PROCEDURE FOR SURFACE PREPARATION AND PAINTING

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Record of Revision

Rev. No	Effective Date	Details of Revision
00	10.10.2002	RP0674199 Rev 05 requirements and PRQA rev 12 requirements were fully reviewed and this document is released as Rev 00 taking care of painting requirements of BAP projects. For project specific painting schemes respective CIS or contract specific painting schemes to be referred
01	22.05.2007	Painting requirement are fully reviewed. Red oxide Zinc chromate for primer application (IS 2074) is corrected as Red oxide Zinc phosphate primer (IS 12744) and also number of coats & DFT corrected
02	24.01.2018	Painting requirement are fully reviewed and totally revamped. Specific painting scheme for different environments are envisaged and other details added for overall painting document.

1.0 SCOPE

1.1 This procedure specifies the requirements for surface preparation, application of primer, intermediate and finish paints, personnel qualification, testing, inspection of manufactured and sub contracted components of APH, Fans, ESP, Gates and Dampers and Chimney. (For desalination, please refer PRQA:526/ Latest respectively)

1.2 As these standard painting schemes have evolved well over the years, and the performance of these paint systems have been satisfactory in many sites, these schemes will be offered to the customers during the tender stage. The use of standard painting scheme has several advantages including the avoidance of certain time consuming surface preparations and also the use of the proven techno-economic options for painting of the products.

1.3 In case of special contract requirements, wherein the customer is specific about having a painting scheme different from the above, then those special contractual requirements will be addressed through a Contract Specific Document with customer approval, when required. The linkage will be provided in the CQR issued by QA.

1.4 Good preservation/ transportation enhances the life of painted products. Suitable lasing method (use of rubber, nylon, rope/bel) shall be used while transporting and avoid metal slings to tie up the product with the load carrier.

2.0 GENERAL

2.1 This procedure specifies the painting requirements to

a) Provide adequate surface protection of components under prescribed storage conditions at Shop/ Site.
b) Temporary protection for components coming under the flue gas path till they are erected and
c) Protection for a reasonable time till completion of erection for components continuously exposed to atmospheric environment.

2.2 The scheme is based on the site practice of need based touch-up/ re-preservation program based on the duration of storage and the condition.

2.3 No painting shall be applied on the stainless steel, galvanized and any plated surfaces. For estimation of requirements of painting, the approximate area of coverage on non-absorbing surface is as given below,

SL NO	Generic nature of paint	Theoretical covering area (Sq.m/ litre)	DFT/ Coat (Min)	Shade
01	Red oxide zinc phosphate primer to IS 12744	10	30	Red oxide
02	Synthetic enamel paint to IS 2932	10	20	Smoke grey
03	Heat resistant aluminum paint to IS 13183	10	20	Aluminum

2.4 For bought-out items, the painting scheme shall be specified in Engineering Drawing/ purchase Specification. Wherever it is not specified, the following is the minimum requirement,

a) Primer: Two coats of red oxide Zinc phosphate primer to IS 12744- DFT 30 microns
b) Finish: Two coats of synthetic enamel to IS 2932 smoke grey shade no:692 of IS: 5. DFT 20 microns per coat

Manufactured items for bough-out items shall be as per the painting scheme of the applicable PGMA in this document.

2.5 All currently active PGMA's are covered. Requirements for Missing/ new PGMA's can be obtained from Engineering and Quality Assurance department.

3.0 PAINTING SCHEME & REFERENCE ANNEXURES

3.1 The surface preparation, primer coat, intermediate coat and finish coat requirements for various painting schemes are given as part of this document.

3.2 Section I deals with the surface preparation schedule and section II deals with painting and coating.

3.3 Standard painting scheme for normal environment/ coastal (or) refinery (or) chemical environment/ export projects can be referred in Part- I/ II / III in Section II available with this document.

3.4 Annexure I shall be referred for notes on painting scheme furnished in this document. Necessary instructions given for protective coating of various components.

3.5 Inspection and testing plan on surface preparation and painting is given under Annexure II. Description given for various grade of surface cleanliness and inspection techniques.

3.6 Procedure for painter qualification given under Annexure III.

3.7 The paints envisaged as per this document are indicated in this document under the Annexure IV- Painting scheme details for procurement and application purposes.

3.8 Good painting practices, which will be of assistance to task performer, have been detailed in Annexure VI.

SECTION - I

4.0 SURFACE PREPARATION REQUIREMENTS FOR PAINTING AND COATING

4.1 The effectiveness and duration of the protection provided by organic, Inorganic and metallic coatings for corrosion protection depends among other things decisively on proper surface preparation. This section deals with the methods of surface preparation, their effectiveness and fields of application.

4.2 This section is largely based on ISO 8501-1; 1988 that in turn is based on the Swedish standard SS 05 59 00.

4.3 SURFACE PREPARATION METHODS

4.3.1 Surface preparation depends on the initial condition of uncoated surfaces. The details of rust level, rust removal methods and characteristics surfaces are given in Table 1.0.

4.4 DEFINITIONS AND METHODS OF CLEANING

4.5 CLEANLINES OF SURFACES

4.5.1 Cleaning requirement and levels of cleanliness, contaminants such as dirt, oil that will interfere with the adhesion or effectiveness of the proposed coating must be removed. Coats of materials related to the metal (scale, rust) and coats of different materials (e.g existing coating) should be removed until the agreed level of cleanliness is attained.

4.5.2 Contaminants/ coats, both of related material and of materials different from the metal may be removed in one operation if the nature, level and thickness permits this. The required level of cleanliness depends on

- The corrosion protection system selected
- The type of corrosion exposure expected
- The initial condition of the surface being prepared
- The possible rust removal method
- Economic considerations

4.5.3 Generally, the standard levels of cleanliness as in table 1.0 should be used as basis. This does not cover the removal of weld spatter, weld or flame cutting slag or chips, repair grinding of rolling defects (laminations) deburring and similar operations.

4.6 MECHANICAL METHODS OF REMOVING DUST

4.6.1 Manual rust removal:

4.6.1.1 This applies to standard levels of cleanliness St 2, St 3 as per table 1.0 manual cleaning uses wire brush, stripping knife, Swedish scraper, rust removing hammer etc., the method must not damage the metal being derusted. Subsequent cleaning by sweeping or brushing off or by blowing off with dry air.

4.6.2 Mechanical rust removal:

4.6.2.1 This applies to standard levels of cleanliness St2, St3 as per table 1.0 cleaning can be done by mechanically driven rust removing tools viz. rotating wire brush, impact piston devices or rotary descalers, sanding discs etc. The surface areas where the power driven tool cannot enter, manual cleaning should be done. The method must not damage the metal being derusted. Subsequent cleaning by sweeping or brushing off or blowing off with dry air.

4.6.3 Blast cleaning

4.6.3.1 This applies to standard levels of cleanliness Sa 1, Sa 2½, Sa 3 as per table 1.0. Chemically contaminated surfaces must be pre-washed. Surfaces having coarse rust must be pre-cleaned with impact tools prior to blast cleaning.

4.6.3.2 Compressed air blasting is generally recommended for our operations. It is freely directed air blasting in blasting cubicles, Rooms or sheds with re-circulation of blasting abrasives.

4.6.4 Removal of contaminants/ coat of material different from the metal

4.6.4.1 Surface of metal contaminated with cutting fluid (machine coolant) oil or grease shall be wiped with mineral turpentine/ tri-chloroethylene prior to applying any methods of mechanical surface preparation.

4.6.4.2 If any old paint film or rust preventive films are present they may be removed with paint removing jelly.

4.6.4.3 As far as possible the cleaning method should be so chosen that all the scale is removed from the metallic surface to be coated. For heavily scaled metallic surfaces either blasting or picking may be adopted over and above the requirements called for in the table 1.0

4.6.5 Notes to Table 1.0

4.6.5.1 Initial condition of uncoated surfaces (rust grade as per SS 05 59 00)

a) Steel surface largely covered with adhering mill scale but little, if any rust.

b) Steel surface, which begun to rust and from which the mill scale has begun to flake.

c) Steel surface on which the mill scale has rusted away or from which it can be scrapped, but with slight pitting visible under normal vision.

d) Steel surface on which the mill scale has rusted away and on which general pitting is visible under normal vision.

4.6.5.2 Standard levels of cleanliness equivalent to steel structures painting council of US (SSPC) also given in brackets in table 1.0.

