



An ISO 9001  
Company

**Bharat Heavy Electricals Limited**  
(High Pressure Boiler Plant)  
Tiruchirappalli – 620014, TAMIL NADU, INDIA

<b>TITLE</b> <b>SUPPLY OF HSS BOLTS WITH NUTS (HSFG)</b>	Phone: +91 431 2577083/7419 Fax : +91 431 252 0719 Email : <a href="mailto:kmanoj@bheltry.co.in">kmanoj@bheltry.co.in</a>
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<b>Reference Number:</b> Enquiry <a href="#">1901300562</a>	<b>Enquiry Date:</b> 19.12.13	<b>Due date for submission of quotation:</b> 10.01.14
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 by the Engineer/PSS/MM/RM for supply of HSS Bolts with Nuts (HSFG)**

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, <b>For Bharat Heavy Electricals Limited</b>  Engineer/Purchase, PSS/MM/RM, 4 <sup>th</sup> Floor – Bldg. 24, Bharat Heavy Electricals Ltd., Tiruchirappalli-620014, Tamilnadu.  Ph: 0431- 2577083, Fax: 0431- 2520719 Email: <a href="mailto:kmanoj@bheltry.co.in">kmanoj@bheltry.co.in</a>
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# BHARAT HEAVY ELECTRICALS LIMITED

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

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PHONE :2577419  
GRAMS : BHARATELEC  
FAX NO: 2520719  
E-mail: cmuthuvel@bheltry.co.in  
Web:

429-002/A

Enquiry No	Enquiry Date	Due Date for Quotation
1901300562 - 27	19.12.2013	10.01.2014
Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order		

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	412402407000 HSS BOLT and NUT M24x70MM-TDC 5/211/ Rev 01/19.04.2012	NO	36000.000	36,000.00	31.03.14
20	412402408000 HSS BOLT and NUT M24x80MM-TDC 5/211/ Rev 01/19.04.2012	NO	1500.000	1,500.00	31.03.14
30	412402409000 HSS BOLT and NUT M24x90MM-TDC 5/211/ Rev 01/19.04.2012	NO	6500.000	6,500.00	31.03.14
40	412402411000 HSS BOLT and NUT M24x110MM-TDC 5/211/ Rev 01/19.04.2012	NO	12000.000	12,000.00	31.03.14
50	412402412000 HSS BOLT and NUT M24x120MM-TDC 5/211/ Rev 01/19.04.2012	NO	9500.000	9,500.00	31.03.14
60	412402413000 HSS BOLT and NUT M24x130MM-TDC 5/211/ Rev 01/19.04.2012	NO	3000.000	3,000.00	31.03.14
70	412402414000 HSS BOLT and NUT M24x140MM-TDC 5/211/ Rev 01/19.04.2012	NO	12000.000	12,000.00	31.03.14
80	412402415000 HSS BOLT and NUT M24x150MM-TDC 5/211/ Rev 01/19.04.2012	NO	8000.000	8,000.00	31.03.14

### 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.

The offers should reach us 30 minutes before the time of opening of tenders.  
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.

**MANOJ KOTAKONDA**  
Engineer  
Purchase / PSS / MM / RM  
BHEL, TRICHY - 620 014.

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

MANAGER / PURCHASE  
(FOSSIL BOILERS)  
Yours faithfully,



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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 A shall be put in a cover and super scribed TECHNO-COMMERCIAL BID AGAINST ENQUIRY NO. 1901300562 dt.19.12.13 due dt.10.01.14. Price bid containing price details shall be put in a separate cover and super scribed as PRICE BID AGAINST ENQUIRY NO. 1901300562 dt.19.12.13 due dt.10.01.14. 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. 1901300562 dt.19.12.13 due dt.10.01.14.

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 "Engineer/Purchase, PSS/MM/RM, 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 greater than or equal to 150mm 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 Test certificates will be rejected.

