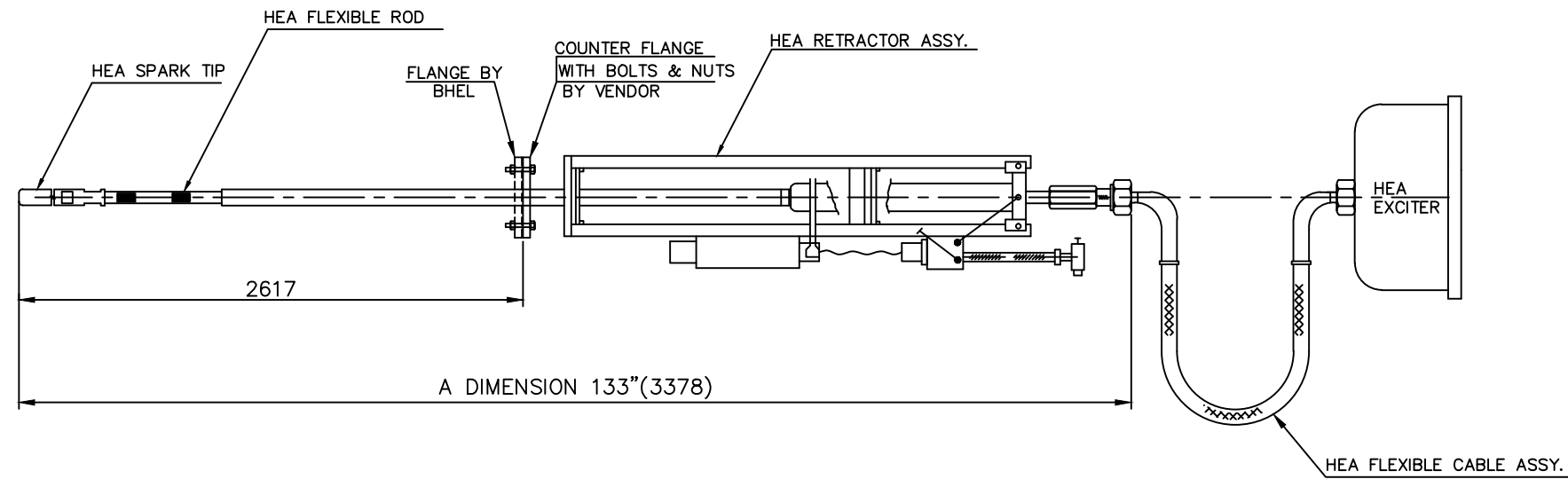


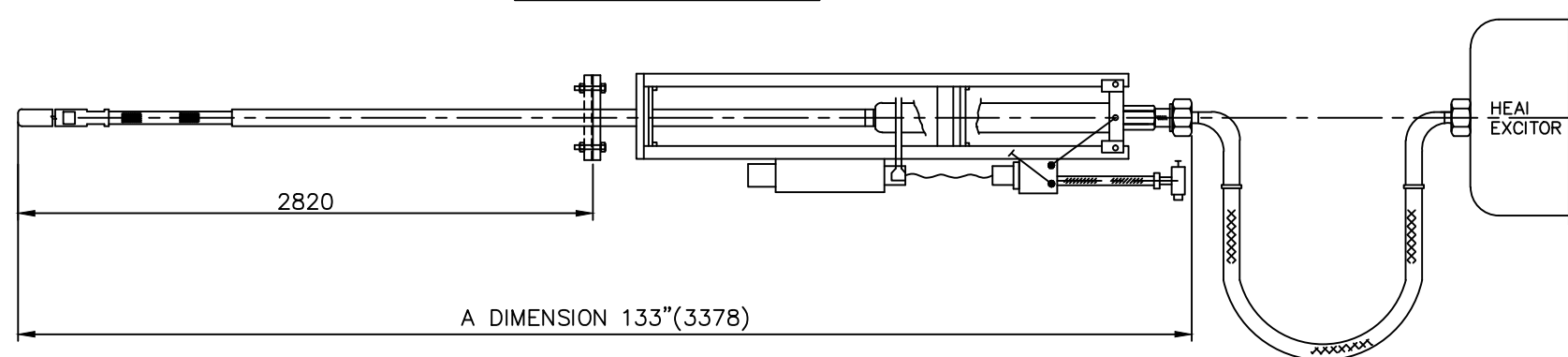
3-41-500-00795
DRAWING NO:

FOR TOLERANCES OF UNTOLERANCED
DIMENSIONS DURING MANUFACTURE
REFER PLANT STD.NO TP 023 0299

RETRACTED POSITION



EXTENDED POSITION



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	DEPT FS(FB) CODE 129		ALL DIMENSIONS ARE IN MM PROJECTION 		SCALE N.T.S
	WEIGHT (Kg) ---		REF TO ASSY / OLD DWG		
	TITLE		DRAWING NO :		REV
HEA IGNITOR DISPOSITION		3-41-500-00795		00	

REV	DATE	ALTERED :
01		CHD & APPD:
ZONE		



एनटीपीसी लिमिटेड

(भारत सरकार का उद्यम)

NTPC Limited

(A Govt. of India Enterprise)

(Formerly National Thermal Power Corporation Ltd.)

केन्द्रीय कार्यालय नोएडा

Corporate Centre NOIDA

Reference: null102:1473

Date:30-11-18

From:	SAMIR KUMAR BHOWMICK GM(TF)	To:	BHEL BHEL sirifort New delhi
		CC:	Gauravbhatia@bhel.in sajal@bhel.in pmgrishipal@bhel.in
SUBJECT : PSTPP, EPC - STEAM GENERATOR			
Please find enclosed following drawings/documents for necessary action at your end as indicated in purpose code.			
VENDOR DRG NO:	null		
NTPC DRG NO:	9585-001-102-PVM-H-006A		
REVISION NO:	02		
DRG TITLE:	Painting scheme for SG & Auxilliaries		
APP CATEGORY:	I		
RELEASE DATE:	30-11-18		
COMMENTS:	This document is approved subject to application of -Heat resistant Aluminium paint of Gr.-I instead of Gr-II & III -All coats at shop for structural steel.		