Table 1.0

Standard levels of cleanliness	Rust removal method	Initial conditions of steel surfaces (Uncoated ref. 4.5)	Essential characteristics of the prepared steel surface
St 2 (SSPC- SP 2)	Thorough hand and power tool cleaning	B, C, D	When viewed without magnification, the surface shall be free from visible oil, grease and dirt and from poorly adhering mill scale, rust coatings and foreign matter.
St 3 (SSPC SP 3)	Very thorough hand and power tool cleaning	B, C, D	As for St 2, but the surface shall be treated much more thoroughly to give a metallic sheen arising from the metallic substrate.
Sa 1 (SSPC SP 7)	Light blast cleaning	B, C, D	When viewed without magnification, the surface shall be free from visible oil, grease and dirt and from poorly adhering mill scale, rust coatings and foreign matter.
Sa 2 (SSPC SP 6)	Thorough blast cleaning	B, C, D	When viewed without magnification, the surface shall be free from visible oil, grease and dirt and from most of the mill scale, rust, paint coatings and foreign matter. Any residual contamination shall be firmly adhering.

Standard levels of cleanliness	Rust removal method	Initial conditions of steel surfaces (Uncoated ref. 4.5)	Essential characteristics of the prepared steel surface
Sa 2½ (SSPC SP 10)	Very thorough blast cleaning	B, C, D	When viewed without magnification, the surface shall be free from visible oil, grease and dirt and from the mill scale, rust, paint coatings and foreign matter. Any remaining traces of contaminations shall show only as slight stains in the form of spots or stripes.
Sa 3 (SSPC SP 5)	Blast cleaning to visually clean steel	A, B, C, D	When viewed without magnification, the surface shall be free from visible oil, grease and dirt and from the mill scale, rust, paint coatings and foreign matter. It shall have a uniform metallic colour.

SECTION –II

PART- I

STANDARD PAINTING SCHEME FOR NORMAL ENVIRONMENT

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
A	**REGENERATIVE AIR PRE- HEATERS**									
01	Heating element baskets (without elements) 52010, 024, 025	Power tool cleaning to ST- 3 (SSPC SP3)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60
02	Heating element baskets (with elements) 52010, 024, 025	--	Temporary rust preventive oil non dry type (*) (Dipping)	--	--	--	--	--	--	--
03	Rotor post assembly machined items of (52011), Pin rack assembly (52012), Seals (52013, 52054, 52055), sector plates (52041, 52042) and machined components of APH	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
04	**Components in flue gas path and insulated** Rotor post assy (52011), T bars (52013), Rotor housing assy (52030), Hot and cold connecting plate assy (52041,52042)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60

(*) Specification as per PRQA 522/ Rev 00

(**) Specification as per PRQA 523/ Rev 00; For CE coil- TEP/AQCS/RP (Latest)

Part- I contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
05	**Components exposed to atmosphere** Rotor drive assy (52100), Access door (52220), Air seal piping (52211), observation port other than glass part (52220), Rotor stoppage alarm other than aluminium (52220), Loose items of air receiver (52220), Guide bearing assy (52261), Support bearing assy (52262), Oil piping GB, SB (52271, 52272), Oil circulation unit (52274), Deluge and wash pipe assy (52301, 52302), Cleaning device assy (52339, 52340), Thermocouple pipe assy other than SS	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT=30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70
B	**TUBULAR AIR PRE-HEATER**									
01	Side walls (external surfaces and internal surfaces)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60

Part- I contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	Machined surfaces, tubes of TAPH, tube plates and intermediate plates	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
C	**FANS**									
01	Foundation materials 550XX, 560XX (Threaded portion)	Power tool cleaning to St-3 (SSPC SP3)	Temporary rust preventive oil	40	--	--	--	--	--	--
			Other areas except threaded portion- Red oxide Zinc phosphate primer to IS 12744, DFT- 30 µ							
02	**Components exposed to atmosphere**									
02.a	Bearing pedestals, Base frame, servomotor assy, shaft with bearing assy, OGV, IGV (55-1XX, 55-2XX, 55-3XX, 55-5XX, 55-6XX, 56-4XX) Bearing pedestals, Base frame, shaft with bearing assy, RVC, IGV, Support for seal, shaft protecting tube, Spiral casing (if no insulation is applicable), Damper (56-1XX, 56-2XX, 56-3XX, 56-4XX) Coupling guard (56-8XX, 55-8XX), Tools (56-000, 55-000)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT=30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70
			General notes for Sl no: 02.a & 02.b for C. Fans 1) As a assy, no blasting to be done for servomotor assy& shaft with bearing assy. 2) Before assy, all external un-machined surfaces of bearing housing/ cylinder to be painted. 3) AP impeller painting to be done before assembly except oil chamber area & mating component contact area. 4) After SR/ Before machining, blasting and primer painting to be done.							
02.b	AP fan components like Servomotor assy, Shaft with bearing assy	Power tool cleaning to St-3 (SSPC SP3)	Epoxy based zinc phosphate primer to IS 13238	02/ DFT=30µ/ coat	--	--	--	--	--	60

Part- I contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
03	**Components in Air/ Gas and under insulation**									
03.a	Suction chamber, diffuser, housing, OGV, Spiral casing, damper, IGV, RVC, impeller, shaft (56-1XX,56-2XX, 56-3XX, 56-4XX) Silencer (55-9XX, 56-9XX)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60
03.b	AP fan impeller (55-2XX, 55-3XX)	Power tool cleaning to St-3 (SSPC SP3)	Epoxy based zinc phosphate primer to IS 13238	02/ DFT=30µ/ coat	--	--	--	--	--	60
04	Journal area of shaft (55-1XX, 56-1XX, 55-2XX, 56-2XX, 55-3XX, 56-3XX, 56-4XX)- Refer PRQA 341/ Latest									
05	All machined surfaces shall be applied with rust preventive.									
D	**ELECTROSTATIC PRECIPITATOR**									
01	GD drive arrangement (7X X10), Drive arrangement for emitting system (7X X17), Inspection doors (7X X23), Drive arrangement for CE rapping (7XX26), Outer roof (7X X42), ESP Penthouse other items (7XX55), ESP test equipment (7XX61), Water washing system (7X X66), Tools & Tackles (7X 996), Lifting beam (7X X20)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT=30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70

Part- I contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	ESP Penthouse columns & Trusses (7X-X55), ESP columns (7X X81), Hopper approach platform (7X X65)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Epoxy based Zinc phosphate primer to IS 13238 (Latest)	01/ DFT= 30µm	Epoxy based MIO pigmented intermediate coat	01/ DFT= 75µm	Epoxy based polyamide cured finish paint to IS 14209 (Latest) + Aliphatic acrylic polyurethane paint to IS 13213 (Latest)	01/ DFT= 30µm 01/ DFT= 30µm	Smoke grey Shade 692 of IS 5	165
		Columns below 0.0 level- Chlorinated rubber based zinc phosphate primer to 50µm (min) to be applied.								
03	Stringer and guard plates (8X 610), Hand rails, post, step treads, Floor grills (8X 611,612,613)	Hot dip galvanizing to a coating weight of 610gm per sq. m (minimum) and to a coating thickness of 85 microns (minimum)								

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
04	Insulator housing assy (7X X06), Gas distribution assy (7X X08), GD rapping mechanism (7X X09), Gas screening (7X X11), Emitting system suspension (7X X13), Emitting Electrode rapping (7X X16), Suspension arrangement for CE (7X X19), Frame of Emitting system Top, middle& bottom (7X	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60

	X21, X22, X32), shock bars(7X X24), CE rapping mechanism (7X X25), contd… Contd… Ridges (7X X43), Hopper upper, lower &middle part (7X X44, X45), Insulator support panel (7X X46), Roof panel assy (7X X47) Casing structure (7X X28, X48), Casing shell (7X X49, ESP funnel (7X X50), Splitter & Guide vane (7X X57)									

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
05	EE (7X X15) (EE hook), EE suspension hook (7X X13), CE (7X X20), CE suspension hook (7X X19), Foundation material for ESP structures & ducts (7X X80)	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
E	**GATES AND DAMPERS**									
01	Gates and Damper Temperature ≤ 95°C (57-0XX, 57-1XX)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT= 30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70
02	Gates and Damper Temperature ≥ 95°C (57-2XX, 57-3XX, 57-4XX, 57-6XX)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60

03	Gates blades, Machined components of G&D	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
F	**CHIMNEY**									
01	Foundation bolt (87010)	Power tool cleaning to St-3 (SSPC SP3)	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
02	Shells- Inside and Uninsulated side, base plate (87 100)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)	02/ DFT= 20µ/ coat	--	--	--	--	--	40
03	Ducts uninsulated, Strakes, (87150), Painter trolley (87200)	Power tool cleaning to St-3 (SSPC SP3)	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)	02/ DFT= 20µ/ Coat	--	--	--	--	--	40
04	Shells- Outside insulated (87100), Ducts- Insulated (87150)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60
05	Ladders, Hand rails, Floor grills. Platforms (87300)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT= 30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70