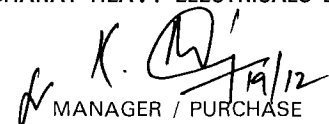
06. Delivery as per the requirement listed in the enquiry to be strictly adhered to.

07. Bidders, who are not currently on registered list of BHEL - HPBP Tiruchirapalli / approved vendors of BHEL-HPBP Tiruchirapalli not registered for "PFHSB" - HSFG Bolt with Nut group, need to complete the Vendor Registration formalities for Fasteners>TPFB-9-PFHSB group at <http://vis.bheltry.co.in/olsa>. Filled in forms can be forwarded in advance/along with the offer to the respective section and the same reference can be mentioned in the offer. Offers received if found not carrying out the Vendor Registration formalities will be duly rejected. For any clarifications, please contact kmanoj@bheltry.co.in or rn@bheltry.co.in.

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**MANOJ KOTAKONDA**  
Engineer  
Purchase / PSS / MM / RM  
BHEL, TRICHY - 620 014.

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

  
MANAGER / PURCHASE  
(FOSSIL BOILERS)  
Yours faithfully,



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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. MSME suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (two years from the date of issue in acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed as per Annexure I) applicable for the year, certifying quantum of investment in plant and machinery within permissible limit as per the act for relevant status (Micro or small) where the deemed validity of EM II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bids at par with other bidders and MSME status of such suppliers shall be shifted to Non MSME supplier till the supplier submits these documents.

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. Test reports by BHEL plant lab shall be final. 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: Payment term is 100% direct payment after 45 days from the date of receipt and acceptance of materials. Offers with Advance payment / LC / thro bank payment will be rejected.

Any deviation in the above payment term will attract loading as mentioned below.


"Base rate of SBI (as applicable on the date of bid opening. Techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidders.

,,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 & Date; Name of supplier; Material Code; Description; Quantity & Wt. Size M24x70 to M24x100 - 50 no's per bag;

The offers should reach us 30 minutes before the time of opening of tenders. 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.

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Engineer  
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BHEL, TRICHY - 620 014.

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MANAGER / PURCHASE  
(FOSSIL BOILERS)  
Yours faithfully,



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

12. Guarantee Certificate to be given for 18 months from the date of acceptance of materials. No deviation permitted and the deviated offers are liable for rejection.

13. 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.

14. 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.

15. 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 14 above.

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

17. Liquidated Damages: If the supplier fails to deliver the material within the period specified in the contract the purchaser shall deduct liquidated damages a sum equivalent to 0.5% of the total order value per week of delay or part thereof subject to a maximum of 10% of the total order value. In case of staggered delivery schedule, LD shall be 0.5% of the undelivered portion per week delay or part thereof subject to maximum of 10% of the total order value. Any deviation from the above LD clause, loading will be applied to the extent to which it is not agreed by the bidder (at offered value).


18. 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 17 above.

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

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20. BHEL reserves the right to negotiate with L1 vendor or refloat the tender if L1 price is not the lowest acceptable price to BHEL.

21. 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.

22. 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 be permitted to participate in the further tender proceedings and will be communicated suitably.

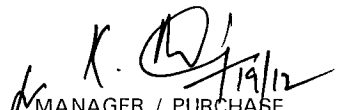
**Enclosures:**

"LD clause has to be confirmed without fail."  
"Payment to vendors will be made only thro E-Payment mode"

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(FOSSIL BOILERS)  
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Revision record: Rev 01: Cl 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. Cl 5: Hardness of Bolt & Nut: Acceptance values changed. Cl 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% (tadle 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:**

