

KINGDOM OF BAHRAIN



STANDARD SPECIFICATIONS FOR CONSTRUCTION WORKS 2008

Module – 10 – Roofing

Introduction

The Standard Specifications are published as a series of 21 stand-alone modules each addressing a single distinct area of the construction process. This stand-alone module 10 is an integral part of the Standard Specifications.

The purpose of the MoW STANDARD SPECIFICATIONS FOR CONSTRUCTION is to provide the design professional with a guide for accepted construction practices for Ministry of Works projects. As an aid to the designer, these Standard Specifications are provided for the inclusion in proposed development projects for ease, efficiency and cost savings.

The Standard Specifications are not intended to limit the design responsibility of the design professional. However, they establish a minimum acceptable criterion and/or quality for use within Ministry of Works projects.

The design professional may increase the requirements of an item contained in the Standard Specifications to meet job requirements, but when this is done, there should be no reference for that item on the drawings to the Ministry of Works Standard Specifications and a new specification should be included with the drawings or project contract documents.

The design professional must review all Standard Specifications to be sure that they are adequate for the proposed project based on the job site conditions; the design professional is solely responsible for the designs submitted under his seal.

In order to keep design standards current with changing regulations and improved construction materials and practices, this section will be updated and maintained by the concerned authorities of the Ministry of Works. Prior to starting a new project, the design professional should contact the concerned Directorate of the Ministry of Works to verify that he/she has the latest document revisions.

Module List

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Foreword

This specification provides the basis for roofing in building construction. It relates to providing all plant, labour and materials and performing all operations in connection with applied waterproofing membranes, sheeting, tiles, insulation, flashings and all other necessary accessories.

This specification must be read in its entirety, as it is structured in order of work-flow, which means that items or activities appear in several places in the specification corresponding to the progression of the construction process.

For larger or more complex or specialist projects, a project-specific Particular Specification for roofing may also be provided.

Absence of clauses for materials and methods does not necessarily signify that they can not be used. Proposals for use of innovative methods and materials are encouraged and are subject to review and approval by the Client.

Where the word approved is used in this specification, this means that the Client or Engineer has been consulted and has confirmed that the item or procedure is acceptable in the specific context for which approval has been requested.

1. PART 1 GENERAL

1.1 Quality Control

All materials brought to site shall be clearly marked with the product name and description. The containers, packages, and so on, shall be intact and undamaged and the stock must be recent and of prime quality.

The contractor shall ensure that all work and practices comply with the Health and Safety section of the Contract documents and that full consideration is given to the health and safety of operatives when handling and installing the specified materials.

1.2 Submittals

The following items shall be submitted:

Product Data:

Manufacturer's printed specification and installation instructions, including procedures and materials for termination, penetrations, flashing, compatibility and bonding. The Contractor shall provide with his submittals all the relevant standards documentation.

Shop Drawings:

Layout of sheets shall be indicated, including side and end laps mechanical equipment flashing, parapet flashing, and drain details.

Membranes/Sheets: Three 300 mm x 300 mm samples

Flashing/Membrane: Three 300 mm x 300 mm samples

Any other components required by the Engineer

Accepted samples shall be retained to serve as a basis for checking at the time of delivery of materials to site. The Manufacturer shall furnish proof of origin and quality of each material that will be used or details of where it has previously been applied. Only materials specified or approved by the Engineer shall be permitted to be used. The Engineer shall stipulate acceptance tests and their mode of operation to be carried out on materials supplied by the Contractor.

1.3 Warranty

A written warranty shall be provided, stating that for a period of 10 years after the date of the Provisional Acceptance certificate, the applicator shall promptly make repairs or replace defective materials without additional costs to the Owner.

The warranty shall clearly include the following:

- All materials in the water proofing systems shall be free from manufacturing defects and comply with manufacturer's published technical specifications.
- All workmanship in waterproofing systems shall be free from any defects and comply in all respects with the manufacturer's technical instructions and control.

1.4 Product Delivery, Storage & Handling

Materials shall be delivered to the site in unopened containers bearing the manufacturer's name, brand name, and description of contents. Containers of liquid materials shall not be left open at any time in the storage area. Membrane, flashing, adhesives and all perishable materials shall be stored in clean, air conditioned, dry areas. Storage temperature for

adhesives shall be between 16°C and 27°C. Protection boards shall be stored flat and clear of the ground surface. UV protection shall also be provided.

