2 MATERIAL TYPES AND FINISHES

2.1 GENERAL

2.1.1 Scope

1 This part specifies the requirements for material types and finishes for non-structural metal work.

2 Related Sections and Parts are as follows:

This Section

Part 1..... General
Part 3..... Metal Doors and Windows
Part 4..... Architectural Metal Work
Part 5..... Light Metal Support and Cladding System
Part 6..... Workmanship

Section 16 Structural Metalwork
Section 18 Carpentry, Joinery and Ironmongery
Section 26 Painting and Decorating

2.1.2 References

1 The following standards are referred to in this Part:

BS 729.....Specification for hot dip galvanized coatings on iron and steel articles (ISO 1461 Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods)

BS 1224.....Specification for electroplated coatings of nickel and chromium; (ISO 1456 Metallic and other inorganic coatings — Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium)

BS 1285.....Specification for wood surrounds for steel windows and doors

BS 1449.....Steel plate, sheet and strip

BS 1615.....Method for specifying anodic oxidation coatings on aluminium and its alloys; (ISO 7599 Anodizing of aluminium and its alloys — Method for specifying decorative and protective anodic oxidation coatings on aluminium)

BS 1706.....Method for specifying electroplated coatings of zinc and cadmium on iron and steel (ISO 2081 Metallic and other inorganic coatings — Electroplated coatings of zinc with supplementary treatments on iron or steel; ISO 2082 Metallic and other inorganic coatings — Electroplated coatings of cadmium with supplementary treatments on iron or steel)

BS 3083.....Specification for hot-dip zinc coated and hot-dip aluminium/zinc coated corrugated steel sheets for general purposes

BS 3987.....Specification for anodic oxidation coatings on wrought aluminium for external architectural applications

BS 4147.....Specification for bitumen-based hot-applied coating materials for protecting iron and steel, including suitable primers where required; (EN 10300 Steel tubes and fittings for onshore and offshore pipelines - Bituminous hot applied materials for external coating).

BS 6497.....Specification for powder organic coatings for application and stoving to hot-dip galvanized hot-rolled steel sections and preformed steel sheet for windows and associated external architectural purposes, and for the finish on galvanized steel sections and preformed sheet coated with powder organic coatings;(EN 13438 Paints and varnishes - Powder organic coatings for hot dip galvanised or sherardised steel products for construction purposes).

BS 7773.....Code for practice for cleaning and preparation of metal surfaces; (ISO 27831-2 Metallic and other inorganic coatings — Cleaning and preparation of metal surfaces — Part 2: Non-ferrous metals and alloys; ISO 27831-1 Metallic and other inorganic coatings — Cleaning and preparation of metal surfaces — Part 1: Ferrous metals and alloys)

EN 10142 .....Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming - Technical delivery conditions; (EN 10346 Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions).

EN 10143 .....Continuously hot-dip coated steel sheet and strip - Tolerances on dimensions and shape

EN 10152 .....Electrolytically zinc coated cold rolled steel flat products for cold forming - Technical delivery conditions

2.1.3 System Description

1 Materials and components used shall be as specified or be suitable equivalents as approved by the Engineer.

2 Materials not specified are to be of the best quality and suitable for the purpose intended and as approved by the Engineer.

3 All materials are to be free from any defect that may impair the strength, functioning, durability, or appearance of the work of this Section or of adjacent construction.

2.1.4 Metals

1 It is the responsibility of the Contractor to select the alloy, degree of alloy control, homogeneity, temper, metallurgical quality, degree of hardness or softness, mill tolerances, cutting tolerances and flatness required to achieve the requirements of design, quality, and colour matching of finish set forth in the Project Documentation.

2 Suitable low-friction separation materials shall be provided where metal materials are adjacent and subject by design to relative movement against one another. Suitable low-friction separation materials are as follows:

(a) teflon strip, 750 microns thick and teflon tape, 125 microns thick

(b) high-impact polystyrene

(c) other materials as approved by the Engineer.

