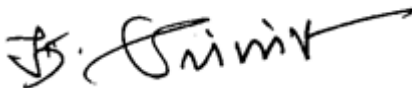




**BHARAT HEAVY ELECTRICALS LIMITED**  
Tiruchirappalli - 620 014



**BHUSAVAL THERMAL POWER PLANT, 1 X 660 MW**  
**M/s. MAHAGENCO, JALGOAN DIST., MAHARASHTRA**  
**CUSTOMER NO. U6/1727, UNIT-6**  
**PAINTING SCHEDULE**

Prepared by	K. Srinivasan Senior Engineer/ Plant Lab		Document No: PL: C3 - PS / 1727
Reviewed by	D. Vijayakumar SM /PE/FB		Revision No: 00 Dated: 11-06-2018
Approved by	A. Santha kumari AGM / Plant Lab		Sheet No. 01 of 11

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**RECORD OF REVISIONS**

<b>Rev. No</b>	<b>Date</b>	<b>Details of revision</b>	<b>Remarks</b>
<b>00</b>	<b>11-06-2018</b>	<b>New</b>	<b>Prepared in line with MAHAGENCO Bid Specification. No. DG/BSL U-6/2011/ T-1 &amp; clarifications to Bidding Documents.</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	Collector & Separator Vessels (Except Internals), Supports  04-147,321,547;	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 IS2932 (DFT = 20 $\mu\text{m}$ /coat)	2	International orange Shade No: 592 of IS 5	70
2 PSSB	Collector & Separator Vessels Internals & foundation materials 04-347; Machined components and threaded surfaces (Dd items): 07-302,303,309,331,360,361,362,393;09-303,304; 12-306,314,317,324,327,328,344,348,354,393; 17-304,306,319;19-304,306,307;21-602,605; 24-352,803,818,823,827,842;28-700; 32-700; 35-010,190,700; 39-012,700; 41-710;42-700,710; 43-710;45-710;47-710;48-019;65-710;67-710;	SSPC-SP1/ or SSPC – SP3 Solvent / Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04 DFT=20 $\mu\text{m}$ per coat	2	--	--	--	--	--	40
3 PS 1JT	<u>Buck stays</u> 08-001,003,006,007,111,501,503,901, 08-910;34-100,200,300; <u>Boiler supporting structures,</u> <u>Columns, Girders, Bracings</u> 35-211,212,213,214,221,222,231,232; 35-311,312,321,322,331,332,341,342,351; 35-352,361,362, 381,382; 35-383, 390,441,442; 35-443, 451,452,453; 35-511,512,513;35-521,522,523; 35-531,532,533,993,995;	Blast cleaning to SA2 ½ or SSPC-SP10 (Near white metal) with surface profile 35 $\mu$	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	Light Grey Shade No: 631 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 PS 1JT (continuation)	36-110,150,311,312,313,314; 36-315,316,321,322,323,324,325, 36-326,331,613,993; <u>Galleries, Stair-ways &amp; inter connecting Walkways</u> 36-332,333,334,335, 341,342; 36-343,344,345,351,352,353,354,355; 36-361,362,363; 36-391,392,393,394; 36-395,610,620,740; 38-210,299,310; 38-381,410,510,610,710,993; 39-101,102, 39-141,142,150, 300,301,304,305,306,993; 48-015,115,225,265,385,435,465,485,495; 48-665,911,912;	Blast cleaning to SA2 ½ or SSPC-SP10 (Near white metal) with surface profile 35 $\mu$	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	Light Grey Shade No: 631 of IS5	140
4 PS3	Components >95° C Insulated other than components in Sl.No.6 &8 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;12-178,900; 15-136,178;15-236,278;17-504,807,900; 18-001,010;19-701,702,753,903;21-600; 24-800,805,806,807,808,809,811,815; 32-010,210,810; 33-970; 37-010; 42-020,030,128,150,158; <u>Hot Air:</u> 48-202, 207,208,212,214, 48-222,224,232,234,262,264,267,662,664,667. <u>Flue Gas:</u> 48-372,382,384,386,432,434 48-462,464,482, 484,492,494;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 $\mu\text{m}$ per coat	2	--	--	No paint	No paint	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 synthetic 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	
5 PS9	Components >95° C and <400°C uninsulated other than components coming in gas path.  20-511; 24-820,824,835,860,865,867; 42-200,300,358;48-200,915;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II DFT 20 $\mu\text{m}$ per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. II DFT 20 $\mu\text{m}$ per coat	1	Aluminum	40
6 PS10	<u>Components uninsulated other than components coming in gas path.</u> Temp: >400°C & <600°C  09-003,004,005,503; 28-220;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT 20 $\mu\text{m}$ per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT 20 $\mu\text{m}$ per coat	1	Aluminum	40
7 PS2	Loose tubes, SH, RH & Eco. coils,  11-074,078,374,378,406,416,467, 11-487,606,608,684,694,716,718, 11-767; 11-769,787,791,916,918,967,969,987,991; 12-184,187,368,405,514,515; 12-524,544,554,803,805;12-852,903,914,917; 12-924,927,928,944,948,954,968; 16-079,201,202,203,270,379; 19-402,802,814,824,884; 19-914,924,984;	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*	--	--	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 $\mu$  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 $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
8 PS1A	<p>Miscellaneous casing sheets, fuel piping, duct plates, expansion joints and coal handling items</p> <p>07-409,431,460,461,462,502,503,531,560; 12-906,907;21-601,604,700; 24-350,700,804; 24-817,822,825,826,836,837,840; 24-841,855,950,955,960; 30-219,233,234,235; 36-611, 621; 38-611; 39-302; 41-350,390,500; 42-001,002,005,010,046,065,070; 42-120,152,154; 42-157;43-004,005,104,105,200;45-200,801; 45-802,804,805,858;47-261,263,858;</p> <p><u>Cold Air</u> 48-012,014,018,112,114,141;</p> <p><u>Tempering Air:</u> 48-142,144,145,204,205; 65-736;67-204,272,276,283,801,802,803; 95-088,089,091,485;96-186;97-585,591,592;</p> <p>Handling equipments: 99-099,100,300,400,600;</p>	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	Smoke Grey Shade No: 692 of IS5	70

