

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

**BHARAT HEAVY ELECTRICALS LIMITED  
TIRUCHIRAPPALLI-620 014  
WORKS CONTRACTS MANAGEMENT**

## NOTICE INVITING TENDER

1.	Tender Ref No:	BHEL: WCM:PICKLING & PASSIVATION: ATP / 04.04.2016
2.	Name of works	WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.
3.	Location of work	BHEL, TRICHY.
4.	Period of contract	12 months from the date of award of contract.
5.	Earnest Money Deposit	₹ 40,000/-
6.	Tender Document details	<p>A] Technical Bid</p> <p>Part-1A (Technical Bid-Qualifying Criteria) - 01 Page.</p> <p>Part-1B (Scope of Work &amp; Technical Terms and Conditions) - 03 Pages.</p> <p>Part-1C (General Terms &amp; Conditions of Contract) - 11 Pages</p> <p>Part-1D (Special Terms &amp; Conditions of Contract) - 02 Pages</p> <p>Part- 1E (Details of Procedures.) - 36 Pages.</p> <p>B] Price Bid</p> <p>Part-2 (Price bid) - 02 Pages.</p>
7.	Place of Submission of Tender Document along with EMD	Tender Drop Box at <b>Works Contracts Management (WCM) Building 53,First Floor, BHEL, High Pressure Boiler Plant, Trichy - 620 014</b>
8.	Last Date for Receipt of Tender	29.04.2016 / 14:00 Hrs.
9.	Date of Techno Commercial Bid Opening	29.04.2016 / 14:30 Hrs.
10.	Date of Price Bid Opening	Will be intimated separately to Technically qualified vendors.

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**INSTRUCTIONS TO THE TENDERERS**

The covers should be addressed to SM/WCM, Works Contracts Management, 53 Building, BHEL, Tiruchirappalli 620 014, to reach on or before by 14.00 Hrs. on 29.04.2016 and the same are to be dropped in the Tender Box which is kept in the Works Contracts Management, 53 Building, BHEL, Tiruchirappalli 620 014. Tenders will be opened by 14.30 (IST) on 29.04.2016 at Works Contracts Management, 53 Building, BHEL, Tiruchirappalli 620 014. BHEL is not responsible for any postal delay. Tender box is available in the Works Contracts Management, 53 Building, BHEL, Tiruchirappalli 620 014.

Bidder has to submit (1) Part-I (Techno-Commercial bid) (2) Part-II (Price bid) & (3) EMD draft in separate covers.

- a. The first envelope shall be contained DD for EMD, super scribed as EMD Cover for NIT / Enquiry No. **Offer without EMD will be rejected.**
- b. The second envelope shall be sealed and super scribed as Part-I (Technical Bid for NIT/Enquiry No.)
- c. The third envelope shall contain only Part-II (Price bid) for the above work as per scope and to be quoted as per the format given in price bid. Any other information in price bid will not be considered. The envelope shall be sealed and super scribed as Price Bid for NIT / Enquiry No.

All the above three envelopes shall be kept into one cover and sealed also super scribed the NIT/Enquiry No. The Techno Commercial Bid will be opened on 29.04.2016 at 14.30 Hrs. (IST).

**Note:**

1. The contract will be awarded for a period of 12 months from the date of ordering.
2. The rates shall be firm for the entire period of the contract.
3. If the Contractor is not able to provide the sufficient service/back outs as indicated in the bid, the contractor is liable for forfeiture of the EMD/Security deposit paid.
4. **Evaluation of the offer shall be done on overall L1 basis.**
5. BHEL reserves the right to increase or decrease the tendered quantity.
6. **BHEL does not guarantee ordering of any minimum quantity.**
7. Income Tax deduction at source as applicable in the IT Act from time to time and will be made on the value of the bills in the absence of Income Tax Exemption Certificate from the concerned IT officer.
8. All the Statutory Obligations such as ESI, PF, Labor Acts, Factories Act, Service Tax, etc. will have to be taken care of by the vendor. BHEL will have no liability on them. Notwithstanding the above, if any demand notice is served by the concerned Statutory Authorities for recovery of any of their dues on BHEL, the same would be paid to the statutory authorities without notice to the vendor and recovered as a due from any pending / future bills.
9. In case contract is not executed by any vendor after award and acceptance of contract, BHEL may exercise the right to forfeit EMD, Security Deposit / BG of such contractors and also suitable action will be taken by BHEL on those Contractors as deemed fit.

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**PART-I (TECHNO COMMERCIAL BID)**

ANNEXURE-1A

**TECHNICAL BID (QUALIFYING CRITERIA)**

**A: Contractor Profile**

1.	Name of the Contractor	
2.	Address	
3.	Phone No.	
4.	E-mail Address	
5.	BHEL Vendor Code ( If any )	

**B: Qualifying Criteria:**

Sl. No.	Qualifying Criteria	DETAILS
1	<b>EMD DETAILS: (EMD Amount: ₹ 40,000 /-)</b> (Offer without EMD will be rejected.) (EMD will be waived off for SME/NSIC/SSI vendors upon verification.) ( Copy of valid Certificate to be enclosed)	AMOUNT : ₹ DD NO: DD DATE: ISSUING BANK :
2	Experience Of Executing Works Contract For Cleaning, Degreasing, Pickling& Passivation Of Titanium, Stainless Steel Components / Consumables and Painting Of CS Assembly <b>(Documentary Evidence to be furnished).</b>	
3	Experience Of Executing Works Contract for Heat Treatment. <b>(Documentary Evidence to be furnished).</b>	
4	<b>PF Registration Details: (No. &amp; Date )</b> (Document to be attached)	
5	<b>ESI Registration Details (No. &amp; Date )</b> (Document to be attached)	
6	<b>Service Tax Registration No:</b> (Document to be attached)	
7	<b>PAN Details</b> (Document to be attached)	
8	<b>Income Tax Return statements or Profit &amp; Loss Statement Certified by CA for last three Financial years.</b> (2012-13 ,2013-14 & 2014-15 ) ( Documents to be enclosed )	
		Contractor Signature
		Contractor Seal

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9	Acceptance to Scope of Work (Annexure-1B), and General Terms & Conditions of Contract. (Annexure-1C), Special Terms & Conditions of Contract (Annexure-1D), Procedures (Annexure- 1E).	
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**ANNEXURE-IB**

## **PART-I (TECHNO COMMERCIAL BID)**

**Name of Vendor:**

### **SCOPE OF WORK AND TECHNICAL TERMS &CONDITIONS**

#### **A. BILL OF QUANTITY**

Sl. No.	Description of Work	UOM	Approx. Qty.	Scope of work Reference Details
<b>A.</b>	<b>CLEANING, DEGREASING, PICKLING&amp; PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS/ CONSUMABLES AND PAINTING OF CS ASSEMBLY.</b>			
A.1	Pickling of Ti wires	M	1500	Procedure Ref No.: Pickling of Ti Welding Wires for ECDS. ( Nil Dated: 07.05.2012 )
A.2	Pickling of Ti Tubes	No.	6000	Procedure Ref No. : PR:CHEM:07-25/00 Dated : 16.05.2007
A.3	Cleaning of ID/ OD of Ti Tubes.	No.	2000	Procedure Ref No. : PR:CHEM:07-25/00 Dated : 16.05.2007
A.4	Cleaning of Ti Wires	M	3000	Procedure Ref No. : PR:CHEM:07-26/00 Dated : 16.05.2007
A.5	Pickling of Ti Plates / Ti Sheet	Sq.M	250	Procedure Ref No. : PR:CHEM:07-25/00 Dated : 16.05.2007
A.6	Degreasing of Ti components / Sub assembly	Sq.M	450	Procedure Ref No. : PR:CHEM:07-30/01 Dated : 24.09.2009
A.7	Degreasing of Ti Consumables	Kg.	100	Procedure Ref No. : PR:CHEM:07-26/00 Dated : 07.06.2007
A.8	Pickling & Passivation of SS components.	Sq.M	1270	Procedure Ref No. : PR:CHEM:07-19/01 Dated : 21.04.1999
				Contractor Signature
				Contractor Seal

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A.9	Painting of CS Body / Assembly	Sq.M	300	Procedure Ref No. : PR:CHEM:07-14/02 Dated : 07.06.2007
A.10	Cleaning of ID/OD of SS Tubes	No.	2300	Procedure Ref No. : PR:CHEM:07-02/02 Dated : 02.06.2006
<b>B</b>	<b>HEAT TREATMENT</b>			
B.1	Heat Treatment of Tube Bundle Assembly	Asse mbly	8	Procedure Ref No. :HTTP:SGB2:026 / 01 Dated : 12.08.2014

**B. SCOPE OF WORK & DELIVERY CONDITIONS**

- All works are to be done at BHEL- ATP shops (163,165 & Unit-II )  
Collection of Ti/SS consumables/Plates/sheets /components from ATP Shop.
- Cleaning/degreasing/pickling /HT/Painting shall be done as per procedure mentioned in Bill of Quantity. **(Note: Vendor shall have to work in Both Morning & Evening to cater Day and Night shift requirement**
- The contractor has to arrange required quantity of chemicals/other items as per procedure mentioned in Bill of Quantity
- After cleaning/degreasing/pickling, surface check shall be successfully done and shown to C’lab/BHEL & QS /BARC Inspection. If not satisfactory, again repeat to be done till it get accepted by the concerned agency. Work completion certificate approved by shop in-charge and lab shall be submitted to ATP/OP&C for final certification.
- The contractor has to come to BHEL - ATP shops whenever called by shop on daily/alternate/weekly basis as per shop requirement. Movement of Tubes/ consumables from shop to pickling/cleaning area and back to shop is in vendors Scope. Sufficient manpower’s shall be engaged on need basis depending on length/size/Qty of job offered to the S/cr. While handling of tubes/consumables, scratches, dents and damages shall be avoided.
- SS tank, heating facility (Burner with producer gas), DM water, Acetone, Spirit, Nitrogen, lint free cloth, polythene and emery sheet will be provided by ATP shop.
- All safety items like shoes, rubber gloves, aprons, respirators, safety glasses shall be brought by sub-contractor.

Contractor Signature

Contractor Seal

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8. Careful handling of components/sub assembly shall be done to avoid damages
9. After degreasing/pickling contact with foreign material shall be avoided
10. Degreasing/Pickling area shall be made clean after work and ensure proper disposal of used chemicals.
11. Drawings for the above items will not be given to S/Cr. However, they can contact OP&C to see the components/assembly physically before they submit offer.
12. All safety precautions shall be followed while executing the job in BHEL.

