



An ISO 9001  
Company

**Bharat Heavy Electricals Limited**  
(High Pressure Boiler Plant)  
Tiruchirappalli – 620014, TAMIL NADU, INDIA  
**PURCHASE/PSS/MM/MFG**

|                                                   |                                                                                                                               |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>TITLE: SUPPLY OF HSS BOLTS AND NUTS (HSFG)</b> | Phone: +91 431 257 7054<br>Fax : +91 431 252 0719<br>Email : <a href="mailto:sankars@bheltry.co.in">sankars@bheltry.co.in</a> |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                      |                                                |                                  |                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------|-------------------------------------------------------|
|                                                                                                                                                      | <b>Reference Number:</b><br>Enquiry 1901300199 | <b>Enquiry Date:</b><br>06.05.13 | <b>Due date for submission of quotation: 04.06.13</b> |
| You are requested to quote the Enquiry number & date and due date in all your correspondences. This is only a request for quotation and not an order |                                                |                                  |                                                       |

Sealed Tenders are invited for **Supply of HSS Bolts & Nuts (HSFG)** as per TDC:5:211/01 dt.19.04.12 enclosed.

BHEL commercial terms & conditions with Price Bid formats and all annexure can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units) Bharat Heavy Electricals Limited) under enquiry reference “1901300199 ”

Tenders should reach us before 14:00 hours on the due date  
Technical bid will be opened at 14:30 hours on the due date  
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present.

Yours faithfully,  
**For Bharat Heavy Electricals Limited**

The Senior Manager/Purchase/PSS/MM/MFG  
Bldg 24, BHEL, Tiruchirappalli-620014  
Ph: 0431- 257 7054, Fax: 0431- 2520719  
Email: [sankars@bheltry.co.in](mailto:sankars@bheltry.co.in)

**BHARAT HEAVY ELECTRICALS LIMITED**

( A Government of India Undertaking )  
 HIGH PRESSURE BOILER PLANT  
 PURCHASE DEPARTMENT - FOSSIL BOILERS  
 THIRUCHIRAPALLI - 620014  
 TAMILNADU (INDIA)

PHONE :2577257  
 GRAMS : BHARATELEC  
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 imanavalan@bheltry.co.in,

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| Enquiry No                                                                                                                  | Enquiry Date | Due Date for Quotation |
|-----------------------------------------------------------------------------------------------------------------------------|--------------|------------------------|
| 1901300199 - 27                                                                                                             | 06.05.2013   | 04.06.2013             |
| Please quote Enquiry No, Date and due date in all correspondences.<br>This is only a request for quotation and not an order |              |                        |

| Item | Description                                                                | Unit | Quantity   | Delivery Quantity | Schedule Date |
|------|----------------------------------------------------------------------------|------|------------|-------------------|---------------|
| 10   | 412402407000<br>HSS BOLT and NUT M24x70MM-TDC 5/211/<br>Rev 01/19.04.2012. | NO   | 3000.000   | 3,000.00          | 16.08.13      |
| 20   | 412402408000<br>HSS BOLT and NUT M24x80MM-TDC<br>5/211/Rev 01/19.04.2012   | NO   | 12000.000  | 2,000.00          | 16.08.13      |
|      |                                                                            |      |            | 2,000.00          | 16.09.13      |
|      |                                                                            |      |            | 2,000.00          | 15.10.13      |
|      |                                                                            |      |            | 2,000.00          | 15.11.13      |
|      |                                                                            |      |            | 2,000.00          | 16.12.13      |
|      |                                                                            |      |            | 2,000.00          | 16.01.14      |
| 30   | 412402409000<br>HSS BOLT and NUT M24x90MM-TDC<br>5/211/Rev 01/19.04.2012   | NO   | 145000.000 | 10,000.00         | 16.09.13      |
|      |                                                                            |      |            | 45,000.00         | 15.10.13      |
|      |                                                                            |      |            | 45,000.00         | 15.11.13      |
|      |                                                                            |      |            | 45,000.00         | 16.12.13      |
| 40   | 412402411000<br>HSS BOLT and NUT M24x110MM-TDC<br>5/211/Rev 01/19.04.2012  | NO   | 12000.000  | 3,000.00          | 16.09.13      |
|      |                                                                            |      |            | 3,000.00          | 15.10.13      |
|      |                                                                            |      |            | 3,000.00          | 15.11.13      |
|      |                                                                            |      |            | 3,000.00          | 16.12.13      |

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 The offers will be opened at 14.30 hrs on the due date of tender in the presence of  
 tenderers who have submitted their offer and who may like to be present for the tender  
 opening. Late and delayed offers are liable to be rejected.

**S. SANKARARAJAN**  
 Senior Manager  
 Purchase / PSS / MFG.  
 BHEL, TRICHY - 620 014.

Yours faithfully,  
 For **BHARAT HEAVY ELECTRICALS LIMITED**

*S. Sankararajan*  
 MANAGER / PURCHASE  
 (FOSSIL BOILERS)  
 Yours faithfully,



# BHARAT HEAVY ELECTRICALS LIMITED

( A Government of India Undertaking )  
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 THIRUCHIRAPALLI - 620014  
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|    |                                                                           |    |           |          |          |
|----|---------------------------------------------------------------------------|----|-----------|----------|----------|
| 50 | 412402412000<br>HSS BOLT and NUT M24x120MM-TDC<br>5/211/Rev 01/19.04.2012 | NO | 15000.000 | 3,000.00 | 15.10.13 |
|    |                                                                           |    |           | 6,000.00 | 15.11.13 |
|    |                                                                           |    |           | 6,000.00 | 16.12.13 |
| 60 | 412402413000<br>HSS BOLT and NUT M24x130MM-TDC<br>5/211/Rev 01/19.04.2012 | NO | 20000.000 | 4,000.00 | 16.08.13 |
|    |                                                                           |    |           | 4,000.00 | 16.09.13 |
|    |                                                                           |    |           | 4,000.00 | 15.10.13 |
|    |                                                                           |    |           | 8,000.00 | 15.11.13 |
| 70 | 412402414000<br>HSS BOLT and NUT M24x140MM-TDC<br>5/211/Rev 01/19.04.2012 | NO | 27000.000 | 7,000.00 | 16.08.13 |
|    |                                                                           |    |           | 5,000.00 | 16.09.13 |
|    |                                                                           |    |           | 5,000.00 | 15.10.13 |
|    |                                                                           |    |           | 5,000.00 | 15.11.13 |
|    |                                                                           |    |           | 5,000.00 | 16.12.13 |
| 80 | 412402415000<br>HSS BOLT and NUT M24x150MM-TDC<br>5/211/Rev 01/19.04.2012 | NO | 9000.000  | 1,000.00 | 16.08.13 |
|    |                                                                           |    |           | 2,000.00 | 16.09.13 |
|    |                                                                           |    |           | 2,000.00 | 15.10.13 |
|    |                                                                           |    |           | 2,000.00 | 15.11.13 |
|    |                                                                           |    |           | 2,000.00 | 16.12.13 |
| 90 | 412402416000<br>HSS BOLT and NUT M24x160MM-TDC<br>5/211/Rev 01/19.04.2012 | NO | 29000.000 | 2,000.00 | 16.09.13 |

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**S. SANKARARAJAN**  
 Senior Manager  
 Purchase / PSS / MFG.  
 BHEL, TRICHY - 620 014.