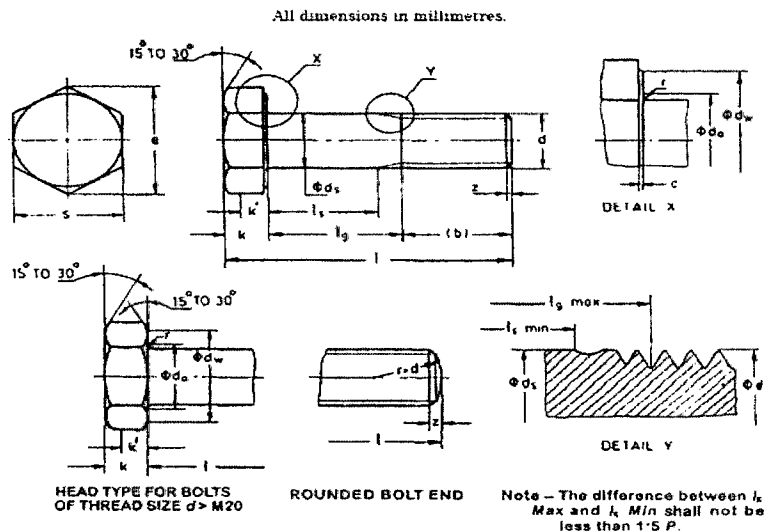
Process: Cold/Hot Forging with Dies and tools clean of loose scale and sheet particles.

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.

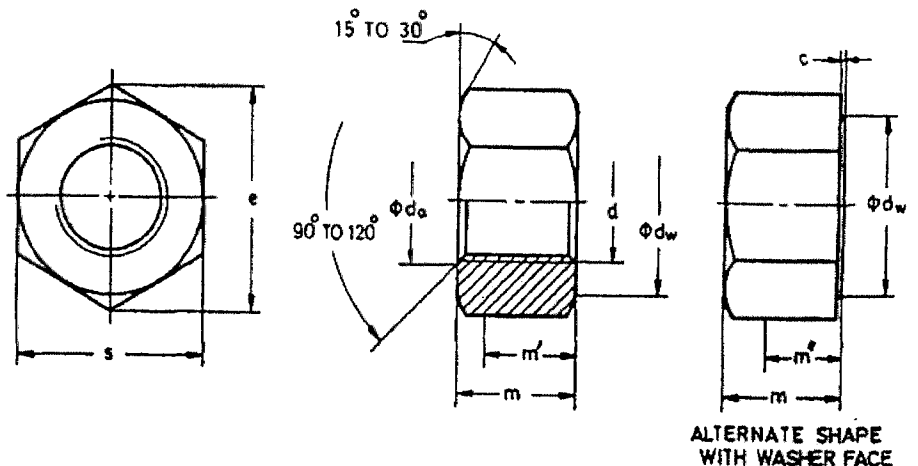
Dimensions of the Bolts shall be as per the Table below:

Thread Size <i>d</i>	M24
<i>p</i> Pitch of thread	3
<i>b</i> ref For length / Nom $\leq 100$	41
$> 100$	48
<i>c</i> Max	0.8
Min	0.4
<i>d<sub>a</sub></i> Max	27.64
Min	24.84
<i>d<sub>s</sub></i> Max	+
Min	38.0
<i>d<sub>w</sub></i> Max	+
Min	45.20
<i>e</i> Nom	15
Max	15.90
Min	14.10
<i>k</i> Max	9.9
Min	1.0
<i>k'</i> Min	1.0
<i>r</i> Min	1.0
<i>s</i> Max	41
Min	40
Chamfer length <i>z</i> Max	4.5



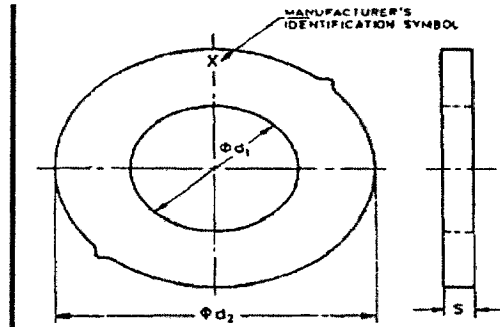
Dimensions of the Nuts shall be as per the Table below :

