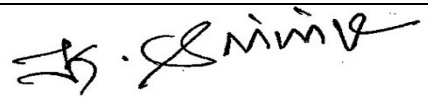
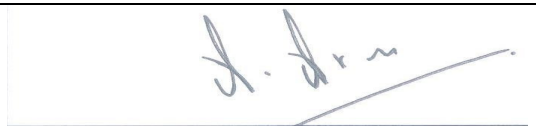
BHARAT HEAVY ELECTRICALS LIMITED
Tiruchirappalli - 620 014

M/s. TELANGANA STATE POWER GENERATION CORPORATION LIMITED
BHADRADRI TPS - 4x270 MW, MANUGURU, KHAMMAM DIST.
CUSTOMER NO: U2-1254/55/56/57, UNIT: 1 to 4
PAINTING SCHEDULE

Prepared by	**K. Srinivasan** **Engineer/Plant Lab**		**Document No: PL: C3 - PS / 1254**
Reviewed by	**Dr. V. Rajasekharan** **Manager/ Plant lab**		**Revision No: 00 Dated: 04.04.2015**
	A. Arunachalam **SM /PE/FB**		
Approved by	**Dr. Anbazhagan. V** **DGM / Plant Lab**		**Sheet No. 01 of 11.**

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RECORD OF REVISIONS

Rev. No	Date	Details of revision	Remarks
00	**04.04.2015**	**NEW**	**Prepared in line with BHEL STD painting scheme for Normal Atmospheric conditions.**

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
				Paint	No. of Coats / DFT	Paint	No. of coats	Paint	No. of coats	Shade	
1.1	1AC	Drum (Except Internals) 04-146;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 / DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Inter-national Orange Shade No: 592 of IS 5	70
1.2	1AC	Drum Suspension 04-126;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1/ DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Inter-national Orange Shade No: 592 of IS 5	70
1.3	5	Drum Internals 04 - 136; Other Machined Components: 35-700;39-700;43-104,105;	SSPC-SP1 or SP3 Solvent / Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04	1 DFT=25µm per coat	--	--	--	--	--	25
1.4	1AE	Drum Transport Structures	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Yellow Shade No: 356 of IS 5	70
2.1	11	Foundation Materials and Pin: 35-010,190;39-012;48-019; & Columns below " 0 " level of PG 35,36, 38 & 39	- -	No Paint	- -	- -	- -	No Paint	- -	- -	- -

Sl. No.	Scheme 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	
2.2	1J	Buck Stays and Structural Items: Buck stays 08-101,104,107,111,380,400,500,700,900; Boiler Supporting Structures 35-110,120,130,140,150,160,210,220,230,310,320,330,340,350,360,380, 35 - 381,390,441,443,511,513,521,523,531,533; 36-310,311,320,321,322,330,331,332,340,341,350,351,352,360,361,391,392, 36 - 393,610,612,620,621; 38-299,310,410; 39-101,140,150,300,301,303,304,305; Duct Supports 48-015,115,145,200,205,225,385,435,465,485,495,665;	Blast cleaning to Sa2 ½ (Near white metal) 35- 50 microns	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Smoke Grey Shade No: 692 of IS 5	100

Sl. No.	Scheme 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	
2.3	1A	Hangers: 36 - 740;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Smoke Grey Shade No: 692 of IS 5	70
2.4	1AB	Hand Rails & Posts 35 - 851; 36 - 851, 853; 38 - 850; 39 - 820,850;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Black	70
2.5	6	Floor grills, Guard plate** 35 - 811; 36 - 811, 813; 38 - 810; 39 - 810;	Floor Grills: Hot dip Galvanizing to a coating weight of 610 gm per sq.m (minimum) and to a coating thickness of 85.0 microns (minimum). ** Guard plates will be painted as given in Sl. No. 2.2.								
2.6	1AB	Ladders & Stairs 35 - 821, 823; 36 - 820; 38 - 820;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Black	70