Engineering Division
ISO 9001:2008 Certified

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BHARAT HEAVY ELECTRICALS LIMITED

Tiruchirappalli - 620 014



**NTPC- PATRATU STPP, PHASE-I (3X800MW)
RANCHI, RAMGARH DIST, JHARKHAND
CUSTOMER NO: U8-1828/1829/1830 UNIT – I,II&III
PAINTING SCHEDULE**

NTPC Drawing No: 9585-001-102-PVM-H-006A

Prepared by	K. Srinivasan Senior Engineer/ Plant Lab		Document No: PL: C3 - PS / 1828
Reviewed by	S. Thiagarajan AGM/ PE/ FB		Revision No: 01 Dated: 16-11-2018
Approved by	A. Santhakumari AGM / Plant Lab		Sheet No. 01 of 13.

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RECORD OF REVISIONS

Rev. No	Date	Details of revision	Remarks
00	12-09-2018	New	Prepared in line with NTPC Bidding Doc. No. CS-9585-001-2 & related amendments and clarifications to Bidding Documents issued by NTPC.
01	16-11-2018	Sheet 3 – Gr.I aluminium paint indicated for Sl.no.1. Paint details indicated in sl.no.3. Sheet 4 – furnace Inlet headers are included in Sl. No. 4. Sheet 5 – Gr. I aluminum paint incorporated for RH & SH headers. Sheet 7 – Coating thickness indicated in sl. no. 10. Sheet 9 – Heat resistant aluminum paint provided for fuel pipes. Sheet 13 – Power tool cleaning requirement is indicated.	Modified as per comments for CAT. II approval by NTPC ‘Transmittal for comments on painting scheme of SG & auxiliaries’ Ref: null 102: 1246 Dt. 26.10.2018 & NTPC drawing no: 9585-001-102-PVM-H-006A.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT μm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
1 PS10	<u>Collector & Separator Vessels (Except Internals), Supports</u> 04 –321,323;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminum Paint to IS 13183 Gr. I DFT 20 μm per coat	1	--	--	Heat Resistant Aluminum Paint to IS 13183 Gr. I DFT 20 μm per coat	1	Aluminum	40
2 PS5	<u>Collector & Separator Vessels internals and Dd items (threaded and machined surfaces only)</u> 04-347;07-331,360,361,362,393; 08-911,912,913; 09-304; 12-306,314; 12-317,324,327,328,344,348,354,393; 17-304,306,319;19-306,307;21-602,605,700; 24-352,700,803,813,818,827,842; 28-700;32-700;35-190,700,701;36-700; 39-700;41-710;42-700,710;43-710; 45-710;47-710;48-019,700; 65-710;67-710; Foundation materials: 35-010, 39-012	SSPC – SP3 Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04 DFT=25 μm per coat	1	--	--	--	--	--	25
3 PS19C4	<u>Buck staves</u> 08-001,003,006,007,111,380,400, 08-501,503,901,910; <u>Boiler supporting structures, Columns, Girders, Bracings</u> 34-101 to 105,200,300,390, 34-441 to 445, 511, to 515, 35-131 to 139, 141 to 149, 151 to 159, 35-181 to 189, 211, 212, 35-213,214,221,222,231,232,311,312,321, 35-322,331,332,341,342,351,352,361,362, 35-371,372,374,375, 381 to 388, 390, 35-441 to 448, 451 to 458, 511 to 518	Blast cleaning to SA2 ½ (Near white metal) conforming to ISO 8501-1 with surface profile 40-60 μm	Inorganic Ethyl Zinc Silicate Primer DFT=70 μm per coat (refer sheet 12 Sl.no.11 for details)	1	Epoxy based MIO pigmented intermediate coat DFT 100 μm per coat (refer sheet 12 Sl.no.10 for details)	1	#Aliphatic acrylic Polyurethane paint DFT 35 μm (refer sheet 12 Sl.no.2 for details)	2	Grey White Shade To RAL 9002	240

~~# Out of 2 coats of aliphatic acrylic Polyurethane finish paint, one coat shall be given at shop / subcontracting works and second coat shall be applied at site.~~

For structural steel, all coats shall be applied at shop as per technical specification.

S. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT μm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3 PS19C4 (Contd.)	35-521 to 528; 35-531 to 538, 995; <u>Galleries, Stair-ways & inter connecting Walkways</u> 36-111,112,113, 151,152,153, 36-311,312,313,314,315,316, 36-321,322,323,324,325,326,331,332,333, 36-334,335,336,337,338,341,342,343,344, 36-345,346,351,352,353,354,355,356,361, 36-362,363,364,365,366, 371 to 377,381,382; 36-391 to 395 36-610,613,620,621,740; 38-210,299,310,381,410,510,610, 710; <u>ID system structures.</u> 39-101,102,141,142,150,299,300,301, 39-304,305,306,993; <u>Duct supports</u> 48-015,115,145, 205,225,235,265,345,355,365,385, 48-435,465,485,495,665;	Blast cleaning to SA2 1/2 (Near white metal) conforming to ISO 8501-1 with surface profile 40-60 μm	Inorganic Ethyl Zinc Silicate Primer DFT=70 μm per coat (refer sheet 12 Sl.no.11 for details)	1	Epoxy based MIO pigmented intermediate coat DFT 100 μm per coat (refer sheet 12 Sl.no.10 for details)	1	#Aliphatic acrylic Polyurethane paint DFT 35 μm (refer sheet 12 Sl.no.2 for details)	2	Grey White Shade To RAL 9002	240
4 PS9	<u>Components >95° C Insulated other than components in Sl.No.7 &9</u> Ring Headers, Down Comers, Hot air Headers outside the gas path etc. 05-137,147,155,227,231,251,327,330,350; 07-102,110,125,217,223,231,232; 12-178, 850,852, 900; 17-407,476,807; 18-001,002,010,701; 19-701,702,903;21-600;24-811,824,828; 24-836,837;42-020,030,128,150,158;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II Gr. I DFT 20 μm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT 20 μm per coat	1	Aluminum	40

~~# Out of 2 coats of aliphatic acrylic Polyurethane finish paint, one coat shall be given at shop / subcontracting works and second coat shall be applied at site.~~