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	
9 PS3	Components >95° C coming in the gas path, Headers, Commissioning Spares & erection Materials, Miscellaneous materials etc.,  05-137,147;06-400,401, 434,437; 06-451,453,455,500,501,731,732; 06-734, 737,741,744, 747,751,752; 06-753,755;07-315,316,318,423,993; 10-182,183,184,185;11-408,491; 12-850,993; 17-506;19-763,783,793,850,851,852,853; 20-998;24-993; 30-215; 30-103,223,224; 31-010,104; 34-390,400,500; 35-111,112,121,122,130,140,150; 36-130,327;42-858; 48-993;65-200;67-200;97-282,590; 20-988;21-987,988;24-987,988; 24-989;41-988;42-988;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30 $\mu\text{m}$ per coat	2	--	--	No paint	No paint	Red oxide	60
10 PS6	Hand rails and posts, ladders / rungs 34 - 820,850; 35 - 821,822, 823,851; 36 -820,851,852,853; 38 - 820,850;39 - 820,850;  Floor Grills, Guard plates 34-810;35 -811;36-811,812,813,814; 38 -810;39 – 810;	Acid pickling to SSPC-SP8	Hot dip Galvanizing to a coating weight of 610 g/m <sup>2</sup> (minimum)  Refer Notes given below **							

Notes \*\*: 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 $\mu\text{m}$ (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
11	Cast carbon steel valves (Conventional) Cast alloy steel valves (Conventional) All API valves, QCNRV, SV & SRV Silencers, 24-885; 21-800,825; <u>Safety valves &amp; ERV</u> 21-850; 24-880,881;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. I/DFT 20 $\mu\text{m}$ per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. I/DFT 20 $\mu\text{m}$ per coat	1	Aluminium	40
-	Forged valves	Chemical cleaning	Phosphating to a coating weight of 1500 mg per sq.ft.	--	--	--	--	--	--	--
12	Soot Blower components (Outside surface – shell) 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	2	Verdigris Green Shade No. 280 of IS5	100
PS 1AS	HP / LP system	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.I 20 $\mu\text{m}$ per coat	2	--	--	--	--	--	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	
13 PS15	For CLH & VLH* PGs 07,08,12,17,19,21,24,47,48 & 80 07-402,403,405,505;12-506; 17-904,906,919; 19-506,507,904,905,906,907; 24-351,353,810; 48-206,395;	Abrasive blast cleaning to Sa2½ 35- 50 $\mu\text{m}$	Epoxy zinc rich Primer to IS 14589 Gr II %VS = 35(min)	1 DFT =40 $\mu\text{m}$ Per coat	--	--	Aliphatic acrylic poly-urethane paint %VS = 35(min)	1 DFT= 30 $\mu\text{m}$ Per coat	Phirozi blue Shade No. 176 of IS 5	70
14 PS8A	Components >95 C & < 150 C, un-insulated Fuel pipes 47-269;	SSPC-SP3/ Power Tool Cleaning	General purpose Aluminium paint to IS 2339 DFT= 20 $\mu\text{m}$ per coat	1	--	--	General purpose Aluminium paint to IS 2339 DFT= 20 $\mu\text{m}$ per coat	1	Aluminum	40
15 PS 5B	All Columns below '0' level (embedded in concrete) PGs 34, 35,36,38 39	SSPC-SP1/ or SSPC – SP3 Solvent / Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04 DFT=20 $\mu\text{m}$ per coat	2	--	--	--	--	--	40

