

**EMPLOYER'S REQUIREMENT FOR  
MECHANICAL & ELECTRICAL WORKS**

**CHAPTER 06  
MATERIALS & WORKMANSHIP  
PAINTING & PROTECTION**

## **CHAPTER 6**

### **MATERIALS & WORKMANSHIP PAINTING AND PROTECTION**

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## **CHAPTER 06**

### **MATERIALS & WORKMANSHIP**

### **PAINTING AND PROTECTION**

#### **6.1. General**

The preparation, application and condition for work shall comply with the recommendations of BS 5493 and CP 231 or if the protection is of a special nature, in accordance with the manufacturer's directions.

Paints primers and undercoats shall be obtained from the same manufacturer and except where a definite time is specified between mixing and application shall be ready mixed for use. They shall be compatible with one another.

Paints shall be delivered in sealed containers bearing the manufacturer's name, batch number, etc. and carry a label giving details of quality and instructions for use.

No site painting shall be carried out unless the surface to be painted is dry, the air temperature above 16°C and the relative humidity less than 55%. The Employer shall approve the methods for removing all dirt, oil, grease, etc. before Site painting commences.

Test plates carrying finishes from the actual coating used may be required by the Employer for inspection and test purposes.

To facilitate inspection, no consecutive coats of paint shall be of the same shade except in the case of white.

Priming to two mating surfaces shall be applied prior to assembly.

All items of Plant shall be delivered to Site with the shop paint finish applied unless specified otherwise. A further coat of final finish paint shall be applied at Site of sufficient thickness to produce a uniform colour and appearance. Such painting shall be carried out within one month of successful acceptance trials of the plant.

All paint thickness shall be checked using alkometer or equivalent instrument, supplied by the Contractor, for each layer of paint, to the reasonable satisfaction of the Employer.

#### **6.2. Surface Preparation**

Surface preparation for the various substrata shall be as follows unless otherwise specified under detailed paint system.

##### **i) Steelwork**

All steelwork including structural steel and steel doors and frames shall be prepared by blast cleaning in the shop. Blast cleaning shall be to a visual standard in accordance with Swedish Standard SIS 05 59 00 Sa 2½ at the time of painting (equivalent to 2nd Quality BS 4232).

Only dry abrasive blast cleaning techniques shall be employed. Abrasives shall be expendable copper slag or re-usable iron and steel grit or shot. All surface defects, including cracks, surface laminations and deep pitting, likely to be detrimental to the protective painting system shall be removed as laid down in BS 4360. All fins at saw cuts, burrs, and sharp edges shall be similarly removed. Where extensive grinding has been necessary, the dressed areas shall be re-blasted to remove all rust and provide an adequate painting surface.

After blast cleaning, before the surface has time to re-rust, and in any case within 4 hours of blast cleaning (2 hours for outdoor blast cleaning) the first coat of primer shall be applied.

**ii) Metal sprayed coating to BS 2569: Part 1 (Zinc)**

The metal deposition shall be coated at-once with two pack zinc chromate etch primer, and the first coat of the paint system shall be applied within 1 to 4 hour.

**iii) Galvanized and non-ferrous surface**

Surfaces shall be cleaned of dirt and building debris. All grease and handling marks shall be removed by the application of zinc chromate etch primer thinners.

The clean dry surfaces shall then be primed with two pack zinc chromate etch primer followed by the first coat of the paint system within 1 to 4 hours.

**6.3. Detailed Paint System**

**i) Structural steelwork**

Shop applied – apply overall:

1 coat high build alkyd zinc phosphate primer to a minimum dry film thickness of 75 microns followed by 1 coat phenolic /alkyd coating containing micaceous iron oxide to a minimum dry film thickness of 50 microns.

Site applied

Any damaged areas to be prepared as for the shop coats and made good with the original shop coat to the specified dry film thickness.

**ii) Apply overall**

1 coat phenolic/alkyd coating containing micaceous iron oxide to a minimum dry film thickness of 50 microns followed by 1 coat alkyd decorative enamel to a minimum dry film thickness of 40 microns.

Where dissimilar metals are in proximity and where the possibility of electrolytic or similar corrosion exists the mating surfaces shall be insulated.

Test plates carrying a sample of the actual coating used may be requested by

the Employer for test and inspection purposes.

All items of Plant shall be delivered to Site with their protective paint finish applied and except where otherwise specified or instructed by the Employer shall be given further coats of final paint finish at Site of sufficient thickness to give uniform colour and appearance.

Site painting shall not be carried out unless the surface to be painted is completely dry, the air temperature is above 16°C, and the surface temperature is at least 3°C above the dew point. Immediately before Site painting, all oil, grease etc. shall be removed from the surfaces to be painted and all damage to the factory applied finish made good.

Unless otherwise specified or approved by the Employer (e.g. where the Contractor's normal protective finish is of a special nature giving equal or better protection) or where the material of construction has an inherent corrosion resistant property, the Plant shall be protected in accordance with the following:

- Component parts which may be in direct contact with water (excluding the Pumping Station steel pipework)

a) blast clean in accordance with the requirements of Swedish Standard SIS 05 59 00 Sa 1½.

b) Ferrous metal

Within 4 hours of (a) above apply zinc metal spray to a thickness of 100 microns or greater in accordance with BS 2569.