For structural steel, all coats shall be applied at shop as per technical specification.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT μ m (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
4 PS9 (Contd.)	Hot Air: 48-018, 202,204,207,208,212,214, 222,224,232,234,262,264,662,664,667; Flue Gas: 48-342,344,352,354,362,364,372,382,384,386, 432,434,462,464,482, 484 ,492,494, 498;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II Gr. I DFT 20 μ m per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. II Gr. I DFT 20 μ m per coat	1	Aluminium	40
5 PS 9	<u>Components >95° C uninsulated other than components coming in gas path.</u> Temp: >95°C & <400°C 20-511; 24-807,820,860,865,867; 42-200,300,358; Instrument tappings, doors 48-200,915;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II Gr. I DFT 20 μ m per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. II Gr. I DFT 20 μ m per coat	1	Aluminium	40
6 PS 10	Components uninsulated other than components coming in gas path. (Temp: >400°C & <600°C) 09-003,004,005; 28-220; Components insulated (Temp: >400°C & <600°C) RH & SH headers 10-135,174,176,178,191,235,274,276,278,283, 10-284,285,291; 15-136, 178,236,278;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT 20 μ m per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT 20 μ m per coat	1	Aluminium	40
7 PS2	<u>Loose tubes, SH, RH & Eco. coils</u> 11-074,078,374,378,406,467,469, 11-487,491,494,606,608,684,694,716,717,718, 11-767,768,769,787,791,916,917,918,967,968, 11-969,987,991;12-179,181,184,187,368, 12-405,514,524,544,554; 12-800,803,805,903,914,917,924,927,928,944,948, 12-954,968; 16-201,202,203,270,278,379; 19-092,402,804,814,824,853,884,914,924,984;	SSPC – SP2 or SSPC – SP3 Hand tool / Power tool cleaning	Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03 DFT=35 μ m per coat	1*	--	--	No paint	No paint	Red Oxide	35

*-In lieu of dip painting, 2 coats of brush painting of Red oxide Zinc Phosphate primer to a coating thickness of 60 μ is also permitted in line with Sr.No.9.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT μm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
8 PS1A1	<p>Miscellaneous and casing sheets 07-409,431,460,461,462,502,503,509,531,560; 12-506,906,907; 17-919; 21-601,604,606; 24-350,351,354, 801,804,805,806,808,809, 24-810,815,817,821,825,826,835,840,841,855, 24-950,955,960;30-233,234; 36-396,611, 999; 38-611; 39-302;</p> <p>04-147, 547</p> <p>Fuel firing: 41-350,390,500;</p> <p>Steam blowing piping 42-001,002,005,010,046,065,070,120,152,154, 42-157; 43-004,104, 200; 45-200,801,802, 804,805,806,858; 47-281,283, 858;</p> <p>Duct plates, expansion joints 48-911,912;</p> <p>Coal Feeding 65-736; 67-204,272,276, 283,801,802,803; 95-088,089,091,485;96-186;97-585, 592;</p> <p>\$Handling equipment:99-099,100,300,400,600;</p> <p>Impulse lines: 24-800 Seal air ducting: 43-005, 105; Cold Air duct:48-012,014, 112,114, 141 Tempering Air: 48-142,144</p>	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 μm per coat	2	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20 μm per coat	2	Smoke Grey Shade No: 692 of IS5	100

\$ - Final Shade is Golden yellow for Under hung crane, Chain Pulley Block, Ratchet Lever and Trolley with hoist. Black shade for Hook.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT μm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
9 PS3	<u>Components >95° C coming in the gas path, Headers, Commissioning Spares & erection Materials etc.,</u> 06-400,401,431,434,437,441,444, 06-447,451, 453,455,500,501,731,732, 06-734,735,737,741,744,745,747,751,752,753, 06-755, 759; 07-309,315,316,318,423,883,993; 10-182,183,184,185; 11-474; 12-883,993;17-174,504,506,900,903; 19-704,753,763,783,793,802,850,851,852; 20-988,998; 21-987,988; 24-822,823, 987,988, 989, 993; 30-105,211,215,219,223,224,235; 31-010,104; 32-010,210,810; 35-993; 36-993;37-010;38-993; 41-997; 42-858,997;43-997;45-997;47-997;48-993; 65-200,997; 67-200,997;95-988;96-193; 97-282,590; 99-501; 41-988; 42-988;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 μm per coat	2	--	--	No paint	No paint	Red oxide	60
10 PS6	<u>Hand rails and posts, ladders / rungs</u> 34-810,820,850; 35-821,822,823,851; 36-821,822,823,851,852,853; 38-820,850;39-820,850; <u>Floor Grills, Step treads</u> 35 – 811,812;36-811,812,813,814 38 – 810, 39 – 810	SSPC – SP8/ Acid pickling	Hot dip Galvanizing to a coating weight of 610 g/m ² (minimum) and to a coating thickness of 87 μm . Refer Notes given below **							

Notes **: The Guard plates, Hood Ladders, Stringer channels, angles and plates shall be painted as per painting scheme prescribed in Sl. No: 03.

PAINTING SCHEME FOR VALVES

Sl.No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT μ m (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
11 PS 9/10	<u>Cast carbon steel valves (Conventional)</u> <u>Cast alloy steel valves (Conventional)</u> <u>All API valves, QCNRV, SV & SRV Silencers,</u> 21-800,825, 24-885; Safety valves & ERV 21-850; 24-880,881,883;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.IV/I Gr. I DFT= 20 μ m per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr.IV/I Gr. I DFT= 20 μ m per coat	1	Aluminum	40
	Forged valves	Chemical cleaning	Phosphating to a coating weight of 1500 mg per Sq.ft.	--	--	--	--	--	--	--
1AS2	<u>Soot Blower components</u> 20-051,054,201,204,794,962.	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 μ m per coat	2	--	--	Syn. Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20 μ m per coat	2	Verdigris Green Shade No. 280 of IS5	100
	HP / LP system	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.I DFT= 20 μ m per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr.I DFT= 20 μ m per coat	1	Aluminum	40

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT μm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
12 PS15	<u>For CLH & VLH*</u> PGs 07,08,12,17,19,21,24,47,48 & 80 07-402 to 405,505;12-517,528; 17-904,906 19-506,507,904,905, 906,907; 24-353; 48-206,395;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 μm	Epoxy zinc rich primer To IS 14589 Gr. II (latest) %VS=35, (min) DFT=40 microns per coat	1	--	--	Aliphatic acrylic Poly-urethane paint to IS13213 (latest) %VS=40.0 (min) DFT= 30.0 microns per coat	1	Phirozi Blue Shade No. 176 of IS5	70
13 PS8B	<u>Components > 95°C, un-insulated Fuel pipes</u> 47-200, 289;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. III - Gr. I DFT 20 μm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. III - Gr. I DFT 20 μm per coat	1	Aluminum	40
14 PS 1BE	All Columns below '0' level (embedded in concrete) PGs 34,35,36,38, 39	SSPC-SP3/ Power Tool Cleaning	HB Chlorinated Rubber Based Zinc Phosphate primer %VS=40, (min) DFT=50 microns per coat	1	--	--	No paint	No paint	Grey	50

*- For components other than CLH & VLH, Painting scheme shall be as given in Sl. No. 8.

