

<b>BHEL :: BAP :: RANIPET</b>			
<b>PURCHASE DEPARTMENT</b>			
<b><u>ANNEXURE-A (Technical Specification)</u></b>			
<b>NOTICE INVITING TENDER</b>			
<b>OPEN TENDER REF: PUR/UTY/HSFG FASTENERS /91;DT: 31.10.15</b>			
Sealed Bids(Two Part Basis) are invited from prospective suppliers (Satisfying Qualification Criteria)for supply of Fasteners as per Specification, Standards and Quantities listed below.			
<b>LAST DATE FOR SUBMISSION OF BID: 16.11.2015 BEFORE 14.00 HRS IST</b>			
<b>BID OPENING DATE: 16.11.2015 AT 14:30 HRS IST</b>			
<b>HSFG BOLTS OF PROPERTY CLASS 10.9 GR C OF IS:1367 PART 2 CONFIRMING TO IS:3757, NUTS AS PER CLASS 10 GR B OF IS:6623 AND WASHER CONFORMING TO IS:6649 AS PER TDC:5:211 REV-02 DT-28.10.14</b>			
SI No.	Item Description	UNIT	QTY
1	M24X100, HSFG BOLT GRIP LENGTH-60MM OTHER DIMENSION AS PER IS 3757 LATEST	} SET	45315
2	M24 HIGH STRENGTH STRUCTURAL NUT AS PER IS 6623 TO SUIT M24 HSFG BOLT		
3	A24 HIGH TENSILE FRICTION GRIP WASHER AS PER IS 6649 TO SUIT M24 HSFG BOLT THICKNESS-5MM		
<p>Note: (1) Supplier has to quote the price on set basis (one set contains one bolt + one nut + one washer) only. Quotation received on individual item wise will not be considered.</p> <p>(2). Supplier has to confirm the specification of HSFG Fasteners as per Technical Delivery Condition (TDC:5:211 Rev 02 dated 28.10.2014).</p> <p>(3). The Delivery date for the above mentioned items are within 3 months from the date of Purchase Order.</p>			

**Revision record:**

Rev 00: 18/10/2011 Fresh Issue released and Test Sampling Plan Rev 00

Rev 01: 19/04/2012 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 &amp; Nut: Acceptance values changed. Cl 7: Preservation and Packing added and Test Sampling Plan Rev 01

Rev 02: 28/10/2014 Property class Bolt 10.9 and Nut 10 and its requirements added (for Neyveli 2x500MW Tower boiler) in all clauses and Test Sampling Plan Rev 02

**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 mandatory requirements, test methods and procedures from the applicable IS standards to confirm a product to its relevant latest IS standard shall be met with. TDC is in addition to specification.

Size, Specification and Qty: As per the BHEL Purchase order (PO) / BHEL Drawing. The bolts, nuts and washers shall be supplied in the dull black heat treated condition with residual coating of light oil.

For Bolts: IS: 3757 (Latest) Property class: 8.8 or 10.9. Product Grade C of IS Specification IS: 1367 Part 2 (Latest).

For Nuts: IS: 6623 (Latest) Property class: 8 or 10, Product Grade B

For Washers: IS: 6649 (Latest) Material: 45C8, Type-A: Plain hole Circular Washers. Grade: Ordinary

**2. RAW MATERIAL:**

- Bolts and Nuts: Rolled/Forged bar of Carbon steel. Washer: as per IS 1571 Part 2 (Latest)
- **Chemical composition:** Shall be checked on receipt of raw material at supplier works for every heat  
Bolts: Plain Carbon Steel, Carbon steel with additives (eg Br, Mn or Cr) – As per Table 2 of IS: 1367 Part 3 (Latest)  
Nuts: As per Table 4 of IS 1367 Part 6 (Latest)  
Washers: As per IS 1570 Part 2 and Sulphur, Phosphorous <0.06% in check analysis

**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 (in an NABL accredited LAB).
- Dimensions of the Bolts shall be as per the table given in IS 3757 (Latest)
- Dimensions of the Nuts shall be as per the table given in IS: 6623 (Latest)
- Dimensions of the Washers shall be as per the table given in IS 6649 (Latest)

Note: The washers shall be flat with a maximum deviation not exceeding 0.25 mm from the straight edge laid along a line passing through the center of the hole. The hole of the washer shall be concentric with the outside dimensions within 0.50 mm. washers are required to be clipped to provide clearance, the clipped edge shall not be closer to the center of the washer than 0.9 of the bolt diameter.