Yours faithfully,  
 For BHARAT HEAVY ELECTRICALS LIMITED

MANAGER / PURCHASE  
 (FOSSIL BOILERS)  
 Yours faithfully,



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9,000.00 15.10.13

9,000.00 15.11.13

9,000.00 16.12.13

## General Note:

01. Bidders should primarily be engaged in manufacturing similar item(s) and should have necessary manufacturing facilities to meet BHEL's quality & delivery requirement. Offers from traders / agents will not be considered.

02. The quotation shall be submitted as two part bids. Techno-commercial bid containing Technical details and all Commercial terms like Duties & Taxes, Delivery schedule, Payment terms (except price details), LD Clause, etc., and Check list for enquiry: Annexure I shall be put in a cover and super scribed TECHNO-COMMERCIAL BID AGAINST ENQUIRY NO. 1901300199 dt.06.05.13 due dt.04.06.13. Price bid containing price details shall be put in a separate cover and super scribed as PRICE BID AGAINST ENQUIRY NO. 1901300199 dt.06.05.13 due dt.04.06.13. Both the covers shall be put inside a larger envelope and this envelope shall be super scribed as TECHNO-COMMERCIAL BID AND PRICE BID AGAINST ENQUIRY NO. 1901300199 dt.06.05.13 due dt.04.06.13.

Note: Bidders are requested to submit their offers only through sealed bids. As the part II (the price bid) will not be opened before the technical evaluation is completed, bidders are requested not to submit their bids through email/fax etc.

03. Tenders should be free from CORRECTION AND ERASURES. Corrections if any must be attested; all amounts shall be indicated both in words as well as in figures. Where there is difference between amount quoted in words and figures, amount quoted in words shall prevail. No revision of prices will be entertained after tenders are opened. The quoted prices should remain firm till the execution of the orders.

04. The Tender should be addressed to "The Senior Manager, Purchase/PSS/MM/MFG, 4th Floor - Bldg. 24, Bharat Heavy Electricals Ltd., Tiruchirapalli-620014, Tamilnadu". Tender should not be addressed to any individual's name but only by designation.

05. Minimum five nos. samples of any length ? 160mm manufactured as per spec: TDC:5:211/01 dt.19.04.12 with all Test certificates as referred in clause 7 (page 4/4 of TDC:5:211/01 dt.19.04.12) are to be submitted along with the offer. Offers received without submission of samples and

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**S. SANKARARAJAN**  
Senior Manager  
Purchase / PSS / MFG.  
BHEL, TRICHY - 620 014.

Yours faithfully,  
For **BHARAT HEAVY ELECTRICALS LIMITED**

  
MANAGER / PURCHASE  
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Test certificates will be rejected.

06. Bidders, who are not currently on registered list of BHEL - HPBP Tiruchirapalli, need to submit duly filled format for "Vendor Registration Form (VRF)". This duly filled form is to be submitted along with the offer. The vendor registration form can be downloaded at [http://www.bhel.com/vender\\_registration/vender.php](http://www.bhel.com/vender_registration/vender.php) or can be requested at [sankars@bheltry.co.in](mailto:sankars@bheltry.co.in) or [kmanoj@bheltry.co.in](mailto:kmanoj@bheltry.co.in). Offers not accompanying VRF are liable for rejection in case of bidders not registered with BHEL - HPBP Tiruchirapalli.

07. Registered vendors with BHEL - HPBP Tiruchirapalli have to mention their vendor code. Registered vendors with any other unit of BHEL are also required to mention the vendor code given by respective BHEL unit along with photocopy of latest POs from BHEL unit & duly filled in Vendor Registration Form (VRF).

08. The bidder may also be an MSME vendor registered as per MSME act. The guidelines issued by government from time to time for engaging MSME vendor, will be applicable. Copy of MSME registration documents valid as on date duly certified by Notary public and current value of Land & Machinery duly certified by a chartered accountant to be enclosed along with the Techno-commercial bid.

09. For verification of data submitted towards evaluation of bidder's capability, BHEL may decide to visit the bidder(s) works. Any fact found deviating from submitted data shall make the bidder liable to be disqualified.

10. On the due date of tender opening, only the technical bids will be opened. Technical bids and samples will be evaluated by us and clarifications required, if any, will be called for from the bidders on technical and commercial points. The price bids of technically suitable bidders will be opened on a later date with prior intimation to techno-commercially suitable bidders. Evaluation of offers shall be on "Net Cash Outflow to BHEL basis" per item.

11. Indigenous Vendors:

- Delivery: Prices should be quoted on FOR / BHEL Stores, Tiruchirapalli basis only (inclusive of freight and transit insurance). Ex-works offers will be rejected.

- Payment: On satisfactory acceptance of materials at BHEL Tiruchirapalli, payment will be made after 45 days. Offers with Advance payment / LC / thro bank payment will be rejected.

- Packing Conditions: Materials (only one size) shall be packed in gunny bags as detailed in clause 6 of TDC:5:211/01 dt.19.04.12 with identification tag on the bag with details of Purchase Order No &

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Date; Name of supplier; Material Code; Description; Quantity & Wt.

Size M24x70 to M24x100 - 50 no's per bag;

Size M24x110 to M24x180 - 25 no's per bag.

## 12. Foreign Vendors:

- For the evaluation purposes, exchange rate (TT selling rate of SBI) as on schedule date of tender opening (Part I, i.e., techno-commercial bid, in case of two part bid) shall be considered.
- Delivery: Prices should be quoted on FOB nearest sea port / CFR-Chennai Port, Tamilnadu, India basis only. Offers with Ex-works / other delivery terms will be rejected.
- Payment: Payment will be made on Cash against documents basis, i.e., Payment will be made in 45 days from the date of submission of complete set of documents as specified in the PO at our bank. Requests for LC will be loaded at 1.5% of the basic charge during evaluation of offers. Further 1.6% will be loaded towards import related incidental costs.
- Packing: Materials shall be packed as detailed in clause 6 of TDC:5:211/01 dt.19.04.12 with identification tag on the bag with details of Purchase Order No & Date; Name of supplier; Material Code; Description; Quantity; Wt. & ensuring seaworthy packing to prevent damages or loss during the transit and storage.