Storage of materials on site shall be in compliance with the manufacturer's written instructions which are to be part of the submittal approval process.

1.5 Spare Materials

The Contractor shall hand over to the Engineer on completion any unused containers or unopened materials.

2. PART 2 MATERIALS & WORKMANSHIP

2.1 Materials – General

Cement shall be Ordinary Portland Cement complying with BS EN 197: Part 1

Sand shall comply with BS EN 13139.

Water shall comply with BS EN 1008.

Roof screed shall consist of a mix of four parts of sand to one part of cement mixed with the minimum practicable amount of water. The water/cement ratio shall not exceed 0.42.

Super purity aluminium flashings shall comply with BS EN 485: Part 2, BS EN 485: Part 3, BS EN 515, BS 573: Part 2 and BS EN 573: Part 3. Flashings shall be carefully handled and stored to prevent damage of any kind.

Roof insulation shall be CFC and HCFC free extruded polystyrene foam board with rebated edges or mineral wool boards. Boards shall be between 50 mm and 120 mm thick (depending on insulation requirements) and with tongue and groove or shiplap edges for interlocking support.

Polystyrene board properties:

Table 1 – Polystyrene Board Properties

Properties	Standard	Unit	Min Value
Density	BS ISO 844	kg/m ³	32
Thermal conductivity	BS EN 13164	W/mk	0.028
Compressive strength	BS ISO 844	kN/m ²	300
Design load	-	kN/m ²	110
Water vapor permeability	BS 3837 Appendix D	ngm/Ns	1.2
Water absorption	BS EN 13164	%-vol	0.3

Roof solar slabs shall be 400 x 400 x 35 mm natural coloured precast concrete complying generally with BS EN 1339.

Solar slab support and spacer pads shall be 5 mm thick x min 120 mm diameter high density PVC pads with integral spacer ribs, stabilized for UV exposure, resistant to ozone and humidity, and a 10-year warranty shall be submitted for the Engineer's approval.

Gravel borders shall be 20 mm single size crushed light grey or white limestone as specified on the contract drawings or in the project Particular Specification, from an approved source and laid on an approved geotextile filter membrane.

Geo-textile filter membrane shall be woven or non woven fabric consisting of only long chain polymeric filaments or yarns formed into a stable network. The fabric shall be stabilized against UV light, inert to common chemicals, or the in-situ soil and water. The minimum requirements are as follows:

- Weight: 135 kg/m²
- Thickness (under load) 0.7 mm
- Tensile strength 1.6 kN
- Permeability 50 l/m²/s
- Puncture resilience 1.5 kN

Wood preservatives: Solvent based wood treatment to prevent rot and insect attack. Wherever possible, wood should be treated by the supplier in pressure-impregnating ovens before delivery to site. Touch up of exposed ends, and so on, is permitted on site.

Other materials shall comply with the following standards:

- All materials in the water proofing systems shall be free from manufacturing defects and comply with manufacturer's published technical specifications.
- Aluminium: sheets, bars, tubes. BS EN 573, BS EN 755
- Fixings: BS 1494
- Nails: BS 1202 or BS 5534
- Screws: BS EN ISO 1479 and BS EN ISO 7049
- Hot dipped zinc coating: BS EN 10143, BS 3083 and BS EN 10327
- Bitumen mixes for paved areas: BS EN 12591
- Expanding polystyrene boards: BS 3837
- Corrugated plastic translucent sheets: BS 4154
- Polyisocyanurate boards (PUR & PIR): BS 4841
- Profiled aluminium sheet: BS 4868
- Sprayed urethane foam (PUR & PIR): BS 5241
- Fibre cement roof sheeting: BS 8219
- Profiled sheeting: BS 8219
- Slating and tiling CP: BS 5534
- Profiled steel sheeting: BS EN 10143. Grade Z1
- Sprayed urethane foam to BS 5241

2.2 Tiles & Tiling

2.2.1 Clay Roof Tile

Clay tile roofing and fittings shall comply with BS EN 1304 and shall be fixed to treated softwood battens with non ferrous fixings to BS 5534.