NOTES:

1. Rust Preventive Coating should be given on HSEFG Bolt and nut threads.
2. Machined surfaces and all retainers are to be applied with a coating of Temporary Rust Preventive oil.
3. All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, Sleeves, shall be coated with Temporary Rust Preventive Fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents.
4. Ground shade/ Colour of Finish paints & identification tag/Band for equipments, pipings pipe service, boiler supporting structures and other boiler components shall be followed as per NTPC doc. ref no: QS-01-DIV-W-4, Rev.00.
5. PGMA's under Sub-Vendor items are not indicated. For all bought-out and sub-vendors items including PGMA's mentioned above falling under the scope of BHEL the same scheme as for main equipment as covered in this document shall be followed. For SCR system, vendor's painting scheme to be followed.
6. This painting Schemes is valid for only Customer No: U8/1828, 1829 & 1830, NTPC PATRATU - 3X800 MW.
7. No painting is required for Stainless Steel, non-ferrous & galvanized components.
08. Wherever inside surfaces of components under PGMA 48 – XXX & others, need protection till erection, two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns shall be applied, after power tool cleaning.
09. The Temporary Rust Preventive coating that already been applied on any components, tubes, pipes etc., shall be visually inspected for good adherence. If the coating is intact, direct coating of alkyd based red oxide paints over the coating is permitted. In case, the coating has peeled off over a large area, then the coating is to be removed by suitable solvents / heating to 350 –400 °C for an hour before primer paint application –but, in this case, it should be ensured that the minimum surface cleanliness required for primer paint application shall be SSPC – SP2 (equivalent – Hand Tool cleaning).
10. In components, wherever plates / sheets of thickness less than or equal to 5 mm and rods of <25mm/tubes/drain pipes are used, power tool / hand tool cleaning to SSPC – SP3 / SP2 shall be followed and the painting shall be done as described in SI.No.8.
11. For all commissioning components-erection materials (xx-993) two coats of Red oxide Zinc Phosphate Primer shall be applied to meet the temporary protection till erection, after power tool cleaning.
12. Touch-up paintings, making good any damaged shop painting and completing any unfinished portion of the shop coat shall be carried out as per clause applicable painting scheme.
13. All components covered under different PGMA's are to be painted. In case any component is left out, the same shall be deemed to be included under the relevant section based on paint logic approved.
14. For very small components like clamps etc. which are not having feasible dimensions for blast cleaning, painting scheme of SI.No.8 shall be followed.
15. For very small components with weldable primer at edges, the entire component shall be applied with weldable primer. Structural members having welded connections at site, relevant area can be painted with primer paint instead of Weldable primer.

16. Painting scheme for all temporary structures like 04-196 shall be PS 1AE i.e. 1 coat of Red oxide Zinc Phosphate primer (Alkyd Base) to IS 12744-DFT-30 μ and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20 μ Shade Yellow –Shade No. 356 of IS 5- Total DFT 70 μ . These are to be cut & removed at site after erection. (It excludes components covered under Sr. No. 3 & 9 of description table).

17. For internal protection of Pipes, tubes, headers and other pressure parts, Volatile Corrosion Inhibitor (VCI) pellets shall be put (after sponge testing/ draining/ or drying) and subsequently end capped. The dosage of VCI pellets shall be approximately 100 g/ Cu.m. For tubes typically 4 – 5 tablets per end are to be put. For C & I items the dosage of self-indicating Silica Gel (colourless) shall be 250 g/ cu.m. (About 2 to 3 bags weighing approximately 100 grams each). VCI pellets shall not be used for stainless steel components and its composite associates.

18. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.

19. Soot blower components i.e Valve head assembly having high surface temperature (> 200 and <600 deg. C) shall be applied with protective coating as per PS9 (up to 400 deg.C) and PS10 (up to 600 deg.C)

20. Corner plate, sheet channel and fixing pins of PGMA 32-210 shall be painted as per scheme PS3 to total DFT of 60 microns.

21. It is mandatory that for finish coat each layer shall have a permanent DFT and free from any paint defects like sags, wrinkles etc. Total DFT of a component correspond to respective painting scheme has to be ensured and recorded by inspection agency as per QP.

22. For chequered plates having thickness ≤ 5 mm, surface preparation can be power tool cleaning to St3 and painting shall be in line with Sl. No. 8.

23. Handrails, step treads of PGMA under Sl. No. 3 need to be galvanized in line with scheme for handrails (i.e. Sl .No. 10).

24. Inside surfaces of fabricated structure (e.g. Box type column) shall be painted with two coats of red oxide primer paint during fit up stage.

25. Painting of bunker structures to be in line with painting scheme of supporting structures (Sl. No. 3).

26. All steel structures shall be provided with painting as given in the specification. Further, painting system shall also meet the requirements of corrosivity category C3 (durability high) as per ISO 12944.

Painting Scheme – Details for procurement & application purposes

Sl. No.	Generic nature of paint	Theoretical Covering Capacity Sq.m per Litre.	No. of pack	Volume solids, % (min)	DFT in microns per coat (approx.)	Shade	Shade No. to IS5	Mode of appln.	Over coating interval, Hrs.
1	Epoxy Zinc rich primer to IS14589 Gr.II (latest)	8	2	35	50	Grey	--	Spray	24
2	Two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% (min) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 Delta – E).	13	2	55	35	Grey white	RAL 9002	Airless Spray	24
3	Heat resistant Aluminium paint to IS 13183 Grade I/II (latest)	10	1	-	20	--	--	Brush / Spray	24
4	Red oxide zinc phosphate primer paint to IS 12744 (latest)	10	1	--	30	-	--	Brush / Spray	12
5	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	35	--	---	Dip	12
6	Long oil alkyd synthetic enamel finish paint to IS2932 (latest)	17	1	--	20	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
7	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	25	--	--	--	12
8	General purpose Aluminium paint to IS 2339 (latest)	10	2	--	20	Aluminum	--	Brush	12
9	HB Chlorinated Rubber Based Zinc Phosphate Primer-Colour Grey	8	1	40	50	Grey	--	Brush / Spray	12
10	Two component polyamide cured epoxy based polyamide cured MIO pigmented intermediate coat. (containing lamellar MIO minimum 30% on pigment)	8	2	80	100 (min)	Brown/ grey	--	Airless Spray	24
11	Two component moisture curing zinc (ethyl) silicate primer, metallic Zinc content 80% (min), Zinc dust quality shall be as per ASTM D 520 Type 2.	8	2	60	70 (min)	Grey	--	Airless Spray	24