13. Guarantee Certificate to be given for 18 months from the date of acceptance of materials.

14. The Bidder, in the event of an order, should furnish a Bank Guarantee from BHEL's consortium banks (List attached) or counter-guarantee by vendor's bank to BHEL's consortium banks, at no extra cost to BHEL, in a proforma prescribed by BHEL, provided along with the order, for an amount equivalent to 10% (Ten percent) of the value of the contract. The BG shall be valid for period of 18 months from the date of last shipment or 12 months from the date of receipt / acceptance / at BHEL, Tiruchirapalli whichever is later, with a claim period of two months.

15. BHEL reserves the right to increase or decrease the tendered quantity and split the tender quantity among more than one tenderer and place order accordingly in any proportion, based on commitment, requirement and supplier's capability in terms of delivery and quality.

16. In order to get uninterrupted supply, it is proposed to release order on more than one source for items with quantity more than 20,000 nos. by splitting the quantity in the ratio of 70:30 between L1 and L2/L3/L4/L5 vendors at matched L1 rate. If L2/L3/L4/L5 vendors do not match to L1 rate, then 30% quantity will also be ordered on L1 vendor.

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17. In the event of more than one vendor becoming L1 for any of the item / items, the enquiry quantity for those item / items will be shared equally among all the L1 vendors. For such item / items splitting will be done among L1 vendors alone and not as mentioned in the point no 16 above.

18. Inspection at vendor's works by BHEL / BHEL appointed agency / approved agencies and by BHEL at Tiruchirapalli on receipt.

19. Liquidated Damages (LD): Penalty and interest on advances for delay in delivery: If the Supplier fails to deliver within the period specified in the contract the Purchaser shall deduct liquidated damages a sum equivalent to 0.5% of the price for each week of delay up to a maximum of 15% of the price of the delayed undelivered goods.

20. Risk Purchase: Alternatively the purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated as aforesaid or if the same were not available, the best and the nearest available substitutes therefor. The supplier shall be liable for any loss, which the purchaser may sustain by reason of such risk purchases in addition to penalty at the rate mentioned in clause 19 above.

21. Offers should have a validity of minimum 90 days from the date of techno-commercial bid opening.

22. BHEL reserves the right to negotiate with L1 vendor or refloat the tender for items where, L1 price is not the lowest acceptable price.

23. The correspondence between the bidder and BHEL through email are considered as valid document

Legally though not signed. It is treated as valid confirmations made on behalf of the respective company and comes under the legal ambit of the business transaction and hence binding on both the parties.

24. Bidders participating in the tender should declare in their technical bid whether they have been black-listed / kept on hold / given Business holiday for a specified period by any Public Sector Undertaking or Government Departments. The reasons for such action with details and the current status of such hold shall be clearly furnished to BHEL. If no such details are mentioned in the offer, it will be construed that the bidder is not under any such hold. However, at a later date if it comes to the notice of BHEL about any such hold under enforcement, BHEL reserves the right to reject the offer at any point of time and also under any stage of the finalization of the tender. Such bidders will not

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be permitted to participate in the further tender proce

## Enclosures:

"LD clause has to be confirmed without fail."

"Payment to vendors will be made only thro E-Payment mode"

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Revision record: Rev 01, CI 2 Requirement if the Carbon content is below 0.6% - Added for Bolts, Mn for Nuts limited to 0.25 min instead of 0.25 max.  
CI 5 Hardness of Bolt & Nut: Acceptance values changed CI 7 Preservation and Packing added

**1. SCOPE:**

This technical delivery condition covers the requirements for the High strength structural steel bolts, Nuts and Washers applicable for boiler structures and shall be procured from the BHEL approved manufacturers only. The applicable Indian Standard Specification:

For Bolts IS: 3757. (Latest) Property class: 8.8 Product Grade C of IS Specification IS: 1367 (Latest).

For Nuts IS: 6623 (Latest) Property class: 8. Product Grade B

For Washers IS: 6649. (Latest). Type-A: Plain Hole Circular Washers. Grade: Ordinary

Size and Qty: As per the BHEL Purchase order (PO) / BHEL Drawing

The requirements of the above IS standard has been provided below which needs to be met mandatorily.

**2. RAW MATERIAL:**

**BOLTS and NUTS:** Carbon steel Bar; Rolled/Forged bar.

**Chemical composition:**

**BOLTS:** Carbon: 0.25-0.55; Phosphorus: 0.035 Max; Sulphur: 0.035 Max; Boron: 0.003 Max. In case of plain carbon boron steel with a carbon content below 0.25% (ladle analysis), the minimum Manganese content shall be 0.6%

**NUTS:** Carbon: 0.58 Max; Phosphorus: 0.06 Max; Sulphur: 0.15 Max; Manganese: 0.25 Min

**WASHERS:** Carbon: 0.40-0.50; Manganese: 0.6-0.9; Sulphur and Phosphorus not exceeding 0.06% in the check analysis

**Non Destructive Test:**

For sizes Diameter  $\geq 40$  mm: UT as per SA388 Acceptance: ASME SEC-VIII Div-II Part 3.3.4

For sizes Diameter  $< 40$  mm: MPI as per ASTM E 709 Linear indications like cracks, folds & other injurious defects are not acceptable

Traceability records for all the tests for the production lot shall be maintained for verification during Inspection.

**3. DIMENSIONS AND TOLERANCES:**

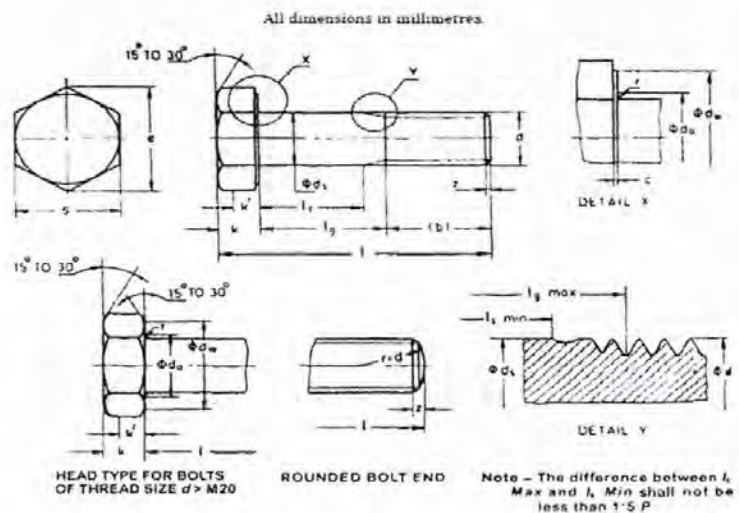
Process: Cold/Hot Forging with Dies and tools clean of loose scale and sheet particles.

