14.00 PAINTING

14.01 GENERAL

14.01.01 This chapter covers the materials, tools, facilities and quality requirement for surface preparation and painting of steel works, equipment, piping, ducts, chutes, etc. required for proposed dry fly ash handling system for 2X210 MW units.

The term "painting" referred herein covers rust preventive, preventive and decorative coating alongwith surface protection of the following :

- Structural steel work .
- Various types of static and rotary equipment inclusive of electric motors, etc.
- Steel tanks and vessels.
- Pipe work including trestles, supports, hangers, etc.
- Metallic duct work such as ventilation ducts, gas ducts including supports, hangers, etc.

14.01.02 Surfaces made of aluminium, brass, bronze, stainless steel, cast iron and other corrosion resistant alloys are not required to be painted unless specified except for aesthetic purposes or for identification bands.

All machined mating surfaces (e.g. flanges) will be properly cleaned, greased and protected before despatch.

14.01.03 The complete paint system for any item includes the activities as follows:

i) Proper surface preparation
ii) Application of primer coats
iii) Application of intermediate coats
iv) Application of finished coats

All the above coats will be of quality paint products and of approved make as stipulated in this specification. The work will also include supply of all paint materials as per specification described herein and of approved quality.

14.02 SURFACE PREPARATION

- Surface preparation being a pre requisite for any paint application, will be such as to clean the surface thoroughly of any materials which will be conducive to premature failure of the paint substrate.

- All surfaces will be cleaned of loose substances and foreign materials, such as dirt, rust, scale, oil, grease, welding flux, etc. irrespective of whether the same has been spelt out in the standards in order that the prime coat is rigidly anchored to the virgin metal surface. The surface preparation grade of Swedish Standards Institution SIS - 055900 or DIN 55928 (Part 4) or BS 4232 or IS:1477 (Part I).

- The acceptable surface preparation quality/grade are described under each painting system. The procedures covered are solvent cleaning, hand tool cleaning, power tool cleaning and blast cleaning.

14.02.01 Solvent cleaning

The surface will be cleaned by wiping, immersion, spraying or vapour contacting of a suitable solvent or washing with an emulsion or alkaline solution to remove oil, grease, dirt, old paint, etc. Solvent cleaning will not remove rust, scales, mill scales or weld flux. Therefore, before application of paint, solvent cleaning will be followed by other cleaning procedures as stated below.

14.02.02 Hand tool cleaning

The surface will be cleaned by vigorous wire brushing done manually to St-2 quality. This method effectively removes loosely adherent materials, but would not affect residues of rust or mill scales that are intact and firmly adherent.

14.02.03 **Power tool cleaning**

The surface will be cleaned by electric or pneumatic tools to St-3 quality. The tools will be used carefully to prevent excessive roughing of surface and formation of ridges and burns. This method will remove loosely adherent materials but would not affect residues of rust or mill scales that are firmly adherent.

14.02.04 **Blast cleaning**

The surface will be cleaned by impingement of abrasive materials, such as graded sand at high velocity created by clean and dry compressed air blast. This method will remove loosely adherent materials as well as adherent scales and mill scales. Prior to application of blast, heavy deposit of oil and grease are removed by solvent cleaning and excessive surface scales are removed by hand tools or power tool cleaning. The surface will be cleaned to Sa-2 1/2 quality which means that to 95% of surface area is free from all rust, mill scales and visible residues, foreign materials, etc. The blast cleaning is not recommended for sheet metal work.

14.03 **PRIMER PAINTS (P)**

Primer paints will be applied only on dry and clean surfaces.

14.03.01 **Primer paint P1 - (Epoxy based)**

A two pack air drying Epoxy polyamide resin based red oxide - Zinc Phosphate (primer).

Epoxy content (% wt.) - 15 to 18

Air drying time - About 30 minutes (touch dry)
-Overnight (hard dry)

Dry film thickness (DFT / Coat) - 30 microns (min)

Temperature resistance - upto 120 deg. C dry heat

14.03.02 **Primer paint P2 - (Epoxy based)**

A two pack air drying Epoxy Polymide with zinc dust of at least 92% Zinc dust on the dry film.

Epoxy content (% wt.)	-	8 to 10
Air drying time	-	10 minutes (touch dry)
	-	2 hours (hard dry)
DFT / coat	-	40 microns (min)
Temperature resistance	-	upto 300 deg. C dry heat

14.03.03 **Primer paint P3 - (Ethyl Zinc Silicate- EZS, based)**

A two pack heavy duty zinc dust rich silicate primer.

Total solid (% wt)	-	84 +/- 2
Density	-	3.07 +/- 0.005
Air drying time	-	16 hours
DFT / coat	-	60 microns
Temperature resistance	-	upto 450 deg. C dry heat

14.04 **INTERMEDIATE PAINTS (I)**

These paints will be applied over primer coats as an intermediate layer to provide weather proof seal of primer coats.