SECTION –II

PART- II

STANDARD PAINTING SCHEME FOR COASTEL/ REFINERY ENVIRONMENT

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
A	**REGENERATIVE AIR PRE- HEATERS**									
01	Heating element baskets (without elements) 52010, 024, 025	Power tool cleaning to ST- 3 (SSPC SP3)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60
02	Heating element baskets (with elements) 52010, 024, 025	--	Temporary rust preventive oil non dry type (*) (Dipping)	--	--	--	--	--	--	--
03	Rotor post assembly machined items of (52011), Pin rack assembly (52012), Seals (52013, 52054, 52055), sector plates (52041, 52042) and machined components of APH	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
04	**Components in flue gas path and insulated** Rotor post assy (52011), T bars (52013), Rotor housing assy (52030), Hot and cold connecting plate assy (52041,52042)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60

(*) Specification as per PRQA 522/ Rev 00

(**) Specification as per PRQA 523/ Rev 00; For CE coil- TEP/AQCS/RP (Latest)

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
05	**Components exposed to atmosphere** Rotor drive assy (52100), Access door (52220), Air seal piping (52211), observation port other than glass part (52220), Rotor stoppage alarm other than aluminium (52220), Loose items of air receiver (52220), Guide bearing assy (52261), Support bearing assy (52262), Oil piping GB, SB (52271, 52272), Oil circulation unit (52274), Deluge and wash pipe assy (52301, 52302), Cleaning device assy (52339, 52340), Thermocouple pipe assy other than SS	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 75µm/ coat	Epoxy based MIO/TiO_2 pigmented intermediate coat	01/ DFT= 75µm/ coat	Epoxy based polyamide cured finish paint to IS 14209 (Latest)	01/ DFT= 75µm/ coat	Smoke grey Shade 692 of IS 5	225
B	**TUBULAR AIR PRE-HEATER**									
01	Side walls (external surfaces and internal surfaces)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60

Part- II contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	Machined surfaces, tubes of TAPH, tube plates and intermediate plates	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
C	**FANS**									
01	Foundation materials 550XX, 560XX (Threaded portion)	Power tool cleaning to St-3 (SSPC SP3)	Temporary rust preventive oil	40	--	--	--	--	--	--
			Other areas except threaded portion- Red oxide Zinc phosphate primer to IS 12744, DFT- 30 µ							
02	**Components exposed to atmosphere**									
02.a	Bearing pedestals, Base frame, servomotor assy, shaft with bearing assy, OGV, IGV (55-1XX, 55-2XX, 55-3XX, 55-5XX, 55-6XX, 56-4XX) Bearing pedestals, Base frame, shaft with bearing assy, RVC, IGV, Support for seal, shaft protecting tube, Spiral casing (if no insulation is applicable), Damper (56-1XX, 56-2XX, 56-3XX, 56-4XX) Coupling guard (56-8XX, 55-8XX), Tools (56-000, 55-000)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT=30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70
			General notes for Sl no: 02.a & 02.b for C. Fans 1) As a assy, no blasting to be done for servomotor assy& shaft with bearing assy. 2) Before assy, all external un-machined surfaces of bearing housing/ cylinder to be painted. 3) AP impeller painting to be done before assembly except oil chamber area & mating component contact area. 4) After SR/ Before machining, blasting and primer painting to be done.							
02.b	AP fan components like Servomotor assy, Shaft with bearing assy	Power tool cleaning to St-3 (SSPC SP3)	Epoxy based zinc phosphate primer to IS 13238	02/ DFT=30µ/ coat	--	--	--	--	--	60

Part- II contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
03	**Components in Air/ Gas and under insulation**									
03.a	Suction chamber, diffuser, housing, OGV, Spiral casing, damper, IGV, RVC, impeller, shaft (56-1XX,56-2XX, 56-3XX, 56-4XX)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60
03.b	Silencer (55-9XX, 56-9XX)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 75µm/ coat	Epoxy based MIO/TiO_2 pigmented intermediate coat	01/ DFT = 75µ m/ coat	Epoxy based polyamide cured finish paint to IS 14209 (Latest)	01/ DFT= 75µm / coat	Smoke grey Shade 692 of IS 5	225
03.c	AP fan impeller (55-2XX, 55-3XX)	Power tool cleaning to St-3 (SSPC SP3)	Epoxy based zinc phosphate primer to IS 13238	02/ DFT= 30µ/ coat	--	--	--	--	--	60
04	Journal area of shaft (55-1XX, 56-1XX, 55-2XX, 56-2XX, 55-3XX, 56-3XX, 56-4XX)- Refer PRQA 341/ Latest									
05	All machined surfaces shall be applied with rust preventive.									
D	**ELECTROSTATIC PRECIPITATOR**									
01	ESP Penthouse other items (7XX55), Water washing system (7X X66), Tools & Tackles (7X 996), Lifting beam (7X X20) Ridges (7X X43), Hopper upper, lower &middle part (7X X44, X45)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	01/ DFT= 30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	70

	Insulator support panel (7X X46), Roof panel assy (7X X47) contd… Contd… Casing structure (7X X28, X48), Casing shell (7X X49, ESP funnel (7X X50), Splitter & Guide vane (7X X57)									

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	GD drive arrangement (7X X10), Drive arrangement for emitting system (7X X17), Inspection doors (7X X23), Drive arrangement for CE rapping (7XX26), Outer roof (7X X42)ESP Penthouse columns & Trusses (7X-X55), ESP columns (7X X81), ESP test equipment (7XX61), Hopper approach platform (7X X65),	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 30µm/ coat	Epoxy based MIO/TiO_2 pigmented intermediate coat	01/ DFT= 75µm/ coat	Epoxy based polyamide cured finish paint to IS 14209 (Latest) + Aliphatic acrylic polyurethane paint to IS 13213 (Latest)	01/ DFT= 30µm/ coat 01/ DFT= 30µm/ coat	Smoke grey Shade 692 of IS 5	165
		ESP columns- Below 0.0 level- Two coats of primer as mentioned above shall be applied since this item will be embedded inside the concrete pedestal.								
03	Stringer and guard plates (8X 610), Hand rails, post, step treads, Floor grills (8X 611,612,613),	Hot dip galvanizing to a coating weight of 610gm per sq. m (minimum) and to a coating thickness of 85 microns (minimum)								

Part- II contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
04	Insulator housing assy (7X X06), Gas distribution assy (7X X08), GD rapping mechanism (7X X09), Gas screening (7X X11), Emitting system suspension (7X X13), Emitting Electrode rapping (7X X16), Suspension arrangement for CE (7X X19), Frame of Emitting system Top, middle& bottom (7X X21, X22, X32), shock bars(7X X24), CE rapping mechanism (7X X25)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
05	EE (7X X15) (EE hook), EE suspension hook (7X X13), CE (7X X20), CE suspension hook (7X X19), Foundation material for ESP structures & ducts (7X X80)	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
E	**GATES AND DAMPERS**									
01	Gates and Damper Temperature ≤ 95°C	Blast cleaning to	Inorganic Ethyl zinc	01/	--	--	Epoxy based	01/	Smoke grey	160

	(57-0XX, 57-1XX)	near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	silicate primer to IS 14946 (Latest)	DFT= 80µm/ coat			polyamide cured finish paint to IS 14209 (Latest)	DFT= 80µm/ coat	Shade 692 of IS 5	

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	Gates and Damper Temperature > 95°C (57-2XX, 57-3XX, 57-4XX, 57-6XX)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 80µm/ coat	--	--	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C	02/ DFT= 20µ/ coat	Alumi nium	120
03	Gates blades, Machined components of G&D	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
F	**CHIMNEY**									
01	Foundation bolt (87010)	Power tool cleaning to St-3 (SSPC SP3)	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
02	Shells- Inside and Uninsulated side, base plate (87 100)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)	02/ DFT= 20µ/ coat	--	--	--	--	--	40
03	Ducts uninsulated, Strakes, (87150), Painter trolley (87200)	Blast cleaning to near white metal Sa 2½	Heat resistant aluminium paint as per IS 13183	02/ DFT= 20µ/ Coat	--	--	--	--	--	40

		(SSPC SP10) Surface profile of 35-50µm	(Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)							
Sl no	**PGMA/Description**	**Surface preparation & surface profile**	**Primer coat**		**Intermediate coat**		**Finish coat**			**Total DFT µ (min)**
			Paint	**No of coats/ DFT**	**Paint**	**No of coats**	**Paint**	**No of coats**	**Shade**	
04	Shells- Outside insulated (87100), Ducts- Insulated (87150)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60
05	Ladders, Hand rails, Floor grills. Platforms (87300)	Hot dip galvanizing to a coating weight of 610gm per sq. m (minimum) and to a coating thickness of 85 microns (minimum)								