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

- Bolt: After forming shall be quenched (HT at AC 3 temperature, with soaking time 30minutes per inch followed by quenching) and tempered (at 425°C min, 60 minutes per inch). There should be a sufficient hardenability to ensure a structure consisting of approximately 90 % martensitic in the core of the threaded sections for the fasteners in the as-hardened condition before tempering.
- 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 Mechanical test: & NDE: As per Sampling Plan

**BOLT :**

Sl	Test	Test Method - As per Table 3 of IS: 1367 Part 3 (Latest)	Acceptance
1	Chemistry	Spectro / Wet Analysis Method – One sample for every heat Of raw material and One sample/HT batch on product	As per Cl 2.0 of this TDC
2	Hardness Test	Note: Surface hardness shall not be more than 30 Vickers above the measured core Hardness on the product when readings of both surface and core are carried out at HV 0.30. For property class 10.9, any increase in hardness at the surface which indicates that the surface hardness exceeds 390 HV is not acceptable.	8.8 – Min 255 HV Max 335 HV 10.9 – Min 320HV, Max 380HV
3	Minimum Tensile Strength, %Elongation on 5.65√A, % Reduction in Area after fracture	*if wedge load test is satisfactory the axial tensile test is not required	8.8 – 830N/mm <sup>2</sup> , 12 min, 52% min 10.9 – 1040 N/mm <sup>2</sup> , 9 min, 48% min
4	Proof Load Test	8.8 – Proof Load of M16(91KN), M20 (147KN), M24 (212KN), M30 (337KN), M36 (490KN); 10.9 – Proof Load of M16(130KN), M20 (203KN), M24 (293KN), M30 (466KN), M36 (678KN) shall be applied axially to the bolt in a calibrated tensile testing machine for 15sec.	Length of the bolt after loading shall be the same as before loading within a tolerance of ± 12.5 µm allowed for measurement error.
5	Strength under Wedge load test	IS: 1367 Part 3 (Latest)	8.8 – < 830N/mm <sup>2</sup> 10.9 – < 1040 N/mm <sup>2</sup>
6	Decarburization Test at 200X min magnification	Determination of the following by MICROSCOPIC Method a)Minimum Height of non decarburized thread zone – E b)Maximum depth of complete decarburization – G	E = 2/3 H1 G = 0.015 mm
7	Hardness after Retempering	IS: 1367 Part 3 (Latest) # test not mandatory, to be applied in case of dispute only	Reduction of hardness 20 HV max.
8	NDE for Surface Integritly	<b>before machining</b> – For bar Diameter ≥ 40 mm: UT as per ASTM A388. For bar Diameter < 40 mm: MPI as per ASTM E 709 <b>After machining</b> – MPI as per ASTM E 709 or as per ISO 6157 Part 3 (Latest)	UT – ASME SEC-VIII. Div-II Part: 3.3.4 (Latest). MPI – Linear indications like cracks, folds & other injurious defects are not acceptable.

9	Micro Examination for Surface Integrity – Laps at threaded region.	If any defectives found in visual and NDE examinations, the extent of defect can be determined by micro examination. 	Max depth of laps in thread = 0.41 mm Laps of any depth or length are not permitted in the following places: <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> The following laps are permissible : <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>
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**NUT: (on Heat Treated finished product)**

Sl	Test	Test Method	Acceptance Value
1.	Chemistry	Spectro / Wet Analysis Method – For every heat Of raw material and, One sample/HT batch on product	As per Cl 2.0 of this TDC
2.	Hardness Test	Hardness of the test mandrel shall be minimum 45 HRC.	8S – Min 188 HV Max 372 HV 10S – Min 272 HV Max 372 HV
3.	Proof Load Test	Proof Load of 8S – M16(168.9KN), M20 (263.4KN), M24 (379.5KN), M30 (603.1KN), M36 (878.3KN) 10S – M16(195.5KN), M20 (305KN), M24 (439.5KN), M30 (698.4KN), M36 (1017.2KN) shall be applied axially to the nut in a tensile testing machine for 15sec.	The nut shall resist the load without failure by stripping or rupture, and shall be removable by the fingers after the load is released.
4.	NDE for Surface Integrity	Before coating, as per IS 1367 Part 10 Cl 4.2 (Latest)	Linear indications like cracks, folds & Other injurious defects are not acceptable.