Threads on the bolts shall be checked with a properly calibrated ring gauge with a tolerance class 6g.

Threads on the nuts shall be checked with a properly calibrated plug gauge with tolerance class 6H.

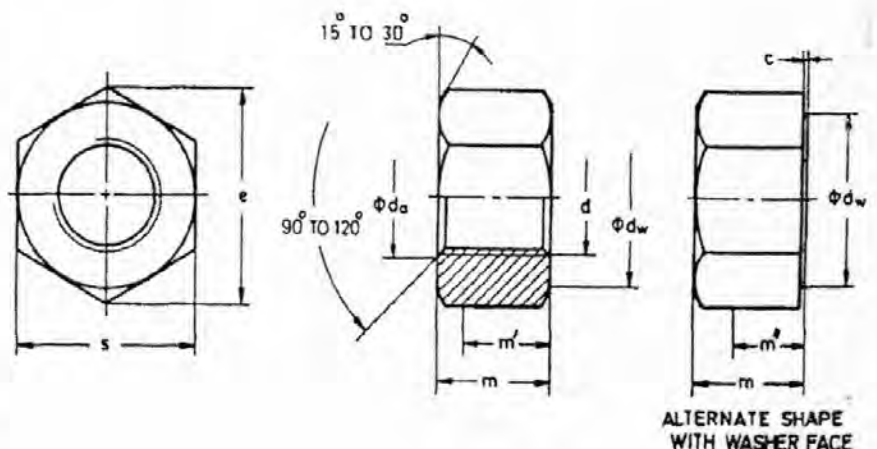
Dimensions of the Bolts shall be as per the Table below:

| Thread Size $d$                     | M24       |
|-------------------------------------|-----------|
| $p$ Pitch of thread                 | 3         |
| $b$ ref For length / Nom $\leq 100$ | 41        |
|                                     | 45        |
| $c$ Max                             | 0.8       |
|                                     | Min 0.4   |
| $d_n$ Max                           | 27.64     |
|                                     | Min 24.84 |
| $d_e$ Max                           | 24.84     |
|                                     | Min 23.16 |
| $d_w$ Max                           | $\varphi$ |
|                                     | Min 38.0  |
| $e$ Max                             | 45.20     |
|                                     | Min 41.0  |
| $k$ Nom                             | 15        |
|                                     | Max 15.90 |
|                                     | Min 14.10 |
| $k'$ Min                            | 9.9       |
| $r$ Min                             | 1.0       |
| $s$ Max                             | 41        |
|                                     | Min 40    |
| Chamfer length $\leq$ Max           | 4.5       |



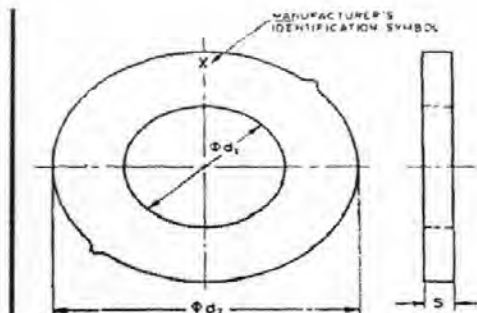
Dimensions of the Nuts shall be as per the Table below:

| Sl No. | Thread Size, $d$ | M 24      |
|--------|------------------|-----------|
| i)     | $p$              | 3         |
| ii)    | $d_n$ Max        | 25.9      |
|        | Min              | 24.0      |
| iii)   | $d_w$ Max        | $\varphi$ |
|        | Min              | 38.0      |
| iv)    | $e$ Max          | 45.20     |
|        | Min              | 41.0      |
| v)     | $m$ Max          | 24.2      |
|        | Min              | 22.9      |
| vi)    | $m'$ Max         | 18.3      |
|        | Min              | 16.0      |
| vii)   | $c$ Max          | 0.8       |
|        | Min              | 0.4       |
| viii)  | $s$ Max          | 41.0      |
|        | Min              | 40.0      |



Dimensions of the Washers shall be as per the Table below.

| Nominal size (thread size $d$ of associated bolt) |     | M24   |
|---------------------------------------------------|-----|-------|
| $d_1$                                             | Min | 26    |
|                                                   | Max | 26.52 |
| $d_2$                                             | Min | 48.4  |
|                                                   | Max | 50    |
| $s$                                               | Min | 3.4   |
|                                                   | Max | 4.6   |



#### 4. Post Forming Heat Treatment (HT):

Bolt: After forming: Normalize at 860°C, 30 minutes per inch, oil quenching, followed by tempering at 425°C minimum, 60 minutes per inch.  
Nut: Shall be hardened and then tempered at a temperature of 425°C minimum.  
Washer: Shall be hardened and tempered. Carburized washers are not permitted.

#### 5. CHEMICAL & MECHANICAL & NDE: on Heat Treated finished product.

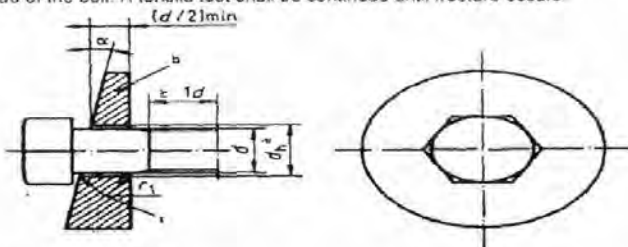
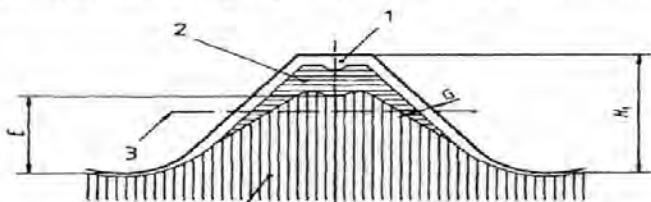
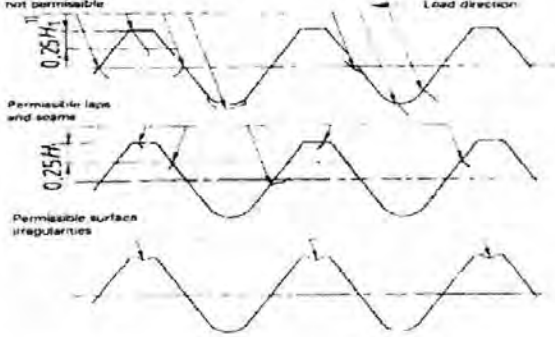
Sample Size for Chemical test: One per TC