SECTION –II

PART- III

STANDARD PAINTING SCHEME FOR EXPORT CONTRACTS

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
A	**REGENERATIVE AIR PRE- HEATERS**									
01	Heating element baskets (without elements) 52010, 024, 025	Power tool cleaning to ST- 3 (SSPC SP3)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60
02	Heating element baskets (with elements) 52010, 024, 025	--	Temporary rust preventive oil non dry type (*) (Dipping)	--	--	--	--	--	--	--
03	Rotor post assembly machined items of (52011), Pin rack assembly (52012), Seals (52013, 52054, 52055), sector plates (52041, 52042) and machined components of APH	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
04	**Components in flue gas path and insulated** Rotor post assy (52011), T bars (52013), Rotor housing assy (52030), Hot and cold connecting plate assy (52041,52042)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60

(*) Specification as per PRQA 522/ Rev 00 (**) Specification as per PRQA 524/ Rev 00 (Sea worthy rust preventive oil); CE coil- TEP/AQCS/RP (Latest)

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
05	**Components exposed to atmosphere** Rotor drive assy (52100), Access door (52220), Air seal piping (52211), observation port other than glass part (52220), Rotor stoppage alarm other than aluminium (52220), Loose items of air receiver (52220), Guide bearing assy (52261), Support bearing assy (52262), Oil piping GB, SB (52271, 52272), Oil circulation unit (52274), Deluge and wash pipe assy (52301, 52302), Cleaning device assy (52339, 52340), Thermocouple pipe assy other than SS	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 75µm/ coat	Epoxy based MIO/TiO_2 pigmented intermediate coat	01/ DFT= 75µm/ coat	Epoxy based polyamide cured finish paint to IS 14209 (Latest)	01/ DFT= 75µm/ coat	Smoke grey Shade 692 of IS 5	225
B	**TUBULAR AIR PRE-HEATER**									
01	Side walls (external surfaces and internal surfaces)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT=30µ/ coat	--	--	--	--	--	60

Part- III contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	Machined surfaces, tubes of TAPH, tube plates and intermediate plates	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
C	**FANS**									
01	Foundation materials 550XX, 560XX (Threaded portion)	Power tool cleaning to St-3 (SSPC SP3)	Temporary rust preventive oil	40	--	--	--	--	--	--
			Other areas except threaded portion- Red oxide Zinc phosphate primer to IS 12744, DFT- 30 µ							
02	**Components exposed to atmosphere**									
02.a	Bearing pedestals, Base frame, servomotor assy, shaft with bearing assy, OGV, IGV (55-1XX, 55-2XX, 55-3XX, 55-5XX, 55-6XX, 56-4XX) Bearing pedestals, Base frame, shaft with bearing assy, RVC, IGV, Support for seal, shaft protecting tube, Spiral casing (if no insulation is applicable), Damper (56-1XX, 56-2XX, 56-3XX, 56-4XX) Coupling guard (56-8XX, 55-8XX), Tools (56-000, 55-000)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT=80µ/ coat	--	--	Epoxy based polyamide cured finish paint to IS 14209 (Latest)	01/ DFT= 80µm/ coat	Smoke grey Shade 692 of IS 5	160
			General notes for Sl no: 02.a & 02.b for C. Fans 5) As a assy, no blasting to be done for servomotor assy& shaft with bearing assy. 6) Before assy, all external un-machined surfaces of bearing housing/ cylinder to be painted. 7) AP impeller painting to be done before assembly except oil chamber area & mating component contact area. 8) After SR/ Before machining, blasting and primer painting to be done.							
02.b	AP fan components like Servomotor assy, Shaft with bearing assy	Power tool cleaning to St-3 (SSPC SP3)	Epoxy based zinc phosphate primer to IS 13238	02/ DFT=30µ/ coat	--	--	--	--	--	60

Part- III contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
03	**Components in Air/ Gas and under insulation**									
03.a	Suction chamber, diffuser, housing, OGV, Spiral casing, damper, IGV, RVC, impeller, shaft (56-1XX,56-2XX, 56-3XX, 56-4XX)	Commercial blast cleaning (Sa 2) (SSPC SP6)	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60
03.b	Silencer (55-9XX, 56-9XX)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 75µm/ coat	Epoxy based MIO/TiO_2 pigmented intermediate coat	01/ DFT = 75µm/ coat	Epoxy based polyamide cured finish paint to IS 14209 (Latest)	01/ DFT= 75µm / coat	Smoke grey Shade 692 of IS 5	225
03.c	AP fan impeller (55-2XX, 55-3XX)	Power tool cleaning to St-3 (SSPC SP3)	Epoxy based zinc phosphate primer to IS 13238	02/ DFT= 30µ/ coat	--	--	--	--	--	60
04	Journal area of shaft (55-1XX, 56-1XX, 55-2XX, 56-2XX, 55-3XX, 56-3XX, 56-4XX)- Refer PRQA 341/ Latest									
05	All machined surfaces shall be applied with rust preventive.									
D	**ELECTROSTATIC PRECIPITATOR**									
01	ESP Penthouse other items (7XX55), Water washing system (7X X66), Tools & Tackles (7X 996), Lifting beam (7X X20) Ridges (7X X43), Hopper upper, lower &middle part (7X X44, X45) Insulator support panel (7X X46),	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	Synthetic Enamel paint to IS 2932	02/ DFT= 20 µ/ coat; Total 40µ	Smoke grey Shade 692 of IS 5	100

	Roof panel assy (7X X47) contd… Contd… Casing structure (7X X28, X48), Casing shell (7X X49, ESP funnel (7X X50), Splitter & Guide vane (7X X57)									

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	GD drive arrangement (7X X10), Drive arrangement for emitting system (7X X17), Inspection doors (7X X23), Drive arrangement for CE rapping (7XX26), Outer roof (7X X42)ESP Penthouse columns & Trusses (7X-X55), ESP columns (7X X81), ESP test equipment (7XX61), Hopper approach platform (7X X65),	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 75µm/ coat	Epoxy based MIO/TiO_2 pigmented intermediate coat	01/ DFT= 75µm/ coat	Epoxy based polyamide cured finish paint to IS 14209 (Latest) + Aliphatic acrylic polyurethane paint to IS 13213 (Latest)	02/ DFT= 35µm/ coat 01/ DFT= 30µm/ coat	Smoke grey Shade 692 of IS 5	250
		ESP columns- Below 0.0 level- Two coats of primer as mentioned above shall be applied since this item will be embedded inside the concrete pedestal.								
03	Stringer and guard plates (8X 610), Hand rails, post, step treads, Floor grills (8X 611,612,613),	Hot dip galvanizing to a coating weight of 610gm per sq. m (minimum) and to a coating thickness of 85 microns (minimum)								

Part- III contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
04	Insulator housing assy (7X X06), Gas distribution assy (7X X08), GD rapping mechanism (7X X09), Gas screening (7X X11), Emitting system suspension (7X X13), Emitting Electrode rapping (7X X16), Suspension arrangement for CE (7X X19), Frame of Emitting system Top, middle& bottom (7X X21, X22, X32), shock bars(7X X24), CE rapping mechanism (7X X25)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Red oxide zinc phosphate primer (Alkyd base) to IS 12744	02/ DFT= 30µ/ coat	--	--	--	--	--	60

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
05	EE (7X X15) (EE hook), EE suspension hook (7X X13), CE (7X X20), CE suspension hook (7X X19), Foundation material for ESP structures & ducts (7X X80)	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
E	**GATES AND DAMPERS**									
01	Gates and Damper Temperature ≤ 95°C (57-0XX, 57-1XX)	Blast cleaning to near white metal Sa 2½	Inorganic Ethyl zinc silicate	01/ DFT= 80µm/ coat	--	--	Epoxy based polyamide cured	01/ DFT= 80µm/ coat	Smoke grey	160

		(SSPC SP10) Surface profile of 35-50µm	primer to IS 14946 (Latest)				finish paint to IS 14209 (Latest)		Shade 692 of IS 5	

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
02	Gates and Damper Temperature > 95°C (57-2XX, 57-3XX, 57-4XX, 57-6XX)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 80µm/ coat	--	--	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C	02/ DFT= 20µ/ coat	Aluminium	120
03	Gates blades, Machined components of G&D	--	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
F	CHIMNEY									
01	Foundation bolt (87010)	Power tool cleaning to St-3 (SSPC SP3)	Temporary rust preventive oil dry type (**)	40	--	--	--	--	--	40
02	Shells- Inside and Uninsulated side, base plate (87 100)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 80µm/ coat	--	--	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)	02/ DFT= 20µ/ coat	Aluminium	120
03	Ducts uninsulated, Strakes, (87150), Painter trolley (87200)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 80µm/ coat	--	--	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)	02/ DFT= 20µ/ coat	Aluminium	120

Part- III contd….