**WASHER:** As per IS 5369. The washers shall be free from cracks, burrs, pits and other defects. All sharp edges shall be removed: (on Heat Treated finished product)

Sl	Test	Test Method	Acceptance Value
1.	Chemistry	Spectro / Wet Analysis Method – For every heat Of raw material and One sample/HT batch on product.	As per Cl 2.0 of this TDC
2.	Hardness Test	IS 1586 (latest)	Min 35 HRC Max 45 HRC

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

The following to be hot stamped or embossed on the top surface of the bolt and nut:  
 Bolt – Manufacturer's Identification Symbol and 8.8S/10.9S  
 Nut – Manufacturer's Identification Symbol and 8S/ 10S

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 Supplier internal W.O No
- 5) Quantum and Weight
- 6) BHEL Material Code
- 7) Item Description with diameter, length

Shall be packed in bituminous coated Polythene lined Hessian Cloth/Bag. Each bag shall contain only the same size of bolts/ nuts/ washers respectively and the same shall be indicated in the tags.

**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 (MTC) shall contain the following:

- 1) Purchase Order No. (BHEL), TDC No, Specification and Grade.
- 2) Name of raw material bar supplier.
- 3) Forming process
- 4) Dimensional reports for each product
- 5) Chemistry including incidental elements on the raw material and final product checked in NABL lab/ suppliers own lab.
- 6) HT details of materials temperature, soaking time, ROH/ROC medium etc.
- 7) All Mechanical test result report including hardness.
- 8) MPI, Micro examination and decarburization test report with the reference & acceptance standard.
- 9) TC of raw material, UT/MPI report done on raw material shall accompany the MTC.

**8. AUDITS AT BHEL:**

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

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Prepared By			Reviewed By			
						Approved By

**BHEL: TRICHY - 14**

**TEST SAMPLING PLAN FOR HSEFG BOLTS, NUTS & WASHERS AS PER BHEL TDC: 5:211 Rev 02**

Lot Size (In nos.)	SAMPLE SIZE										Remarks	
	Visual (nos.)	Dimensional (nos.)	MPI (nos.)	Physical Tests						Decarb (nos.)		
				Total nos.	Hardness (nos.)	Hardness after Re-tempering (nos.)	Proof Load (nos.)	Wedge Load (nos.)	Min Tensile Strength (nos.)			
Upto 100	20	8	15	5	5	2	2	2	2	2	1	
101 to 300	32	13	15	5	5	2	2	2	2	2	1	
301 to 500	50	20	15	5	5	2	2	2	2	2	1	
501 to 1000	80	32	15	5	5	2	2	2	2	2	1	
1001 to 3000	125	50	25	8	8	2	2	4	2	2	1	Upto 1500 nos. 15 nos. for MPI
3001 to 10000	200	80	50	13	13	2	2	6	2	2	1	Upto 5000 nos. 25 nos. for MPI
10001 to 35000	315	125	75	20	20	4	4	10	4	4	2	Upto 15000 nos. 50 nos. for MPI
Above 35000	500	200	100	32	32	6	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	

**Remarks:**

- 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.
- 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. Each bag shall contain only the same size of bolts/nuts/washers respectively and the same shall be indicated in the tags.
- Inspection by BHEL / BHEL AIA shown as "W" shall be witnessed for the sample size indicated against the lot size.

<i>10/2/2014</i>	<i>R. Kalpana</i> 28/10/2014	<i>20/11/2014</i>	<i>20/11/2014</i>	<i>20/11/2014</i>
Haritha.C QA	Venkanna Rupani QA	Kalyanaraman.V QA	Sekar.S QC	Revisankaran.U QA
Prepared By		Reviewed By		Approved By