Sample Size for Mechanical test: As per Sampling Plan

Sample Size for NDE: As per Sampling Plan

BOLT:

| Sl No             | Test                                                                                                                                                                               | Test Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Acceptance                                         |                                        |                                                                                                                      |   |    |   |   |   |     |                       |                                                           |                                                    |                                        |                       |      |               |     |             |     |                                                                             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| 1                 | Chemistry                                                                                                                                                                          | Spectro / Wet Analysis Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | As per CI 2.0 of this TDC.                         |                                        |                                                                                                                      |   |    |   |   |   |     |                       |                                                           |                                                    |                                        |                       |      |               |     |             |     |                                                                             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| 2                 | Hardness Test                                                                                                                                                                      | The head and end of the bolt are to be faced & Vickers Hardness measurements shall be made with 98N (or) 10kg load. Minimum 3 measurements to be made & reported.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| 3                 | Minimum Tensile Strength<br><br>*if wedge load test is satisfactory the axial tensile test is not required.<br><br>%Elongation on 5.65VA<br><br>% Reduction in Area after fracture | <p>Round specimen of size as given in Table 1 with fillet radius <math>r</math> as below :</p> <table><tr><th>Diameter <math>d</math> (mm)</th><th>Fillet radius <math>r</math> (mm)</th></tr><tr><td>20</td><td>4</td></tr><tr><td>10</td><td>4</td></tr><tr><td>5</td><td>1</td></tr></table> <p>Rate of stressing : 6 - 60 N/mm<sup>2</sup>/sec</p> <p><b>Table 1 — Circular cross-section test pieces</b></p> <table><tr><th><math>k</math></th><th>Diameter<br/><math>d</math><br/>mm</th><th>Original cross-sectional area<br/><math>S_0</math><br/>mm<sup>2</sup></th><th>Original gauge length<br/><math>L_0 = k\sqrt{S_0}</math><br/>mm</th><th>Minimum parallel length<br/><math>L_c</math><br/>mm</th><th>Total length<br/><math>L_1</math></th></tr><tr><td rowspan="3">5.65</td><td><math>20 \pm 0.15</math></td><td>314</td><td><math>100 \pm 1</math></td><td>110</td><td rowspan="3">Depends on the method of fixing the test piece in the machine grips<br/><br/>In principle:<br/><math>L_1 &gt; L_c + 2d</math> or <math>4d</math></td></tr><tr><td><math>10 \pm 0.075</math></td><td>78.5</td><td><math>50 \pm 0.5</math></td><td>55</td></tr><tr><td><math>5 \pm 0.040</math></td><td>19.6</td><td><math>25 \pm 0.25</math></td><td>28</td></tr></table> | Diameter $d$ (mm)                                  | Fillet radius $r$ (mm)                 | 20                                                                                                                   | 4 | 10 | 4 | 5 | 1 | $k$ | Diameter<br>$d$<br>mm | Original cross-sectional area<br>$S_0$<br>mm <sup>2</sup> | Original gauge length<br>$L_0 = k\sqrt{S_0}$<br>mm | Minimum parallel length<br>$L_c$<br>mm | Total length<br>$L_1$ | 5.65 | $20 \pm 0.15$ | 314 | $100 \pm 1$ | 110 | Depends on the method of fixing the test piece in the machine grips<br><br>In principle:<br>$L_1 > L_c + 2d$ or $4d$ | $10 \pm 0.075$ | 78.5 | $50 \pm 0.5$ | 55 | $5 \pm 0.040$ | 19.6 | $25 \pm 0.25$ | 28 | 830N/mm <sup>2</sup><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>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| Diameter $d$ (mm) | Fillet radius $r$ (mm)                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| 10                | 4                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| $k$               | Diameter<br>$d$<br>mm                                                                                                                                                              | Original cross-sectional area<br>$S_0$<br>mm <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Original gauge length<br>$L_0 = k\sqrt{S_0}$<br>mm | Minimum parallel length<br>$L_c$<br>mm | Total length<br>$L_1$                                                                                                |   |    |   |   |   |     |                       |                                                           |                                                    |                                        |                       |      |               |     |             |     |                                                                             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| 5.65              | $20 \pm 0.15$                                                                                                                                                                      | 314                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | $100 \pm 1$                                        | 110                                    | Depends on the method of fixing the test piece in the machine grips<br><br>In principle:<br>$L_1 > L_c + 2d$ or $4d$ |   |    |   |   |   |     |                       |                                                           |                                                    |                                        |                       |      |               |     |             |     |                                                                             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|                   | $10 \pm 0.075$                                                                                                                                                                     | 78.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $50 \pm 0.5$                                       | 55                                     |                                                                                                                      |   |    |   |   |   |     |                       |                                                           |                                                    |                                        |                       |      |               |     |             |     |                                                                             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|                   | $5 \pm 0.040$                                                                                                                                                                      | 19.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $25 \pm 0.25$                                      | 28                                     |                                                                                                                      |   |    |   |   |   |     |                       |                                                           |                                                    |                                        |                       |      |               |     |             |     |                                                                             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| 5 | <p>Strength under Wedge load test</p>                                                        | <p>Test for strength under wedge loading shall be carried out in a calibrated UTM / tensile testing equipment using a wedge as illustrated in below figure. The minimum distance from the thread run-out of the bolt to the contact surface of the nut of the fastening device shall be d.</p> <p>A hardened wedge in accordance with tables 10 &amp; 11 shall be placed under the head of the bolt. A tensile test shall be continued until fracture occurs.</p>  <p>Radius <math>r_1 = r_{\max} + 0.2</math><br/>in which, <math>r_{\max} = (d_{a\max} - d_{s\min}) / 2</math><br/>where <math>r</math> – radius of curvature under head ; <math>d_a</math> – transition diameter<br/><math>d_s</math> – diameter of unthreaded shank ; <math>\alpha = 6^\circ \pm 0^\circ 30'</math></p> <table border="1"><tr><td>a</td><td>Nominal Thread Diameter <math>d = 24</math> mm ;<br/>Hole Diameter <math>d_h = 26</math> mm</td></tr><tr><td>b</td><td>Hardness : 45 HRC min</td></tr><tr><td>c</td><td>Radius or Chamfer of <math>45^\circ</math></td></tr></table>                                                                                                                                                                                                                                                                                                                                     | a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Nominal Thread Diameter $d = 24$ mm ;<br>Hole Diameter $d_h = 26$ mm | b | Hardness : 45 HRC min | c | Radius or Chamfer of $45^\circ$ | <p>Strength under Wedge load test : <math>\leq 830\text{N/mm}^2</math></p> <p>The fracture shall occur in the shank or the Free threaded length of the bolt and not between the head and shank. The bolt shall meet the requirements for minimum tensile strength during wedge tensile testing</p> |
| a | Nominal Thread Diameter $d = 24$ mm ;<br>Hole Diameter $d_h = 26$ mm                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |
| b | Hardness : 45 HRC min                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |
| c | Radius or Chamfer of $45^\circ$                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |
| 6 | <p>Decarburization Test</p>                                                                  | <p>Determination of the following by MICROSCOPIC Method.</p> <p>a) Minimum Height of non decarburized thread zone - E<br/>b) Maximum depth of complete decarburization - G</p> <p>The specimens to be used are longitudinally sections taken through the thread axis approximately half a nominal diameter (1/2 d) from the end of the bolt, after all heat treatment operations have been performed on the product. The specimen shall be mounted for grinding &amp; polishing in a clamp or preferably, a plastic mount. After mounting, grind &amp; polish the surface in accordance with good metallographic practice. Etching to be done in a 3% Nital solution (concentrated nitric acid in ethanol). 200X min magnification shall be used for examination. If the microscope is of a type with a ground glass screen, the extent of decarburization can be measured directly with a scale. If an eyepiece is used for measurement, it should be of an appropriate type, containing a cross-hair or a scale. Also image may be captured &amp; decarburisation depth may be measured using Image Analysis System with proper calibration.</p>  <p>1 - completely decarburized<br/>2 - partially decarburized<br/>3 - pitch line<br/>4 - base metal<br/><math>H_1</math> - external thread height in the maximum material condition<br/>(For Thread Pitch = 1.75 mm, <math>H_1 = 1.074</math>)</p> | <p><math>E = \frac{1}{2} H_1</math><br/><math>= 0.537 \text{ mm}</math></p> <p><math>G = 0.015 \text{ mm}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |
| 7 | <p>Hardness after Retempering<br/># test not mandatory, applied in case of dispute only.</p> | <p>Shall be retempered at a part temperature of <math>10^\circ\text{C}</math> less than the Specified minimum tempering temperature and held for 30 minutes. The mean of three core hardness readings on a bolt, tested before and after retempering shall be reported</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Reduction of hardness<br/>20 HV10 maximum</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |
| 8 | <p>NDE for Surface Integrity</p>                                                             | <p>Wet Fluorescent MPI as per ASTM E 709</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Linear indications like cracks, folds &amp; other injurious defects are not acceptable</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |
| 9 | <p>Micro Examination for Surface Integrity – Laps at threaded region.</p>                    | <p>If any defectives found in visual and NDE examinations, the extent of defect can be determined by micro examination.</p> <p>Laps and seams not permissible</p>  <p>Load direction</p> <p>Major diameter</p> <p>Pitch diameter</p> <p>Minor diameter</p> <p>Major diameter</p> <p>Pitch diameter</p> <p>Minor diameter</p> <p>Major diameter</p> <p>Pitch diameter</p> <p>Minor diameter</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>Max depth of laps in thread = 0.41 mm</p> <p>Laps of any depth or length are not permitted in the following places:</p> <ul style="list-style-type: none"><li>at the root of the thread</li><li>at the loaded flank of screw thread below the pitch diameter, even if they start beyond the pitch diameter.</li></ul> <p>The following laps are permissible</p> <ul style="list-style-type: none"><li>laps in the crest of the threads of 0.25 H1 max.;</li><li>crest of the threads not entirely rolled out, maximum half a turn on one thread;</li><li>laps below the pitch diameter, if they run on the non-loaded flank towards the major diameter and not deeper than 0.25 H1 and not longer than half a turn on one thread.</li></ul> |                                                                      |   |                       |   |                                 |                                                                                                                                                                                                                                                                                                    |