I. Safety Points

1. The Contractor shall be familiar with the Acid's properties and Processes.
2. To create awareness necessary training to be given on "Handling of Acids and Hazardous Chemicals" to all Working and Supervising persons with Laboratory Faculties.
3. Emergency procedures (Do's & Don'ts) and Material Safety Data Sheet (MSDS) of acid being used are to be displayed legibly at work spot.
4. Along with Safety Shoes and Helmets suitable Acid Proof PPEs like Apron, Goggles, Gloves and Light fume Respirator are to be used by Working and supervising persons.
5. All working persons must be made aware of acid properties and suitable training session shall be arranged with laboratory faculties.
6. The activity shall be done in the presence of both BHEL as well as contract supervision.

II. EMS Points

1. Suitable mechanism to be provided to control the spillage of Chemicals.
2. The Effluents generated due to degreasing, Pickling etc., are to be neutralized and disposed safely.

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**PART-I (TECHNO COMMERCIAL BID)**

**ANNEXURE-IC**

**Name of Vendor:**

**GENERAL TERMS & CONDITIONS OF CONTRACT**

**1. Definition:**

In these General Conditions of Contract, the following terms shall have, I meaning hereby assigned to them, except where the context otherwise requires:

- a) The "Contract" means, the documents forming the tender and acceptance thereof, together with all the documents referred to therein including general and special conditions to contract. All these documents as applicable taken together shall be deemed to form one contract and shall be complementary to one another.
- b) The "Work" means, the work described in the tender documents in individual work orders as may be issued from time to time to the contractor by the Officer-In charge within the power conferred upon him including all notified or additional items of works and obligations to be carried out as required for the performance of contract.
- c) The "contractor" means, the individual Firm or Company whether incorporated or not, undertaking the work and shall include the legal personal representatives of such individuals or the persons composing the firm or Company or the successors of the firm or company and the permitted assigns of such individual or firm or Company.
- d) "The Officer-In charge" means, the Officer deputed by the respective area **AGM** to supervise the work or part of the work.
- e) "Approved" and "Directed" means, the approval or direction of the respective area **AGM** or person deputed by him for the particular purposes.
- f) "BHARAT HEAVY ELECTRICALS LIMITED" (hereinafter referred to as BHEL) shall mean the Board of Directors, Chairman, Executive Director, General Manager or, other Administrative Officer of the said Company including Manager/Stores (Valves) authorised to invite tenders and enter into contract for works on behalf of the Company.
- g) The "Contract sum" means, the sum accepted or the sum calculated in accordance with the prices accepted in tender and / or the contract rates as payable to the contractor for the execution of the work during the currency of the contract.
- h) A "week" means, Seven Days, without regard to the number of hours worked or not worked in any day in that week.
- i) A "day" means, the day of 24 hours (TWENTY FOUR) irrespective of the number of hours worked or not worked in that day.
- j) A "working day" means, any day other than that prescribed by the *NEGOTIABLE INSTRUMENTS ACT* as being a Holiday, and consists of the number of hours of labour as commonly recognized by good employers in the trade in the District where the work is carried out or as laid down in the BHEL regulations.

Contractor Signature

Contractor Seal

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**2. Heading to the Contract Conditions:**

The heading to these conditions shall not affect the interpretations thereof.

**3. Work To Be Carried Out:**

The Contract shall include all labour which may be required for the execution of the work.

The Contractor will be deemed to have satisfied himself as to the nature of the site, local facilities of access and all matters affecting the execution of the work. No. extra charges consequent on any misunderstanding in these respects or otherwise will be allowed.

**4. Deviations:**

The contractor shall carry out any Scope of work as per instructions of Executing official.

**5. Assignment of Transfer of Contract:**

The Contractor shall not, without the prior written approval of the BHEL, assign or transfer the contract or any part thereof, or any share, or interest thereon to any other persons. No sum of money which may become payable under the contract shall be payable to any person, other than the contractor unless the prior written approval of the BHEL to the assignment or transfer of such money is given.

**6. Sub-Contract:**

The Contractor shall not sublet any portion of the contract without the prior written approval of the BHEL.

**7. Compliance to Regulations and Bye-Laws:**

The Contractor shall confirm to the provisions of any statute relating to the work and regulations and Bye- laws of any local authority. The Contractor shall be bound to give all notices required by statutory regulations or by-laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.

**8. Security Deposit:**

(1) Security Deposit should be paid by the contractor. The Security Deposit rate will be as follows:

a)	Up to Rs. 10 Lakhs	10% of PO Value
b)	Above Rs.10 Lakh & Up to Rs. 50 Lakhs	Rs. 1 Lakh + 7.5% of the amount exceeding Rs. 10 Lakhs
c)	Above Rs.50 Lakh	Rs.4 Lakh + 5% of the amount exceeding Rs. 50 Lakhs

The Earnest Money paid at the time of tender will be adjusted as part of the Security Deposit to a level of 50% of contract value before start of the work and the balance amount recovered by deduction from the running bills of the contractor at the rates mentioned above.

Contractor Signature

Contractor Seal

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Security Deposit shall not be refunded except in accordance with the terms of Security Bond or Agreement. Security Deposit may be furnished in any one of the following terms:

- i) Cash.
- ii) Cash Deposit receipt, Pay Order, Demand Draft duly pledged in favour of BHEL.
- iii) Post Office cash certificate, National Savings Certificates, Treasury Savings Deposit Certificates, National Plan Savings Certificates, 12 Years National Defence Certificates and 10 Years Defence Deposit certificates.
- iv) Fixed Deposit Receipt issued by State Bank of India / Nationalised Banks.
- v) Bank Guarantee shall be accepted to a value of 50% of the calculated Security Deposit amount only and 50% of Security Deposit shall be in any one of the form as mentioned above from Sl. No. (I to VI).
- vi) The Bank Guarantee shall be kept valid until the due date for refund of Security Deposit.

No interest shall be allowed on Security Deposit. BHEL shall not be responsible for any loss of securities due to liquidation for any other reasons, whatsoever or any depreciation in the value of the securities while in their charge or for any loss of interest thereon.

All compensation or other sums of money payable by the Contractor to BHEL under the terms of this contract or under any other contract with BHEL may be deducted from the Security Deposit or realised by the sale of the securities or from the interest arising therefrom or from any sums which may be due or may become due to the contractor by BHEL and in the event of this Security Deposit being deducted by reason of such deductions or sale, as aforesaid, the Contractor shall, within 7 days thereafter, make good in cash or in securities endorsed as aforesaid, any sum by which the Security Deposit has been reduced.

**(2) Security Deposit has to be deposited within 15 days of LOI/WO. Else EMD will be forfeited and may also attract the provision of "Suspension of Business dealings with Suppliers/Contractors".**

#### **9. Orders under the Contract:**

All orders, notices etc. to be given under the contract shall be in writing, typescript or printed and if sent by registered post to the address given in the tender of the Contract, shall be deemed to have been served on the date, when in the ordinary course they would have been delivered to him. The Contractor shall carry out without delay all orders given to him.

Contractor shall be deemed to have included in his tender price of all the plant, machinery and appliances required for the purpose of all operations connected with the work embraced under the contract to secure a satisfactory quality of work and rate of progress which in the opinion of the "Contract Signing Officer" will ensure the completion of the work within the time specified. BHEL is having every right to split the schedule and to award the work to single or many parties on the lowest offered rates basis. This is a time bound contract for period mentioned, and does not envisage any extension of time / period.

Contractor Signature

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**10. Contractor's Supervision:**

1. The Contractor shall either himself supervise the execution of the contract or shall appoint a competent agent acceptable to BHEL Officials.
2. Orders given to the Contractor's agent shall be considered to have the same force as if they have been given to the Contractor himself.
3. The Contractor or his accredited agent shall attend when required without making any claim for doing so to the OFFICER-INCHARGE, to receive instructions.
4. The respective area AGM shall have full powers and without assigning any reason, requires the Contractor to immediately cease to employ in connection with this contract, any agent, servant or employee where continued employment is, in his opinion undesirable. The Contractor shall not be allowed any compensation on this account.

**11. Labour:**

1. The Contractor shall remain liable for the payment of all wages or other moneys to his work people or employees under the payment of Wages Act 1936.
2. Employees Liability Act. 1938, Workmen's Compensation Act 1923 or any other Act or enactment, relating thereto and rules framed, there under from time to time
3. Contractor shall be responsible for making payment of wages before expiry of 7days from the last day of wage period and to ensure disbursement of wages in the presence of the authority's representative of contract operating division who shall record under his signature at the end of entries in the Register of wages.
4. Contractor to obtain license under CL(R&A) Act, 1970.
5. As per BHEL circular HR-Welfare circular dt 08.04.2014, the following additional wages per month has to be paid over and above minimum wages declared by Tamil Nadu Government to labours as:
  - a) Unskilled : Rs. 3200/
  - b) Semi-skilled : Rs. 3700/-
  - c) Skilled : Rs. 4100/-
6. The contractor should remit the salary/wages of their workmen only through Bank, directly to the salary/savings account of the employee concerned. Wherever the number of contract workmen employed by the contractor is more than ten and the contract period is more than one month, monthly clearance will be given in respect of those contractors, only if the salary/wages to the workmen concerned has been remitted in the bank account of the workmen. The relevant Bank statement/proof for Bank payment should be produced along with PF and ESI challans every month.

**12. Precautions against Risk:**

The Contractor shall be responsible for providing at his own expense for all precautions to prevent loss or damage from any and all risks and to minimize the amount of any such loss or damage and for the necessary steps to be taken for the said purpose.

Contractor Signature

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**13. Damage & Loss to Private Property & Injury to workmen:**

The Contractor shall at his own expense reinstate and make good to the satisfaction of the respective area **AGM** and pay compensation for any injury, loss or damage occurred to any property or rights whatever including property and rights of BHEL (or agents) servants or employee of BHEL, the injury loss or damage arising out of or in any way in connection with the execution or purported execution of the contract and further the contractor shall indemnify BHEL against all claims enforceable against BHEL (or any agent, servant or employee of BHEL) or which would be so enforceable against BHEL where BHEL is a private person, in respect of any such injury (including injury resulting in death) loss or damage to any person whomsoever or property including all claims which may arise under the Workmen's Compensation Act or otherwise.

**14. Laws Governing the Contract:**

The contract shall be governed by the Indian Laws for the time being in force.