Sl no	PGMA/Description	Surface preparation & surface profile	Primer coat		Intermediate coat		Finish coat			Total DFT µ (min)
			Paint	No of coats/ DFT	Paint	No of coats	Paint	No of coats	Shade	
04	Shells- Outside insulated (87100), Ducts- Insulated (87150)	Blast cleaning to near white metal Sa 2½ (SSPC SP10) Surface profile of 35-50µm	Inorganic Ethyl zinc silicate primer to IS 14946 (Latest)	01/ DFT= 80µm/ coat	--	--	Heat resistant aluminium paint as per IS 13183 (Gr I- Upto 600°C, Gr II- 200°C to 400°c Gr. III- Upto 200°C)	02/ DFT= 20µ/ coat	Aluminium	120
05	Ladders, Hand rails, Floor grills. Platforms (87300)	Hot dip galvanizing to a coating weight of 610gm per sq. m (minimum) and to a coating thickness of 85 microns (minimum)								

ANNEXURE I

NOTES FOR PAINTING SCHEME PART I, II& III

1. This painting scheme covers a comprehensive list of PGMAs being used in 125 to 800MW in an effort to standardize the painting scheme. Therefore, 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 and nut threads and inside surfaces of fabricated structure shall be painted with red oxide primer paint during fitup stage.
3. All threaded & machined surfaces are to be applied with a coating of Temporary Rust preventive oil.
4. All surfaces of foundation materials, insulation pins, Anchor channels, Sleeves Splice/ cover plate/ gusset plate and metal contact area usually bolted at site to enhance the load transfer by friction grip shall be coated with temporary rust preventive fluid and during execution of civil works; the dried film coating shall be removed using organic solvents.
5. PGMAs under sub vendor items are not indicated. Please refer respective Engineering document for all sub-vendor items. Whenever it is not specified, it shall be as per the painting scheme of the applicable PGMA.
6. No painting is required for Aluminium, Stainless steel components and galvanized items. Abrasive blast cleaning to SSPC – SP 6 (Sa 2) grade shall be done on any damaged painting area. This repair is not applicable to inorganic ethyl zinc silicate pained component.
7. 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 is peeled off over a large area, then the coating is to be removed by suitable solvents/ heating to 350- 400 deg 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)
8. All currently active PGMAs are covered. Requirements for Missing / new PGMAs will be included under the relevant section following the appropriate paint logic.
9. Ground shade/ color finish paints & identification tag/ band for equipments, supporting structures and other components shall be followed as per tender.
10. In components, wherever plate/ sheets of thickness less than or equal to 4mm, tubes/ rods are used, power/ hand tool cleaning to SSPC- SP3/ SSPC-SP 2 shall be followed and the painting shall be done as per SL no: D/01 of PRQA:590- Section II A/B/C. For all commissioning components- erection materials two coats of Red oxide Zinc phosphate primer shall be applied to meet the temporary protection till erection, after power tool cleaning.
11. Touch-up painting of damaged areas shall be carried out as per clause applicable painting scheme.
12. Structural members having welded connections at site, relevant area can be painted with primer paint instead of weldable primer.
13. This painting scheme is the final document and it overwrites any other document indicating painting/ coating schemes. The component not covered in approved painting scheme, this is the document to decide the type of paint application.
14. All components covered under different PGMAs are to be painted. In case any component is left out, the same shall be deemed to be included under relevant section.

ANNEXURE II

INSPECTION & TESTING PLAN FOR SURFACE PREPARATION, PAINTING

SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CL	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC/ ACCEPTANCE NORM	TYPE OF RECORD	AGENCY			REMARKS
								M	C		
1.0	Surface preparation for plates/ rolled sections/ components										
1.1	Raw material	Rust, pitting	B	Visual	100%	Note 1	R	P	V	-	
1.2	Blasting media	Type of quality of abrasives	B	Random sample test	Abrasive quality for each lo	Note 1a	R	P	V	-	
1.2.1	Blasting/ Power tool cleaning	Surface roughness/ cleanliness	A	Visual, Measure-ment	100% 10 spots/ sq.m	Surface profile as per approved painting scheme, Note 2	R	P	W	-	
		Profile defects	B	Visual	100%	Note 3	R	P	W		
1.2.2	Substrate dust contamination (for blasting)	Adhesive Tape test	B	Measure-ment	Two spots/ component	Note 4	R	P	W	-	Randomly selected 10X magnifier, Transparent adhesive tape 25mm width
1.2.3	Substrate chemical contamination (for blasting)	Surface contamination test	B	Measure-ment	One test/ abrasive lot used	SSPC SP 12 Chloride <15µg/cm² (PPM) Sulphate <20 PPM	R	P	W	-	Any suitable method to identify salt contamination
1.2.4	Substrate-coating conditions	Flash rusting steel temp environmental condition	A	Visual Measure-ment	100% One spot/ Lot	Note 5	R	P	V	-	
2.0	In process Painting										
2.1	Paint	Physical& Chemical	A	Review of documents	100%	Invoice/ data sheet	TC	P	V	-	Physical verification of shade, batch no, date of manufacture, supplier approval status
2.2	Mixing (Two pack system)	Mixing ratio& Durations	B	Documents	100%	Painting data sheet Note 6	R	P	V	-	Electrical/ pneumatic agitator

SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CL	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC/ ACCEPTANCE NORM	TYPE OF RECORD	AGENCY			REMARKS
								M	C		
2.2.1	Filtering	Free from foreign particle	B	Documents	100%	Use sieves 80-100 microns	R	P	V	-	Nylon mesh or muslin cloth
2.2.2	Paint testing	Physical & chemical properties	C	Lab test	Random	Suppler TC/ Data sheet/ IS specificaions	R	P	W		Sample collected at each vendor at regular intervals as advised by BHEL shall be sent to BHEL/ NABL accredited lab
2.2.3	Painting	Personnel qualification Inspection personnel	C C	Review of documents	100%	In line with this PRQA- Annexure III Certification by reputed institution or by an Expert. (NACE/SSPC/ Level II)	R R	V V	V V		
2.3	Airless/ Air spray	Spray process pot life	B	Documents	100%	Supplier manual Tip selections, Note 7	R R	V P	V V		
2.4	Coating thickness & coating intervals	Wet film, Dry film thickness	B	Measurement	100%	SSPC- PA 2 Note 8	R	P	V		
		Intervals	B	Documents	100%	Painting data sheet/specification	R	P	V		Min: 24 hrs or as per paint specification / data sheet
3.0	Final Testing										
3.1	Peel off test Cross cu/ X-cut	Adhesive strength between substrate & primer and subsequent over coats	A	Test on each coat: Primer, Intermediate& final coat	3 spots	ASTM D3559-7 Note 9	R	P	W		4x magnifier lens, 25mm width pressure sensitive tape (P99), cutting edges with template

SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CL	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC/ ACCEPTANCE NORM	TYPE OF RECORD	AGENCY			REMARKS
								M	C		
3.2	Final Inspection	Dry film thickness	A	Document	15 spots/ sq.m	Approved painting scheme, SSPC PA 2	R	P	W		
		Finish, shade and paint defect	A	Visual	100%	Note 8	R	P	W		Use of shade card

NOTE- 1: Rust Grade

As per ISO 8501-1, rust and painting are graded into four categories as A, B, C & D. Rust and pitting shall be removed by competent process prior to application of primer. Pitted area shall be cleaned by blasting/ power tool cleaning/ grinding provided thickness shall be met to the design requirement. Plates/ components identified under heavy pitted category C or D, acceptance/rejection reserved to QC/ BHEL.

NOTE- 1a: Blasting media

Blasting media shall be copper slag, iron slag, steel shots/ grits & aluminum oxide. The abrasive used for blasting process shall be within chemical contaminations chloride<15ppm and sulphate <20ppm. Mixing ratio of shots/ grits (generally 3:1) shall meet the surface roughness 35-50 microns after blasting. Blasting media shall be suitably sieved to get the required particle size 0.5 to 1.0mm. (Steel shots ASTM G40/G80)