14.04.01 **Intermediate Paint I1**

A two pack air drying high build epoxy resin based paint with MIO.

Air drying time	-	6 to 8 hours (touch dry)
	-	7 days (full cure)
DFT / coat	-	100 microns

Temperature resistance	-	upto 180 deg. C dry heat
Compatible with	-	Primer P1 and P2

14.05 **FINISH PAINTS (F)**

Finish paint coats will be applied over primer coats and intermediate coats after proper cleaning and touch up of primed coats.

14.05.01 **Finish Paint F1**

A two pack air drying epoxy polyamide enamel suitably pigmented.

Air drying time	-	2 to 3 hours (touch dry)
	-	7 days (full cure)
DFT / coat	-	40 microns (min)
Temperature resistance	-	upto 130 deg. C dry heat
Compatible with Intermediate I1	-	Primers P1 and P2
Colour	-	Generally all shades

14.05.02 **Finish paint F2**

A single pack synthetic rubber based aluminium paint.

Air drying time	-	2 hours (touch dry)
	-	24 hours (hard dry)
DFT / coat	-	25 microns
Temperature resistance	-	upto 200 deg. C dry heat
Compatible with	-	no primers
Colour	-	smooth aluminium

14.05.03 **Finish Paint F3**

A single pack heat resistant silicon resin based paint with leafing aluminium.

Air drying time	-	3 to 4 hours (touch dry) - 24 hours (hard dry)
DFT / coat	-	20 microns (min)
Temperature resistance	-	upto 400 deg.C dry heat
Compatible with	-	no primer paint except P3
Colour	-	smooth aluminium

14.06.00 **PAINT APPLICATION**

14.06.01 Paint will be applied in accordance with manufacturer's recommendations. The work will generally follow IS 1477 (Part II) for jobs carried out in India.

14.06.02 Paint will not be applied when the ambient temperature is 5 deg. C and below. Also paint will not be applied in rain, wind, fog or at relative humidity of 80% and above.

14.06.03 Each coat of paint will be continuous, free of pores and of even film thickness without thin spots.

14.06.04 Each coat of paint will be dry sufficiently before application of next coat.

14.06.05 The Bidder will furnish paint manufacturer's test report or technical data sheet pertaining to the paint selected. The data sheet will indicate among other things the relevant standards, if any, composition in weight percent of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash points, method of application ,quality of surface preparation required, corrosion resistance properties and colour.

14.06.06 The colour code to be followed during painting will be intimated to the Bidder.

14.06.07 All flanges, fittings, valves and other accessories will be painted with paint having the same identification as that of corresponding pipelines. Flanges will be painted on the circumference.

14.06.08 All equipment and parts susceptible to corrosion by exposure to moisture will be thoroughly protected against damage during transit and storage.

14.06.09 All equipment and parts will be tagged with reference to the assembly drawings and corresponding part numbers before packing and despatch.

14.07.00 **PAINTING SCHEME**

14.07.01 Type of paint products like P1, P2, P3, I1, F1, F2 and F3 have been specified under Sl. nos. 3, 4 and 5 of this specification.

For a complete painting scheme of any item being painted, all types of paints are to be procured from the same manufacturer as approved by the purchaser.

14.07.02 **Legend**

SP	-	Surface preparation quality
2P1	-	Two (2) coats of primer paint type P1
1I1	-	One (1) coat of intermediate paint type II
2F1	-	Two (2) coats of finish paint type F1
DFT	-	Dry film thickness
CRT	-	Clean and retouch

14.07.03 The painting scheme to be followed for various equipment/structures is briefly given below for guidance to the Bidder.

Sl no.	Description	Painting Scheme		Inside DFT	Outside DFT
		At shop	At site		
1.	Steel Structure	SP-Sa 2 1/2 2P1+1I1	2F1	220	210

2.	Mechanical equipment (temp. not over 80 deg. C) Both static and rotary equipment for	SP-Sa2 ½ 2P1+1I1	2F1	220	210
3.	Equipment with hot surfaces (temp. upto 400 deg. C)	SP-Sa 2 ½ 2P2	F2	220	210
4.	Equipment with hot surfaces (temp. above 400 deg.C)	SP-Sa 2 ½ 2P3	2F3	220	210
5.	Non insulated pipe/ duct works - Temperature not over 80 °C - Temperature upto 200 °C - Temperature upto 400 °C	SP-Sa 2 1/2 2P1+1I1 SP-Sa 2 1/2 2P2 SP-Sa 2 1/2 2P3	2F1 2F2 2F3	220	210
6.	Insulated pipe/duct works	SP-Sa 2 1/2 2 coats primer suitable for intended temperature application as per the manufacturer's recommendation. The primers selection will be done generally inline with the specification	2F2 FinaL Painting will be done over the cladding. In case of aluminium cladding, final painting will not be required.	220	210