**15. Cancellation of Contract for Corrupt Acts:**

BHEL, whose decision shall be final and conclusive, shall without prejudice to any other right or remedy which shall have accrued, shall accrue thereafter to BHEL cancel the contract in any of the following cases and the Contractor shall be liable to make payment to BHEL for any loss or damage resulting from any such cancellation to the same extent as provided in the case of cancellation for default.

If the Contractor shall:

a) Offer or give or agree to give to any person in BHEL service any gift or consideration of any kind, as an inducement or reward for doing or for bearing to do or for having done or for having borne to do any act, in relation to the obtaining or execution of this or any other contract for BHEL service,

OR

b) enter into a contract with BHEL in connection with which commission has been paid or agreed to be paid by him or with his knowledge, unless the particulars of any such commission and the terms of payment thereof have previously been disclosed in writing to BHEL,

OR

c) To obtain' a contract with BHEL as a result of ring tendering or by non-bonafide methods of competitive tendering, without first disclosing the fact in writing to BHEL.

**16. Cancellation of Contract for Insolvency Assignment of Transfer or Subletting Of Contract:**

BHEL, without prejudice to any other right or remedy, which shall have accrued or shall accrue thereafter to BHEL, shall cancel the contract in any of the following cases:

If the Contractor,

Contractor Signature

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a) Being an individual or if a firm any partner thereof shall at any time be adjudged bankrupt or have a receiving order for administration of his estate, made against him or shall take any proceedings for liquidation or composition under any bankruptcy Act or assignment of his effects of composition or arrangement for the benefit of his creditors or purport to do so, or if any application made under any Bankruptcy Act for the time being in force for the sequestration of his estate or if a trust deed be granted by him on behalf of his creditors.

OR

b) Being a Company, shall pass a resolution or the Court shall make an order for the liquidation of its affairs, or a receiver or Manager on behalf of the debenture holders shall be appointed or circumstances shall a rise which entitle the Court or debenture holders to appoint a receiver or Manager.

OR

c) Assigns, Transfers, Sublets or attempts to assign, transfer or sublet any portion of the work without the prior written approval of the BHEL.

d) Whenever BHEL exercises the authority to cancel the contract under these conditions, BHEL may have the work done by any means at the Contractor's risks and expenses provided always that in the event of the cost of the work so done (as certified by the respective area **AGM**) being less than the contract cost, the advantage shall accrue to BHEL and if the cost exceeds the money due to Contractor under the contract, the Contractor shall either pay the excess amount ordered by the respective area **AGM** or the same shall be recovered from the Contractor by other means.

e) In case BHEL carries out the work under the provisions of this condition, the cost to be taken into account in determining the excess cost to be charged to the Contractor under this condition shall consist of the cost of the materials, hire charges of tools and plants and / or labour provided by BHEL with an addition of such percentage to cover superintendence and establishment charges as may be decided by the respective area **AGM** whose decision shall be final and conclusive.

f) Labour engaged by the contractor should be disciplined & exhibit good behaviour in dealing with employees of BHEL. Any misbehaviour or conduct of any person engaged by the contractor is not good, contractor shall change that person immediately or else it may even lead to termination of the contract & security deposit will be forfeited as penalty.

**17. Cancellation of Contract In Part or Full for Contractor's Default:**

If the contractor:

a) makes default in carrying out the work as directed and continues in that state after a reasonable notice from the respective area **AGM** or his authorized representative:

b) fails to comply with any of the terms & conditions of the contract or after reasonable notice in writing with orders properly issued thereunder:

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

c) BHEL, May without prejudice to any other right or remedy which shall have accrued or shall accrue thereafter to BHEL CANCEL the contract as whole or in part thereof or c only such work order or items of work in default from the contract. Whenever BHEL exercises the authority to cancel the contract as a whole or part under this condition, BHEL may complete the work at the contractor's risk and cost (as certified by the respective area **AGM** which is final and conclusive) being less than the contract cost, the advantage shall accrue to BHEL. If the cost exceeds the money due to the Contractor under this contract, the Contractor shall either pay the excess amount ordered by the respective area **AGM** or the same shall be recovered from the Contractor by other means. In case BHEL carries out the work or any part thereof under the provisions of the conditions the cost to be taken into account in determining the excess cost to be charged to the Contractor under this condition shall consist of the cost of the materials, hire charges of tools and plant and/or labour provided by BHEL with an addition of such percentage to cover the superintendence and establishment charges as may be decided by the respective area **AGM** whose decision shall be final and conclusive.

**18. Termination of Contract on Death of Contractor:**

Without prejudice to any of the rights or remedies under this contract, if the Contractor dies, or if the firm IS dissolved or the company is liquidated, BHEL shall have the option of terminating the contract without compensation to the Contractor.

**19. Special Power to Termination:**

If at any time after the award of contract, BHEL shall for any reason whatsoever not require whole or any part of the work to be carried out the respective area **AGM** shall give notice in writing of the fact to the Contractor who shall have no claim to any payment of compensation or otherwise howsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not derive in consequence of the foreclosing of the work.

**20. Submission and Processing Of Bills:**

**Payment of Bills:**

1. 100% payment will be made after completion of work on pro-rata basis on acceptance and certification of bills by BHEL Engineer.
2. Payment shall be made against Certification by shop QC & OP&C.

The Contractor at the end of each month shall submit a bill in triplicate detailing the various items of work done during the month supported by the requisitions issued from time to time. The Contractor shall, once in every month, submit to the respective area **AGM** separately details of their claims for the work done by them up to and including the previous month which are not covered by their contract agreement in any of the following respects:

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

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- a) Deviation from the items provided in the contract documents.
- b) Extra items / new items of work.
- c) Items in respect of which rates have not been settled. He should in addition furnish a clear certificate to the effect that the claims submitted by him as aforesaid cover all his claims and that no further claims shall be raised by him in respect of the work done up to and including the period under report.

**21. Along with bills, Contractors has to furnish copy of the following documents for further processing of bills:**

- a) Documentary proof for payment of PF/ESI with individual names to be submitted.
- b) Copy of payment challan of previous Month / Quarter as proof of deposit of Service Tax along with a certificate from the Contractor that tax collected from BHEL has been remitted to tax authorities.
- c) Any other relevant document which is required from time to time as per BHEL requirement.
- d) If the Contractor is not registered then a declaration shall be submitted along with offer that they are within the threshold limit.

**22. Recovery from Contractor:**

Whenever under the contract, any sum of money, shall be recoverable from or payable by the Contractor, the same may be deducted from or any sum then due or which at any time thereafter may become due to Contractor under the contract or under any other contract with BHEL or from his Security Deposit or he shall pay the claim on demand.

**23. Post- Technical Audit of Work and Bills:**

BHEL reserves the right to carry out the post-payment Audit and technical examination of the work and final bill including all supporting vouchers, abstracts etc., and enforce recovery of any sum becoming due as a result thereof in the manner provided in the presiding sub- paragraphs. However no such recovery shall be enforced after three years of passing the final bill.

**24. Refund of Security Deposit:**

The Security Deposit mentioned in condition 10 above may be refunded to the Contractor after a period of 6 months on termination or expiry of the contract provided always that the Contractor shall first have been paid the last and final bill and have rendered a "NO DEMAND CERTIFICATE".

**25. Force Majeure Clause:**

If, at any time during the continuance of this Contract the performance in whole or in part by either party of any obligations under this Contract shall be prevented or delayed by reason of any War, Hostile acts of the public enemy Civil Commotion, Epidemics, or Acts of God (Floods, Storm/Cyclone, Hurricane, Earthquake etc. ) then provided notice of happening of any such event is given by either party to other within 7 days from the date of occurrence there for neither party shall by reason of such event be entitled

Contractor Signature

Contractor Seal

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**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

to terminate this Contract nor shall either party have any claim for damages against the other in respect of such non-performance and delay in performance under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist. If the performance in whole or part of any obligation under this Contract is prevented or delayed by reason of any such event, claims for extension of time shall be granted for periods considered reasonable by the Manager /Stores/Valves subject to prompt notification by the contractor.

**26. Arbitration:**

All disputes between the parties to the contract, arising out of or relating to the contract, other than those for which the decision of the respective area **AGM** or Accepting Officer or any other person is by the contract expressed to be final and conclusive shall after written notice by either party to the contract to the other party be referred to the sole Arbitration of GENERAL MANAGER or other Officer of BHEL appointed as Arbitrator, by the GENERAL MANAGER of BHEL in his sole discretion. Unless the parties otherwise agree, such reference shall not take place until after the completion, alleged completion or abandonment of the work of the determination of the contract. The venue of Arbitration shall be such a place or places, as may be fixed by the Arbitrator in his sole discretion. The award of the Arbitrator shall be final, conclusive and binding on both parties to the contract.

**27. Signing Of Contract:**

Each contract document shall be signed by the Contractor with his usual signature. Contract by partnership of Hindu Joint Family firm, may be signed in the FIRM'S name by one of the Partners or the Karta or Manager as the case may be or by any other duly authorised representative followed by the name and designation of the person so signing. Contract by a Company shall be signed with the name of the Company from a person authorised in this behalf and a power of attorney or other satisfactory proof, showing that the person signing the Contract documents on behalf of the Company is duly authorised to do so, shall accompany the contract.

**28. LIQUIDATED DAMAGES (LD)/PENALTY:**

If the contractor fails to complete the service/work as per terms & conditions of the order within the delivery schedule,

- a) LD shall be levied @ 0.5 % of the order value per week of delay or part thereof subject to a maximum of 10% of the full order value.
- b) In case of any change to the order value, the LD shall be @ 0.5 % of the revised order value per week of delay or part thereof subject to a maximum of 10% of the revised order value.

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

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**29. Biometric Entry/Exit System for Contract Workmen:**

1. The Entry/Exit of the contract workmen is to be regulated only through Biometric system.
2. The Contractor initially will be issued with a temporary gang pass for his/her contract workmen for a period of ten days.
3. The contractor should arrange photo coverage for all his/her workmen within the above stipulated time.
4. The contractor has to submit FORM-I for all his/her contract workmen. All the particulars required in FORM-I are to be provided by the contractor without fail.
5. The contractor should educate the contract workmen in registering the attendance through the system.
6. Whenever a contract workman migrates or leaves service, the contractor has to surrender the biometric card of the particular contract workman to Contract Cell with immediate effect.
7. If a contract workman having biometric card joins another contractor, the contractor who engages them, has to intimate contract cell along with the biometric card for switching over the contract workmen from the earlier contractor to the present contractor.
8. On completion of the work, the contractor has to surrender all the biometric cards immediately to the contract cell. Otherwise, an amount of Rs.100/- per card will be deducted from the final bill/security deposit of the contractor.
9. If any contract workmen lose his/her card, the contractor shall arrange a duplicate card for the workmen by paying an amount of Rs.100/-.
10. The Contractor is totally responsible for the biometric cards issued to his/her contract workmen.
11. The Contractor has to indemnify BHEL for all the damages and loses caused by his/her workmen.