NOTE- 2: Blast cleaning

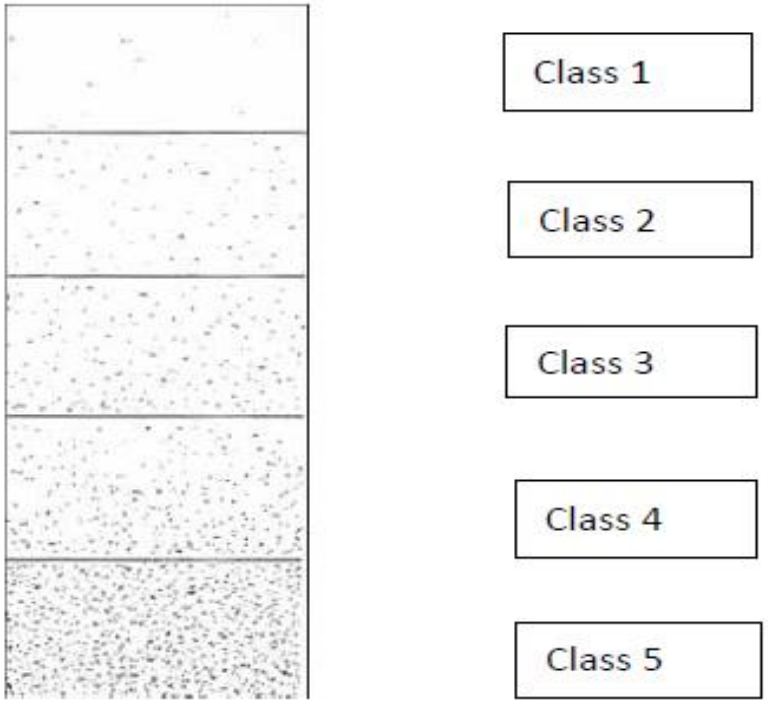
a) Air quality must be checked before start of blasting process by blotter test
b) Surface finish: The blasted surface shall meet the SSPC- SP10 (SA 2.5) finish near white metal. Surface roughness shall be checked in 10 spots/Sq.m. Digital/ Analog instrument duly calibrated shall be used to measure the surface roughness. Power tool cleaned surface shall be met to SSPC- SP3. Blasting/ power tool cleaned surface shall be met as per ISO 8501-1 requirement.
c) Surface roughness: Average value shall be 35-50 microns for blast cleaned surface.
d) Blasting: Shall not be done during rainy/ mist seasons where relative humidity is more than 80%.
e) Optimum blasting pressure and nozzle size (straight bore or venturi type) to get required surface roughness (90-100psi for mineral abrasives and 120-125 psi for metallic abrasives, standing distance 12-18 inches and standing angle 80-90 deg. for full blasting, sweep blast 45-60 deg. with respect to the substrate).

NOTE- 3: Profile defects

a) Surface shall be visually checked and free from defects such as rust, dust, grease, oil, sharp corner/edges, rolling imperfection/ overlap, vein, undulations, mill scales, improper weld beads/ shapes/ undercuts, weld slag, spatters etc.
b) Sharp corner/edges shall be ground off to radius 1.5 to 2mm and blunted. Other profile defects if any shall be ground/chipped out/ repaired by suitable means

NOTE- 4: Dust

A transparent adhesive tape test shall be conducted on substrate to ensure cleanliness of the substrate and same shall meet the class 1 requirement.



NOTE- 5: Coating conditions

a) Abrasive media used for blasting shall be free from moisture and other contaminations.
b) Flash rusting if any shall be removed by sweep blasting

c) Primer paint shall be applied immediately or within 4 hours in case of blast cleaning and within 8 hours in case of power tool cleaning.
d) Painting shall not be done during rainy/ mist seasons when relative humidity is >80%.
e) Painting shall be commenced, when the metal surface temperature is >3°C above the dew point temperature
f) Painting shall not be done, when the steel surface temperature is >45°C.
g) A suitable instrument duly calibrated is required to check the dew point temperature and steel surface temperature.

NOTE- 6: Mixing

a) Paint mixing ratio for two packs painting system shall be done as per the painting data sheet provided by the manufacturer. Individual component shall be mixed thoroughly and then mix the component as per data sheet ratio (by volume or by weight). Blend by boxing is prohibited for inorganic zinc rich primer (ie react with moisture). Off ratio (partial ratio) blends won't cure properly.
b) Mixing of thinner is not required for airless spray, however mixing of thinner<5% is permitted. If required add thinner after mixing of paints and mix it with homogenously.
c) Paint mixing shall be done at least for not less than 20 minutes or as per paint data sheet with electrical/ pneumatic operated tool to achieve mixing chemically matured.
d) Mixed paint particles shall be filtered with sieves of 80-100 microns to avoid clogging of nozzle tip. Once components are blended, pot life begins and use the mixed paint immediately as specified pot life period indicated in the data sheet.
e) Zinc rich primers dispersed slowly in to binder and agitate slowly while mixing process.
f) Primer, Intermediate and final coat shall be the same supplier, if any change, compatibility certificate shall be obtained from the paint supplier.

NOTE- 7: Spray process

a) Painting shall be done at controlled environment only and free from dust& paint soot.
b) When volume of solids of paint s more than 50%, airless spray shall be selected for painting application.
c) Select proper nozzle tip size and pressure to achieve uniform DFT and less wastage.
d) Painting shall be done within pot life period specified in the paint product data sheet, to avoid premature paint failure.
e) Avoid arcing, tilting and maintain constant distance (12-18 inch), tip selection, tip pressure according to paint, triggering at appropriate locations and banding while painting.
f) While painting of inorganic zinc silicate, RH shall be above 65%, if painted below RH 65% water curing is required.
g) Top coat over and above epoxy intermediate coat shall be done within a month and proper roughness shall be created before top coat.

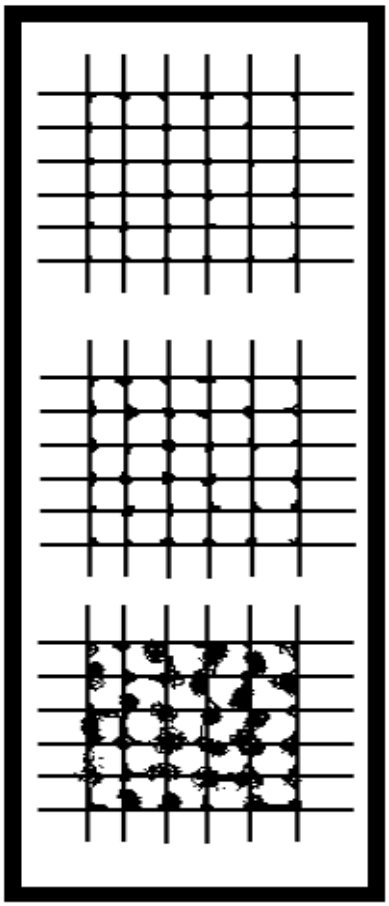
NOTE- 8: Coating Thickness

a) Wet film thickness (WFT) shall be measured immediately after paint applications using Comb gauge/ eccentric wheel.
b) WFT can be calculated as: WFT= (100XDFT)/ VS where, DFT is the dry film thickness and VS= % of volume solid of supplied paint from data sheet.
c) Dry film thickness shall be measured after hard dry condition of each coat.
d) Dry spray/ Dust particles embedded after previous coat shall be cleaned/ removed with fine emery paper prior to application of subsequent coat. Coating thickness shall not be less than the requirement as specified in the painting scheme at any case tolerance on total DFT as specified in the applicable painting scheme shall be within -0/+20 microns or +10% of total DFT, whichever is higher.
e) Coating thickness shall not be less than the requirement as specified in the painting scheme at any case tolerance on total DFT as specified in the applicable painting scheme shall be within -0/+20 microns as specified in the applicable painting scheme.
f) Painted surface shall be free from paint defects namely crack, sagging, dry spray, orange peel etc.
g) Finish and shade as per paint data sheet. A painted panel shall be made available with at works to check/ compare the painted surface.

NOTE- 9: Peel off Test

a) Paint peel off test shall be done after 48 hours of painting operation, on single/ multi coated painted surface of the component for each coat.
b) When total DFT is less than 125 microns- Cross cut method shall be followed.
c) DFT up to 50 microns 1mm spacing with 6 cuts minimum to the length of 20mm.
d) DFT more than 50 microns and less than 125 microns 2mm spacing with 6 cuts minimum to the length of 20mm.
e) When total DFT is more than 125 microns- X cut method shall be followed. The smaller angle of cut shall be between 30 to 45 degrees cut to length of 40mm.
f) For all tests, ensure that coating film has been penetrated and minimum three locations shall be tested.
g) The adhesion test shall be conducted where the substrate temperature is below 35°C for alkyd base paints.

