

BHARAT HEAVY ELECTRICALS LIMITED  
Tiruchirappalli - 620 014



**GUJARAT STATE ELECTRICITY CORPORATION I  
WANAKBORI 8, KHEDA DIST, GUJARAT  
STEAM GENERATOR PACKAGE & AUXILIARY B  
1 X 800 MW – SUPERCRITICAL BOILER  
CUSTOMER NO: U8/1809 - UNIT I  
PAINTING SCHEDULE**

DEVELOPMENT CONSULTANTS PRIVATE LIMITED			
Reviewed only for general conformance with contract drawings and specifications. Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents.			
ACTION : 2		DATE : 18.06.2015	
DISTRIBUTED BY :		TKD/AS/SHM	
1	Distributed	4	Approved except as noted. Resubmission required.
2	Approved	5	Disapproved. See accompanying letter.
3	Approved except as noted. Forward final drawing.	6	For information and record only.
SEE COVERING LETTER			
Letter Ref. No.		Date :	

Prepared by	K. Srinivasan Engineer/Plant Lab		Document No: PL: C3 - PS / 1809
Reviewed by	Dr. V. Rajasekharan Manager/ Plant lab		Revision No: 01 Dated: 16.06.2015
	A. Arunachalam SM /PE/FB		
Approved by	Dr. Anbazhagan. V DGM / Plant Lab		Sheet No. 01 of 12.

**RECORD OF REVISIONS**

<b>Rev. No</b>	<b>Date</b>	<b>Details of revision</b>	<b>Remarks</b>
<b>00</b>	<b>28.05.2015</b>	<b>New</b>	<b>Prepared in line with bid resolution between GSECL-DCPL and BHEL (page no. 09 to 16 of 17) dated 07.01.2013 Ref: Technical deviations/ Clarifications (SG-Quality) Annexure III of GSECL 1x800MW Wanakbori TPP.</b>
<b>01</b>	<b>16.06.2015</b>	<b>Painting scheme of Sl. No. 7 &amp; 10 has been changed as per DCPL comments in line with Vol. IIA, Sec- IV, Cl. 15.04.00 - b)</b>	<b>Change incorporated as per comments for CATEGORY 'ACTION-3' approval by DCPL Ref: 'GSECL-DCPL comments for BHEL reply on painting scheme of the Wanakbori 1x800MW SG Package' Dt.12.06.2015</b>

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
1 PS1AC	<u>Collector &amp; Separator Vessels (Except Internals), Supports Drum (Except Internals), Drum suspension</u> 04 -147,321,323,547.	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 $\mu\text{m}$ per coat	1	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20 $\mu\text{m}$ per coat	2	International-Orange Shade No: 592 of IS 5	70
2 PS5	<u>Collector &amp; Separator Vessels internals and Dd items Drum Internals &amp; foundation materials</u> 04-347; 07-302,303, 331; 07-360,361,362; 09-303,304;12-306, 12-314,317,324,327,328,344,348,354,393; 17-304,306,319;19-306,307; 21-602,605; 24-352,803,813,818,827,842; 32-010; 35-010,190, 701; 36-701; 39-012; 41-710; 42-710; 43-710; 45-710; 47-710; 65-710; 67-710	SSPC-SP1/ or SSPC – SP3 Solvent / Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04 DFT=25 $\mu\text{m}$ per coat	1	--	--	--	--	--	25
3 PS1JT	<u>Buck stavs</u> 08 – 001, 003,006,007, 111; 08 - 380, 501,503,901, 910; <u>Bunker columns, beams and bracings</u> 34 – 100, 200, 300, 400, 500; <u>Boiler supporting structures, Columns, Girders, Bracings</u> 35- 111,112,121,122, 140,150, 35- 211,212,213,214,221,222,231,232 35- 311,312,321,322,331,332,341,342	Blast cleaning to SA2 ½ or SSPC-SP10 (Near white metal)	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 35 $\mu\text{m}$ per coat	2	--	--	#Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 25 $\mu\text{m}$ per coat  # Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20 $\mu\text{m}$ per coat	2*  1	Smoke Grey Shade No: 692 of IS5	140

# Out of 3 coats of finish paint, \*first coat of synthetic enamel finish paint to 25 microns shall be given at shop / subcontracting works. Second coat of synthetic enamel finish to 25 microns and third coat of synthetic enamel paint to 20 microns shall be applied at site.

S. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3 PS1JT	35- 351, 352,361,362,381 to 387,390 35- 441 to 447,451 to 457,511 to 517, 35- 521 to 527,531 to 537 <u>Galleries, Stair-ways &amp; inter connecting Walkways</u> 36-110,130,150, 311,312,313,314, 36-315,316, 321to 326, 331 to 338, 36 - 341 to 346,351 to 356, 361 to 366, 36 - 391 to 395 ,610, 620,621,740; 38-210,299,310,381,410,510,610,611,710; <u>ID system structures</u> 39 - 101,102,141,142,150,299,300,301; 39 - 304,305,306; <u>Duct supports</u> 48-015, 115,145,200,205,225,235,265, 385,435,465,485,495, 665,911,912;	Blast cleaning to SA2 ½ or SSPC-SP10 (Near white metal)	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 35 $\mu\text{m}$ per coat	2	--	--	#Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 25 $\mu\text{m}$ per coat  # Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20 $\mu\text{m}$ per coat	2*  1	Smoke Grey Shade No: 692 of IS5	140
4 PS3	<u>Components &gt;95° C Insulated other than components in Sl.No.6 &amp;8</u> Ring Headers, Down Comers, Hot air Headers outside the gas path etc.  05-155,227,231,251,327,330,350; 07-110,125, 223,231,232; 10- 174,178,191, 274,278,283,284, 10-285,291; 12-178, 850,852,900; 15-136, 177, 236,279; 17-407,776,807; 18-001,010; 19-701,702,903; 21-600, 604; 24-811,824,828, 836,837,860,865,867; 42-020,030,150,158;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 $\mu\text{m}$ per coat	2	--	--	--	--	Red oxide	60

# Out of 3 coats of finish paint, \*first coat of synthetic enamel finish paint to 25 microns shall be given at shop / subcontracting works. Second coat of synthetic enamel finish to 25 microns and third coat of enamel paint to 20 microns shall be applied at site.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
4 PS3 (Contd.)	<u>Hot Air:</u> 48-018, 202,204,207,208,212,214, 222,224,232,234,262,264,662,664,667 <u>Flue Gas:</u> 48 - 372,382,384, 388,389,432,434, 48 - 462,464, 482, 484, 492,494,498;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 $\mu\text{m}$	2	--	--	--	--	Red oxide	60
5 PS 9	<u>Components &gt;95° C uninsulated other than components coming in gas path.</u>  09-503; 20-511; 24-807,820; 42- 300; 48-915	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II - DFT 20 $\mu\text{m}$ per coat	2	--	--	--	--	Aluminum	40
6 PS2	<u>Loose tubes, SH, RH &amp; Eco. coils</u>  11- 074,078, 374,378,406, 11 - 416,467,487,491,606, 608, 684,694,716, 11 - 718,767, 769,787,791,916,917, 11 - 918,967, 969,987,991; 12 - 184,187,368, 405, 514, 515, 524, 544,554, 12 - 803,805,903, 914,917,924,927,928,944, 12 - 948,954,968; 16-079,201,202,203, 379; 19- 814,824, 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 $\mu\text{m}$ per coat	1*	--	--	--	--	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 $\mu$  is also permitted in line with Sr.No.8.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
7 <b>PSLJR</b>	<u>Components &lt; 95° C –Other than components in Sl.No.3.</u>  07-409,431,460,461,462, 07-502,503, 531, 560; 12-906, 907; 21-601; 24-350, 801,804,805, 24 - 806, 808, 809,810, 815, 825,826,835, 24 - 840,841, 855,950; 30-233,234; 35-995; 36-396,611,613; 37-010; 39- 302; 41- 350,390, 500; 42-001,002,005,010,046,065,070,120,128, 42 -152,154,157; 43-004, 104, 200; 45-200,801, 802,804,805,858; 47-261,263,858; 65-736; 67-204,272,276, 283, 801,802,803; 95 - 088, 089, 091, 485; 96-186, 189; 97-097, 585,591,592 ; 99-100,300,600;  Impulse lines: 24-800 Seal air ducting: 43-005, 105;  Cold Air 48-012,014,022, 112,114,132,141 Tempering Air: 48-142,144,152;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 35 $\mu\text{m}$ per coat	2	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 25 $\mu\text{m}$ per coat	2	Smoke Grey Shade No: 692 of IS5	120

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
8  PS3	<u>Components &gt;95° C coming in the gas path ,Headers, Commissioning Spares &amp;erection Materials etc.,</u> 05-137,147; 06-400,401, 451, 500,501, 06-731,734, 737,741,744, 747, 06-751,752,753,755; 07-315,316,318,423, 993; 10- 182,183,184,185; 17-174, 504, 506, 903; 19-753,763,783,793,802, 19-850, 851,852; 20-988,998; 21-987,988; 24-822,823, 987,988,989,993; 30-103, 215,219,223,235; 31-010,104, 993; 32-210; 35-993; 37-810; 39-993; 41-988; 42-858, 988; 48-993; 65-200; 67-200; 96-193; 97-282,590; 99-099,502;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 $\mu\text{m}$ per coat	2	--	--	--	--	Red oxide	60
9  PS6	<u>Hand rails and posts, ladders / rungs</u> 34-850; 35 – @821,822, @823,851 36 – @820, 821, 851, 852, 853; 38 – @820,850 39 – @820,850 <u>Floor Grills, Step treads</u> 34-810,820; 35 – 811,812; 36-811,812,813,814 38 – 810, 39 – 810	SSPC-SP8, pickling	Hot dip Galvanizing to a coating weight of 610 g/m <sup>2</sup> (minimum) and to a coating thickness of 85.0 microns (minimum).  Refer Notes given below **							