**30. Common Terms and Conditions for Works Contract relevant to Safety:**

1. All the Contract employees should be trained on Safety and certified by Safety/BHEL New employees should undergo Safety Training before take up the work, without Safety Training no contract person is allowed to do any work.
2. Use of cell phones and other mobile electronic devices (including hands-free devices) in the work spot and during the operation of a vehicle in the BHEL premises is prohibited.
3. Contractor employees working on BHEL premises must wear appropriate personal protective equipment. Strict adherence to all required Personal Protective Equipment (Helmet, Safety Shoes and Goggles) are mandatory, specific PPE requirements will be based on job type or tasks performed.
4. Excessively loose-clothing, dhoti/Lungi is prohibited especially around rotating or moving equipment.

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

5. The contractors work area should be kept clean and orderly, free of clutter and trash, so that work may proceed in a safe and orderly manner. Tools should be safely positioned during use and promptly put away when no longer required.
6. Fire-fighting, emergency shutdown devices, and life-saving equipment, should not be blocked by the contractors and access to the path to this equipment should be maintained at all times.
7. Only approved equipment should be used in locations where flammable mixtures are present. A Hot Work Permit is required when open flames, or electric arcs are in the work area and while handling flammable materials.
8. Smoking is not allowed in work area.
9. BHEL operate under a comprehensive Emergency Response Plan.
10. Contractors should be aware of the site Emergency Response Plan and communicate that plan to all their employees.
11. It is recommended that the contractor should know & display the emergency phone numbers like Fire, Ambulance, Safety, Security etc. at their work area.
12. It is the responsibility of the contractor to understand and use the appropriate Work Permits and to verify any permit requirements at the location. Contractor must make necessary arrangements with their Representative to acquire appropriate authorization to perform those operations at the site.
1. Also the contract will be executed through other contractors and any additional cost incurred will be recovered from any of their dues.

### **31. FRAUD PREVENTION POLICY**

The Bidder along with its associate / collaborators / sub – vendors / consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about fraud or suspected fraud as soon as it comes to their notice”.

Fraud Prevention policy and List of Nodal Officers shall be hosted on BHEL website, vendor portals of Units / Regions intranet.

### **32. SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS / CONTRACTORS:**

Penal action can be initiated on the suppliers / Contractors in line with extant ‘Guidelines for Suspension of Business Dealings with Suppliers/ Contractors. The abridged version of extant ‘Guidelines for suspension of business dealings with suppliers/ contractors’ has been uploaded on <http://www.bhel.com> on “supplier registration page”.

### **33. RISK PURCHASE:**

a) In the event of any successful Tenderer’s failure to fulfil any of the tender / Contract obligations as per Contract / Agreement, BHEL may entrust the job to alternate vendor and get it completed to meet the BHEL requirement and additional expenditure, if any, including consequential cost viz., demurrage etc., will be fully recovered from the Contractor who failed to complete the job in line with the Contract.

b) The decision of BHEL with regard to the actual losses / consequential expenditure incurred by BHEL shall be final and binding on the Contractor.

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

## **PART-I (TECHNO COMMERCIAL BID)**

**ANNEXURE-ID**

**Name of Vendor:**

### **SPECIAL TERMS & CONDITIONS OF CONTRACT**

#### **1.0 CRITERIA FOR AWARD OF WORK:**

The evaluation of Offer for award of work shall be on the basis of "Total Cost to BHEL". Contract will be finalized based on Total Cost to BHEL for Item A & B Separately.

#### **2.0 FINALIZATION OF CONTRACT BY ADOPTING "REVERSE AUCTION":**

**2.1** "BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

**2.2** In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit „online sealed bid“ in the Reverse Auction. Non- submission of „online sealed bid“ by the bidder will be considered as tempering of the tender process and will invite action by BHEL as per extant guidelines in vogue.”

**2.3** The business rules for Reverse Auction (RA) are as follows:

- i) Technically and Commercially acceptable Bidders shall only be eligible to participate in the Reverse Auction.
- ii) BHEL shall engage the services of a Service Provider, who shall extend all necessary training and assistance before commencement of ON-LINE-BIDDING through Internet, at NO extra-cost to the Bidders.
- iii) Eligible Bidders shall be informed in writing, about the details of Service Provider, to enable Vendors to contact the Service Provider and get trained.
- iv) Event Date, Time, Start Price, Bid Decrement, Time-Extensions, etc. shall also be communicated through the Service Provider for compliance by Bidders.
- v) Vendors have to FAX the Compliance Form, before start of RA. Without furnishing the above Compliance Form, Bidders shall not be eligible to participate in the RA.

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

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vi) BHEL shall provide the calculation sheet through the Service Provider, which shall be helpful to arrive at "TOTAL COST to BHEL", like Packing and Forwarding Charges, Taxes and Duties, Freight Charges, Insurance, Service Tax and other loading factors (for non-compliance to BHEL Standard Commercial Terms and Conditions), for each of the Bidder, to enable them to fill in the price and keep it ready for inputting data during the RA.

vii) RA shall be conducted on a pre-determined Date and Time.

vii) At the end of RA, the lowest Bid Value will be known on the Network.

viii) Lowest Bidder has to FAX the Prescribed Format, duly filled in and signed in, as provided, on a case-to-case basis, to the Service Provider, within 24 Hours of RA without fail.

ix) Any variation between the ON-LINE Bid Value and the signed document will be considered as unethical the Tender process and will invite disqualification of Bidder, for further business dealings with BHEL as per the prevailing procedure.

Contractor Signature

Contractor Seal

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

**PART-II (PRICE BID)**

**ANNEXURE-II**

<b>A. CLEANING, DEGREASING, PICKLING&amp; PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY.</b>					
Sl. No.	Description of Work	UOM	Approx. Qty.	Offer Rate / UOM ( ₹ / UOM)	Offer Value ( ₹ )
A.1	Pickling of Ti wires	M	1500		
A.2	Pickling of Ti Tubes	No.	6000		
A.3	Cleaning of ID/ OD of Ti Tubes.	No.	2000		
A.4	Cleaning of Ti Wires	M	3000		
A.5	Pickling of Ti Plates / Ti Sheet	Sq.M	250		
A.6	Degreasing of Ti components / Sub assembly	Sq.M	450		
A.7	Degreasing of Ti Consumables	Kg.	100		
A.8	Pickling & Passivation of SS components.	Sq.M	1270		
A.9	Painting of CS Body / Assembly	Sq.M	300		
A.10	Cleaning of ID/OD of SS Tubes	No.	2300		
Total Offer value ( Without Taxes )( ₹ )					
Applicable Taxes ( ₹ )					
Total offer value ( Including Taxes ) ( ₹ )					
Contractor Signature					
Contractor Seal					

**NOTES**

**Name of Woks:** WORKS CONTRACT FOR CLEANING, DEGREASING, PICKLING& PASSIVATION OF TITATNIUM, STAINLESS STEEL COMPONENTS / CONSUMABLES AND PAINTING OF CS ASSEMBLY AT BHEL, TRICHY FOR 2016-17.

**Enquiry No:** BHEL: WCM: PICKLING & PASSIVATION: ATP / 04.04.2016

<b>B HEAT TREATMENT</b>					
Sl. No.	Description of Work	UOM	Approx. Qty.	Offer Rate / UOM ( ` / UOM)	Offer Value ( ` )
B.1	Heat Treatment of Tube Bundle Assembly	Assembly	8		
Total Offer value ( Without Taxes ) ( ₹ )					
Applicable Taxes ( ₹ )					
Total offer value ( Including Taxes ) ( ₹ )					

1. Rates should be quoted in figures and words and are to be identical, if not the prices in the words will be considered as correct and the same shall be valid and binding.
2. The rate quoted shall remain firm and valid for a period of one year and no extra payment will be reimbursed to the contractor by BHEL. Any increase of DA/ wages to the contract labor shall be absorbed by the contractor themselves during the period of contract.

Contractor Signature

Contractor Seal

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OP&C/ATP

PICKLING OF TITANIUM WELDING WIRE FOR ECDS

( $\varnothing$  0.8,  $\varnothing$  1.6 &  $\varnothing$  3 mm)

DATE: 07-05-2012

Procedure:

- 1 Clean the consumable surface thoroughly by emery sheet of grade 400. Minimum 16 passes (4 passes/sheet) and again be cleaned with Birla 3M emery for 6 times.
- 2 Clean the surface with spirit soaked lint-free white cotton cloth till no dirt is picked up. While doing this, the person who is doing the process has to use white lint-free cotton gloves to handle the wires.
- 3 Clean the surface with dry white cloth.
- 4 Place the wire in a vessel filled with pickling solution (of 15% Hydrofluoric Acid and remaining 85% of potable water) for 30 seconds. Then, the wire is taken out from the solution and rinsed with potable water followed by rinsing in de-mineralized water.
- 5 After the above operations, the pickled surfaces of the wire shall have GOOD SILVERY LUSTER COLOR. Absence of stains, dark stripes, patches, temper colours are indication of good pickling. It shall be checked by QC/BHEL.
- 6 Pickled wires shall not be touched with bare hand or in contact with any other surfaces. Preserve the wires in a lint-free white cloth.

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REFERENCE:- PR:CHEM:07-26 - dt. 07-06-2007

---

Approved By

*[Signature]*  
27/5/12  
(C. N. Ravi)  
BHEL/93

Prepared By

*[Signature]*  
07/05/2012

L.N. RAJASEKARAN  
Senior Manager / OP & C  
Advanced Technology Products  
BHEL, TRUCHY - 520 014.

