FLANGE)	NB80	4.85	--	5A	11.160	E6013	ARC	Ø2.50	477No's	
				-	6A	11.160					
35	IS:1239 (BL) / IS:2062Fe410B (FLANGE)	NB150	5.4	--	5A	50.758	E6013	ARC	Ø2.50	1777No's	
				--	6A	50.758					

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93178 AND 4-80-999-93179 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD/APD - QA	DATE	DRAWING No:	REV
A.AROKIARAJ	P.SANKAR	P.SESHAGIRI		23/09/08	4-80 463-E7601 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT: TYPICAL FOR 250 MW

PGMA : 80-462

CUST. No.

PGMA DESC : TO AUX COOLING WATER

ASSY. DRG. NO. :

SL No	MATERIAL SPECN.1 / MATERIAL SPECN 2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
36	IS:1239 (HL) / IS:2062Fe410S (FLANGE)	NB200	6.4	-- / --	6S / 7S	5.507 / 5.507	E6013 / E5013	ARC / ARC	Ø2.50 / Ø3.15	1BEND's / 45No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED

PREPARED	DESIGN/CHD.	DESIGN/APD.	CHD./APD. - QA	DATE	DRAWING No.	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/05/06	4-80-462-57601 SHEET 6 of 8	00

ERECTION WELDING SCHEDULE

PROJECT : TYPICAL FOR 250 MW

PGMA : 80-673

CUST. No.

ASSY. DRG. NO –

PGMA DESC : LUBR OIL PIPING SYSTEM

SL No.	MATERIAL SPEC.1 / MATERIAL SPEC.2	PIPE SIZE OD (mm)	PIPE SIZE THK (mm)	TOTAL No. OF JOINTS	WELD SPECN.	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN.	ARC / GAS / TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA106GrB / SA234WPB/ SA515GR70 (END CAP)	88.9	5.49	450	5.49▽	–	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	9820.0gms 675Nos	
2	SA106GrB / SA105	33.4	4.55	22	4.55▽	–	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	140gms 11Nos	
3	SA106GrB / SA106GrB/ SA234WPB	48.3	5.08	20	5.08▽	–	RT½Mo E7018-1	TIG ARC	Ø2.50 Ø2.50	200.0gms 14Nos	
4	SA106GrB / IS:2062Fe410A FLANGE	88.9	5.49	– –	5△ 6△	2.7929 2.7929	E7018-1	ARC	Ø2.50	73Nos	
5	SA106GrB / IS:2062Fe410A FLANGE	48.3	5.08	– –	5△ 6△	0.0607 2.7929	E7018-1	ARC	Ø2.50	2Nos	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG NO 4-80-999-93172 AND A 80-999-93173 SHALL BE REFERRED.

PREPARED	DESIGN/CHD.	DESIGN/APD	CHD/APD. – QA	DATE	DRAWING No:	REV.
A.AROKIARAJ	P.SANKAR	R.SESHAGIRI		29/09/08	1 80 673-67585 SHEET 1 of 1	00