3 Low-friction material shall be impervious to moisture.

2.2 PROTECTIVE TREATMENTS FOR METALS

2.2.1 General

1 Galvanized carbon steel (hot-dip) shall comply with the relevant provisions of BS 729, BS 1245, BS 6497, EN 10142, EN 10143.

2 Zinc-rich coating system shall comply with the relevant provisions of BS 3083, EN 10152

3 Nickel and chromium shall comply with the relevant provisions of BS 1224.

4 Zinc plating shall comply with the relevant provisions of BS 1706.

5 Aluminium/zinc-coating shall comply with the relevant provisions of BS 1615.

6 Bituminous paint shall comply with the relevant provisions of BS 4147.

2.3 ALUMINIUM FINISHES

2.3.1 General Requirements

1 The requirements and specification for finishes on aluminium as referred to in this Part shall comply with the following paragraphs.

2 Final colours will be selected by the Engineer from actual samples submitted by the Contractor.

3 Metal surfaces are to match the appearance, colour, and texture of samples submitted to and approved by the Engineer.

4 The Contractor shall submit a writing list of all aluminium products used in the Works. This list shall identify the location of each product and their finishes as per the following principal finishes:

(a) mechanical finishes:
  (i) as fabricated
  (ii) buffed
  (iii) directional textured
  (iv) non-directional textured.

(b) chemical finishes
  (i) non-etched cleaned
  (ii) etched
  (iii) brightened
  (iv) chemical conversion coatings

(c) coatings
  (i) anodic
  (ii) resinous and other organic coatings
  (iii) vitreous coatings
  (iv) electroplated and other metallic coatings
  (v) laminated coatings

5 All aluminium and aluminium alloy products used in the Works that are to be finished in a similar way shall be obtained from the same source unless otherwise approved by the Engineer.

6 All metal surfaces which are required by Project Documentation or manufacturer's standards to receive a chemical conversion coat pre-treatment are to meet the minimum requirements of BS 3987 and BS 1615.

2.3.2 Finishes for Aluminium and Aluminium Alloys

1 Unless otherwise specified for one of the alternative finishes listed Clause 2.2.1 in the specific Project Documentation, the finish in general for aluminium shall be as follows:

2 Exterior exposed aluminium: All metal surfaces exposed to the exterior, including framing members, shall receive either a two or three coat polyvinyl di-fluorine (PVDF) liquid coating as follows:

(a) surfaces shall receive a thermally-cured, pigmented, PVDF coating system, containing not less than 70 % of the fluoropolymer resin

(b) the coating system is to be spray applied under factory conditions to a pre-treated base metal in a two-coat, two-bake process or three-coat, three-bake process in accordance with the coating system manufacturers recommendations

(c) unless otherwise stated in the Project Documentation, the coating system shall include a primer for added substrate protection as recommended by the manufacturer to meet any coating system guarantees

(d) finished coating thickness is to be minimum of 55 microns dry film finish (18 microns primer, 18 microns colour coat, and 18 microns clear top coat to seal and protect the system). The final dry film thickness shall be 55 to 65 microns

(e) the coating system is to be applied by a licensed applicator approved by the coating system manufacturer. The applicator is to propose a program of records and samples are to be made available to the Engineer upon request

(f) the surface quality of the coating is to be smooth and free of flow lines, streaks, blistering, and other imperfections. The coating will be opaque and be uniform in colour and tonality, within the range of approved upper and lower limit samples when viewed under a uniform light source such as north daylight or light source approved by the Engineer

(g) prior to production coating, the Contractor is to present for approval full-size extrusions and sample panels representative of the maximum proposed range of colour and tonality to be expected in the finished work. The number of full-size sample panels for each coating colour is to be as approved by the Engineer

(h) to assure consistency of paint colour and tonality in the finished work, the Contractor should propose and implement a quality control program as approved by the Engineer. The quality control program is to be vertically integrated, and include controls by the coating manufacturer and applicator, as well as by the Contractor during assembly and installation of the finished work

(i) if required, the quality control program will include the use of co-ordinated empirical inspection methods, such as the use of calibrated multi-angle spectrophotometers to provide 3 independent checks of paint colour and tonality at the point of paint application, during assembly, and during installation

(j) no production coating application is to commence prior to approval of this quality control program, any installed work with coating defects or variation in colour or tonality in excess of the approved sample range will be subject to rejection

(k) the colour and finish are subject to the sample approval procedures specified herein and shall include:

(i) surface exposed to view

(ii) concealed surfaces

(l) provide a compatible field touch-up PVDF coating system formulated for air-drying at ambient temperature.