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BHARAT HEAVY ELECTRICALS LTD.,  
TIRUCHIRAPPALLI-14

Doc. No: PR: CHEM:07-25  
Rev: 00  
Date: 16.05.2007  
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*5/1/2007  
Procedure for  
pickling*

### NUCLEAR PROJECTS/BARC PROCEDURE FOR PICKLING OF TITANIUM TUBE/PIPE AND PLATE EP FACES

Rev No	REV DATE	PREPARED	REVIEWED		APPROVED	
					BHEL	BARC
00	16-05-2007	<i>V. Rajasekharan</i> V.Rajasekharan Sr. Scientific Officer Plant Laboratory	<i>L. Gragori</i> L.Gragori Dy. Manager Plant Laboratory	<i>M. Antony Peter</i> M. Antony Peter SM Methods Welding ATP	<i>R. Easwaran</i> R. Easwaran Sr. DGM Plant Laboratory	<i>P. An. w</i> 22/5/07 C.N. RAO ENGINEER-G GOVT. OF INDIA DAE/BARC/INDIA BLDG. No. 28 & BHEL TIRUCHY - 620 014

CBF113664

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RECORD OF REVISIONS

Rev.No:	Date	Details of Revision	Remarks
00	16-05-2007	NEW PROCEDURE	---

CBF113864



**BHARAT HEAVY ELECTRICALS LTD.,  
TIRUCHIRAPPALLI -14**

Doc. No: PR: CHEM:07-25  
Rev: 00  
Date: 16.05.2007  
Page 3 of 5

1.0 SCOPE:

1.1 The following procedure explains the method for surface cleaning, pickling of Titanium Tube/Pipe and Plate EP surfaces.

2.0 DEGREASING:

2.1 The component shall be thoroughly swabbed with lint free cotton cloth soaked in Acetone or Sprit.

2.2 Cleaning shall be carried out till fresh portion of the white cloth does not pick up any soil from the surface of the component.

3.0 PICKLING:

3.1 The EP faces and near by surfaces up to minimum of 100 mm on both ID and OD side shall be pickled using the following acid mixture.

Nitric Acid	: 38 to 40 % v/v
Hydrofluoric Acid	: 3.5 to 4 % v/v
Water	: Remaining.

3.2 Tank made of stainless steel material only shall be used for the preparation of the above acid bath.

3.3 The period of Pickling shall be about 9 to 11 minutes at room temperature for First pickling and 4 to 6 minutes for second pickling.

3.4 Alternately, the pickling operation shall also be carried out by swabbing the above pickling solution, where the size and shape of the component is a constraint for immersion process.

CBF113564



**BHARAT HEAVY ELECTRICALS LTD.,  
TIRUCHIRAPPALLI -14**

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**4.0 RINSING AFTER PICKLING/DESCALING OPERATION:**

- 4.1 The component shall be thoroughly flushed with hot water having temperature  $\geq 70^{\circ}\text{C}$  water and cleaned well using lint free cotton cloth to get a bright metal surface.
- 4.2 After thorough rinsing with cold water, the rinsing does not show any free acidity when tested with Methyl Orange indicator (The rinsing do not show red color with indicator).

**5.0 RINSING WITH DEMINERALISED WATER:**

- 5.1 After rinsing with service water, the component shall be rinsed with DM water (Refer Para 9.0).
- 5.2 At the end of rinsing operation with DM water, the rinsing does not show opalescence with 1% w/v Silver Nitrate solution.

**6.0 INSPECTION:**

- 6.1 After completion of pickling operation, The pickled surfaces shall have good silvery luster colour, If not repeat the pickling operation (maximum of Two pickling operation allowed)

**7.0 PRESERVATION:**

- 7.1 The pickled surfaces shall not be touched by bare hand or in contact with any other surfaces
- 7.2 The component shall be packed in lint free cloth and polythene sheets to prevent shop floor contamination till taken for further welding operations.

**8.0 SAFETY PRECAUTIONS:**

- 8.1 All safety precautions shall be taken while handling the acids.
- 8.2 Rubber gloves, aprons, respirator and safety glasses shall be used by the personnel who are performing/ supervising the aforesaid operations.

CBF113664



BHARAT HEAVY ELECTRICALS LTD.,  
TIRUCHIRAPPALLI -14

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8.3 The entire operation shall be carried out in a clean room with ventilated area.

9.0 The quality of DM water for the rinsing operations shall be as follows:

- p<sup>H</sup> : 6.5 to 7.5
- Conductivity : Less than 10  $\mu$ s/cm.
- Chloride : Less than 0.5 ppm.

10.0 After pickling the welding shall be done with in 24 hours for auto welding and 36 hrs for manual welding.

11.0 Before welding the pickled surfaces shall be cleaned with good quality spirit (The spirit shall not leave any residue on a clean glass plate after evaporation).

12.0 A mockup shall be conducted through OPS to qualify the pickling procedure before applying it on jobs

13.0 REFERENCE:

The above operations are in line with reference given by ATP/welding methods

14.0 NOTE:

The pickling time, date, Duration, pickling solution composition, temperature of pickling shall be recorded.

\*\*\*\*\*

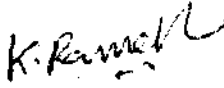

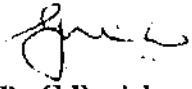

CBF113664



Bharat Heavy Electricals Ltd.,  
Tiruchirappalli -14

Doc. No: PR:CHEM:07-30:00  
Rev: 01  
Date:24-09-2009  
Page 1 of 4

### PROCEDURE FOR DEGREASING OF TITANIUM COMPONENTS & SUB-ASSEMBLIES

REV No	REV DATE	PREPARED	REVIEWED	APPROVED	
				BHEL	QS/BARC
01	24-09-2009	 K.Ramesh Assistant Engineer (Scientific)Gr-II Plant Laboratory	 V.Rajasekharan DM/ Plant Laboratory	 Dr.G.Ravichandran SDGM Plant Laboratory	 P. Anand 25/9/09 (C. V. Rao) Barc/PA



Bharat Heavy Electricals Ltd.,  
Tiruchirappalli -14

Doc. No: PR:CHEM:07-30:00

Rev: 01

Date:24-09-2009

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## RECORD OF REVISIONS

Rev.No:	Date	Details of Revision	Remarks
00	01-08-2008	New	---
01	24-09-2009	Clause 2.3 modified	As per instruction from BARC



**1.0 SCOPE:**

1.1 The following procedure details the methods for degreasing of titanium components & sub-assemblies and also removing the excess lubricant which remain on the interior surface of the tubes, after tube expansion

**2.0 FACILITIES**

2.1 Two storage tanks made of stainless steel material with controlled heating facility (one for cleaning chemical and other for DM water)

2.2 approved cleaning chemical, **MAXICLIN-2SP** (a proprietary alkaline degreasing chemical of M/S. Plastipeel chemicals & plastics PVT..LTD., Mumbai) or equivalent after approval by plant Laboratory.

2.3 The quality of DM water shall be checked before use and shall meet the following requirements :

- pH --- 6 - 7
- Total Residue --- < 2 ppm
- Total Chloride --- < 0.05 ppm
- Conductivity --- < 2µ Mho/cm

**3.0 CLEANING WITH ALKALINE DEGREASER:**

3.1 In the first tank , prepare the cleaning chemical solution . The Concentration of the bath shall be about 5% W/V of MAXICLINE -2SP

3.2 The temperature of the bath during the entire operation shall be maintained between 85°C and 90°C

3.3 The components shall be immersed in the hot bath solution of 5% W/V of MAXICLINE -2SP for 15 minutes. During dipping operation the bath shall be agitated using compressed air free from dust and oil. The components should be lifted and re-dipped periodically for further 15 minutes. The entire process shall be carried out along with three test coupons coated with oil & grease. After 30 minutes the test coupons shall be examined for the presence of oil and grease by water film break test. If the test is found to be OK, the component shall be lifted from the bath for flushing. Before lifting the components for flushing the froth / oil floated on the surface of the bath solution shall be skimmed off to avoid contamination



**4.0 FLUSHING**

- 4.1 The degreased component shall be flushed with service water till the flushing does not show any pink colour with Phenolphthalein.
- 4.2 Immediately after services water flushing, DM water shall be used for flushing till the flushing show no chloride when tested with silver nitrate

**5.0 DRAYING**

- 5.1 The DM water wetted surface shall be dried using oil and dust free compressed air or Nitrogen gas.

**6.0 DOCUMENTATION**

- 6.1 The degreasing process for the component pertaining to specific work order shall be suitably documented.

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BHARAT HEAVY ELECTRICALS LTD.,  
TIRUCHIRAPPALLI -14

Doc. No: PR: CIEM:07-26  
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Date: 07.06.2007  
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### NUCLEAR PROJECTS/BARC PROCEDURE FOR CLEANING OF TITANIUM WELDING WIRES

Rev No	REV DATE	PREPARED	REVIEWED		APPROVED	
					BHEL	BARC
00	07-06-2007	 V. Rajasekharan Sr. Scientific Officer Plant Laboratory	 I. Graguri Dy. Manager Plant Laboratory	 M. Antony Peter SM Methods Welding ATP	 R. Easwaran Sr. DGM Plant Laboratory	 C.N. Ravi ENGINEER-3 GOVT. OF INDIA BAE/BARC/WELDQA BLDG. NO: 204/BHC TIRUCHI - 620014

BARC approval for  
Annexure - 1 -



**BHARAT HEAVY ELECTRICALS LTD.,  
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**Doc. No: PR: CHEM:07-26  
Rev: 00  
Date: 07.06.2007  
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**RECORD OF REVISIONS**

<b>Rev.No:</b>	<b>Date</b>	<b>Details of Revision</b>	<b>Remarks</b>
00	07-06-2007	NEW PROCEDURE	---

9

9



1.0 SCOPE:

1.1 The following procedure explains the method for surface cleaning of Titanium Welding wires.

2.0 DEGREASING:

2.1 The welding wire shall be degreased as follows

2.2 The wire shall be degreased and pickled by the persons using white gloves only

2.3 General requirements:

2.3.1 The bath, hooks, tongs etc used for degreasing and pickling shall be made up of stainless steel material only

2.4 Degreasing solutions

- a) Sodium Phosphate 10 - 20 g/l  
Calcinated soda 10 - 20 g/l  
Caustic Soda 20 - 40 g/l.  
Balance - potable water. *SV*
- b) Cinatonol/Cintamid-5/Washing powder 5- 10g/l  
Trisodium Phosphate (Na<sub>3</sub>P<sub>04</sub>) 30 - 35 g/l  
Balance - potable water

2.5 The welding wire bundle has to be degreased using one of the solutions mentioned above.

2.6 The concentration of the above degreasing solutions bath

- a) Weight of the chemicals in gram  
b) Volume of water in litre

Shall be recorded before preparing solutions.

2.7 The welding wire bundle has to be dipped in the bath at 70 - 80°C for 20 - 30 min. After degreasing, to remove the chemicals lift the bundles using special hangers and wash with 40 - 50°C hot potable water (10 - 20 min) and then with cold DM water also, till the washings are free from chemicals.



2.8 After thorough rinsing with cold DM water, the rinsing does not show any free alkalinity with Phenolphthalein indicator (The rinsing should not show pink colour with the indicator).