**NUT:**

| Sl.No | Test                      | Test Method                                                                                                                                                                                                                                               | Acceptance Value                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | Chemistry                 | Spectro / Wet Analysis Method                                                                                                                                                                                                                             | As per CI 2.0 of this TDC.                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2.    | Hardness Test             | The bearing surfaces of the nut are to be faced and Vickers Hardness measurements shall be made with 294 N or 30 kg load. Minimum 3 measurements to be made and reported.                                                                                 | Min 233 HV<br>Max 353 HV                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3.    | Proof Load Test           | Proof Load of 379.5 KN shall be applied axially to the nut in a tensile testing machine for 15sec. Hardness of the test mandrel shall be minimum 45 HRC.<br><br>Speed of Testing as determined with a free running cross head shall not exceed 25 mm/min. | The nut shall resist the load without failure by stripping or rupture, and shall be removable by the fingers after the load is released. If the thread of the mandrel is damaged during the test, the test should be discarded. It may be necessary to use a manual wrench to start the nut in motion. Such wrenching is permissible provided that it is restricted to one half turn and that the nut is then removable by the fingers. |
| 4.    | NDE for Surface Integrity | Wet Fluorescent MPI as per ASTM E 709                                                                                                                                                                                                                     | Linear indications like cracks, folds & Other injurious defects are not acceptable                                                                                                                                                                                                                                                                                                                                                      |

**WASHER:**

| S.No | Test          | Test Method                                                                                                                                                        | Acceptance Value           |
|------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 1.   | Chemistry     | Spectro / Wet Analysis Method                                                                                                                                      | As per CI 2.0 of this TDC. |
| 2.   | Hardness Test | Rockwell Hardness Test : The washer surface to be faced & Rockwell Hardness measurements shall be made in C Scale. Minimum 3 measurements to be made and Reported. | Min 35 HRC<br>Max 45 HRC   |

**6. MARKING, PRESERVATION AND PACKING:**

**BOLT & NUT :** The following to be hot stamped on the top surface of the bolt/nut:

- 1) Manufacturer's Identification Symbol
- 2) Property Class Identification Symbol (8.8S/8S)

**WASHERS:** Shall be identified by the provision of 2 nbs and manufacturers identification symbol being placed as near to the outer edge as possible.

The following details shall be clearly indicated in the tags tied to the bundle:

- 1) Customer Name
- 2) Manufacturer's Name
- 3) Vendor Code
- 4) Purchase Order No and SPI W.O No
- 5) Quantum and Weight
- 6) BHEL Material Code
- 7) Item Description

The bolts, nuts and washers shall be supplied in the dull black heat treated condition with residual coating of light oil. Shall be packed in bituminous coated Polythene lined Hessian Cloth/Bag.