**The covering capacity of paints specified is only approximate.
The paints and Rust Preventive fluid shall be procured from BHEL's approved suppliers.**

Painting of Damaged Areas

(Areas where the paint has deteriorated badly by erosion and areas where the paint film has lost its adhesion and where the steel has rusted appreciably, should be repainted as follows)

Sl.No.	Components	Surface Preparation	Primer coat		Intermediate coat		Finish coat			Total DFT μm
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
1	Paint damaged components fall under Sl.no: 3	Power tool cleaning of minimum 6" of surrounding areas to bare metal	Epoxy zinc rich primer to IS 14589 Grade II	2 T.DFT 70 μ (min)	As given in scheme	1	As given in scheme	3	As given in scheme	As given in scheme



SPECIFICATION FOR HEA IGNITORS

1. The specification Contains :
Part I – Specification for HEA Ignitor
Part II A – Contract specific requirement of HEA Ignitor Assembly.
Part II B – Data sheet confirmation by Vendor.
2. If the requirement of part II A is differing with part I. The requirement of part II A will be mandatory.
Vendor should fill up the Part II after studying Part I and submit along with offer.
3. Vendor should fill up the Part II datasheet if any after placement of order and submit for approval.
4. Vendor offer is liable to be rejected if part II is not filled up and submitted with offer or incomplete submission.

PREPARED BY: P.DURAISAMY	CHECKED BY: M.ANBAGAN	APPROVED BY : M.THANDAPANI	DATE: 23.03.2008
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REV No.	DETAILS	REVISED BY	APPROVED BY	DATE
REV-01	General spec. revision	-Sd-	-Sd-	24.03.2015
REV-02	Specification as such revised based on MOU exercise.	N. Fazil	M. Thandapani	30.03.2017



PART-1 - SPECIFICATION FOR HEA IGNITOR

1.0 Description:

Retractable HEA Ignitor complete with Pneumatic Retractor, Exciter, Flexible cable, Spark rod and Spark Tip.

2.0 Application:

To ignite No.2 through No.6 fuel oils in a corner fired boilers or wall fired boilers.

3.0 Ignitor Type:

High Energy Arc capacitive discharge type or Thyristor type.

3.1.0: Excitor: Option: 1

3.1.1.0	Input Voltage	: 110V AC + 10%,-15%, 50 ± 5 Hz 230V AC + 10%,-15%, 50 ± 5 Hz (Refer clause 8.2 for contract specific requirements).
3.1.1	Output voltage	: 2000 V DC
3.1.2	Stored energy	: 12 Joules/Spark. *
3.1.3	Spark rate	: 4 per second minimum at rated voltage & frequency. *
3.1.4	Spark discharge time	: Total discharge time of 30 micro second; 6.3 micro second for first loop, when connected with 4 m long flexible cable.
3.1.5	First loop power	: 525 KW (Measured at tip)
3.1.6	Duty cycle	: 15 min. On, 30 min. OFF
3.1.7	Enclosure	: NEMA 4, Weather proof, openable type
3.1.8	Working temp (Min.)	: 75 deg C.
3.1.9	Working temp (Max.)	: 110 deg C.

3.1.0: Excitor: Option: 2

3.1.1.0	Input Voltage	: 110V AC + 10%,-15%, 50 ± 5 Hz 230V AC + 10%,-15%, 50 ± 5 Hz (Refer clause 8.2 for contract specific requirements).
3.1.1	Output voltage	: 1500 V DC
3.1.2	Stored energy	: 4.5 Joules/Spark. *
3.1.3	Spark rate	: 20 Sparks per second minimum at rated voltage & frequency. *
3.1.4	Spark discharge time	: Total discharge time of 30 micro second; 6.3 micro second for first loop, when connected with 4 m long flexible cable.
3.1.5	First loop power	: 500 KW (Measured at tip)



- 3.1.6 Duty cycle : 300 Sec at ED50%. Initial switch phase 60 sec @ 20 sparks / sec.
- 3.1.7 Enclosure : NEMA 4, Weather proof, openable type.
- 3.1.8 Working temp (Min.) : 75 deg C.
- 3.1.9 Working temp (Max.) : 110 deg C.
- (* Min. energy shall be maintained)
- 3.2.0 Spark Rod** : Flexible / Rigid
(Refer clause 8.4 for contract specific requirements).
- 3.2.1 Total length : As required \pm 3 mm.
(Refer clause 8.5 for contract specific requirements).
- 3.2.2 Flexible portion, if required : 900mm long, designed for 100 mm min., radius of bend flexing duty.
- 3.2.3 Maximum outer dia : 15.9 mm max. at any section.
- 3.2.4 Wire : Suitable for 540 deg. C maximum temperature and voltage of 2500 V DC, water and oil resistant insulation & should withstand flexing duty.
- 3.2.5 End connectors : Non - rotating type; material should ensure no binding during working.
- 3.2.6 Firing end rigid portion : Max. 235mm (when measured after tip is mounted).
- 3.2.7 Ambient temp : 110 deg. at cable end, 540 deg C at tip end.
- 3.3.0 Spark Tip:**
- 3.3.1 Max. Working temp : 650 deg C at tip (inserted approx.15 seconds into the furnace for every light up).
- 3.3.2 Tip life : 10⁶ Sparks (or) 10000 burner starts of 15-20 sec. / each start.
- 3.3.3 Construction : With end seal to avoid oil soaking into the spark tip.
- 3.4.0 Flexible Cable** : To connect excitor and spark rod.
- 3.4.1 Length : 3658 \pm 50 mm.
- 3.4.2 Construction : High temp. Cable with metal braided armored SS conduit with PVC outer protection.
- 3.4.3 Ambient temp : Max. 110 deg C.
- 3.5.0 Retractor:**
- 3.5.1 Air cylinder : 1 NO. Heavy duty cylinder 38 - 40 mm dia
- 3.5.1.1 Air cylinder stroke : 5" (127mm) / 8" (203mm) / 12" (305 mm)
(Refer clause 8.1 for contract specific requirements).
- 3.5.2 Air pressure : 3 to 7 kg/cm² (g), dry air.