Sl No.	Thread Size, <i>d</i>	M 24	
i)	<i>P</i>	3	
ii)	<i>d<sub>s</sub></i>	Max	25.9
		Min	24.0
iii)	<i>d<sub>w</sub></i>	Max	"
		Min	38.0
iv)	<i>e</i>	Min	45.20
v)	<i>m</i>	Max	24.2
		Min	22.9
vi)	<i>m'</i>	Max	18.3
		Min	16.0
vii)	<i>m''</i>	Max	0.8
		Min	0.4
viii)	<i>c</i>	Max	41.0
		Min	40.0
ix)	<i>s</i>	Max	41.0
		Min	40.0



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

Nominal size (thread size <i>d</i> of associated bolt)		M24
<i>d</i> <sub>1</sub>	Min	26
	Max	26.52
<i>d</i> <sub>2</sub>	Min	48.4
	Max	50
<i>s</i>	Min	3.4
	Max	4.6



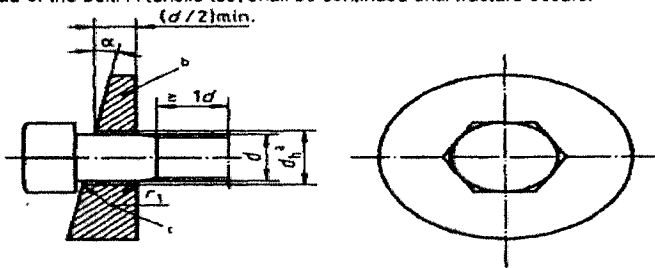
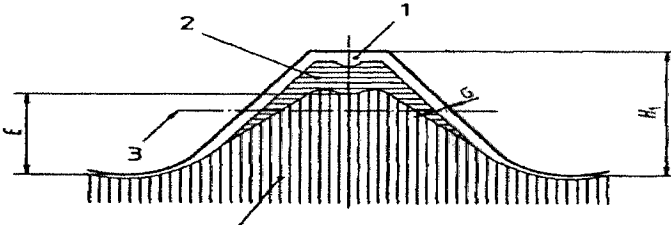
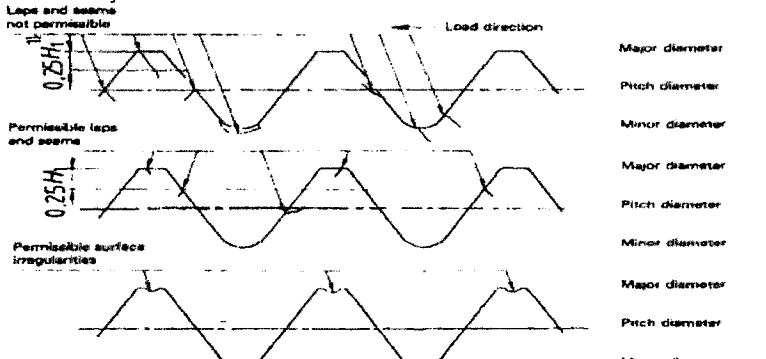
4. Post Forming Heat Treatment (HT):

