

ANNEXURE-A

SCHEDULE OF QUANTITY & TECHNICAL SPECIFICATION

1. Scope of Supply

Manufacturing, Inspection and Supply of PTFE Coated Fully Threaded Studs with two hex nuts as per Technical Specifications, Sizes and Quantity as given below:

Sr. No.	Item Description	Unit	Qty.	Remarks
	Manufacturing, Inspection and Supply of PTFE Coated Fully Threaded Studs with two hex nuts as per Technical Specifications, Sizes and Quantity as given below:			
1	Fully Threaded Studs with Two Hexagonal Nuts in PTFE Coated Condition , Size: Dia: 1/2" , Length: 4-1/2" , Thread Pitch: 2.5 mm MOC: ASTM A 193 Gr B7M in PTFE Coated Condition .	Set	600	One Set= One No. Stud + Two No. Hexagonal Nuts
2	Fully Threaded Studs with Two Hexagonal Nuts in PTFE Coated Condition , Size: Dia: 5/8" , Length: 4-1/2" , Thread Pitch: 2.5 mm MOC: ASTM A 193 Gr B7M in PTFE Coated Condition .	Set	600	
3	Fully Threaded Studs with Two Hexagonal Nuts in PTFE Coated Condition , Size: Dia: 3/4" , Length: 4-1/2" , Thread Pitch: 2.5 mm MOC: ASTM A 193 Gr B7M in PTFE Coated Condition .	Set	300	
4	Fully Threaded Studs with Two Hexagonal Nuts in PTFE Coated Condition , Size: Dia: 1/2" , Length: 6" , Thread Pitch: 2.5 mm MOC: ASTM A 193 Gr B7M in PTFE Coated Condition .	Set	400	
5	Fully Threaded Studs with Two Hexagonal Nuts in PTFE Coated Condition , Size: Dia: 5/8" , Length: 6" , Thread Pitch: 2.5 mm MOC: ASTM A 193 Gr B7M in PTFE Coated Condition .	Set	400	
6	Fully Threaded Studs with Two Hexagonal Nuts in PTFE Coated Condition , Size: Dia: 3/4" , Length: 6" , Thread Pitch: 2.5 mm MOC: ASTM A 193 Gr B7M in PTFE Coated Condition .	Set	400	

2. Material of Construction:

The fully threaded studs shall be in accordance to material specification as per ASTM A-193 Gr. B7M and two hexagonal nuts for each stud shall be in accordance with ASTM A-194 Gr-2HM. These studs and nuts shall be PTFE coated.

3. The supplier shall submit the QAP for approval from HWPK within 2 weeks from the issue of Purchase Order.
4. **Bidders must confirm that offered material will undergo quenching and tempering operation before thread rolling and material will undergo final heat treatment after thread rolling to achieve required final hardness in the given range.**
5. The heat treatment should be such that there is not excessive scaling and if required the heat treatment should be done in inert atmosphere.
6. The specifications of PTFE coating are as follows:

Sl. No.	Parameters	Values
---------	------------	--------

1	Thickness of Coating	Uniform thickness of 20 to 40 microns
2	Maximum Working Temperature for coating	250°C
3	Corrosion Resistance	Salt Spray (ASTM B117) up to 3,000 hrs (Nuts not frozen)
4	Adhesion	5B (ASTM D3359-95)

7. Material is subjected to inter-stage as well as final inspection by manufacturer QA department, which will include (but not restricted to) hardness measurement before as well as after thread rolling, Magnetic particles tests etc. Following tests shall be carried out on the material by the QA department of the supplier:

- 7.1. Chemical composition analysis. The chemical composition shall confirm to ASTM A-193 Gr. B7M for studs and ASTM A-194 Gr-2HM for nuts.
- 7.2. Tension Test for Mechanical properties i.e. UTS, % elongation in length, % reduction in area, yield strength etc as per ASTM A 370. The mechanical properties shall confirm to those given in ASTM A-193 Gr. B7M for studs and ASTM A-194 Gr-2HM for nuts.
- 7.3. Proof load testing for hexagonal nuts as per ASTM A 194M/ ASTM A 962M requirements.
- 7.4. Hardness testing of 100% fasteners by Indentation Method only.
- 7.5. Magnetic Particle testing (MPT) for 100% Studs as per ASTM Practice E 1444 and acceptable as per ASTM A 962/A962M Clause S57 under Supplementary Requirements.
- 7.6. Dimensional measurement including thread, fitment checking with GO / NO GO gauge.
- 7.7. Visual inspection.

8. Pre-dispatch Inspection (PDI):

The PDI at supplier's works will include following activities to be witnessed/reports to be submitted to the HWPk Representative without any additional financial implication:

- 8.1. Review of Original Mill Test Report (issued by NABL approved lab) towards chemical analysis of material. The chemical composition shall confirm to ASTM A-193 Gr. B7M for studs and ASTM A-194 Gr-2HM for nuts.
- 8.2. **Witness to Tensile Test of one stud from each heat/lot** towards mechanical properties i.e. UTS, % elongation in length, % reduction in area, yield strength etc as per ASTM A 370. The mechanical properties shall confirm to those given in ASTM A-193 Gr. B7M.
- 8.3. **Witness to Proof Load Test of one hexagonal nut for each heat/lot** as per ASTM A 194M/ ASTM A 962M requirements.
- 8.4. **Witness to 10% hardness testing** (by indentation method) and submission of Original Hardness Testing Report.
- 8.5. **Witness to Magnetic Particle Inspection of 10% randomly sampled fasteners** and submission of MPI Report.
- 8.6. Review of Heat Treatment Reports towards heat treatment operations i.e. quenching and tempering, Final Heat Treatment etc.
- 8.7. Dimensional measurement including thread etc.
- 8.8. Visual Inspection.
- 8.9. Fitment checking with GO / NO GO gauge.