Where clay tiles are to be laid on timber roofing, the following requirements shall also apply:

- Underlay shall be laid with vertical laps not less than 100 mm and each end shall be securely fixed. Horizontal laps shall be not less than 75 mm. Underlay shall be carried over fascia board to form drip.
- Battens shall be fixed to suit the gauge of the tiles with nails of sufficient length to penetrate not less than 55 mm into the rafters. Battens shall be butt jointed and all joints shall be centered over supporting rafters.
- Each course of tiling shall be laid with a minimum lap of 65 mm. The number of tiles to be nailed will depend on the pitch and exposure of the roof. The two end tiles in every course adjacent to verges, abutments, valleys and hips shall be nailed with 45 mm by 2.65 mm diameter nails as specified or other approved fixing.
- Verge tiling shall be tilted to prevent dripping of run off water. The under cloak shall be formed with plain tiles bedded in cement mortar cut back 6 mm. The edges of the tiles and the underside of the under cloak projections shall be left clean.
- Ridge tiles shall be carefully bedded at joints and pointed in cement mortar with a neat flush joint. Open ends shall be filled with pieces of cut tiles bedded and pointed in cement mortar with the ends of ridge and cut tiles kept clean.
- Hip tiles shall be carefully bedded in cement mortar and pointed with a neat joint cut back 6 mm. All visible edges and tiling shall be left clean. Hip tiles shall bond and course with the general tiling.
- Valleys shall be formed carefully. Cut tiles shall be supported on counter battens. Valleys shall bond and course with general tiling.
- All cutting and fitting to abutments shall be done carefully and flashings shall be in accordance with appropriate details.

2.2.2 Concrete Roof Tiles

Precast concrete interlocking tiles with coloured aggregate shall be of maximum gauge 100 mm and minimum headlap 65 mm, and fixed to treated battens with aluminium clout nails to BS 5534. Ridge tiles, verge tiles, and so on, shall be supplied by the manufacturer to match colours. Dry fixing method using clips shall meet the requirements of BS 5534.

2.3 Built Up Roofing System

2.3.1 Preparation

Concrete roof slabs shall be sweep-blasted to remove laitance. All loose water shall then be removed by brushing or compressed air, neat cement grout scrubbed into the damp concrete surface and screed material laid immediately. Screed material shall be compacted and finished by wooden floats to the required falls. The maximum permissible surface deviation shall be a 5 mm gap under a 3 m straight edge.

A minimum of 24 hours shall elapse between the placing of adjacent bays.

Finished bays shall be continuously wet cured for 7 days.

2.3.2 Screeds

Screed shall be laid in bays of area not exceeding 16 m² and length not exceeding 5 m. Falls shall be 1% minimum and the minimum screed thickness shall be 50 mm. Angle fillets are to be formed to vertical wall junctions where the membrane will be turned into a wall chase.

2.3.3 Aerated / Lightweight Screeds

Portland cement, water and a foaming emulsion shall be combined as the manufacturer's instructions in order to provide a spray applied lightweight screed with improved insulation values. Density of screed shall be between 550 kg/m³ and 650 kg/m³ with a compressive strength of at least 24 kg/cm². Curing shall be carried out for at least 7 days. Any shrinkage cracks appearing shall be made good with an approved repair mortar to the satisfaction of the Engineer.

Alternatively, lightweight screed incorporating Styrofoam beads shall be used if specified on the contract drawings or with approval from the Engineer.

2.3.4 Lightweight Aggregate Screeds

Lightweight aggregate screeds shall be of sintered pulverized fuel ash, expanded clay bonded, with a cement binder, with a 25 mm to 30 mm sand/cement topping for a smooth surface.

2.3.5 Bitumen Primer

Bituminous primer to BS 6949 shall be spread on the prepared substrate to increase adhesion. Coverage shall be approximately 2 m² per litre. Primer shall be left to dry for 2 to 24 hours.

2.3.6 Venting Layer

Venting layer shall be perforated glass mat impregnated with polymer modified electrometric bitumen with perforations to allow partial bonding of waterproofing system.

2.3.7 Torch Applied and Adhesive Membrane

Torch applied and adhesive membrane shall be a 4 mm SBS electrometric bituminous membrane reinforced with a non woven polyester or fibreglass mat supplied in roll form, laid over the primed substrate with 80 mm side laps and 120 mm end laps torched and seamed. The application must be carried out by a contractor familiar with the product and with at least ten years continuous experience in the field.

If a second layer is required it shall be applied 90° to the first layer and fully flame bonded to the bottom layer. Dressing into rainwater outlets, up stands and flashings shall be carried out after the main roof is installed.

Corner reinforcement strips shall be 250 mm wide, and of 4 mm thick SBS electrometric bitumen membrane polyester reinforced.