**Annexure-C****Essential Commercial Terms & Conditions for our Enquiry No: PUR/UTY/HSFG FASTENERS /91; DT 31.10.15**

SL. NO	DESCRIPTION	BHEL'S REQUIREMENT	SUPPLIER'S COMMENTS
01	PRICE	Firm till completion of order.	
02	DELIVERY TERMS	FOR, DESTINATION (BHEL,Ranipet-Stores)	
03	PACKING&FORWARDING	Included. (if extra indicate in %)	
04	FREIGHT & INSURANCE	To be included (If extra indicate in %)	
05	EXCISE DUTY in %	To be indicated by supplier. (MODVAT copy to be provide along with supply)	
06	SALES TAX in % VAT/CST	To be indicated by supplier. (concessional form "C" will be/will not be given)	
07	OCTROI	If any, to supplier's account only.	
08	PAYMENT	100% within 45 days (for registered MSE vendors) / 90 days (for non MSE vendors) after receipt & acceptance of materials at our end. Please confirm your acceptance for the same. In the event of any deviation in the above payment terms the following loading on your base rate will be done as below." Base rate of SBI (as applicable on the date of techno commercial bid opening) + 6% shall be considered for loading for the period of relaxation sought by you")	
09	DELIVERY PERIOD	To be indicated by supplier	
10	L.D.CLAUSE	As indicated in Enquiry (as per IMPORTANT NOTE) Confirmation L.D. clause as indicated in Enquiry @ 0.5% per week subject to a maximum of 10% for the delayed delivery. (In case any bidder is not accepting the above penalty for delayed Supply, the offer of bidder shall be loaded to the extent to which it is not agreed by the bidder. Example: If the Supplier has accepted for maximum 5% penalty clause, then balance 5% will be loaded for evaluating lowest bidder)	
11	OFFER VALIDITY	Minimum 90 days from the date RA /Technical bid opening.	
12	INSPECTION BEFORE DESPATCH	Will be done at Your Works Before Dispatch	
13	TEST CERTIFICATE	Required	
14	GUARANTEE CERTIFICATE	The materials are to be guaranteed for satisfactory performance for a period of 12 months from the date of commissioning / putting in to use. OR, 18 months from the date of dispatch, which ever is earliest and if any defect is noticed during the above period, the same shall be rectified / replaced free of cost on FOR Ranipet / Destination basis within a reasonable time.(Required)	
15	RISK PURCHASE (PLEASE REFER OVERLEAF OF ENQUIRY FORMAT CLAUSE:7)	Alternatively, the purchaser at his option will be entitled 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 substitute 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 10 above	

16	Cancellation Clause	In the event of non- performance of the contract by the supplier. BHEL reserves the right to cancel the order with issue of a written notice. BHEL would provide a curing period of 30 days, for the supplier to rectify the situation. If the supplier fails to rectify the reason/s that led to the issue of cancellation notice by BHEL, then the cancellation order would be issued automatically by BHEL, without further recourse to the seller. BHEL will not pay any cancellation charges or any other charges/damages to the supplier, arising out of such cancellation. In the event of the non-performance of the supply contract, by the supplier, the rights of BHEL include, in addition to cancelling the order, to take alternate purchase action at the cost and risk of the supplier. The additional expenditure to be incurred by BHEL in such alternate purchase would be to the account of the supplier. (Risk Purchase). This remedy would be in addition to the revoking of the CEBG on grounds of failure of the supplier in executing the contract and any other legal remedies.”	
17	Force Majeure	If at any time, during the continuance of this contract, the performance in whole or in part by either party of any obligations under this contract shall be prevented or delayed by reason of any war, hostilities, acts of the public enemy, civil commotion, sabotage, fires, explosions epidemics quarantine restrictions, or acts of God ( herein after referred to as event ) then, provided notice of happening of any such event is given by other within 21 days from date of occurrence thereof neither party shall be reason of such event be entitled to terminate this contract nor shall either party have any claim for damages against the other in respect of such non-performance and delay in performance and delivery under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist. If the performance in whole or part of any obligation under this contract is prevented or delayed by reason of any such event, claims for extension of time shall be granted for periods considered reasonable by the Purchaser subject to prompt notification by the seller to the Purchaser of the particulars of the event and supply to the purchaser if, required , of any supporting evidence. Any waiver of time in respect of partial installment shall not be deemed to be a waiver of time in respect of remaining deliveries.	
18	Any Other Charges	Please indicate any charge applicable which is not include above	
19	CONTACT PERSON NAME:		
20	PHONE #, FAX#		
21	E-MAIL ID,		
22	CELL #		
23	Tin No		

The above format shall be completely filled and deviation if any shall be clearly spelt out. The columns which are not applicable shall be mentioned as “not applicable”. No column should be left blank. Non filling-up of columns may lead to rejection of your offer.

Date:

SIGNATURE WITH SEAL

**Note:** The techno- commercial terms both in the offer and in commercial terms & conditions sheet (Annexure-C) should be same and if any deviation/s in between the offers and commercial terms & conditions (Annexure-C) is/are found, the commercial terms & conditions (Annexure-C) will only be considered.