- 3.5.3 Solenoid valve : 1 No., single coil, 4-way, class H coil; energize to advance Spark rod; de energize to retract spark rod; suitable for any one of the following voltage, as per specification.
: 110V AC + 10%,-15%, 50 Hz \pm 5 Hz /
: 240V AC + 10%,-15%, 50 Hz \pm 5 Hz /
: 24V DC
(Refer clause 8.2 for contract specific requirements).
- 3.5.3.1 Enclosure : NEMA 4
- 3.5.4 Limit switches : 2 Nos. with DPDT / Two Circuit double break contacts;
240 VAC, 10 Amps. Rating.
- 3.5.5 Clamp Assembly : Should be firm and designed such that clamping / de clamping does not disturb Limit Switch actuating clamp position and clamp does not slip in operation.
- 3.5.6 Working temp (Min) : 85 deg C.
- 3.5.7 Junction box : All wiring from solenoid valve and limit switches shall be terminated in a junction box.
: The junction box shall be of water and dust proof NEMA 4 construction with 22.2mm hole for 1/2" conduit entry.
Heat resistant wires of 20 SWG min shall be used.

4.0 INSPECTION & TESTS:

- 4.1 Following type test certificates shall be furnished:
- Enclosure Certification for exciter box & Junction box.
 - Dry heat damp recycling test as per IEC: 68-2-30 for exciter components.
 - Tip life, in 650 Deg C test furnace.
 - Spark rate at specified voltage.
 - First loop power.
- 4.2 Following works test certificates shall be furnished:
- Insulation test for exciter flexible cable and spark rod minimum 5 M Ω .
 - Dielectric test for 7500 V DC for 50 seconds.
 - Certificates for satisfactory working of exciter and retractor.

5.0 DOCUMENTS:

Following documents are required:

- 5.1 1 set of offer documents with point by point confirmation / deviation without which offer will be rejected.



- 5.2 1 Set of constructional drawings with offer.
- 5.3 1 Set of Test Certificates.
- 5.4 1 set of O&M and troubleshooting manual with detailed spares identification drawings along with soft copy.

6.0 GUARANTEE:

For 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier.

7.0 PACKING

Each item shall be separately packed in sea worthy casings with purchasers and supplier's part numbers/ material code numbers. The damaged items due to inadequate packing shall be replaced free of cost.



Part II A – Contract specific requirement of HEA Ignitor Assembly.

8.0 Contract Specific Requirements for HEA Ignitor Assembly:

Project Name: **PATRATU 3X800 MW STPS EXPANSION PHASE-I**

Customer No: **1828,1829 &1830**

- 8.1: HEA Retractor Assy Stroke Length (12") 127 MM (5") 203 MM (8") 305 MM
- 8.2: Solenoid Valve voltage for HEA Retractor Assy 110V AC + 10%,-15%, 50 Hz ± 5 Hz
 240V AC + 10%,-15%, 50 Hz ± 5 Hz
 24 V DC
- 8.3: HEA Ignitor Excitor Input voltage 110V AC + 10%,-15%, 50 Hz ± 5 Hz
 230V AC + 10%,-15%, 50 Hz ± 5 Hz
- 8.4: HEA Spark Rod Flexible Rigid
- 8.5: HEA Spark Rod Length ("A" Dim) 2390 mm (94") 2540 mm (100") 2920 mm (115")
When mounted with Spark Tip 3380mm (133") 3712 mm (146")
 2413 mm (95")
- 8.6: Electrical Enclosure for Solenoid Valve, Limit Switch, Excitor & Junction / Conduit Box Weather Proof Flame Proof Explosion Proof
- 8.7: Tubing Material SS (PVC sheathed) Copper (PVC sheathed)

- Denotes selection / Requirement

Special Contract requirement if any(attach separate sheet if required): --



9.0 Following drawing variants are to be submitted for approval.

- Variant No: 01: HEA Ignitor Assy; 5" stroke; A= 94" (2390 mm) Flexible spark rod.
- Variant No: 02: HEA Ignitor Assy; 5" stroke; A=100" (2540 mm) Flexible spark rod.
- Variant No: 03: HEA Ignitor Assy; 5" stroke; A=115" (2920 mm) Flexible spark rod.
- Variant No: 04: HEA Ignitor Assy; 5" stroke; A=133" (3380 mm) Flexible spark rod.
- Variant No: 05: HEA Ignitor Assy; 5" stroke; A=146" (3712 mm) Flexible spark rod.

- Variant No: 06: HEA Ignitor Assy; 8" stroke; A= 94" (2390 mm) Flexible spark rod.
- Variant No: 07: HEA Ignitor Assy; 8" stroke; A=100" (2540 mm) Flexible spark rod.
- Variant No: 08: HEA Ignitor Assy; 8" stroke; A=115" (2920 mm) Flexible spark rod.
- Variant No: 09: HEA Ignitor Assy; 8" stroke; A=133" (3380 mm) Flexible spark rod.
- Variant No: 10: HEA Ignitor Assy; 8" stroke; A=146" (3712 mm) Flexible spark rod.

- Variant No: 11: HEA Ignitor Assy; 8" stroke; A= 94" (2390 mm) Rigid spark rod.
- Variant No: 12: HEA Ignitor Assy; 8" stroke; A=100" (2540 mm) Rigid spark rod.
- Variant No: 13: HEA Ignitor Assy; 8" stroke; A=115" (2920 mm) Rigid spark rod.
- Variant No: 14: HEA Ignitor Assy; 12" stroke; A= 95" (2413 mm) Rigid spark rod.



Part II B – Data sheet confirmation by Vendor.