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 :**

SI No	Test	Test Method	Acceptance																								
1	Chemistry	Spectro / Wet Analysis Method	As per CI 2.0 of this TDC.																								
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.	Min 255 HV Max 335 HV																								
3	Minimum Tensile Strength  *if wedge load test is satisfactory the axial tensile test is not required.  %Elongation on 5.65√A  % Reduction in Area after fracture	Round specimen of size as given in Table 1 with fillet radius <i>r</i> as below : <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Diameter <i>d</i> (mm)</th> <th>Fillet radius <i>r</i> (mm)</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>4</td> </tr> <tr> <td>10</td> <td>4</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table> Rate of stressing : 6 - 60 N/mm <sup>2</sup> /sec Table 1 – Circular cross-section test pieces <table border="1" style="margin-left: 20px;"> <thead> <tr> <th><i>x</i></th> <th>Diameter <i>d</i> (mm)</th> <th>Original cross-sectional area <i>S</i><sub>0</sub> (mm<sup>2</sup>)</th> <th>Original gauge length <i>L</i><sub>0</sub> = <i>k</i>√<i>S</i><sub>0</sub> (mm)</th> <th>Minimum parallel length <i>L</i><sub>c</sub> (mm)</th> <th>Total length <i>L</i><sub>1</sub></th> </tr> </thead> <tbody> <tr> <td rowspan="2">5,65</td> <td>20 ± 0,15</td> <td>314</td> <td>100 ± 1</td> <td>110</td> <td rowspan="2">Depends on the method of fixing the test piece in the machine grips  In principle: <i>L</i><sub>1</sub> &gt; <i>L</i><sub>c</sub> + 2<i>d</i> or 4<i>d</i></td> </tr> <tr> <td>10 ± 0,075 5 ± 0,040</td> <td>78,5 19,6</td> <td>50 ± 0,5 25 ± 0,25</td> <td>55 28</td> </tr> </tbody> </table>	Diameter <i>d</i> (mm)	Fillet radius <i>r</i> (mm)	20	4	10	4	5	1	<i>x</i>	Diameter <i>d</i> (mm)	Original cross-sectional area <i>S</i> <sub>0</sub> (mm <sup>2</sup> )	Original gauge length <i>L</i> <sub>0</sub> = <i>k</i> √ <i>S</i> <sub>0</sub> (mm)	Minimum parallel length <i>L</i> <sub>c</sub> (mm)	Total length <i>L</i> <sub>1</sub>	5,65	20 ± 0,15	314	100 ± 1	110	Depends on the method of fixing the test piece in the machine grips  In principle: <i>L</i> <sub>1</sub> > <i>L</i> <sub>c</sub> + 2 <i>d</i> or 4 <i>d</i>	10 ± 0,075 5 ± 0,040	78,5 19,6	50 ± 0,5 25 ± 0,25	55 28	830N/mm <sup>2</sup>          12 min  52% min
Diameter <i>d</i> (mm)	Fillet radius <i>r</i> (mm)																										
20	4																										
10	4																										
5	1																										
<i>x</i>	Diameter <i>d</i> (mm)	Original cross-sectional area <i>S</i> <sub>0</sub> (mm <sup>2</sup> )	Original gauge length <i>L</i> <sub>0</sub> = <i>k</i> √ <i>S</i> <sub>0</sub> (mm)	Minimum parallel length <i>L</i> <sub>c</sub> (mm)	Total length <i>L</i> <sub>1</sub>																						
5,65	20 ± 0,15	314	100 ± 1	110	Depends on the method of fixing the test piece in the machine grips  In principle: <i>L</i> <sub>1</sub> > <i>L</i> <sub>c</sub> + 2 <i>d</i> or 4 <i>d</i>																						
	10 ± 0,075 5 ± 0,040	78,5 19,6	50 ± 0,5 25 ± 0,25	55 28																							
4	Proof Load Test	Proof Load of 212 KN shall be applied axially to the bolt in a calibrated tensile testing machine for 15sec. The length of free thread subjected to the load shall be one diameter (1 <i>d</i> ). For measurement of permanent extension, the bolt shall be suitably prepared at each end, as given in the fig. Before & After the application of the load, the bolt shall be placed in a bench-mounted measuring instrument fitted with spherical anvils. Gloves or tongs shall be used to minimize measurement error. Speed of testing, as determined with a free running cross head, shall not exceed 3mm/min. The grips of the testing machine should be self aligning to avoid side thrust on the test piece. <div style="text-align: center;"> </div> Required "sphere to cone" contact between the measuring points and the centre-drilled holes in the end of the bolt or screw. <p>Nominal Thread Diameter <i>d</i> = 24 mm ;                      Hole Diameter <i>d</i><sub>h</sub> = 26 mm</p> Some variables such as straightness and thread alignment (plus measurement error), may result in apparent elongation of the fasteners when the proof load is initially applied. In such cases, the fasteners may be retested using a 3% greater load, and	Length of the bolt after loading shall be the same as before loading within a tolerance of ± 12.5 μm allowed for measurement error.																								