9. Each stud/nut shall have product marking including grade, class and manufacturer identification symbols as per applicable ASTM material specification.

10. Packing, Shipment & Surface Coating

- 10.1. The studs/nuts shall be packed in fit up condition with a suitable coating to prevent corrosion and the packing shall have identification marks showing number of stud-nut sets, size etc. The material shall be packed properly to prevent deformation and damage during handling. The packing shall take care of transportation/shipment odds and evens to ensure no damage during transit of the material.
- 10.2. The packing shall be done in wooden box suitable for shipment.

11. Other Instructions for Vendors:

- 11.1. All the vendors shall attach the detailed technical specifications of studs/nuts along with their commercial offer. The technical specifications shall at least mention the ASTM standard for material of construction, expected mechanical properties & hardness of studs/nuts, the inspection they got conducted on material and the inspection reports they will submit for review i.e. Magnetic Particle Testing, heat treatment practices they carry out on the studs/nuts and heat treatment reports they submit for review etc. The offers not including such details in their offer shall be liable to technical disqualification.
- 11.2. The material shall be delivered to Stores Officer, Heavy Water Plant-Kota, Anushakti, Rajasthan-323303.

QUALITY ASSURANCE PLAN

Manufacturing, Inspection and Supply of PTFE Coated Fully Threaded Studs with two hex nuts.

Sr. No.	Components & Operation	Characteristics	Type of Check	Quantum of check	Ref.Doc.	Acceptance Norms	Form of Record	Insp. Agency		
								P	W	R
1	QAP	Submission of QAP for approval	Overall check of plan	-	Annexure-A	Annexure-A	Approved QAP	2	-	3
2	<u>Raw Material</u>									
2.1	Raw material for Studs & Nuts (Heat Treated Bars/Other Methods)	Chemical Properties	Mill Test for Full Chemical composition	Heat taken from each lot	Tender Specifications in Annexure-A & ASTM A-193 Gr. B7M and ASTM A-194 Gr-2HM	Conforming to ASTM A-193 Gr. B7M and ASTM A-194 Gr-2HM	Original Mill Test Certificates/ Lab Test Certificates/Purchase Docs	1,2	1,2	3
2.2	Raw material for Studs & Nuts (Heat Treated Bars/ Other Methods)	Mechanical Properties	Tension Test for Mechanical properties (Tensile & Yield, % Elongation,% reduction in area, Hardness etc)	Heat Treated Bars/ Tension Test Specimen taken from finished fasteners for other methods	Tender Specifications in Annexure-A & ASTM A-193 Gr. B7M and ASTM A-194 Gr-2HM, ASTM A 370	Conforming to Tender Specifications in Annexure-A, ASTM A-193 Gr. B7M and ASTM A-194 Gr-2HM, ASTM A 370 Hardness in the range RC-18 to RC-22	Mechanical Properties Certificate	1,2	1,2	3
3	Quenching & Tempering before Thread Rolling and Final Heat Treatment after Thread Rolling on fasteners.	Mechanical Properties Improvement	Heat Treatment	100%	Tender Specifications in Annexure-A & ASTM A-193 Gr. B7M and ASTM A-194 Gr-2HM	Conforming to ASTM A-193 Gr. B7M and ASTM A-194 Gr-2HM	Heat Treatment Reports	1,2	1,2	3
4	<u>Pre-Dispatch Inspection</u>									
4.1	Studs	Mechanical Properties	Tension Test	One from each Heat/Lot	ASTM A-193 Gr. B7M & ASTM A 370	ASTM A-193 Gr. B7M & ASTM A 370	Test Reports	1,2	2,3	-
4.2	Nuts	Strength of the nut	Proof Load Test	One from each Heat/Lot	ASTM A-194 Gr-2HM & ASTM A 962M	ASTM A-194 Gr-2HM & ASTM A 962M	Test Reports	1,2	2,3	-
4.3	Studs & Nuts	PTFE Coating	Specifications & properties	-	Tender Specifications	Tender Specifications	Test Reports	1,2	2	3

4.4	Studs & Nuts	Hardness	Hardness Check by Indentation Hardness Testing Method Only	10 % randomly selected samples from each lot	ASTM A 962/A962M or Test Methods F606	Hardness in the range RC-18 to RC-22	Hardness Check Report	1,2	2,3	-
4.5	Studs & Nuts	NDT	Magnetic Particle Inspection (MPI)	10 % randomly selected samples from each lot	ASTM A 962/A962M & ASTM Practice E 1444	ASTM A 962/A962M Clause S57	MPI Report	1,2	2,3	-
4.6	Studs & Nuts	Fitment	Fitment Check with GO/NO GO Gauge	Minimum 10% randomly selected Samples from each size lot	-	Proper Fitment	-	1,2	2,3	-
4.7	Studs & Nuts	Dimensions and Tolerances	Dimensional Check	100 %	Tender Specifications in Annexure-A and ANSI B 1.13M for threads	Conforming to Tender Specifications in Annexure-A and ANSI B 1.13M for threads	Dimensional Check Report	2	3	-
4.8	Studs & Nuts	Visual Check	Workman Ship, Finish, Thread Condition, deformation, Appearance etc	100%	-	Proper Workmanship, Finish, Devoid of any deformation etc	-	2,3	2,3	-

P = Performing Agency, W = Witnessing Agency, R = Review of documents agency

1 = Sub-Vendor, 2 =Supplier/Manufacturer, 3 = HWP (K) representative