**7. INSPECTION AND CERTIFICATION:**

All the finished components shall be visually and dimensionally inspected as per sampling plan. All the test results shall be documented and maintained. Products to be inspected at works & test certificates (in English) shall be submitted with the following details counter signed by BHEL/BHEL Authorized Inspection agency as indicated in the PO. Manufacturers Test certificate shall contain the following:

1. Purchase Order No. (BHEL), TDC No, Specification and Grade.
2. Dimensional reports for each product.
3. Forming process
4. Chemistry including incidental elements on the finished product.
5. HT details of materials temperature, soaking time, ROH/ROC medium etc.
6. Mechanical test result report.
7. MPI, Micro examination and decarburization test report with the reference & acceptance standard

**8. AUDITS AT BHEL:**

BHEL reserve the right to reject any item found to be not meeting the requirements during check tests or during subsequent processing at BHEL.

|             |                           |                           |                |                         |                    |           |
|-------------|---------------------------|---------------------------|----------------|-------------------------|--------------------|-----------|
| PREPARED BY | NANTHINI.J / QA           | J. Nanthini<br>19/04/2012 |                | fms                     |                    |           |
|             | HARITHA.C / QA            |                           |                |                         |                    |           |
| REVIEWED BY | KALYANARAMAN.V / QA       | the m<br>19/4/12          | Raj<br>15/4/12 | Suresh<br>19/04/12      | M. Anil<br>19/4/12 | S. Anitha |
|             | RAVI.N / QC               |                           |                |                         |                    |           |
|             | SUNDARAMOORTHY.P / LAB    |                           |                |                         |                    |           |
|             | ARUNACHALAM / ENGINEERING |                           |                |                         |                    |           |
|             | SANKARARAJAN.S / MM       |                           |                |                         |                    |           |
| APPROVED BY | EASWARAN.R / QC           | Ravi Kumar<br>19/4/12     |                | V.R. Lakshmi<br>19/4/12 |                    |           |
|             | RAVIKUMAR.V / QA          |                           |                |                         |                    |           |

## BHEL : TRICHY - 14

### TEST SAMPLING PLAN FOR HSFG BOLTS, NUTS & WASHERS (Mx24) AS PER BHEL TDC:5:211 REV 01

| SAMPLE SIZE                      |                  |                       |               |                |                    |                                         |                         |                         |                                   |                  |   | Remarks |
|----------------------------------|------------------|-----------------------|---------------|----------------|--------------------|-----------------------------------------|-------------------------|-------------------------|-----------------------------------|------------------|---|---------|
| Lot Size<br>(in nos.)            | Visual<br>(nos.) | Dimensional<br>(nos.) | MPI<br>(nos.) | Physical Tests |                    |                                         |                         |                         |                                   |                  |   |         |
|                                  |                  |                       |               | Total<br>nos.  | Hardness<br>(nos.) | Hardness after<br>Retempering<br>(nos.) | Proof<br>Load<br>(nos.) | Wedge<br>Load<br>(nos.) | Min Tensile<br>Strength<br>(nos.) | Decarb<br>(nos.) |   |         |
| Upto 100                         | 20               | 8                     | 15            | 5              | 5                  | 5                                       | 2                       | 2                       | 2                                 |                  | 1 |         |
| 101 to 300                       | 32               | 13                    | 15            | 5              | 5                  | 5                                       | 2                       | 2                       | 2                                 |                  | 2 | 1       |
| 301 to 500                       | 50               | 20                    | 15            | 5              | 5                  | 5                                       | 2                       | 2                       | 2                                 |                  | 2 | 1       |
| 501 to 1000                      | 80               | 32                    | 15            | 5              | 5                  | 5                                       | 2                       | 2                       | 2                                 |                  | 2 | 1       |
| 1001 to 3000                     | 125              | 50                    | 25            | 8              | 8                  | 8                                       | 2                       | 4                       | 2                                 |                  | 2 | 1       |
| 3001 to 10000                    | 200              | 80                    | 50            | 13             | 13                 | 13                                      | 2                       | 6                       | 2                                 |                  | 2 | 1       |
| 10001 to 35000                   | 315              | 125                   | 75            | 20             | 20                 | 20                                      | 4                       | 10                      | 4                                 |                  | 4 | 2       |
| Above 35000                      | 500              | 200                   | 100           | 32             | 32                 | 32                                      | 6                       | 15                      | 6                                 |                  | 6 | 3       |
| Inspection by<br>BHEL/BHEL AIA : | W                | W                     | W             |                | W                  | W                                       | W                       | W                       | W                                 |                  | W | W       |

Remarks :

1. Acceptance Number is zero. If the sample is having deviations in Visual, Dimensional and MPI then the entire lot shall be 100% inspected. In case of deviations in Physical tests a second sample of twice the sample size of initial sample shall be taken. The lot will get rejected if the second sample fails.
2. Preservation & Packing: The bolts shall be supplied in the dull black heat treated condition with a residual coating of light oil. Finished products shall be packed in a Bituminous coated Polythene lined Hessian cloth/bag.
3. Inspection by BHEL / BHEL AIA shown as "W" shall be witnessed for the sample size indicated against the lot size.

|                               |                                  |                                            |                             |                                         |
|-------------------------------|----------------------------------|--------------------------------------------|-----------------------------|-----------------------------------------|
| <i>S. N. S.</i><br>17/04/2012 | <i>Haritha</i><br>HARITHA.C / QA | <i>Kalyanaraman</i><br>KALYANARAMAN V / QA | <i>Ravi N</i><br>RAVIN / OC | <i>V.R. Lakshmi</i><br>RAVIKUMAR V / QA |
| PREPARED BY                   | REVIEWED BY                      | APPROVED BY                                |                             |                                         |

**Bharat Heavy Electricals Ltd. Tiruchirapalli-620 014****PSS / MM / MFG****Terms and Conditions to Enquiry No: 1901300199 dt. 06.05.13 – Due dt.04.06.13****Checklist for the Enquiry***(To be Filled and submitted for evaluation and to consider for Price-Bid opening)*