ERECTION WELDING SCHEDULE

PROJECT: RAICHUR TPS 1 X 250 MW — PGMA: 80-342

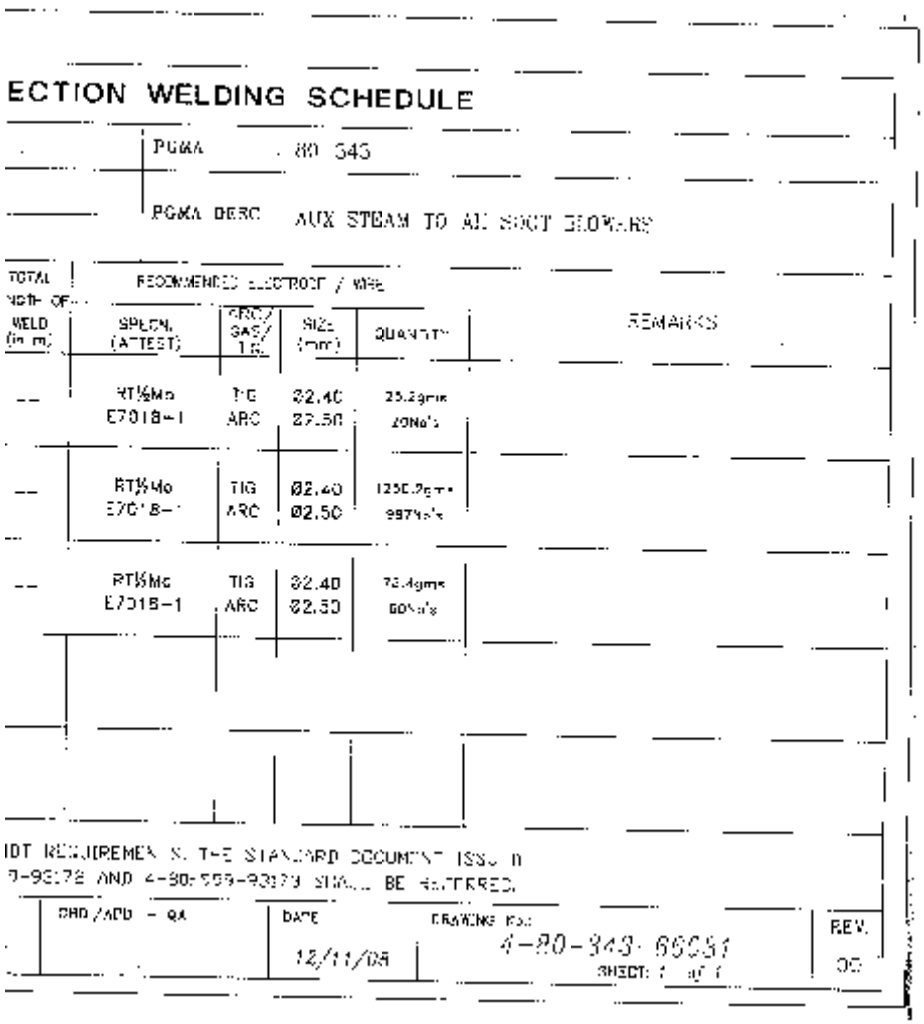
CUST. No.: 03E9 — PGMA DESC: AUX STEAM TO SCAPH

ASSY. DRG. NO.: 1-80-342-15092

SL No	MATERIAL SPECN.1 / MATERIAL SPECN.2	PIPE SIZE OD (in mm)	PIPE SIZE THK (in mm)	TOTAL No. OF JOINTS	WELD SPECN	TOTAL LENGTH OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN (AWS/ASTM)	ARC/GAS/TIG	SIZE (mm)	QUANTITY	REMARKS
1	SA105Gr5(A) / SA106GrB(A) SA234WPB(A)	114.3	6.02	..	6.0	—	R7½Mo E7018-1	TIG ARC	Ø2.40 Ø2.50	222.6gms 231No's	
2	SA106GrB(A) / SA106GrB(A) SA234WPB(A)	88.9	5.49	35	5.5	—	R1½Mo E7018-1	TIG ARC	Ø2.40 Ø2.50	586.0gms 525No's	
3	SA106GrB(A) / SA106GrB(A) SA234WPB(A)	168.3	7.11	55	7.1	—	R7½Mo E7018-1 E7018-1	TIG ARC ARC	Ø2.40 Ø2.50 Ø3.15	2912.0gms 825No's 605No's	
4	SA106GrB(A) / SA106GrB(A) SA234WPB(A)	219.1	6.35	40	6.4	—	R1½Mo E7018-1	TIG ARC	Ø2.40 Ø2.50	2840.0gms 1490No's	

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED	DESGN/CHD.	DESIGN/APD	CHD./APD. - QA	DATE	DRAWING No.	REV.
PALANISKUMAR	VENKAT	R. SESHAGIRI		12/11/02	4-80-342-55852 SHEET 1 of 1	00