OR

Within 4 hours of (a) above apply sufficient coats of polyamide cured epoxy zinc rich primer containing at least 90% of zinc in the dry film to give a minimum dry film thickness of 30 microns.

c) Non-ferrous metal

Within 4 hours of (a) above apply sufficient coats of polyamide cured epoxy etch primer to give a minimum dry film thickness of 50 microns.

Thoroughly clean and degrease previous finish and within 2 hours apply sufficient coats of tar or pitch epoxy resin to give a minimum dry film thickness of 250 microns.

#### **i) Steel door and Frames**

##### **Shop applied:**

1 coat high build alkyd zinc phosphate primer to a minimum dry film thickness of 75 microns followed by 1 coat alkyd based undercoat to a minimum dry film thickness of 40 microns.

##### **ii) Site applied:**

1 coat alkyd based undercoat to a minimum dry film thickness of 40 microns. 1 coat decorative alkyd enamel to a minimum dry film thickness of 40 microns.

**iii) Steelwork in contact with water**

**Shop applied:**

Hot dip galvanized to BS 729

**Site applied:**

Any damaged areas to be thoroughly cleaned of rust and surface deposit and painted with 1 coat of epoxy zinc phosphate to a minimum dry film thickness of 75 microns followed by 1 coat of epoxy micaceous iron oxide undercoat to a minimum dry film thickness of 100 microns, followed by 1 coat of epoxy micaceous iron oxide to a minimum dry film thickness of 60 microns.

**iv) Pipework and valves**

All pipe work and valves above ground. unless otherwise specified, shall be treated as described herein for pumping station. Steel pipework and valves in chambers shall be treat as described for buried pipework.

**v) Mechanical and Electrical equipment**

Immediately before Site painting, all oil, grease etc. shall be removed from the surfaces to be painted and all damage to the factory applied finish made good.

Paints, including primers and undercoats, shall be obtained from the same manufacturers and shall, except where application has to be made within a limited time of mixing, be ready mixed for use and compatible with one another. Only paints which are delivered in sealed containers, bearing the name of the manufacturers and properly labeled as to their quality and instructions for use, will be acceptable.

The manufacturer's proposed paint and protection system for all mechanical and electrical equipment shall be submitted to the Employer for approval at the time of submission of shop drawings.

All surfaces of Plant shall be protected against corrosion and/or erosion with the exception of stainless material and rotating gland or bearing surfaces.

Pumping station steel pipework:

- a) Fettle to remove all flash, weld spatter, sharp and rough surfaces.
- b) Blast clean in accordance with the requirements of Swedish Standard SIS 05 59 00 Sa 2½.
- c) Within 4 hours of (b) above apply one coat epoxy polyamide primer to give a minimum dry film thickness of 25 microns.
- d) Apply second and third coat amine adduct cured epoxy, each coat to give a minimum dry film thickness of 125 microns.

- Exposed plant, not coming into direct contact with water.

- a) Blast clean in accordance with the requirements of Swedish Standard SIS

05 59 00 Sa 2½.

- b) Within 4 hours of (a) above apply sufficient coats of polyamide cured epoxy primer containing red oxide or zinc phosphate to give a minimum dry film thickness of 50 microns.
  - c) Thoroughly clean and degrease previous finish and within 2 hours apply sufficient coats of polyamide cured epoxy micaceous iron oxide to give a minimum dry film thickness of 100 microns.
- Plant installed inside buildings excluding electrical panels and the pumping station steel pipework.
    - a) Thoroughly clean surfaces to remove rust, scale, dirt, loose paint etc. and degrease by the use of solvents which are compatible with the paint finish to be applied.
    - b) Within 4 hours of (a) above apply sufficient coats of polyamide cured epoxy or alkyd resin based primer to give a dry film thickness of not less than 40 microns.
    - c) Thoroughly clean and degrease previously applied finish and within 2 hours apply sufficient coats of polyamide cured epoxy or alkyd resin based undercoat and gloss finish paint to give an even and uniform colour and covering.
  - Electrical panels installed within buildings shall be finished with sufficient stove dried enamel primer and gloss finish to give a dry film thickness of not less than 90 microns.
  - Electrical panels installed in exposed positions or in damp conditions shall receive a surface preparation containing zinc prior to stove enameling.

#### **6.4. Colour coding and labeling of pipes and equipment**

All pipes and requirement shall be colour coded to a schedule to be agreed with the Employer before any Site painting starts, or earlier if necessary to suit manufacturing procedures. Valves and fittings shall be painted in the same colour as the pipe of which they form a part. Where a pipe enters or leaves a piece of equipment, the pipe colour shall extend upto but not including the flange attached to the equipment.

All pipelines shall be identified by stick-on 90 micron thick vinyl film labels showing the name of the material to be carried by the pipeline and an arrow indicating the direction of flow. Letters of titles shall be pre-spaced on carrier tape and the complete title protected by one piece removable liners. Titles shall be at intervals not less than 8 m, but shall in any case be provided in every space through which the pipe passes. Locations of labels shall be subject to prior approval of the Employer. Lettering sizes shall be between 16 mm and 75 mm in height depending on the size of the pipe.

Pipes smaller than 22 mm outside diameter shall be labeled by the use of tags instead of labels. Tags shall be made of brass no smaller than 65 mm x 16 mm by 1.5 mm thick, with lettering etched and filled with black enamel.

Titles shall also be provided on all equipment in locations and in sizes to be approved by the Employer.

Construction of New 65 MGD Pump House(Equipped with M&E Pumping Machineries)  
at Gharo, Karachi. Package # 2