2.9 Then dry the wire bundles using hot air.

2.10 Inspection & Acceptance:

2.11 The effectiveness of degreasing shall be ensured, by comparing the silvery lustre of the degreased wire with standard sample.

2.12 The degreased wire shall be used for welding after final cleaning with sprit and if the welding gives lustre silver colour, it is acceptable, if not the degreasing shall be repeated as above.

3.0 PICKLING:

3.1 If black patches (due to oxides and graphite grease) are found and also if temper colors indicative of surface oxidation are noticed on the filler wire, the wires should undergo pickling.

3.2 The welding wire bundle shall be pickled using the following acid mixture.

Hydrofluoric Acid	: 15 % v/v
Potable Water	: Remaining.

The concentration of the above pickling solutions bath,

a) Volume of the Hydrofluoric Acid in liter

b) Volume of water in litre

Shall be recorded before preparing solutions.

3.3 Tank made of stainless steel /polyvinyl or similar material shall be used for the preparation of the above acid bath.



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3.4 The welding wire bundle has to be immersed in the above bath at room temperature (18 -25°C) for 8 - 15 min. (depending on wire surfaces)  
Minimum consumption of pickling solution will be one liter per 2 kg of wire

**4.0 RINSING AFTER PICKLING OPERATION:**

4.1 The welding wire bundle shall be thoroughly flushed with potable water.

4.2 After thorough rinsing with cold water, the rinsing does not show any free acidity when tested with Methyl Orange indicator (The rinsing should not show red color with indicator).

**5.0 RINSING WITH DEMINERALISED WATER:**

5.1 After rinsing with service water, the component shall be rinsed with DM water (Refer Para 9.0).

5.2 At the end of rinsing operation with DM water, the rinsing does not show opalescence with 1% w/v Silver Nitrate solution.

**6.0 INSPECTION:**

6.1 After completion of pickling operation,  
6.2 The pickled surfaces shall have good silvery luster color.

6.3 Absence of stains, dark stripes, patches, temper colours are indication of good pickling.

6.4 Hydrogen (%) content shall be checked before and after pickling. If the (%) of Hydrogen exceeds ~~0.002~~ to 0.0024, Vacuum degassing shall be done as per the procedure for Vacuum degasification.

**7.0 PRESERVATION:**

7.1 The pickled surfaces shall not be touched with bare hand or in contact with any other surfaces

7.2 Welding wire bundle shall be packed in lint free cloth and polythene sheets to prevent shop floor contamination till



they are taken for further welding operations.

7.3 The wire bundles shall be stored in a closed dry PVC/SS containers with proper identification tag

8.0 SAFETY PRECAUTIONS:

8.1 All safety precautions shall be taken while handling the acids.

8.2 Rubber gloves, aprons, respirator and safety glasses shall be used by the personnel who are performing/ supervising the aforesaid operations.

8.3 The entire operation shall be carried out in a clean room with ventilated area.

9.0 The quality of DM water for the rinsing operations shall be as follows:

p <sup>H</sup>	: 6.5 to 7.5
Conductivity	: Less than 10 $\mu$ s/cm.
Chloride	: Less than 0.5 ppm.


10.0 REFERENCE:

The above operations are in line with reference given by ATP/welding methods

11.0 NOTE:

The pickling time, date, Duration, pickling solution composition, temperature of pickling shall be recorded.

\*\*\*\*\*

	<b>BHARAT HEAVY ELECTRICALS LTD., TIRUCHIRAPPALLI-14</b>	<b>Doc. No: PR: CHEM:07-26</b> <b>Date: 10.01.2015</b> <b>Page 1 of 2</b>
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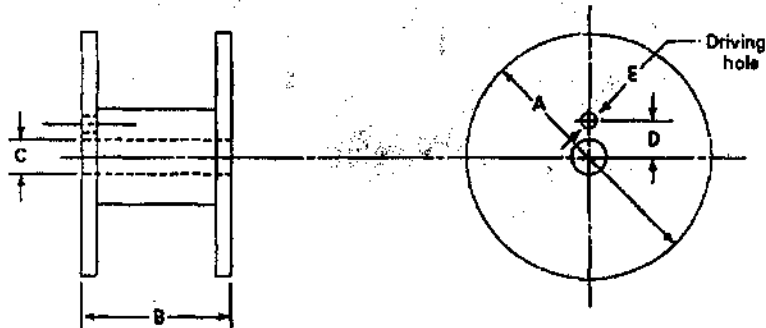
## Annexure I

### PROCEDURE FOR SPOOLING AND PACKAGING OF TITANIUM WELDING WIRES

- 1.0 **Spooling of degreased filler wires**
- 1.1 Clean the machine thoroughly and ensure the parts of the machine that will come in contact with the degreased filler wire are free from dust, oil, grease, lubricants and any other impurities that will contaminate cleaned wires.
- 1.2 Use SS rollers in the machine during straightening and spooling of Titanium wires.
- 1.3 Straighten the wire to remove any bend, kink and then wind the wires to spools.
- 1.4 Wind the wires uniformly layer by layer on the PVC Spool. After winding, tie up the spools using same wire at four places.
- 1.5 Wire after straightening and winding shall be free from sliver, depressions, scratches, scale, seams, laps and foreign matter that would adversely affect the welding characteristics, the operation of welding equipment, or the properties of the weld metal.
- 1.6 The weight of the wire in the spool shall be 0.25 kg for dia. 0.8mm wire, 2kg for dia.1.6mm wires and 3 kg for all the remaining dia. of the wires. The bare wire of diameter 0.8mm to be spooled on 100mm spool, of 1.6mm and 3mm to be spooled on 300mm spool. Detailed dimensions of spools are given in Fig.1.



FIG. 1 STANDARD SPOOLS – DIMENSIONS OF 4, 8, 12, AND 14 IN. (100, 200, 300, AND 350 MM) SPOOLS



	Dimensions									
	4 in. (100 mm) Spools		8 in. (200 mm) Spools		12 in. (300 mm) Spools		14 in. (350 mm) Spools			
	in.	mm	in.	mm	in.	mm	in.	mm		
A	Diameter, max. [Note (1)]		4.0	102	8.0	203	12	305	14	355
B	Width		1.75	46	2.16	56	4.0	103	4.0	103
	Tolerance		±0.03	+0, -2	±0.03	+0, -3	±0.06	+0, -3	±0.06	+0, -3
C	Diameter		0.63	16	2.03	50.5	2.03	50.5	2.03	50.5
	Tolerance		+0.01, -0	+1, -0	+0.06, -0	+2.5, -0	+0.06, -0	+2.5, -0	+0.06, -0	+2.5, -0
D	Distance between axes		...	...	1.75	44.5	1.75	44.5	1.75	44.5
	Tolerance		...	...	±0.02	±0.5	±0.02	±0.5	±0.02	±0.5
E	Diameter [Note (2)]		...	...	0.44	10	0.44	10	0.44	10
	Tolerance		...	...	+0, -0.06	+1, -0	+0, -0.06	+1, -0	+0, -0.06	+1, -0

2.0 Packing of filler wires

- 2.1 Ensure the spooled wires and packing materials are 100% free from dust, oil, grease, moisture and other contaminants.
- 2.2 The individual spools shall be put in a white polythene sheet bag and tightly air sealed to avoid moisture and foreign material contamination. The thickness of polythene sheet shall be 175 (+/-25) microns.
- 2.3 The sealed bags shall be packed in suitable card board boxes, tightly closed and shall withstand handling.
- 2.4 The following information shall be printed on each spool rim and each box.

Specification/ Grade of wire  
Size of wire  
Batch Number of consumable  
Weight of spool.

*Krishna*  
*Contract*

Prepared by  
MW/ATP

Approved by  
MW/ATP

*V. Anbazhagan*  
V. ANBAZHAGAN  
DGM (MW)




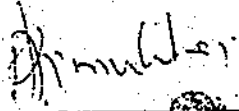
BHARAT HEAVY ELECTRICALS LIMITED  
TIRUCHIRAPALLI - 620 014

PLANT LABORATORY

PR:CHEM:07-19/01

PAGE :01 OF 05

NUCLEAR PROJECTS/BARC  
PROCEDURE FOR  
CLEANING, PICKLING/DESCALING AND PASSIVATION OF  
STAINLESS STEEL (AUSTENITIC) COMPONENTS

REV	DATE	PREPARED	REVIEWED	APPROVED	
				BHEL	BARC
01	21-04-99	 A. SUNDARARAJU	 M. SOMU	 R. EASWARAN	 21-04-99

(2)

I/III HX

Revisions

Rev.No.	Clause revised	Details
01	11.0	Quality of DM water changed.

1.0 SCOPE:

1.1 The following procedure explains the method for surface cleaning, pickling/ descaling and passivation of stainless steel (austenitic) components.

2.0 CLEANING:

2.1 The component shall be thoroughly swabbed with lint free cotton cloth soaked in Acetone.

2.2 Cleaning shall be carried out till fresh portion of the white cloth does not pick up any soil from the surface of the component.

3.0 PICKLING/DESCALING:

3.1 The components which have undergone machining operation shall be waived from the pickling/descaling operation.

3.2 The components which have undergone heat treatment (solution annealing)/ welding operations shall be pickled/ descaled so as to remove the black/brown oxide, using the following acid mixture.

Nitric Acid	: 20 % v/v
Hydrofluoric Acid	: 1 to 2 % v/v
Water	: Remaining.

3.3 Tank made of stainless steel material only shall be used for the preparation of the above acid bath.

3.4 The period of immersion shall be about 1 hr. or till all the black/brown oxide on the component is removed.

3.5 The component shall be periodically scrubbed with SS wire brushe to easen the removal of oxide layer.

3.6 The pickling/descaling shall also be carried out at 50 to 55°C, depending up on the adherence of the oxide layer.

3.7 Alternately, the pickling/descaling operation shall also be carried out by applying an inert paste prepared using the above pickling solution, where the size and shape of the component is a constraint for immersion process.

#### 4.0 RINSING AFTER PICKLING/DESCALING OPERATION:

- 4.1 The component shall be thoroughly flushed with service water and cleaned well using lint free cotton cloth to get a bright metal surface.
- 4.2 After thorough rinsing, the rinsings do not show any free acidity when tested with Methyl Orange indicator (The rinsings do not show red colour with indicator).

#### 5.0 RINSING WITH DEMINERALISED WATER:

- 5.1 After rinsing with service water, the component shall be rinsed with DM water (Refer para 11.0).
- 5.2 At the end of rinsing operation with DM water, the rinsings do not show opalescence with 1% w/v Silver Nitrate solution.