Variant no selected as per Clause 9.0: **09**

BHEL Specification		Suppliers' confirmations
1.HEA RETRACTOR ASSY.		
1.1.0 AIR CYLINDER		
1.1.1.0 Make	*	
1.1.1.1 Part No / Model No.	*	
1.1.1 Bore	38-40 mm	
1.1.2 Gaiter	To be Provided	
1.1.3 Stroke Length		
Stroke Length = 127 mm (5")	<input type="checkbox"/> Part No. / Model No.	
Stroke Length = 203 mm (8")	<input checked="" type="checkbox"/> Part No. / Model No.	
Stroke Length = 305mm (12")	<input type="checkbox"/> Part No. / Model No.	
1.1.3 Construction	Heavy Duty	
1.1.4 Working Temp (Min.)	85 ⁰ C	
1.1.5 Air Pressure Min/Max	3 to 7 Kg/ cm ² (g)	
1.1.6 Advance /Retract time Adjustable	2 to 5 Sec.	
1.1.7 Shaft Diameter	*	
1.1.8 Material		
Body	Aluminium	
Shaft	Stainless Steel	
Piston	Aluminium	
O Ring	Viton	
1.1.9 Pressure Port Connection	1/4" NPT	
1.1.10 Retractor mounting	4 holes dia 13.5 mm on PCD 98.5 mm, Flange OD 127 mm.	
1.2.0 SOLENOID VALVE		
110V AC + 10%,-15%, 50Hz ± 5Hz	<input type="checkbox"/> Part No. / Model No.	
240V AC + 10%,-15%, 50Hz ± 5Hz	<input type="checkbox"/> Part No. / Model No.	
24 V DC	<input checked="" type="checkbox"/> Part No. / Model No.	
1.2.1 Make	*	
1.2.1.1 Part No / Model No.	*	
1.2.2 Style	Single Coil,4 Way / 3Port	
1.2.3 Coil Duty	Continuous	
1.2.4 Inrush / Hold-AC	*	
1.2.5 Inrush / Hold-DC	*	
1.2.6 Insulation	Class H	
1.2.7 Valve Cv	*	
1.2.8 Material		
Body	Stainless Steel / Aluminium	
Internals	Stainless Steel / Aluminium	
Seating	Viton O Ring	
1.2.9 Valve ends	1/4" NPT	
1.2.10 Enclosure	Weather proof -NEMA 4	
1.2.11 Working Temp (Min.)	85 ⁰ C	
1.3.0 LIMIT SWITCHES	2 Number	
1.3.1 Make	*	
1.3.1.0 Part No / Model No.	*	
1.3.2 Contacts	DPDT/ 2 CKT DOUBLE BREAK	
1.3.3 Rating	240 VAC,10 Amps	
1.3.4 Enclosure	Weather proof -NEMA 4	
1.3.5 Working Temp (Min.)	85 ⁰ C	
1.4.0 JUNCTION BOX		



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(with terminal block)		
1.4.1 Enclosure	Weather proof -NEMA 4	
1.4.2 Conduit Entry	22.2 mm Hole	
2.0.0 IGNITOR EXCITER		
2.1.0 Make	*	
2.2.0 Input		
110V AC + 10%,-15%, 50Hz ± 5Hz	<input type="checkbox"/> Part No. / Model No.	
230V AC + 10%,-15%, 50Hz ± 5 Hz	<input checked="" type="checkbox"/> Part No. / Model No.	
2.3.0 Output Voltage	* V DC / Vendor to specify	
2.4.0 No. of Sparks @ rated Voltage	Minimum Sparks / Sec. / Vendor to specify	
2.5.0 Discharge Time	6.3 μ Sec. / Spark / Vendor to specify	
2.6.0 Stored Energy	Minimum Joules / Vendor to specify	
2.7.0 Power at Tip (First loop) min.	* Kw / Vendor to specify	
2.8.0 Peak Power	*	
2.9.0 Working Temp (Min.)	75 ⁰ C	
2.10.0 Duty	* Vendor to specify	
2.11.0 Enclosure	Weather proof -NEMA 4	
2.11.1 Conduit Entry	22.4 mm	
3.0.0 SPARK ROD		
Flexible	<input checked="" type="checkbox"/>	
3.1.0 Make	*	
3.1.1 Max. OD	15.9 mm	
3.1.2 Flex Section- To be Provided	900 mm	
3.1.3 Length 'A' dim (with tip)		
2390 mm (94")	<input type="checkbox"/> Part No. / Model No.	
2540 mm (100")	<input type="checkbox"/> Part No. / Model No.	
2920 mm (115")	<input type="checkbox"/> Part No. / Model No.	
3380 mm (133")	<input checked="" type="checkbox"/> Part No. / Model No.	
3712 mm (146")	<input type="checkbox"/> Part No. / Model No.	
2413 mm (95")	<input type="checkbox"/> Part No. / Model No.	
3.0.0 SPARK ROD		
Rigid	<input type="checkbox"/>	
3.2.0 Make	*	
3.2.1 Max. OD	15.9 mm	
3.2.2 Flex Section	Not required	
3.2.3 Length 'A' dim (with tip)		
2390 mm (94")	<input type="checkbox"/> Part No. / Model No.	
2540 mm (100")	<input type="checkbox"/> Part No. / Model No.	
2920 mm (115")	<input type="checkbox"/> Part No. / Model No.	
2413 mm (95")	<input type="checkbox"/> Part No. / Model No.	
3.4.0 Operating Voltage	* V DC	
3.5.0 Breakdown Voltage	* V DC	
3.6.0 Operating Temp.	540 ⁰ C at Tip, 110 ⁰ C at Retractor end	
3.7.0 Materials		
Tube	Stainless Steel	
Flex Section	Stainless Steel	
Pin / Socket	Nickel / Inconel	
Insulation of wire	Mica & Fibre glass	
Insulation of Socket	Ceramic	
3.8.0 Ceramic Insulator type	Non-rotating type	
4.0.0 SPARK TIP	180 mm Long	
4.1.0 Make	*	
4.1.1 Part No./ Model No.	*	
4.2.0 Operating Voltage	* V DC	



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4.3.0 Tip life	10 ⁶ sparks	
4.4.0 Material		
Casing	SS 310	
Tip	*	
Coating	Semi conductive	
5.0.0 FLEX CABLE	Length = 3658±50 mm	
5.1.0 Make	*	
5.1.1 Part No/ Model No.	*	
5.2.0 Operating Voltage	* V DC	
5.3.0 Break down Voltage	* V DC	
5.4.0 Operating Temp.	110 ⁰ C	
5.5.0 Materials		
Insulation	*	
Armour	Braiding	
Outer Cover	PVC	
6.0.0 INSPECTION & TEST		
6.1.0 Test Certificates		
6.1.1 Enclosure certification for Exciter box	Vendor to provide	
6.1.2 Enclosure certification for Junction box	Vendor to provide	
6.1.3 Dry Heat Damp Recycling Test as per IEC:68-2-30 for Excitor components	Vendor to provide	
6.1.4 Tip Life in 650 Deg C test furnace	Vendor to provide	
6.1.5 Spark rate at specified voltage	Vendor to provide	
6.1.6 First loop power	Vendor to provide	
6.2.0 Work Test Certificates		
6.2.1 Insulation Test for excitor flexible cable and spark rod	Min. 5 M Ω	
6.2.2 Dielectric Test	7500 VDC for 50 Sec.	
6.2.3 For working of Exciter & Retractor	Vendor to provide	
7.0.0 PACKING	<input checked="" type="checkbox"/> Seaworthy <input type="checkbox"/> Landworthy	
8.0.0 GUARANTEE	12Months from commissioning or 18 Months from supply: whichever is earlier	
9.0.0 REF.DOCUMENTS / DRGS		
9.1.0 HEA Ignitor Assy.	Vendor to provide	
9.2.0 Retractor Assy.	Vendor to provide	
9.3.0 Air Cylinder	Vendor to provide	
9.4.0 Solenoid Valve	Vendor to provide	
9.5.0 Limit Switch	Vendor to provide	
9.6.0 Exciter	Vendor to provide	
9.7.0 Spark Rod	Vendor to provide	
9.8.0 Spark Tip	Vendor to provide	
9.9.0 Circuit Drg/ Wiring diagram	Vendor to provide	
10.0.0 Special contract req. if any	-NIL-	