Flashing membrane shall be 4 mm thick SBS electrometric bitumen, reinforced with an 85 g/m² glass grid under faced with a torch-off film and self protected with an embossed, thermos table, fire resistant aluminium foil.

Membrane termination shall be protected by a counter flashing system (metal flashing, groove or similar approved) and shall be at least 150 mm higher than the top level of the roof tiles.

If the roof is opened to public access, the flashing membrane shall be protected by a vertical concrete tile, reinforced screed or similar approved.

2.3.8 Separator or Filter Layer

Separator or filter layer shall be non-woven geotextile polypropylene fabric, of at least 135 g/m² weight.

Insulation boards shall be laid loose with staggered joints and shall be cut neatly as necessary to fit tightly around protruding elements and against parapets. Pre-tapered insulation boards are suitable for renovation/restoration work. Density to be at least 32 kg/m³.

2.3.9 Solar Slabs

Solar slabs to BS EN 12975 shall be laid loose to a square pattern on 5 mm PVC support and spacer pads and shall be cut as necessary to allow a 150 mm wide gravel border around protruding elements and parapets.

Slabs shall be laid so that cutting is kept to a minimum and cut slabs are next to parapets; cut edges shall be rubbed smooth.

2.3.10 Gravel Edges

Wadi gravel borders (that is, rounded) of minimum size 40 mm diameter shall be laid 50 mm thick and 300 mm wide, loose on a filter membrane over roof insulation between the edge of precast concrete solar slabs and protruding permanent elements such as parapets to form drainage routes to rain water outlets. Gravel shall be retained from blocking drain outlets by gravel traps, which shall be plastic, non-ferrous metal or aluminium.

2.3.11 Flashings

Aluminium flashings and the like for in-situ work shall be cut from coils and kept free from contact with lime and all other corrosive agents before fixing. Aluminium surfaces in contact with concrete or mortar shall be painted with two coats of bituminous paint, prior to installation. Fixing shall be round head aluminium alloy screws to BS 1473.

2.3.12 Sealant

Sealant for use in all roofing systems shall comply with BS 6093 and BS 6213 Table 7. All proprietary sealants specified shall be applied strictly in accordance with the manufacturer's instructions. All sealants shall meet the requirements of the roofing system manufacturer's recommendations.

2.4 Liquid Applied Membranes

2.4.1 Liquid Roofing

Hot applied (BS 8218)

Liquid applied mastic asphalt type layer 12 mm to 25 mm thick shall be applied on site with mineral (sand or crushed stone) applied to the top layer to provide a traffic resistant finish, and asphalt shall be trowelled up vertical surfaces to prepared rebates to form continuous finish.

Cold applied (BS 7021)

Liquid applied solvent based polyurethane coating shall be applied as a two coat (minimum) system with fibre glass reinforcement to upstands and openings. Top coats shall be available in various colours as shown on drawings or to selection of Engineer.

2.5 Single Layer Roofing System

High performance electrometric, one component, moisture curing polyurethane coating shall be applied by brush, spray or rubber blade, UV stable and able to be overcoated with a reflective coating or granules. A period of 24 hours shall be allowed for initial curing and 7 days to achieve full cure. Application shall be at 1 kg/m² to 2 kg/m² depending on substrate. DFT required shall be 1.3 mm when applied in two coats. Properties shall comply with BS 2782.

2.6 Metal Roofing System

Profiled steel or aluminium roofing panel cladding shall have a structurally efficient trapezoidal profile capable of withstanding maximum stress, web buckling and deflection limits.

The sheeting profiles for the buildings shall be as shown on the drawings with a minimum cover width of 900 mm.

The aluminium sheeting shall further conform to the requirements for material and finishes as laid down in BS 4868, "Profiled Aluminium Sheet for Building".

The minimum thickness of uninsulated cladding shall be 0.70 mm for roof and wall. For insulated cladding, external profiled sheet shall be 0.70 mm thick and the liner sheet, 0.50 mm thick with an insulation of minimum 50 mm thick rigid polyurethane foam (100% CFC free), injected at an overall average density of 40 kg/m³ with fire retardant foam.

The Contractor shall supply all necessary trims, flashings, infill panels, and so on, from 0.7 mm gauge aluminium with the same finish as that of cladding. The edges of flashings are to have welts and the leg length of the flashings shall be as per contract drawings.