#### 6.0 PASSIVATION :

- 6.1 The passivation of the component shall be carried out by immersion process in a bath of Nitric Acid.
- 6.2 The concentration of the bath shall be as follows :

Nitric Acid : 20% v/v  
Sodium dichromate : 5% w/v (For machined components only)  
Demineralised Water : Remaining

- 6.3 Tank made of stainless steel material only shall be used for the preparation of this acid bath.
- 6.4 Period of immersion shall be 30 minutes to one hour or till the passivity of the surface is attained, which is revealed by passivity test using passivity test kit.
- 6.5 Alternately, passivation operation shall also be carried out by applying an inert paste prepared using the above bath solution, where the size and shape of the component is a constraint for immersion process.

#### 7.0 RINSING AFTER PASSIVATION:

- 7.1 The component shall be thoroughly rinsed with DM water (Refer Para 11.0).
- 7.2 The rinsing operation shall be carried out till the rinsings do not show any free acidity when tested with Methyl Orange indicator as indicated in Para 4.2.

8.0 INSPECTION:

8.1 After completion of passivation operation, passivity check shall be conducted on the surface at random using "Passivity Test Kit".

8.2 If passivation is found satisfactory, the component/ areas where the test had been carried shall be rinsed with DM water and dried using compressed air free from oil, dust and moisture.

9.0 PRESERVATION:

9.1 The component shall be handled using clean cotton gloves.

9.2 The component shall be packed in polythene sheets to prevent shop floor contamination till taken for further operations.

10.0 SAFETY PRECAUTIONS:

10.1 All safety precautions shall be taken while handling the acids.

10.2 Rubber gloves, aprons, respirator and safety glasses shall be used by the personnel who are performing/ supervising the aforesaid operations.

10.3 The entire operation shall be carried out in a ventilated area.

11.0 The quality of DM water for the rinsing operations shall be as follows :

- pH : 6.5 to 7.5
- Conductivity : Less than 10  $\mu$ s/cm.
- Chloride : Less than 0.5 ppm.

12.0 REFERENCE:

The above operations are inline with ASTM A 380.

13.0 NOTE:

The exact method for pickling/descaling and passivation operations (either immersion or paste application) to be adopted for specific component shall be agreed upon between BHEL and BARC and the same shall be incorporated in the relevant OPS along with the procedure document number.



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Date: 17.05.2009  
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*Procedure  
File*

### NUCLEAR PROJECTS/BARC PROCEDURE FOR PAINTING

Rev No	REV DATE	PREPARED	REVIEWED	APPROVED	
				BHEL	BARC
02	17-05-2009	<i>K. Remesh</i> K. Remesh Asst Engg Gr-I	<i>V. Rajasekharan</i> V. Rajasekharan Sr. Scientific Officer Plant Laboratory	<i>Dr. Ravichandran</i> Dr. Ravichandran Sr. DGM Plant Laboratory	<i>C.N. Ravi</i> C.N. Ravi Engineer-G



**BHARAT HEAVY ELECTRICALS LTD.,  
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Rev: 02  
Date: 17.05.2009  
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<b>Rev.No:</b>	<b>Date</b>	<b>Details of Revision</b>	<b>Remarks</b>
01	20-02-2009	Changes made to accommodate components of Nuclear projects/BARC	--
02	17-05-2009	Clause 2.5 modified	--



- 1.0 **SCOPE:**
- 1.1 The following procedure details the methods for pretreatment and painting of the exterior surface of components.
- 2.0 **PRETREATMENT:**
- 2.1 The component shall be inspected thoroughly prior to painting, to ensure that the surface is free from grease, oil and other external contaminants.
- 2.2 The surface shall be thoroughly cleaned using solvents like Acetone/ Trichloroethylene/Petroleum solvents.
- 2.3 The inspection shall be carried out for the total removal of grease/ oil by water film break test (Water film break test is performed by wetting the surface with water and observing the pattern of wetting).
- 2.4 The areas, where the water is not uniformly wetting and shattering into tiny droplets, shall be further cleaned with *alkaline degreasing agent*.
- 2.5 After complete degreasing, the surface shall be rinsed with water till the surface is free of alkali and dried. Water film break test shall be further conducted to ensure the total removal of grease/oil.
- 2.6 In addition to the above, the cleaned area shall be wiped with white cotton cloth soaked in Acetone, particularly in areas where non-destructive examination had been carried out; the cloth shall not show any soil or dirt.
- 2.7 The substrate shall be further cleaned using power tool/ emery paper etc.
- 2.8 The surface shall be cleaned to remove any soil left after power tool cleaning using white cotton cloth soaked in Acetone.



**3.0 PAINTING:**

3.1 The first coat of heat resistant Aluminium paint which withstands a temperature of 400°C (Ref.clause 4.0) shall be applied by spray or brush, within 4 to 6 hrs. of power tool cleaning.

3.2 The paint film shall be allowed to cure for 48 hrs. in a day light.

3.3 The dry film thickness (DFT) shall not be less than 20 microns.

3.4 The second coat of the above paint shall be applied and allowed to cure for min: 24 hrs. in a day light.


3.5 The DFT of the two coats (cumulative) shall not be less than 40 microns.

**4.0 DETAILS OF PAINTS:**

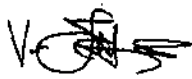

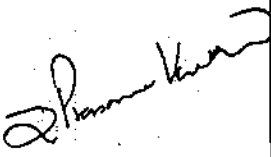

**4.1 Table -A**

Sl.No	Name of Supplier	Product details
01	M/s.Berger Paints	HR 47/ HR 123
02	M/s.Asian Paints	Apcotherm Product code 176 or 189
03	M/s.Star Paint Oil Industries.	Heatex 400
04	M/s.CDC Carboline	CDC 4674 HT
05	Jenson & Nicholson Paints.	Ferrotect HR 800

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	<b>BHARAT HEAVY ELECTRICALS LTD.,</b> <b>TIRUCHIRAPPALLI -14</b>	<b>Doc. No: PR:CHEM:07-02</b> <b>Rev: 02</b> <b>Date:02.06.2006</b> <b>Page 1 of 4</b>
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**NUCLEAR PROJECTS/BARC**  
**PROCEDURE FOR CLEANING OF TITANIUM AND OTHER TUBE SURFACES**  
**DURING MANUFACTURING AND ASSEMBLY**

REV No	REV DATE	PREPARED	REVIEWED	APPROVED	
				BHEL	BARC
02	02-06-2006	 V. Rajasekharan Sr. Scientific Officer Plant Laboratory	 L. Gragori Dy. Manager Plant Laboratory	 S. Prasana Venkatesan Sr. Manager Plant Laboratory	 (C. N. Ram) BARC/QA

To Mr. Ramasamy SBE/OP&E/ATP



BHARAT HEAVY ELECTRICALS LTD.,  
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Doc. No: PR:CHEM:07-02  
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Date:02.06.2006  
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RECORD OF REVISIONS

Rev.No:	Date	Details of Revision	Remarks
01	20-02-1999	Changes made to accommodate all components of Nuclear projects/BARC.	---
02	02-06-2006	Title changed for Titanium tubes. Editorial corrections made in clause 2.4. New clause added 2.12	--



**BHARAT HEAVY ELECTRICALS LTD.,  
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Date:02.06.2006  
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- 1.0           **SCOPE:**
- 1.1           The following procedure details the methods for handling and cleaning of Titanium and other tube surfaces during manufacturing and assembly.
- 2.0           **CLEANING OPERATION:**
- 2.1           The cleaning operation shall be carried out in a well protected, clean area earmarked for this activity, as mentioned in the respective OPS's.
- 2.2           All personnel handling the tubes shall wear clean, unsoiled white cotton gloves.
- 2.3           Before manufacturing operations (coiling, bending etc.), the tubes shall be taken, one by one from the box.
- 2.4           The interior (after removal of end caps) and exterior surfaces of the tubes shall be cleaned to its entire length using lint free cotton cloth soaked in Acetone. Alternatively, the ID of the tube can also be cleaned by blowing acetone soaked sponge piece with Nitrogen two three times.
- 2.5           The cleaning shall be continued till fresh portion of the white cloth does not pick up soil from the surface of the tubes.
- 2.6           The tubes after cleaning shall be end capped and properly covered with clean polythene sheets until taken up for further process either inside or outside the protected area.
- 2.7           All tools and surfaces of machineries, which come into contact with tube surface during manufacturing operations, shall be cleaned by swabbing with lint free cotton cloth soaked in Acetone. Swabbing shall be continued till fresh portion of the white cloth does not pick up soil from the surface of the tools.
- 2.8           The tubes/tube bundles after completion of manufacturing operation shall be adequately covered with clean polythene sheets until taken for further operation.
- 2.9           During assembly making/formation, the surfaces that come into contact with tube surface shall also be cleaned as per clause



**BHARAT HEAVY ELECTRICALS LTD.,  
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- 2.10 Whenever the assembly is taken out of protected area, adequate protection shall be ensured to prevent external contamination by covering with clean polythene sheets and end caps.
- 2.11 Periodical inspection of cleaning and inter stage quality checks shall be carried out on all accessible areas while the assembly is taken out of the clean room and vice versa.
- 2.12 Before welding of tube to tube joint carryout grinding with abrasive paper for a length of 20 mm on both ID/OD of tubes at the ends and wipe with acetone.