Acceptable norm for Cross cut method:



< 5% Peel- Acceptable-(5A)

5-10% % Peel – Acceptable (4A)

>10% Peel - Not Acceptable (3A)

Acceptable norm for X cut method:

5A- No peeling- Acceptable

4A- Trace peeling along incisions or at their intersection- Acceptable

3A- Jagged removal along incision up to 1.6mm on either side- Not acceptable

PAINTING INSPECTION FORMATS

VENDOR CODE	I ST VENDOR : FABRICATION/ 2 ND VENDOR BLASTING							
	SURFACE PREPARATION (POWER TOOL/BLASTING REPORT							
PAINTING SCHEME			REPORT NO& date					
PROJECT			PO.NO.					
WO.NO.								
PRODUCT DESCRIPTION								
SURFACE PREPARATION (REF STANDARD ISO 8501)								
Sieve size used and size of abrasive								
BLASTING MEDIUM USED			RAW MATERIAL RUST GRADE A B C D					
DU .NO	QTY	TEMPERATURE			RH	DATE	START TIME	END TIME REMARKS
		DRY BULB	WET BULB	DEW POINT				
MOISTURE CONTENT TEST FOR IF COMPRESSED AIR USED (BLOTTING PAPER CHECK)							OK / NOT OK	
SURFACE PROFILE GAUGE READING(IN MICRONS) DATE & TIME SURFACE FINESH TO SA 2.5 (SSPC SP 10)/ SURFACE CLEANLINESS FOR POWER TOOL CLEANING								
SURFACE SALT CONTAMINATION TEST(IF ANY) FOR BLASTED SURFACE					REPORT		OK / NOT OK	
DUST FREE CHECK TEST FOR BLASTED SURFACE	TAPE REPORT							
DUST FREE CHECK RESULT LEVEL FOR BLASTED SURFACE					1 2 3 4 5			
Visual inspection(pitting, weld spatter/slag, rolling defects ,etc.,								
FIRM QC					TPI /BHEL QC			

VENDOR CODE	1'ST VENDOR;FABRICATION, 2'ND VENDOR: PAINTING									
	PAINT REPORT									
PAINTING SCHEME			REPORT NO & date							
PROJECT			PO.NO.							
WO.NO.										
PRODUCT										

PRIMER COAT PAINT

PAINT SPECIFICATION/STD IS No:..... /SHADE	
PAINT MANUFACTURER	
SUPPLIER/TRADER NAME	
MANUFACTURING DATE / BATCH NO. / TC No	
MIXING RATIO / TWO PART SYSTEM IF ANY	
NUMBER OF COAT	
DURATION OF MIXING (use of stirrer) DATE / TIME :	

DU NO	QTY	TEMPERATURE				RH	DATE	START TIME	END TIME	REMARKS
		DRY BULB	WET BULB	METAL SURFACE	DEW POINT					

WET FLIM THICKNESS (in microns)			
SPRAY GUN USED			
HARD DRY TIME (REQURIED)			
DFT REQUIRED			
DFT ACTUAL MEASURED (SSPC PA 2)			
Visual inspection(pitting,weld spatter/slag,rolling defects ,etc.,) / paint defect			
PEAL OFF TEST(AST M- D3359)	CROSS CUT TEST DFT UP TO 50 MICRONS PITCH 1mm , cut Length 20mm	REPORT	OK / NOT OK
	CROSS CUT TEST DFT BETWEEN 50 TO 125 MICRONS PITCH 2mm, cut length 20 mm	REPORT	OK / NOT OK
	X CUT TEST ABOVE 125 MIC(included angle 30 to45 deg, cut length 40mm)	REPORT	OK / NOT OK

FIRM QC	TPI /BHEL QC

VENDOR CODE	1ST VENDOR;FABRICATION 2ND VENDOR: PAINTING
	PAINT REPORT

PAINTING SCHEME	-	REPORT NO& Date	
PROJECT		PO.NO.	
WO.NO.			
PRODUCT			

INTERMEDIATE/FINAL COAT	
PAINT SPECIFICATION/ SHADE	
PAINT MANUFACTURER	
SUPPLIER/TRADER NAME	
MANUFACTURING DATE / BATCH NO. / TC No./DC	
MIXING RATIO / TWO PART SYSTEM IF ANY	
NUMBER OF COAT	
DURATION OF MIXING (use of stirrer) DATE / TIME :	

DU NO	QTY	TEMPERATURE				RH	DATE	START TIME	END TIME	REMARKS
		DRY BULB	WET BULB	METAL SURFACE	DEW POINT					

WET FLIM THICKNESS (in microns)			
SPRAY GUN/NOZZLE NO USED			
HARD DRY TIME (REQURIED)			
DFT REQUIRED			
DFT ACTUAL MEASURED (Not less than specified in painting scheme)			
Visual /paint defect (if any)			
Peel of test (ASTM-D3359)	CROSS CUT TEST DFT BETWEEN 50 TO 125 MICRONS PITCH 2mm, cut length 20 mm	REPORT	OK / NOT OK
	X CUT TESTABOVE 125 MIC(cut included angle 30 to45 deg, cut length 40mm)	REPORT	OK / NOT OK

FIRM QC	TPI/BHEL QC

ANNEXURE III

PROCEDURE FOR QUALIFICATION OF PAINTERS

1.0 SCOPE

This standard describes, in general, the procedure and criteria to be followed for qualifying an operator/ painter for carrying painting work at BHEL Shop or at vendor works.

2.0 OBJECTIVE:

To evolve criteria and procedure for qualification of operators/ painters.

3.0 PROCEDURE:

Following procedure shall be adopted for certification of operator/ painter qualification for carrying out painting process.

3.1 Vendor shall initiate the format 'Record of personnel deployed for painting work' as shown in Annexure III A. This annexure is subsequently forwarded to concerned department of the unit.

3.2 Concern department is to forward to the reputed agency/expert having NACE/ SSPC (Level II) shall assess and certify the suitability of an operator / painter to conduct a painting process. In case, a new operator/ painter is inducted shall have experience in the painting field minimum 2 years and qualification not less than VII std, then he shall be assessed by reputed agency/expert. In case, an operator/painter does not carry out painting work for more than two years, then he shall be re-qualified and issued a certificate in line with the annexure.

3.3 An operator/ painter engaged in carrying special process like painting shall be re-qualified once in 3 years.

3.4 Following criteria have been identified and evaluated for each operator/ painter. Each criterion has been allocated 10 marks.

3.4.1 Mainly, there are three types of painting processes which are being followed for carrying out painting, these are

- Brush application
- Air spray painting
- Airless spray painting/ Air assisted airless spray

The operator is expected to know the basics of the above painting processes, technical details of process equipment and their salient features, awareness about Do's and Don'ts in painting work.

3.4.2 Understanding of the documents/ specification

The operator/ painter should have the knowledge about surface cleaning and acceptance norms, paint systems, mixing ratio and pot life of two pack systems, drying and curing behavior, use of proper thinner, control of viscosity and its importance, over-coating interval, precautions to be observed during their use etc.

3.4.3 Awareness about handling of materials/ jobs

The operator/ painter is expected to have knowledge about handling of paint components like base, hardener and thinner, handling and upkeep of painting equipment, cleaning of brush, gun and other parts of equipment. He is also expected to know how to handle cleaned and painted jobs.

3.4.4 Performance evaluation based on job/samples

The operator / painter shall be asked to prepare the test panel/job which shall be evaluated for following parameters:

- Uniformity of coating + 10% DFT required.
- Visual defects like brush marks, wrinkles, pinholes etc.
- Surface finish, gloss
- Presence of dry spots, overflow marks

The operator/ painter shall first clean the test panels thoroughly followed by a coat of primer/ finishing paint etc, using requisite painting process , i.e., brush/ air spray/ airless spray etc. After evaluation of test panels and based on result, the marks shall be allotted. After evaluation of test panels and based on result, the marks shall be allotted.

3.4.5 Knowledge about safety and hygiene

Each operator/ painter is expected to know about the safety of self and surroundings, use of safety appliances, effect of solvent vapors on health etc. He is supposed to know personal hygiene as well as upkeep of painting equipment and painting area.

3.4.6 Classroom training

A class room training by the supplier/ expert (manufacturer like Nerolac, Berger etc) of the paint which we are procuring, must be arranged for the painters to have knowledge about the paints, enamels, coatings etc and their applications. The class room training must be arranged in local languages for understanding of the painters.

4.0 CERTIFICATION FOR QUALIFICATION

Each operator/ painter is evaluated for above criteria and marks are being allotted for each criterion. The operator/ painter must obtain a minimum marks 5 for each criteria and

qualifying marks shall be 25 out of 50. The painter should pass in field/ practical test, even performed well in the written examination. The certification shall be specified in the area of type of application process as a painter is qualified. (example: airless/ spray/ pressure pot/ air spray) etc.

5.0 ISSUE OF CERTIFICATE

The operator/painter who qualifies the test shall be issued a certificate in standard format shown below, which shall be kept in the concerned and certifying department/ vendor works for record. The format can be modified to suit the requirement at vendor works with prior approval from QA. This certificate shall be signed by initiating section in charge and certifying department/ reputed agency/expert

6.0 VALIDITY

The validity of the certificate is for 3 years from the date of issue. The operator/ painter is required to appear for re-test to extend the validity.