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <b>Description of the Item:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Various sizes of HSS Bolt with Nut</b>     |
| <b>Enquiry Ref:</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>1901300199 dt.06.05.13 due dt.04.06.13</b> |
| <b>Sl No.</b>                   | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Vendor's confirmation</b>                  |
| 1                               | <b>Technical :</b> Supply shall be as per BHEL's TDC:5:211/01 dt.19.04.12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |
| 2                               | <b>Samples:</b> Confirmation to submission of Samples and Test certificates<br>(Mention size & no. of samples submitted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                               |
| 3                               | <b>Firm Price:</b> The quoted/Finalised rates shall be Firm till execution of the supplies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                               |
| 4                               | <b>Delivery and Price Basis:</b><br>Indigenous Vendor: Price should be quoted on FOR / BHEL Stores, Tiruchirapalli basis only (inclusive of freight and transit insurance).<br><b>Ex-works offers will be rejected.</b><br>Foreign Vendor: Prices should be quoted on FOB / CIF-Chennai, Tamilnadu, India basis only. <b>Offers with Ex-works terms will be rejected.</b>                                                                                                                                                                                                                              |                                               |
| 5                               | Acceptance of Performance Bank Guarantee (PBG) of 10% of the order value as per enquiry as per enclosed PBG format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                               |
| 6                               | <b>Payment terms:</b><br>Indigenous vendor: On satisfactory acceptance of materials at BHEL Tiruchirapalli, payment will be made after 45 days. Indigenous offers with Advance payment / LC / thro bank payment will be rejected.<br>Foreign vendor: Payment will be made on Cash against documents basis, i.e., Payment will be made 45 days from the date of submission of complete set of documents as specified in the PO at our bank. Requests for LC will be loaded at 1.5% of the basic charge during evaluation of offers. Further 1.6% will be loaded towards import related incidental costs |                                               |
| 7                               | <b>Delivery:</b> Bidders shall confirm the delivery as required by BHEL. In case of ordering, supplies to be made in staggered manner as required by BHEL.                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                               |
| 8                               | <b>Validity:</b> Price Validity of your offer shall be Minimum 90 days from the date of techno-commercial bid opening.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                               |
| 9                               | <b>Liquidated damages:</b> Our standard LD term is 0.5% per week subject to a maximum of 15% shall be applicable for late deliveries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                               |
| 10                              | Acceptance to <b>Risk Purchase</b> clause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |
| 11                              | <b>Guarantee:</b> Guarantee Certificate to be given for 18 months from the date of acceptance of materials.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                               |

**Dt:****Signature with Seal**

(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT AND THE EXPIRY DATE OF BG MUST BE AFTER 60 DAYS FROM THE DATE OF COMPLETION OF WARRANTY PERIOD)

## PERFORMANCE BANK GUARANTEE

In accordance of M/s. Bharat Heavy Electricals Limited (A Government of India undertaking, a company incorporated under the Companies Act 1956 having its Registered Office at "BHEL House", SIRI Fort, New Delhi 110 049) through its High Pressure Boiler Plant Division located at Tiruverumbur, Tiruchirapalli- 620 014 (hereinafter called 'the Company') having entered into a contract with .....hereinafter called 'the said contractor' which term includes 'suppliers' for the purpose of this Bond and under the terms and conditions of the contract No..... Dt ..... Between BHEL, Trichy and as per the contract, the contractor / supplier is to furnish a performance Bank guarantee for Rs. .... for the due performance of the equipment to be supplied under the above referred contract and for the fulfillment of all the terms and conditions of the contract, We .....(indicate the name of the bank) (herein after referred to as the bank) at the request of ..... (Contractor(s) ) do hereby undertake to pay the company an amount not exceeding Rs.....against any loss or damage caused to or suffered or would be caused to or suffered by the company by reason of any breach by the said contractor (s) of any of the terms and conditions contained in the said agreement.

2. We .....(indicate the name of the bank with full address), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Company stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of breach by the said Contractor(s) of any of the terms and conditions contained in the said Agreement or by the reason of the contractor(s) 'failure to perform' the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. ....

3. We undertake to pay unconditionally to the Company any money so demanded notwithstanding any dispute(s) raised by the Contractor in any suit, or proceedings pending before any Court or Tribunal or Arbitration or before any other authority relating thereto our liability under this present being absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the arbitration proceedings or by any other authority. The payment so made by us under this Bond shall be a valid discharge of liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We.....( indicate the name of Bank), further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Company under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till ..... Office / Department/ Division of the Company certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. (I) Unless a demand or claim under this guarantee is made on us in writing on or before the \_\_\_\_\_ we shall be discharged from all the liability under this guarantee thereafter. But where such claim or demand has been preferred by the Company with the Bank before the expiry of the said date, the claim shall be enforceable notwithstanding the fact that the said enforcement is effected after the said date.

(ii) For the purpose of this clause, any letter making demand on the Bank by M/s. BHEL dispatched by Registered Post with Ack.Due or by Telegram or by any Electronic media addressed to the above mentioned address of the Bank shall be deemed to be the claim / demand in writing referred to above irrespective of the fact as to whether and when the said letter reaches the Bank, as also any letter containing the said demand or claim is lodged with the bank personally.

6. We .....(indicate the name of Bank), further agree with the company that the Company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor (s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Company against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said Contractor(s) or for any forbearance, act or omission on the part of the company or any indulgence by the company to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating would, but for this provision, have effect of not so relieving us.
7. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).
8. It shall not be necessary for the company to proceed against the contractor before proceeding against the guarantor-bank and the guarantee herein contained shall be enforceable against them notwithstanding any security, which the company may have obtained or obtain from the Contractor shall, at the time when proceedings are taken against the guarantor hereunder be outstanding or unrealised.
9. Any claim or dispute arising under the terms of this document shall only be enforced or settled in the Courts at Tiruchirapalli.
10. The guarantor hereby declare that it has power to execute this guarantee and the executant has full powers to do so on its behalf under the proper authorities granted to him/them by the guarantor.
11. We .....(indicate the name of Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the company in writing.

In witness whereof we....., (indicate the name of Bank) have hereunto setout Bank Seal the \_\_\_\_\_ day \_\_\_\_\_ month 200  
BANK E-MAIL ID:  
BANK PHONE NO.  
BANK FAX NO:

| List of Consortium Bank |                           |                                                          |
|-------------------------|---------------------------|----------------------------------------------------------|
|                         | <b>Nationalised Bank</b>  | <b>Nationalised Bank</b>                                 |
| 1                       | Allahabad bank            | 18 United Bank of India                                  |
| 2                       | Andhra bank               | 19 Vijaya Bank                                           |
| 3                       | Bank of Baroda            | <b>Public Sector Banks</b>                               |
| 4                       | Bank of India             | 20 IDBI                                                  |
| 5                       | Canara Bank               | <b>Foreign bank</b>                                      |
| 6                       | Corporation bank          | 21 CITI Bank N.A                                         |
| 7                       | Central bank              | 22 Deutsche Bank AG                                      |
| 8                       | Indian Bank               | 23 The Hongkong and Shanghai Banking Corporation Limited |
| 9                       | Oriental bank of Commerce | 24 Standard Chartered Bank                               |
| 10                      | Punjab National Bank      | 25 The Royal Bank of Scotland N.V.                       |
| 11                      | Punjab & Sindh Bank       | <b>Private bank</b>                                      |
| 12                      | State Bank of India       | 26 Axis Bank                                             |
| 13                      | State Bank of Hyderabad   | 27 The Federal Bank Limited                              |
| 14                      | Syndicate Bank            | 28 HDFC                                                  |
| 15                      | State Bank of Travancore  | 29 Kotak Mahindra Bank                                   |
| 16                      | UCO Bank                  | 30 ICICI                                                 |
| 17                      | Union Bank of India       | 31 Indusind Bank                                         |