<p>5</p>	<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. 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>r1 = r \max + 0.2</math>          in which, <math>r \max = (da \max - ds \min) / 2</math>          where <math>r</math> – radius of curvature under head ; <math>da</math> – transition diameter  <math>ds</math> – diameter of unthreaded shank ; <math>\alpha = 6^\circ \pm 0' 30''</math></p> <table border="1" data-bbox="383 694 1005 795"> <tr> <td>a</td> <td>Nominal Thread Diameter <math>d = 24 \text{ mm}</math> ; Hole Diameter <math>dh = 26 \text{ mm}</math></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 $d = 24 \text{ mm}$ ; Hole Diameter $dh = 26 \text{ mm}$	b	Hardness : 45 HRC min	c	Radius or Chamfer of $45^\circ$	<p>Strength under Wedge load test : &lt; 830N/mm<sup>2</sup></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 $d = 24 \text{ mm}$ ; Hole Diameter $dh = 26 \text{ mm}$								
b	Hardness : 45 HRC min								
c	Radius or Chamfer of $45^\circ$								
<p>6</p>	<p>Decarburization Test</p>	<p>Determination of the following by MICROSCOPIC Method.          a) Minimum Height of non decarburized thread zone - E          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          2 - partially decarburized          3 - pitch line          4 - base metal          H1 - external thread height in the maximum material condition          (For Thread Pitch = 1.75 mm, H1 = 1.074)</p>	<p><math>E = \frac{1}{2} H1</math>  <math>= 0.537 \text{ mm}</math></p> <p><math>G = 0.015 \text{ mm}</math></p>						
<p>7</p>	<p>Hardness after Retempering # test not mandatory, applied in case of dispute only.</p>	<p>Shall be retempered at a part temperature of 10°C 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 20 HV10 maximum</p>						
<p>8</p>	<p>NDE for Surface Integrity</p>	<p>Wet Fluroscent MPI as per ASTM E 709</p>	<p>Linear indications like cracks, folds &amp; other injurious defects are not acceptable.</p>						
<p>9</p>	<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>Max depth of laps in thread = 0.41 mm</p> <p>Laps of any depth or length are not permitted in the following places:          • at the root of the thread          • at the loaded flank of screw thread below the pitch diameter, even if they start beyond the pitch diameter.</p> <p>The following laps are permissible :          • laps in the crest of the threads of 0.25 H1 max. ;          • crest of the threads not entirely rolled out, maximum half a turn on one thread;          • 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.</p>						

**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 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.  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 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 nibs 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	<i>J. Nanthini</i> 19/04/2012		<i>[Signature]</i>		
	HARITHA.C / QA					
REVIEWED BY	KALYANARAMAN.V / QA	<i>[Signature]</i> 19/4/12	<i>[Signature]</i> 19/4/12	<i>[Signature]</i> 1904 12	M. Anel 19/4/12	<i>[Signature]</i>
	RAVI.N / QC					
	SUNDARAMOORTHY.P / LAB					
	ARUNACHALAM / ENGINEERING					
	SANKARARAJAN.S / MM					
APPROVED BY	EASWARAN.R / QC	<i>[Signature]</i> 19/4/12		<i>[Signature]</i> 19/4/12		
	RAVIKUMAR.V / QA					