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**ADVANCED TECHNOLOGY PRODUCTS**  
**OPERATION PLANNING AND CONTROL**

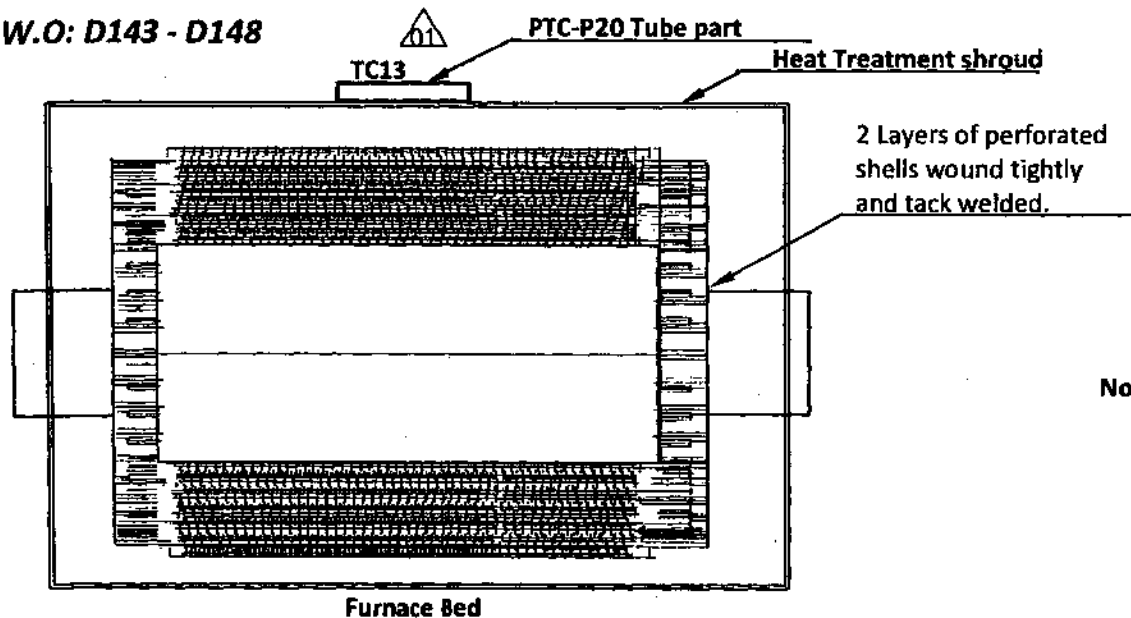
**Heat Treatment plan for Outer Pipe Coil Assy**

Heat Treatment cycle						Details
<p>Note: 1) No thermocouple should cross 675°C at any time.                  2) Maximum rate of heating above 300°C is 15 - 45°C/Hr.                  3) Cooling inside furnace with door closed and power off condition up to 250°C and record the temp. Then open the furnace door and cooling up to RT                  4) At 300°C merge all thermo couples with in 20°C.                  5) Rate of heating up to 300°C shall not be more than 100°C/Hr.                  6) During heating above 300°C the difference between TC1&amp;TC3) and(TC9&amp;-TC11 shall be less than 50°C                  7) Soaking shall be started when difference between TC1&amp;TC3 and TC9&amp;TC11 become less than 15°C                  8) <math>T_{avg} = (TC1+TC3+TC9+TC11)/4 = 660+15^{\circ}C</math></p>						Work Order
						D143-148
						Applicable for
						1)OPS bundle assy 2)PTC-P12 Tube +Tube weld 3)PTC-P20 tube part
Reference Drawing No						
0-00167 (W.O D143-144)						
0-00285(W.O D145-148)						
Material						
Ti Alloy-PT-7M						
Rev No	Date	Nature of revision	Prep BHEL	Appd BHEL	Appd BARC	<p><b>BHARAT HEAVY ELECTRICALS Ltd</b></p> <p align="center"><b>HTP:SGB2:026</b></p>
00	22-07-2014	Fresh	Vinayachandran	K.Ramasamy	C.N.Ravi	
01	12-08-2014	PTC-P20 Tube part details added in page-2/4	<i>Vinay</i>	<i>K.Ramasamy</i>	<i>Ravi</i> 12/8/14	

**ADVANCED TECHNOLOGY PRODUCTS**  
**OPERATION PLANNING AND CONTROL**

**Loading Plan For Outer Pipe Coil Assembly (HTP No:- HTP:SGB2:026)**

W.O: D143 - D148



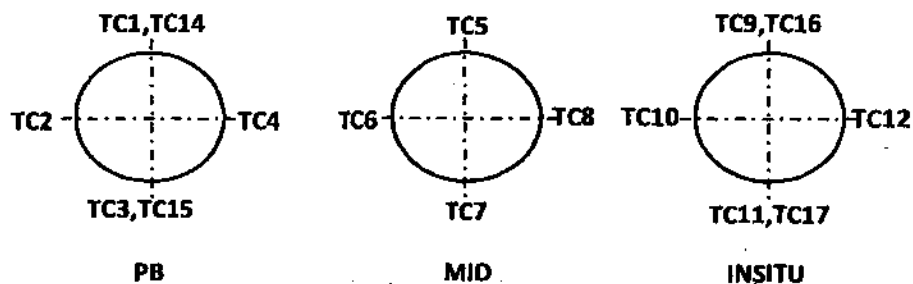
**Applicable for**

- 1) OPS bundle assy
- 2) PTC-P12 Tube + Tube weld
- 3) PTC-P20 tube part

**Note:**

- 1) Rotate the bundle such that 8° lies on 45° orientation of the shroud to get heating coil full heat.
- 2) TC1 to TC12 are on 12th row of OD of bundle
- 3) TC13 on PTC tubes
- 4) TC14 to TC17 are to be kept near by TC1, TC3, TC9 & TC11 as stand by.
- 5) Additional heating coils are to be used as per regular practice

**TCs on OD of tubes of 12th row**



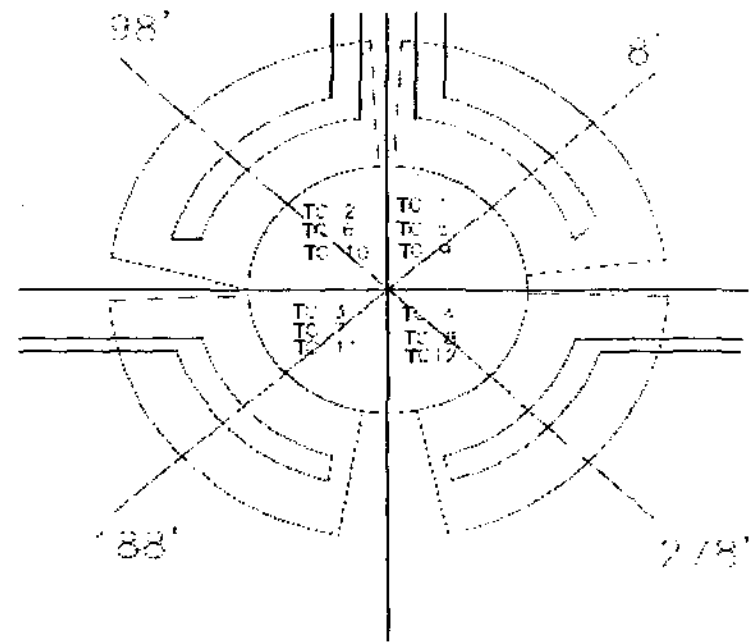
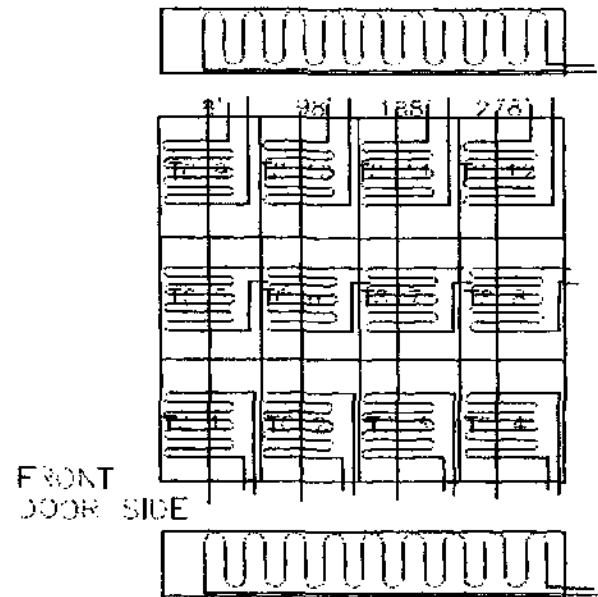
*Ravi*  
12/08/14

*Chiray*  
12/08/14

# OUTER COIL BUNDLE HEAT TREATMENT - HEATING COIL LAYOUT

**HT PLAN No: HTP:SGB2:026**

- > Furnace heating along with heating coil heating
- > Heating coil will be used to control specific one thermcouple piont



TC 1	STAND BY
TC 2	TC 14
TC 3	TC 19
TC 4	TC 26
TC 11	TC 17

*Handwritten signature*  
 12/18/14

1. Furnace heating of four sides (two side wall, top and bottom) along with subcontractor heating coils-12 coils in 12 segments and each one coil at back and front to be engaged.
2. All heating coils outlets (two ends) to be taken out securely passing through tack welded Nut to the wrapping sheet and to prevent sliding of coil ends during heating cycle.
3. Heating coil to power cable connection to be done with bolt & nuts instead of twisting the terminals for connections.
4. Thermo Couple leads and heating coil cables are to be laid separately without crossing each other.
5. All heating coil laying, heating coil connection to control box, thermocouple connections to Job and recorder to be thoroughly checked from start to end.
6. Door closing to be done two times and to be checked to free fouling of heating coils and thermocouples and to be ensured no damage of them.
7. Glass wool to be placed wherever required to separate coils.
8. Looping of heating coil neutral to be eliminated and direct power cable to be connected.
9. Heating coils of 10-gauge thickness of 34 M to be used in all segments.
10. Both sub contracting and BHEL heat treatment crews (same persons) to be engaged through out the cycle more than 24 hours.
11. As usual ATP executives are to be put in shifts to monitor HT cycle.
12. Current rating of coils used to be 100 Amps capacity.
13. Furnace Temperature to be set at Maximum 675 deg. C.
14. Furnace temperature at soaking to be of range 660 deg. C  $\pm 15/-0^{\circ}\text{C}$

*K. Ranjey*  
24/7/14

Note 14 to be checked

*Ran*  
24/7/14



419-026

Scope of Work

Item Sl no.	Scope of Work	W.O.	Lot Qty.	Place of Work
10	<ol style="list-style-type: none"> <li>1) HT shall be carried out as per given heat treatment plans.</li> <li>2) Job will be loaded in Electrical furnace 166/WRI/Unit-II /Press shop and BHEL Personal will conduct main furnace Operations</li> <li>3) Sub-contractor has to operate the resistance pads synchronizing with main furnace heating rates.</li> <li>4) Necessary quantity of heating coils/pads, control units Insulation glass wools and tools are to be brought by sub-contractor.</li> <li>5) BHEL will Provide Power supply.</li> <li>6) All safety rules and wearing safety accessories are to be strictly followed.</li> <li>7) After conducting heat treatment, all arrangements are to be dismantled and given back as it was.</li> <li>8) Heat treatment are to be performed in the presence of QC/BHEL &amp; QS/BARC.</li> <li>9) All instructions given in HTP shall be strictly followed</li> <li>10) Drawings and HT plan shall be returned to OP&amp;C/ATP after HT cycle completion</li> </ol>	D144 to D148	Total 08 HTs	ATP Shop

*R. Ramasamy*  
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