*** Vendor to specify**

Technical Pre-Qualification Criteria (PQR)

Technical Pre-Qualification Requirement for HEA Igniters

1. The vendor shall be an established retractable HEA (High Energy Arc) igniter (henceforth referred as Igniter) manufacturer and having adequate Engineering, Manufacturing, testing and servicing facilities. Vendor to Submit back-up documents for the same.
2. The supplier shall have experience of having supplied Igniters for igniting No.6 oil in thermal power plants or for the application of similar severity and to meet the technical parameters of exciter, spark rod, spark tip and retractor as per technical specification of enquiry or higher.
3. The igniter and its accessories offered shall be from the existing regular supply range of the supplier.
4. As proof of above pre-qualifying requirement points, vendor should submit :
 - a. Their manufacturing product catalogue which lists the enquired igniter as per above technical requirements.
 - b. Vendor shall furnish general reference list with details of Customer name, Oil handled, igniter parameter, P.O date, and customer reference details wherein the vendor has supplied igniters meeting the technical requirements as stated in this enquiry or higher.
 - c. Minimum ONE end user certificate for the satisfactory operational performance of their supplied igniter, meeting the minimum pre- qualifying requirements stated above.

OR

Minimum two purchase order meeting the minimum pre- qualifying requirements stated above.

- d. Vendor to attach the corresponding data sheets/ technical documents of the igniter supplied as per P.O / End user certificate (submitted vide point 4.c) for our review.
5. In case of order placement, the Vendor shall have the responsibility for the followings and same to be confirmed point wise.
 - a) Vendor should have the component replacement responsibility in case of defect / failure.
 - b) Vendor shall provide assistance in commissioning activities at site, if required.
 - c) Vendor should ensure that their product would perform as intended during erection & commissioning.
6. Backup document checklist to meet PQR to the fullest satisfaction of BHEL:

S. No	Document description	Check list
a.	Back-up documents as per pt. 1	<input type="checkbox"/>
b.	Product Catalogues as per pt. 4a	<input type="checkbox"/>
c.	General reference list as per pt. 4b	<input type="checkbox"/>
d.	One end user certificate OR Two P.O as per pt. 4c	<input type="checkbox"/>
e.	Data sheets/ technical documents as per pt. 4d	<input type="checkbox"/>
f.	Confirmation to clause (5)	<input type="checkbox"/>



CORPORATE QUALITY ASSURANCE
SUB-VENDOR QUESTIONNAIRE

i.	Item/Scope of Sub-contracting	
ii.	Address of the registered office	Details of Contact Person <i>(Name, Designation, Mobile, Email)</i>
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured	Details of Contact Person: <i>(Name, Designation, Mobile, Email)</i>
iv.	Annual Production Capacity for proposed item/scope of sub-contracting	
v.	Annual production for last 3 years for proposed item/scope of sub-contracting	
vi.	Details of proposed works	
1.	Year of establishment of present works	
2.	Year of commencement of manufacturing at above works	
3.	Details of change in Works address in past (if any)	
4.	Total Area	
	Covered Area	
5.	Factory Registration Certificate	Details attached at Annexure – F2.1
6.	Design/ Research & development set-up <i>(No. of manpower, their qualification, machines & tools employed etc.)</i>	Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 <i>(if applicable)</i>
7.	Overall organization Chart with Manpower Details <i>(Design/Manufacturing/Quality etc)</i>	Details attached at Annexure – F2.3
8.	After sales service set up in India, in case of foreign sub-vendor <i>(Location, Contact Person, Contact details etc.)</i>	Applicable / Not applicable Details attached at Annexure – F2.4
9.	Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any	Details attached at Annexure – F2.5
10.	Sources of Raw Material/Major Bought Out Item	Details attached at Annexure – F2.6
11.	Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing	Details attached at Annexure – F2.7



**CORPORATE QUALITY ASSURANCE
SUB-VENDOR QUESTIONNAIRE**

12.	Manufacturing facilities (List of machines, special process facilities, material handling etc.)	<i>Details attached at Annexure – F2.8</i>					
13.	Testing facilities (List of testing equipment)	<i>Details attached at Annexure – F2.9</i>					
14.	If manufacturing process involves fabrication then-	<i>Applicable / Not applicable</i>					
	List of qualified Welders	<i>Details attached at Annexure – F2.10</i>					
	List of qualified NDT personnel with area of specialization	<i>(if applicable)</i>					
15.	List of out-sourced manufacturing processes with Sub-Vendors' names & addresses	<i>Applicable / Not applicable</i> <i>Details attached at Annexure. –F2.11</i> <i>(if applicable)</i>					
16.	Supply reference list including recent supplies	<i>Details attached at Annexure – F2.12</i> <i>(as per format given below)</i>					
Project/ package	Customer Name	Supplied Item (Type/Rating/Model /Capacity/Size etc)	PO ref no/date	Supplied Quantity	Date of Supply		
17.	Product satisfactory performance feedback letter/certificates/End User Feedback	<i>Attached at annexure - F2.13</i>					
18.	Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating) <i>Note:- Reports need not to be submitted</i>	<i>Applicable / Not applicable</i> <i>Details attached at Annexure – F2.14</i> <i>(if applicable)</i>					
19.	Statutory / mandatory certification for the proposed product	<i>Applicable / Not applicable</i> <i>Details attached at Annexure – F2.15</i> <i>(if applicable)</i>					
20.	Copy of ISO 9001 certificate (if available)	<i>Attached at Annexure – F2.16</i>					
21.	Product technical catalogues for proposed item (if available)	<i>Details attached at Annexure – F2.17</i>					
Name:		Desig:		Sign:		Date:	

Company's Seal/Stamp:-