**BHEL : TRICHY - 14**

**TEST SAMPLING PLAN FOR HSEFG BOLTS, NUTS & WASHERS (MX24) AS PER BHEL TDC:5:211 REV 01**

Lot Size (in nos.)	SAMPLE SIZE										Remarks				
	Visual			Dimensional			MPI			Physical Tests					
	(nos.)	(nos.)	(nos.)	(nos.)	(nos.)	(nos.)	Total nos.	Hardness (nos.)	Hardness after Retempering (nos.)	Proof Load (nos.)		Wedge Load (nos.)	Min Tensile Strength (nos.)	Decarb (nos.)	
Upto 100	20	8	15	5	5	5	5	5	5	2	2	2	2	1	
101 to 300	32	13	15	5	5	5	5	5	5	2	2	2	2	1	
301 to 500	50	20	15	5	5	5	5	5	5	2	2	2	2	1	
501 to 1000	80	32	15	5	5	5	5	5	5	2	2	2	2	1	
1001 to 3000	125	50	25	8	8	8	8	8	8	2	4	2	2	1	Upto 1500 nos. 15 nos. for MPI
3001 to 10000	200	80	50	13	13	13	13	13	13	2	6	2	2	1	Upto 5000 nos. 25 nos. for MPI
10001 to 35000	315	125	75	20	20	20	20	20	20	4	10	4	4	2	Upto 15000 nos. 50 nos. for MPI
Above 35000	500	200	100	32	32	32	32	32	32	6	15	6	6	3	Upto 50000 nos. 75 nos. for MPI
Inspection by BHEL/BHEL AIA :	W	W	W	W	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. Nataraj</i> 19/04/2012	<i>Hartha C</i>	<i>Kalyanaraman V</i>	<i>Ravikumar V</i>
NANTHINI.J / QA	HARTHA.C / QA	KALYANARAMAN.V / QA	RAVIN / QC
PREPARED BY	REVIEWED BY	APPROVED BY	

## Bharat Heavy Electricals Ltd. Tiruchirapalli-620 014

PSS / MM / RM

Terms and Conditions to Enquiry No: 1901300562 dt. 19.12.13 – Due dt.10.01.14

**Checklist for the Enquiry***(To be Filled and submitted for evaluation and to consider for Price-Bid opening)*

<b>Description of the Item:</b>		Various sizes of HSS Bolt with Nut
<b>Enquiry Ref:</b>		1901300562 dt.19.12.13 due dt.10.01.14
<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 <i>(Mention size &amp; no. of samples submitted)</i>	
3	<b>Firm Price:</b> The quoted/Finalised rates shall be Firm till execution of the supplies.	
4	<b>Delivery and Price Basis:</b> Indigenous Vendor: Price should be quoted on FOR / BHEL Stores, Tiruchirapalli basis only (inclusive of freight and transit insurance). Ex-works offers will be rejected.	
5	<b>Payment terms:</b> Indigenous vendor: As per Cl 11 of Enquiry Terms & Conditions.	
6	<b>Delivery Period:</b> Bidder shall indicate the firm delivery period required for the delivery of the materials from the date of Purchase Order.	
7	<b>Validity:</b> Price Validity of your offer shall be Minimum 90 days from the date of techno-commercial bid opening.	
8	<b>Liquidated damages:</b> As per Cl 17 of Enquiry Terms & Conditions	
9	Acceptance to <b>Risk Purchase</b> clause	
10	<b>Guarantee:</b> Guarantee Certificate to be given for 18 months from the date of acceptance of materials.	

Dt:

Signature with Seal

**Certificate by Chartered Accountant on letter head**

This is to Certify that M/S .....  
(hereinafter referred to as 'company') having its registered office at  
..... is registered under MSMED Act 2006, (Entrepreneur  
Memorandum No (Part-II) ..... dtd:.....,  
Category: ..... (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on  
date..... as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :  
Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:  
Rs.....Lacs

The above investment of Rs.....Lacs is within permissible limit of  
Rs.....Lacs for .....Micro / Small (Strike off which is not applicable)  
Category under MSMED Act 2006.

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