ECTION WELDING SCHEDULE

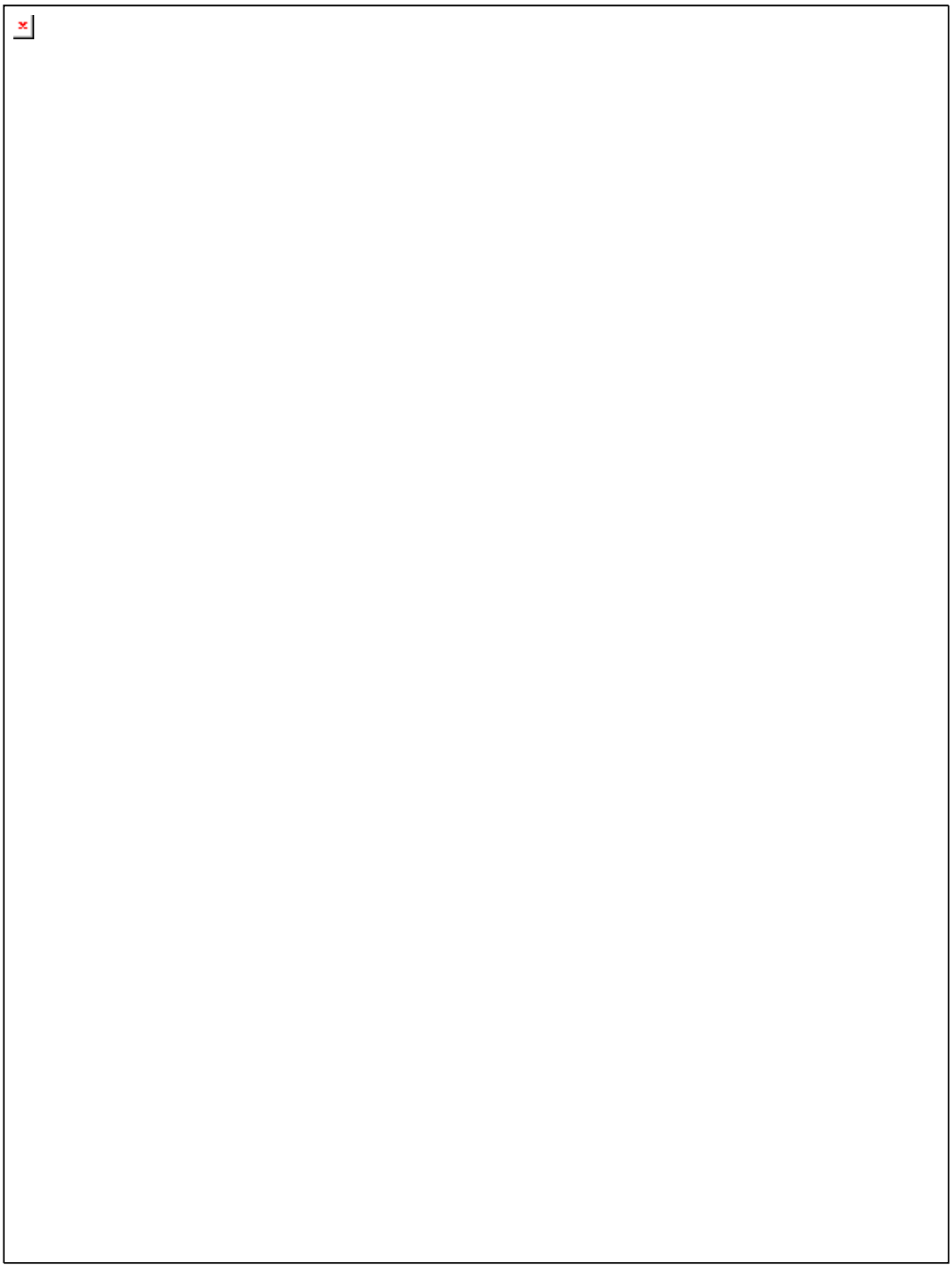
PGMA . 80 343

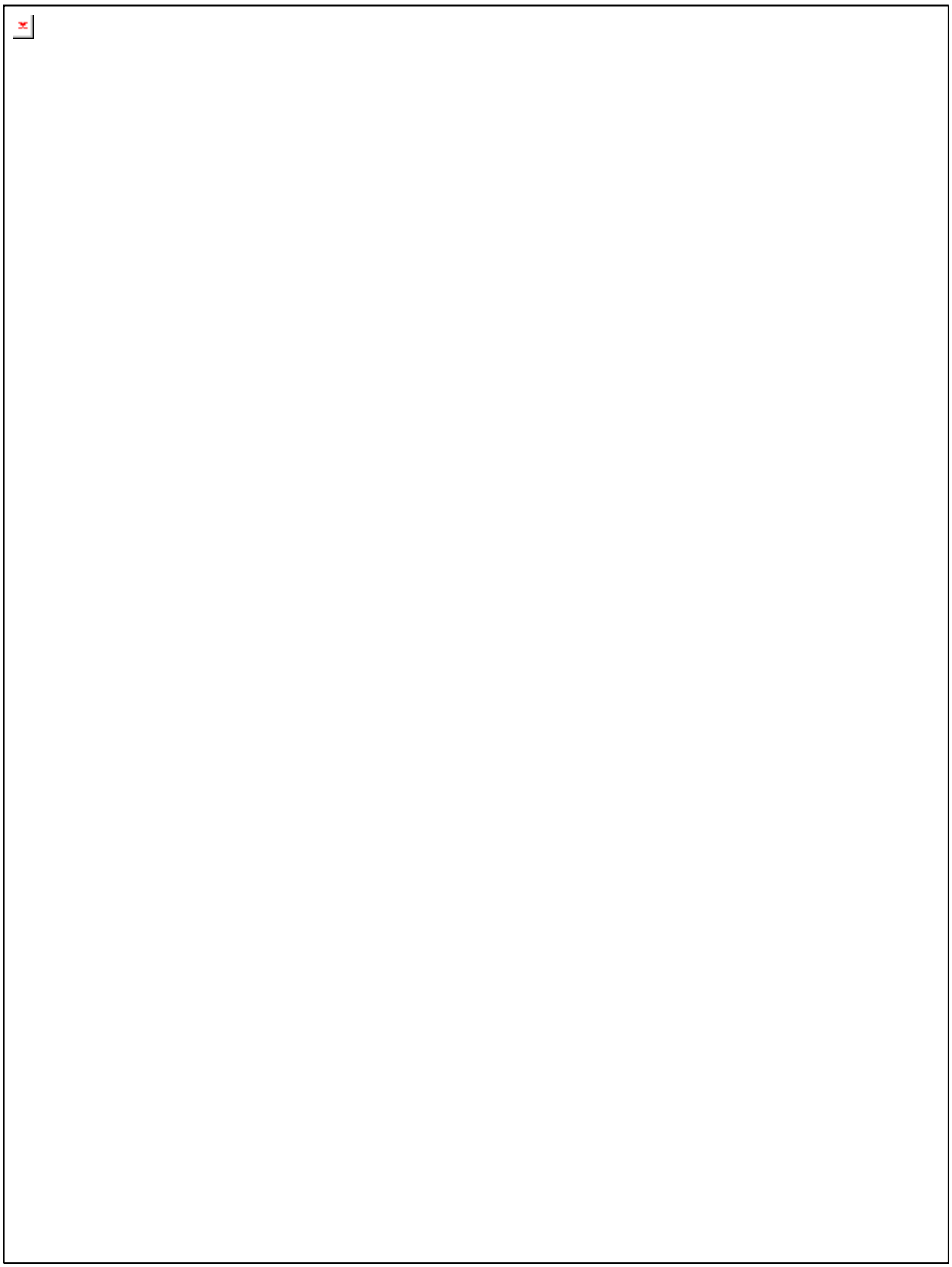
PGMA DESC AUX STEAM TO AE SOOT BLOWERS

TOTAL NOM OF WELD (in m)	RECOMMENDED ELECTRODE / WIRE SPECN. (ATTEST)	PROC/ GAS/ TR.	SIZE (mm)	QUANTITY	REMARKS
--	RT½Mo E7018-1	TIG	Ø2.40	25.2gms	
		ARC	Ø2.50	20No's	
--	RT½Mo E7018-1	TIG	Ø2.40	1250.2gms	
		ARC	Ø2.50	997No's	
--	RT½Mo E7018-1	TIG	Ø2.40	75.4gms	
		ARC	Ø2.50	60No's	

IDT REQUIREMENTS OF THE STANDARD DOCUMENT ISSUED
0-90178 AND 4-90-999-90179 SHALL BE ALTERED.