(m) the organic coating shall not peel, check, crack, chalk or change

3 Interior used aluminium: All surfaces exposed to the interior and not exposed to the exterior shall receive a high-performance acrylic enamel organic non-metallic coating as follows:

(a) the coating is to be spray applied under factory conditions to pre-treated base metal in a one-coated process in accordance with the coating system manufacturer's recommendations

(b) unless otherwise stated in the Project Documentation, the coating system shall include a primer for added substrate protection as recommended by the manufacturer to meet any coating system guarantees

(c) the finished coating thickness shall be a minimum of 25 microns dry film thickness (typical) unless otherwise approved by the Engineer

(d) the coating system to be applied by a licensed applicator approved by the coating system manufacturer. The applicator is to propose a program of records and samples of the entire coating production for approval by the Engineer, and which records and samples shall be made available to the Engineer upon request

(e) the surface quality of the coating shall be smooth and free of flow lines, streaks, blistering or other imperfections. The coating is to be opaque and be uniform in colour and tonality; within the range of approved upper and lower limit samples when viewed under a uniform light source such as north daylight or light source approved by the Engineer

(f) prior to production coating the Contractor will present for approval full-size extrusions representative of the maximum proposed range of colour and tonality to be expected in the finished work.

(g) to assure consistency of paint colour and tonality in the finished work, the Contractor should propose and implement a quality control program as approved by the Engineer. The quality control program to be vertically integrated, and include controls by the coating manufacturer and applicator, as well as by the Contractor during assembly and installation of the finished work. If necessary, such a quality control program is to include the use of co-ordinated empirical inspection methods, such as the use of calibrated multi-angle spectro-photometers to provide 3 independent checks of paint colour and tonality at the point of paint application, during assembly, and during installation.

(h) no production coating application should commence prior to approval of this quality control program by the Engineer. Notwithstanding the implementation of an approved quality control program, any installed work with coating defects or variation in colour or tonality in excess of the approved sample range will be subject to rejection

(i) the colour and finish are subject to the sample approval procedures specified herein and are to include a one-coat acrylic enamel to match Engineer's sample

(j) provide a compatible field touch-up acrylic enamel coating system formulated for air-drying at ambient temperature in a colour to match the factory applied finish

(k) the organic coating shall not peel, check, crack, chalk or change colour for a period of 5 years from the completion of the Project.

2.3.3 Storage and Handling of Materials

1 Material shall not be shipped, delivered or supplied when the finish of such material:

(a) has not been inspected and tested in the manner and by the means specified above and as approved

(b) does not meet all the specifications for the finishes set forth in the alloy manufacturer's instructions

(c) does not fall within the colour and tonality range approved by the Engineer

(d) has been rejected by the Engineer

(e) has not otherwise been processed in accordance with the specified requirements.

2 Protection of Aluminium. All aluminium surfaces in contact with blockwork, concrete, render or other alkaline materials shall be coated with two coats of black bitumen solution or similar approved protective coating. Alternatively, shims of fibre, neoprene, or other materials which will not interact with the aluminium or other adjacent materials may be provided and gaps filled with backer rod and sealant as approved by the Engineer.

2.4 CARBON STEEL FINISHES

2.4.1 General

1 Requirements and specification for finishes on carbon steel as referred to this Section shall comply to the following:

(a) all surfaces of steel members incorporated in Works shall be finished as required in this Section

(b) if concealed from view, steel surfaces are to receive a finish in accordance with Section 16, Structural Steel, and Section 26 Painting

(c) if exposed to view, steel surfaces are to receive the following coating system:

(i) surface preparation: BS 7773

(ii) primer: fast curing epoxy primer coat

(iii) intermediate coat: high-build epoxy-polyamide paint

(iv) top coat: aliphatic acrylic polyurethane finish system.