Annexure III- A

RECORD OF TRAINING & QUALIFICATION FOR PERSONNEL TO BE DEPLOYED FOR PAINTING PROCESS

Photo

VENDOR NAME AND ADRESS

1. Name :
2. Father's name :
3. Date of birth/ Age :
4. Basic Qualification :
5. Experience in the painting field :

Name of Expert trainer :
Designation :

Date of start of training	Training subject	Faculty	Duration (Hrs.)	Certificate issued Yes/no	Remarks
	1.Painting process and Equipment		2		Issued on
	2.Painting Document/ Data sheet/Batch TC		1		
	3.Knowlege of paint component and mixing		1		Validity up to:
	4.Painting performance Evaluation on sample		2		
	5. Safety and hygiene		1		

Marks obtained: (each section carry 10 marks)

1) Knowledge of painting process and equipment : ----------
2) Understanding of documents / specification : ----------
3) Handling of components : ----------
4) Performance evaluation based on jobs/samples : ----------
5) Knowledge of safety and hygiene : ----------

Qualifying marks are 25/50

Qualified for : Airless spray & air spray
Painting System : Alkyd/ Epoxy/zinc silicate and heat Resistant based paints

Signature of Initiating Official

Signature of Certifying expert

ANNEXURE IV

Painting Scheme- Details for procurement and application process

Sl no	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 IS 5	Mode of appln	Over coating Interval hrs
01	Heat resistant Aluminium paint to IS 13183 Gr. I	10	1	--	--	Aluminium	--	Brush/ Spray	24
02	Heat resistant Aluminium paint to IS 13183 Gr. II	10	1	--	--	Aluminium	--	Brush/ Spray	24
03	Red oxide zinc phosphate primer to IS 12744	10	1	--	--	Red oxide	--	Brush/ Spray	12
04	Epoxy Zinc rich primer to IS 14589 Gr.II	8	2	35	40	Grey	--	Spray	24
05	HB Chlorinated rubber based zinc phosphate primer	10	1	40	50	Grey	--	Brush/ Spray	12
06	Epoxy based zinc phosphate primer to IS 13238	10	2	40	35	Grey	--	Spray	24
07	Inorganic Ethyl Zinc silicate to IS 14946	8	2	60	65	Grey	--	Spray	24
08	Polyamide cured Epoxy based MIO/ TiO_2 pigmented intermediate coat	8	2	50	75	Grey/ Brown	--	Spray	16
09	Long oil alkyd synthetic enamel finish paint to IS 2932	10	1	--	--	Reqd. shade	Corrpdg. Shade no	Brush/ Spray	12
10	Epoxy based polyamide cured finish paint to IS 14209	10	2	40	35	Smoke grey/ Grey white	692 RAL 9002	Spray	24
11	Aliphatic acrylic polyurethane paint to IS 13213	10	2	40	30	--	--	Spray	24

Sl no	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 IS 5	Mode of appln	Over coating Interval hrs
12	Temporary rust preventive fluid (Non- drying type) to PRQA 522 (Latest)- For APH Elements	10	1	--	--	Black	--	Dip	--
13	Temporary rust preventive fluid (Drying type) to TEP:AQCS:RP (Latest)- For CE coils	10	1	--	--	Black	--	Dip	--
14	Temporary rust preventive fluid (Drying type) to PRQA:523 (Latest) for other components	10	1	--	--	Amber	--	Brush/ Spray	12
15	Sea worthy rust preventive fluid to PRQA:524 (Latest) for other components	10	1	--	--	Amber	--	Brush/ Spray	12

ANNEXURE V

GOOD PAINTING PRACTICES (DO's and DON'Ts IN PAINTING):

1.0 Do's:

a) Remember, painting is an important value adding activity. Give it all your care.
b) Store paints in covered places. Avoid direct exposure to sunlight on paints.
c) Ensure the validity of the shelf life of the paint before use.
d) Roll the paint drum several times to ensure thorough mixing of the paint before use.
e) Use proper tools to open lid of the drum.
f) Mix the paints thoroughly to ensure homogeneity.
g) Apply strip coat on edges, corners and weld beads.
h) Follow instructions on the paint can or literature whenever a new scheme/ source of paint is used.
i) Draw only the required quantity of the paint for the job and immediately recap the can.
j) Ensure proper ratio of mixing in case of two pack system, as per norms.
k) Use only the specified thinner prescribed by the supplier or standard.
l) Ensure good quality of compressed air (free from moisture and oil) prior to spray painting.
m) Use only clean/ new brushes of definite size for painting.
n) Clean the bristles well in the thinner before they are used for the painting.
o) Painting shall be done in a well-ventilated area/ identified area
p) Ensure proper surface preparation as per the painting scheme.
q) Ensure that the blasted surface be painted within 4 hours after blasting.
r) Ensure that the surface to be painted is free from oil, grease, stay arcs, dents etc.
s) Adhere to the number of coats shade, dry film thickness and inter-coat curing time interval as specified. Clarify with lab, if needed.
t) Use lint free cloth/ clean wiping rags for cleaning the surfaces prior to the painting.
u) Maintain the right distance between the surface and spray gun (6 inches to 8 inches)
v) Ensure that the mixed paints will be used before the expiry of its pot life in case of two-pack systems.
w) Ensure that the items to be painted are inspected and cleared by the inspection personnel concerned.
x) Preserve the balance thinned paints in a separate closed container for future use, if they don't have any restricted pot life.
y) Clean the brush before and immediately after painting. Keep them clean during interruptions too.

2.0 Don'ts:

a) Do not use the paint, which has crossed its expiry date.
b) Do not draw more paint than necessary from the stores.
c) Do not make holes in the drum to draw the paint.
d) Do not keep the paint drum open for a long time.
e) Do not interchange the thinners for the same generic paint between suppliers.
f) Do not use kerosene as thinner.
g) Do not smoke while painting.
h) DO not leave the brush without cleaning after painting.
i) Do not paint close to a welding area.
j) Do not paint when there is rain or sandstorm or when the relative humidity is about 90%.
k) Do not paint when the metal is chill (temp< (dew point+3°C) or very hot (>48°c)
l) Do not paint when the surface is not cleaned/ prepared for painting requirements.
m) Do not paint the finish coat if the primer coat is not satisfactory.
n) Do not leave the balance paint open after painting.
o) Do not use VCI pellets for stainless steel components and its composite assemblies.

3.0 CLEANING OF PAINTED & RUST PREVENTIVE COATED SURFACES

Wherever required, paints and rust preventive protection can be removed either by using the following commercial solvents or by flame cleaning/ blasting

For rust preventive	Acetone, Methyl Ethyl ketone or Tri-chloro Ethylene
For all paints	Alkaline paint strippers or Solvent based paint strippers

4.0 SURFACE PREPARATION

- Surfaces of components shall be thoroughly cleaned before the application of primer paint and shall be free from grease, oil, rust, weld slag, spatters etc.
- Abrasive blast cleaning to SSPC SP6 (Sa 2) grade shall be done to prepare the surfaces of hot worked pipes prior to application of primer.
- A comparative chart indicating the surface preparation standard equivalents is given below for ready reference.

DESCRIPTION	SSPC SCHEME	SWEDISH STANDARD SIS - 05 - 5900
Solvent cleaning	SSPC- SP 1	-
Hand tool cleaning	SSPC- SP 2	St2
Power tool cleaning	SSPC- SP 3	St3
Flame cleaning	SSPC- SP 4	F1
Blast cleaning to White metal	SSPC- SP 5	Sa3
Commercial blast cleaning	SSPC- SP 6	Sa2
Brush off blast cleaning	SSPC- SP 7	Sa1
Pickling	SSPC- SP 8	-
Blast cleaning to near white metal	SSPC- SP 10	Sa 2½

5.0 APPLICATION OF PAINT

a) Primer paint shall be applied immediately or within 4 hours in the case of shot blast cleaning and within 8 hours for mechanical cleaning.
b) Wherever tubes/ pipes are not either shot blasted or heat treated during manufacture, the rust preventive coating provided by the tube/ pipe mill shall be treated as base for primer coating for subsequent painting of alkyd base paints like one coat of red oxide zinc phosphate (when called for). When special paint is specified in the painting scheme, the existing rust preventive fluid is to be removed by blast cleaning. However, rusted areas are to be cleaned free of oil, grease, rust etc. thoroughly using emery paper/wire brush and making rust preventive coated surfaces coarse.
c) Ready mixed paints shall be used as supplied by the supplier without any addition of thinner unless otherwise specified. Two pack systems are to be used as per supplier's instructions.
d) Wherever second coat of finish coat is to be applied in succession, 24 hours minimum drying time shall be provided between each coat for single pack paints. For two-pack system refer paint supplier's catalogue.
e) No painting is required in case of Stainless Steel, Aluminium and Galvanized components, unless otherwise specified in contracts.
f) For all machined components, rust preventive fluids shall be applied.
g) All weld edge preparations for site welding shall be applied with one coat of weldable primer. For small components having weld ends on both sides, full surface can be painted with weldable primer.
h) Part processed items meant for shop assembly shall be painted at sub-contractors works with primer/ special paints (when called for in the painting scheme) based on the scope

of the indent/ purchase order. Further paint touchup/ Coating shall be given appropriately during assembly.

i) 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 and not with respect to PGMA. All running meter items for spares one coat of red oxide primer and two coats of Synthetic enamel paint to IS 2932 (Latest) shall be supplied.

j) Assemblies consisting of machined components and special equipments shall not be shot blasted wherever it may affect the system. In such cases power tool cleaning may be adopted for the localized areas only.