DRD/ADD - QA	DATE	DRAWING NO.	REV.
	12/11/08	4-90-343-66031	05
		SHEET 1 of 1	





SECTION VII

APPENDIX – VI

DECLARATION SHEET

I, hereby certify that, all the information and data furnished by me with regard to this TenderSpecification No: BHEL: PSSR: SCT: 1335 are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations in detail and agree to comply which the requirements and intent specifications.

I further certify that I am duly authorized representative of the under mentioned tenderer and a valid power of Attorney to this effect is also
enclosed.

TENDERER'S NAME & ADDRESS

AUTHORISED REPRESENTATIVE'S
SIGNATURE WITH NAME &
ADDRESS

SECTION VII

APPENDIX – VII

TENDER SPECIFICATION NO BHEL: PSSR: SCT: 1335

CERTIFICATE OF DECLARATION FOR CONFIRMING KNOWLEDGE ON SITE CONDITIONS

We,

hereby declare and confirm that we have visited the project site under subject, namely and acquired full knowledge and information about the site conditions.

We further confirm that the above information is true and correct and we will not raise any claim of any nature due to lack of knowledge of site conditions.

TENDERER'S NAME AND ADDRESS

Place:

Date: SIGNATURE OF AUTHORISED REPRESENTATIVE WITH NAME & ADDRESS:

OFFICE SEAL

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector: Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

SECTION VII
APPENDIX – VIII
CHECK LIST
TENDER SPECTFICATION NO, BHEL: PSSR: SCT: 1335

Tenderers are required to fill in the following details:

1. a) Name of the Tenderer with address	:	YES/NO
b) Telegraphic/Telex address	:	YES/NO
c) Phone (Office/Residence)	:	YES/NO
d) Management Structure of firm (Pvt. Ltd/ Public Ltd./Partnership/Sole Proprietorship) Documentary proof For the same enclosed)	:	YES/NO
2. Whether EMD submitted as per Tender specifications terms and Conditions		YES/NO
3. Validity of offer (offer shall be kept open for acceptance for minimum six months)	:	YES/NO
4. Whether tenderer visited the erection site and acquainted with the site conditions before quoting		YES/NO

SIGNATURE OF THE TENDERER

5. Whether the following details are furnished	:	YES/NO
a) Previous Experience	:	YES/NO
b) Present assignments	:	YES/NO
c) organization chart of the company	:	YES/NO
d) Company financial status	:	YES/NO
e) Incase of company, proof of Registration of the company	:	YES/NO
f) Memorandum & Articles of Association of company/copy of Partnership deed	:	YES/NO
g) Profit & Loss account for the Last 3 years	:	YES/NO
h) Audited Balance sheet for the Last 3 years	:	YES/NO
i) Income Tax clearance certificate (latest)	:	YES/NO
j) Solvency Certificate from a Nationalised Bank	:	YES/NO
k) Power of Attorney of the person Signing the tender duly attested By a Notary Public	:	YES/NO

SIGNATURE OF THE TENDERER

l) Manpower organization chart
With deployment plan at site
For posting of Engineers/super
Visitors and workers/labourers : YES/NO
For satisfactory completion of
Work under this specification

6. Whether the Tenderer is conversant
with local labour laws & conditions : YES/NO

7. Whether the tenderer is aware of
all safety rules and codes : YES/NO

8. Whether the Declaration sheet (as
per appendix) enclosed : YES/NO

9. Time required for mobilization of
of site organization and start of work : YES/NO

10. Whether list of tools and Plants
available with the contractor and
proposed to be deployed for this
work enclosed : YES/NO

11. Whether all the Pages are read
understood and signed. : YES/NO

12. Deviations, if any Pointed out : YES/NO

13. Whether PF exemption No. is
allotted by RPFC of your area if
so, indicate number : YES/NO

SIGNATURE OF THE TENDERER