2.4.2 Painted Steel

1 The Contractor will propose and implement a quality program for approval by the Engineer. The quality control program is to be vertically integrated, and include controls by the steel fabricator and the steel finisher, as well as by the Contractor to provide independent checks of steel quality and finish at the point of fabrication, finishing, and during installation.

2 Preparation of steel shall be as follows:

(a) steel received from the mill will be inspected for any defects or damage which could adversely affect the fabrication and finishing of the steel. All steel members are to be blast cleaned prior to final fabrication and assembly

(b) all fabrication is to be done prior to finishing. All welds are to be ground smooth and finished to match adjacent surfaces, all burrs and foreign particles removed, and any other defects remedied prior to finishing

(c) prior to finishing all fabricated steel is to be inspected and if, in the determination of the coating applicator, the steel is not sufficiently cleaned to ensure a high-quality finish, the steel is to be further cleaned as required to achieve the finish desired.

(d) verify that all surfaces to be painted are dry, clean and free of dust, dirt, oil, wax, grease, or other contaminants

(e) after steel members are installed, inspect steel for damage and staining. Repair or replace damaged members. All repair procedures are subject to approval by the Engineer who will have the right to reject any installed work notwithstanding any rededication procedures instituted.

3 Painting applications shall be as follows:

(a) steel is to be shop-painted with one coat of fast-curing epoxy primer and one coat of epoxy intermediate coat as specified herein. The epoxy primer coat is to be in a contrasting colour from the epoxy intermediate coat

(b) all steel to be painted in accordance with the recommendations of the coating manufacturer

(c) mix and apply all coatings in accordance with paint manufacturer's recommendations. Apply paint only under the climatic conditions recommended by paint manufacturer

(d) check dry film thickness after application of each coat in accordance with the recommendations of the manufacturer

(e) inspect finished steel members thoroughly prior to shipping to the Site. Package, ship, store and protect primed steel prior to installation

(f) prior to application of the finish coat, inspect the primed substrates for any defects or conditions which may affect the application and quality of the finish coat

(g) spray or roller apply the finish coating in accordance with paint manufacturer's recommendations. If roller applied, finish coat is to be rolled in one direction; avoid backrolling of any kind. Avoid combining application procedures; all surfaces are to be rolled or all surfaces are to be sprayed

(h) the surface quality of the coating is to be smooth and free of flow lines, sags, dry spray, overspray, imbedded particles, and other imperfections

(i) the coating is to be opaque and uniform in colour and tonality when viewed under a uniform light source such as north daylight. Inspection shall be by visual comparison with previously approved range samples and if necessary, include the use of co-ordinated empirical inspection methods, such as the use of calibrated multi-angle spectrophotometers.

2.4.3 Stainless Steel Finishes

1 Stainless steel finishes as referred to in this Section shall comply with the following.

2 Stainless steel shall comply with BS 1449 Part 2.

3 Unless otherwise specified in the Project Documentation, the quality of metal work components manufactured from stainless steel shall comply with the following:

(a) externally Type 316

(b) internally Type 304

4 Unless otherwise specified in the Project Documentation, the finish of metal work components manufactured from stainless steel shall comply with the following:

(a) non visible surfaces 2D mill finish (e.g., roof flashings)

(b) visible surfaces 3B brush polished finish.

The finish is to be uniform and free from blemishes, scratches, and other defects. Notwithstanding the above, the finish shall be appropriate for its function and selected so as not to invalidate its warranty.

5 The grain of stainless steel and brushed finishes are to run in the same direction for contiguous or adjacent components.

6 For special applications (e.g. use in swimming pools or in environments where exposure to chemicals may occur), the usage of stainless steel type shall be as stated in the Project Documentation.

END OF PART