Sl. No.	Scheme 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	
3.1	9/10	Components >95° C Un-insulated other than components coming in Gas Path 09-001,002,003; 21-800,850; 24-220,260,273,280,285; 28-220; 42-300,358;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Grade-II/I	1 (DFT =20 microns)	- -	- -	Heat Resistant Aluminium Paint to IS 13183 Grade-II/I	1 (DFT =20 µm per coat)	Aluminium	40
3.2	3	Components >95° C **Insulated** 05-137,147,155,175,227,229,231,251;12-993; 07-108,109,215,216,218,223,225,226,231,232; 10-135,174,178,191,235,274,278,283,284,291,687; 15-174,274; 18-001,010,020; 19-701,702,753; 21- 600; 24-200,215,275,316; 30-224; 42-020,030,128,150,158; 48-202,204,207,212,214,222,224,382,384,432,434,462,464,482,484; 48-492,494,662,664,667,993;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	-	- -	- -	- -	Red Oxide	60

Sl. No.	Scheme 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	
3.3	2	Heat Exchanger Coils: (SH, RH & Economiser Coils) 11-236,237,274,278,616,618,684,685,686,687,688,691,694; 12-174,184,187,535,803,805,850,852,900,903,906,914,917,924,927,928; 12-944,948,954,968; 16-275,277; 19-114,124,802;	SSPC – SP2 or SSPC – SP3 Hand tool / Power tool cleaning	Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03	1 DFT= 35µm per coat	--	--	--	--	--	35
3.4	3	Components coming in Gas Path other than Coils 06-400,631,634,637,644,647,651,655,670; 10-182,183,184,185; 19-763,783,850,851; 20-988,998; 21-988;24-988; 30-103,105,211,212,215,219,220; 31-010,102,104,105; 37-810; 41-988; 42-988; 96-193; 97-282,590;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	- -	- -	- -	- -	Red Oxide	60
3.5	8A	Uninsulated Fuel Pipes 47- 229;	SSPC-SP3/ Power Tool Cleaning	General purpose Aluminium paint to IS 2339	2	--	--	--	--	Aluminum	40

Sl. No.	Scheme 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	
4	15	Constant Load and Variable Load Hangers (CLH / VLH) **(See NOTE 14)** 07-401,410,420,431 ; 17-904,919,929; 19-904,905,906,907; 24-351;	Blast cleaning to Sa 2 ½ 35- 50 microns	Epoxy zinc rich primer to IS 14589 Gr. II %VS=35 (min)	1 DFT=40 µm / coat	--	--	Aliphatic acrylic Poly-urethane paint %VS=40 (min) t	1 DFT=30 µm per coat	Phirozi Blue Shade No. 176 of IS5	70
5.1	1A	Miscellaneous and Casing Sheets: 07-500,501,601; 21-601,987; 24-201,225,235,240,350,950,987,989; 37-010; 39-302; Fuel Firing: 41-350,390,500; Steam Blowing Piping: 42-001,002,005,010,046,065,070,120,152,154,157,200; 43-004,005,200;45-220,221; 47-221,223 ; Duct Plates and Expansion Joints: 48-012,014,,112,114,141,142,144; Coal Handling: 65-736; 67-204,272,276,283,801,802,803 ;95-088,089,091,092,485,495;96-186,187,188,189; 97-591,592;99-100;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Smoke Grey Shade No: 692 of IS 5	70
5.2	3	Erection Materials and Commissioning Components: 04-988; 07-993; 24 - 993; 35 - 993;38 - 993, 39 - 993;**97-**585;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm / coat	- -	- -	- -	- -	Red Oxide	60

Sl. No.	Scheme 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	
6.1	10	Cast carbon steel valves (Conventional) Cast alloy steel valves (Conventional) All API valves, QCNRV, SV & SRV Silencers, Water Level gauge HP / LP system	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.I	2	--	--	--	--	--	40
6.2	--	Forged valves	Phosphating	Coating weight of 1500 mg per sq.ft.	--	--	--	--	--	--	--
6.3	1AS	Soot Blower components 20-051,054,201,204,511,794,972;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Verdigris Green Shade No. 280 of IS**5**	70
6.6	8A	Hand Wheels	SSPC-SP3/ Power Tool Cleaning	General Purpose Aluminium Paint to IS 2339	2 DFT= 100µm per coat	--	--	--	--	--	40

PS for Arrows shall be as per valves and the final shade will be 'Post Office Red-Shade No. 538 of IS 5

NOTES:

1. **This painting scheme covers a comprehensive list of PGMAs being used in 125 / 210 / 250 / 270/500 MW and Industrial Boilers under Fossil Boilers working in normal environment, in an effort to standardise the painting scheme. Therefore, the entire list of PGMAs will not be applicable for any specific project and only those PGMAs applicable for the project may be used, while choosing the painting scheme applicable.**
2. **Rust Preventive coating should be given on HSFG Bolt & Nut threads.**
3. **All threaded & machined surfaces and all retainers 'A' & ''C' types are to be applied with a coating of Temporary Rust Preventive oil.**
4. **All surfaces of foundation 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.**
5. **PGMAs under Sub-Vendor items are not indicated. For all bought-out and sub-vendors items including PGMAs mentioned above falling under the scope of BHEL the same scheme as for main equipment as covered in this document shall be followed. (Please refer respective Engineering Document for all sub-vendor items)**
6. **No painting is required for Aluminium, Stainless Steel components and galvanized items.**
7. **Wherever inside surfaces of components under PGMA 48 – XXX, need protection till erection, and all running meter items for spares and main item two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns shall be applied, after power tool 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.**
8. **The Temporary Rust Preventive coating that has already been applied on any component, 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).**
9. **All currently active PGMAs are covered. Requirements for Missing / new PGMA s will be included under the relevant section, following the appropriate paint logic.**
10. **Ground shade/colour finish paints & identification tag/ band for equipments, piping, pipe service, boiler supporting structures and other boiler components shall be followed as per tender.**
11. **In components, wherever plates/sheets of thickness less than or equal to 5 mm, tubes/ rods/drain pipe are used, power tool /hand tool cleaning to SSPC-SP3/ SSPC-SP-2 shall be followed and the painting shall be done as described in Sl no: 5.1.**
12. **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.**
13. **Touch-up painting of damaged areas shall be carried out as per clause applicable painting scheme.**
14. **For very small components like clamps etc. Sl.no.5.1 shall be followed. For very small components with weldable primer at edges, the entire component shall be applied with weldable primer.**
15. **Only weldable primer shall be applied on surfaces, which require to be welded subsequently at site. At those locations no other paint shall be applied.**
16. **DUs coming under Constant Load Hangers (CLH) shall be painted as per the system - PS 15 indicated in Sl. No. 4 of the table. However, for DUs coming under Variable Load Hangers (VLH), the painting shall be as per Painting Scheme PS 1A indicated in Sl. No. 5.1 of the table. (i.e., one coat of Red Oxide Zinc Phosphate Primer followed by two coats of Synthetic Enamel Paint –shade smoke grey, total DFT – 70 microns)**
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 gm/ 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 gm/ 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. **Painting scheme for all temporary structures shall be PS 1AE i.e. 1 coat of Red oxide Zinc Phosphate primer (Alkyd Bse) to IS 12744-DFT-30 μ and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20μ Shade Yellow –Shade No. 356 of IS 5- Total DFT 70μ. These are to be cut & removed at site after erection. (It excludes components covered under Sr. No. 2.2, 2.4, 2.5 & 2.6 of description column)**
20. **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)**
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.**

Painting Scheme – Details for procurement & application purposes

Sl. No.	Material Code of Paint	Generic nature of paint	Theoretical Covering Capacity Sq. m per Litre	No. of pack	Volume solids, % (min) **	DFT in microns (min) per coat	Shade	Shade No. to IS5	Mode of appln.	Over coating interval, Hrs.
1	120016131800	Heat Resistant Aluminium paint to IS 13183 Grade I	10	1	-	20	Aluminium	--	Brush / Spray	24
2	120011111900	Red oxide Zinc Phosphate primer paint to IS 12744	10	1	--	30	Red Oxide	--	Brush / Spray	12
3	120011121900	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	35	Red Oxide	---	Dip	12
4	120011311200	Long oil alkyd synthetic enamel finish paint to IS2932	10	1	35	20	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
5	120011140000	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	25	Amber	--	Brush / Spray	12
6	120012141700	Epoxy Zinc rich primer to IS14589 Gr. II	8	2	35	40	Grey	--	Spray	24
7	120013310200	Aliphatic acrylic polyurethane paint to IS13213	10	2	40	30	Phirozi – Blue./French Blue	176/166	Spray	24
8	120017101800	De Oxy Aluminate Weldable Primer- Colour Aluminium	10	1	--	--	Aluminium	--	Brush / Spray	24
9	120014111700	HB CR Based Zinc Phosphate Primer	10	1	40	50	Grey	--	Brush / Spray	12
10	120014300100	CR Based Finish Paint	10	1	30	30	French Blue	166	Brush / Spray	12

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.