Notes \*\*: The Guard plates, Hood Ladders and Stringer channels 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 $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
10  PS 9/10	<u>Cast carbon steel valves (Conventional)</u> <u>Cast alloy steel valves (Conventional)</u> <u>All API valves, QCNRV, SV &amp; SRV Silencers,</u> 21-800; 24-885; 42-300,358; <u>Safety valves &amp; ERV</u> 21-850; 24-880, 883; <u>Seal Boxes &amp; Doors etc.</u> 09-003,004,005; 28-220;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.II/ I	2	--	--	--	--	Aluminium	40
	Forged valves	Phosphating	To a coating weight of 1500 mg per sq.ft.	--	--	--	--	--	--	--
<b>1AS3</b>	<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 $\mu\text{m}$ per coat	2	--	--	Syn. Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20 $\mu\text{m}$ per coat	<b>3</b>	Verdigris Green Shade No. 280 of IS5	<b>120</b>
	HP / LP system	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.I	2	--	--	--	--	Aluminium	40

Sl.No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
11 PS15	<b><u>For CLH &amp; VLH*</u></b> PGs 07,08,12,17,19,21,24,47,48 &80  07-402, 403,405; 17-904,906,919; 19-506,507,904,905, 906,907; 24-351,353,817,819; 48-206,395;	Blast cleaning to SA2½ (Near white metal) with surface profile 35-50 $\mu\text{m}$	Epoxy zinc rich primer To IS 14589 Gr. II %VS=35, (min) DFT=40 microns per coat	1	--	--	Aliphatic acrylic Poly-urethane paint %VS=40.0 (min) DFT=30.0 microns per coat	1	Phirozi Blue Shade No. 176 of IS5	70
12 PS8A	<b><u>Components &gt; 95 C, un-insulated Fuel pipes</u></b>  47 - 266,267,268,269;	SSPC-SP3/ Power Tool Cleaning	General purpose Aluminium paint to IS 2339	2	--	--	--	--	Aluminum	40
13 PS 1BE	All Columns below '0' level (embedded in concrete) PGs 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	--	--	--	--	Grey	50

\*- For components other than CLH & VLH, Painting scheme shall be as given in Sl. No. 7.

**NOTES:**

01. Rust Preventive Coating should be given on HSFG Bolt and nut threads.
02. Machined surfaces and all retainers are to be applied with a coating of Temporary Rust Preventive oil.
03. 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.
04. Final coat of paint (site scope) for boiler structures (Sl. No.3) shall be given immediately after the boiler drum lifting activity without delay. 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 tender.
05. 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.
06. This painting Schemes is valid for only Customer No: U8/1809 - GSECL WANAKBORI SG PACKAGE-1X800 MW.
07. 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 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 Sl.No.7.
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 painting of damaged areas shall be carried out as per clause 15.03.00, sheet 11 of section 4, Volume IIA of the DCPL Technical Specification (Doc.no: K9213-EPC-SPC-001\_Vol. IIA-Sec-04\_LEAD) – Wanakbori 8 STPP- 1x800MW.
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. Sl. no.7 shall be followed.

15. For very small components with weldable primer at edges, the entire component shall be applied with 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 $\mu$  and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20 $\mu$  Shade Yellow –Shade No. 356 of IS 5- Total DFT 70 $\mu$ . 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. It is mandatory that for finish coat each layer shall have a permanent DFT and free from any paint defects like sags, wrinkles etc.
21. Handrails of PG 39 shall be hot dip galvanized as per PS6 – Sl. No. 9.

**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	Aliphatic acrylic polyurethane paint to IS 13213	10	2	40	30	Phirozi – Blue	176	Spray	24
2	Heat resistant Aluminium paint to IS 13183 Grade I/II	10	1	-	20	--	--	Brush / Spray	24
3	Red oxide zinc phosphate primer paint to IS 12744	10	1	--	30	-	--	Brush / Spray	12
4	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	35	--	---	Dip	12
5	Long oil alkyd synthetic enamel finish paint to IS2932	10	1	--	20	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
6	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	25	--	--	--	12
7	Epoxy Zinc rich primer to IS14589 Gr.II	8	2	35	40	Grey	--	Spray	24
8	General purpose Aluminium paint to IS 2339	10	2	--	20	Aluminum	--	Brush	12
9	HB Chlorinated Rubber Based Zinc Phosphate Primer-Colour Grey	8	1	40	50	Grey	--	Brush / Spray	12

## Brush painting is accepted, if recommended by the Paint suppliers. The covering capacity of paints specified is only approximate. The paints and Rust Preventive fluid shall be procured from BHEL's approved suppliers. \*\* Values are indicative.