\*- 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 HSFG Bolt and nut threads.
2. All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, Sleeves, machined surfaces and retainers 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.
3. Ground shade/ colour of Finish paints & identification tag/Band for equipments, pipings pipe service, boiler supporting structures and other boiler components shall be followed.
4. Refer respective engineering document for all sub-vendor items not covered under this document.
5. No painting is required for Stainless Steel, non-ferrous & galvanized components. Abrasive blast cleaning to SSPC-SP6 (Sa2) shall be done to prepare the surfaces of hot worked pipes prior to application of primer.
6. 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 followed by 1 coat of synthetic enamel paint to IS 2932 – shade smoke grey shall be applied, after blast cleaning. For items meant for spares and subcontracting where no further processing is involved, the painting scheme selected shall be the same as that of similar product configuration/ description.
07. 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, 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).
08. 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 shall be followed and the painting shall be done as described in Sl.No.8.
09. For all commissioning components-erection materials (xx-993) two coats of Redoxide Zinc Phosphate Primer shall be applied to meet the temporary protection till erection, after power tool cleaning. This painting Schedule is valid for only Customer No: U6/1727- 1X660 MW BOILER for MAHAGENCO BHUSAWAL TPP.
10. Touch-up painting of damaged areas shall be carried out as per clause no. 15.1 of Page. No. 80 of 555 of Section – 4, Volume – II, master specifications of bid specification no. DG/BSL U-6/2011/ T-1.
11. 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.
12. For very small components like clamps etc. Sl.no.8 shall be followed with power tool cleaning.
13. Only weldable primer 2 coats to a DFT of 50 $\mu$  (2x25 $\mu$ ) shall be applied on both external and internal surfaces within 50mm from the end of the component to be welded subsequently at site. At those locations no other paint shall be applied. All small components (less than 300x300 mm in dimension) shall be given only weldable primer.
14. DUs coming under Constant Load Hangers (CLH)/ Variable Load Hangers (VLH) shall be painted as per the system - PS 15 indicated in Sl. No. 13 of the table. However, for DUs other than CLH/VLH, the painting shall be as per Painting Scheme PS 1A indicated in Sl. No. 8 of the table.
15. 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.
16. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.
17. Soot blower components i.e Valve head assembly having high surface temperature (> 200 and <600 deg. C) shall be applied with HR aluminium IS13183 Gr.II paint (up to 400 deg.C) and Gr.I paint (up to 600 deg.C)
18. Handrails of PGMA under Sl. No. 3 need to be galvanized in line with scheme for handrails (i.e. Sl .No. 10). For chequered plates having thickness <=5mm, surface preparation can be power tool cleaning to St3 and painting shall be in line with Sl. No. 8.
19. 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.
20. 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.
21. Painting of bunker structures to be in line with painting scheme of supporting structures (Sl. No. 3).

**Details for paint 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	8	2	35	40	Grey	--	Spray	24
2	Aliphatic acrylic polyurethane paint to IS 13213	12	2	40	30	Phirozi – Blue.	176	Spray	24
3	Heat resistant Aluminium paint to IS 13183 Grade I/II	10	1	-	20	--	--	Brush / Spray	24
4	Red oxide zinc phosphate primer paint to IS 12744	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	10	1	--	20	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
7	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	20	--	--	--	12
8	General purpose Aluminium paint to IS 2339	10	2	--	20	Aluminum	--	Brush	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.