2.6.1 Standing Seam

The standing seam roof system shall be a proprietary system from a specialized manufacturer. Extruded aluminium support halters shall be positively fastened directly to the structure. The halter height shall be determined by the insulation requirements.

The outer standing seam sheets shall be clipped together over the support halters and the upstand seams mechanically closed using a zipping machine.

The 1.0 mm gauge aluminium/steel standing seam profile (400 mm/600 mm pitch) shall have a factory applied, semi-gloss two-coat PVF2 paint finish of the Engineer's choice from the RAL international colour range on the external side and with a reverse side clear lacquer service coat. Sheets shall be of alloy AA3004/3105 H46 to BS EN 10326, BS EN 10327 and BS EN 485, BS EN 515, BS EN 1396.

The sheet shall be manufactured by a company certified to the QA and QC requirements of the BS EN ISO 9000 standard.

Profiled sheet shall conform to the requirements for material and finishes as laid out in BS 4868.

The standing seam sheets shall be supplied in one length without any horizontal sheet overlaps and curved, where applicable, to suit building design.

2.6.2 Insulation

Insulation shall be minimum 100 mm thick mineral wool blanket insulation at a density of 70 kg/m³ (compressed to 80 mm following installation.)

2.6.3 Vapour Barrier

Vapour barrier shall be a multi-layer composite membrane with a woven polypropylene reinforcing mesh sandwiched between two layers of UV stabilized virgin polyethylene film, supplied in rolls of 2 m x 50 m x 0.4 mm and joined by a clear sealant tape.

2.6.4 Flashings

Flashings shall be 0.7 mm-gauge polyester white finish on reverse side of Aluminium sheet (cover width 1,000 mm) to BS EN 10326 and BS EN 10327.

The verge support cap attached to the verge clip (type dependent on insulation requirements) shall support verge flashings.

All external flashings shall be 1.0 mm gauge, with the finish the same as the external roof sheet. Joints shall be overlapped or butted with butt straps to allow for thermal movement.

Halters shall be fastened directly onto the purlins with stainless steel (Grade 304) self-tapping screws. Purlins shall be covered with PVC barrier tape to isolate the halters.

2.6.5 Fixings

All primary fasteners shall be of the high threaded type, manufactured from austenitic Grade 304 stainless steel fasteners and fitted with a stainless steel washer.

Flashings shall be stitched with stainless steel stitching screws, complete with stainless steel washers.

The number of fixings shall comply with the requirements of BS 6399: Part 2.

Ridge closures shall be EPDM with aluminium shroud with the finish the same as the external sheet. Closures shall be held in position with ridge retainer section. Ends of the external panel shall be turned up with the ridge-folding tool.

Eaves closures shall be in EPDM retained in position with the drip angle.

2.7 Fibre Cement

Fibre cement sheeting erection shall comply with BS 8219, BS EN 494, BS 5247: Part 14. End laps shall be 150 mm, side laps shall be 1.5 corrugations for type "A" sheets and 0.5 corrugations for type "B" sheets and shall be fixed at centres not exceeding 300 mm by galvanized diamond shaped washers and lead or plastic sealing washers. All holes for bolts or screws shall be drilled (not punched) from the underside of the sheets and shall be on the crown of the corrugations. All fixings, bolts, screws, washers, and so on, shall generally comply with BS 1494 and Appendix B of BS 5427.

Special fittings including ridges, barge boards, cappings, gutters, eaves, filler pieces, and apron flashings shall be compatible with the roof coverings and shall be fixed strictly in accordance with the manufacturer's written instructions.

Fibre cement sheeting shall be manufactured by an approved supplier and fixed to rafters or purlins strictly in accordance with manufacturer's written instructions using the requisite starter, finishing and apex sheeting.

Each sheet shall be fixed starting from the eave level. The finishing sheet shall be fixed to the last sheet and to the apex sheet. The sheets shall project 75 mm beyond all fascia and barge boards. On double pitched roofs the laying of sheeting on both slopes shall commence from the opposite end to the prevailing wind. All holes shall be drilled 1.5 mm larger in diameter than that of the nail or bolt hole and no holes may be punched. The nails shall not be driven in

nor bolts tightened any more than is necessary to seat the washers firmly in position. All cutting shall be accurately and carefully executed with a sharp saw. Neat close fitting joints shall be formed around vent pipes and openings.

2.8 Corrugated Steel Sheeting

Hot dipped galvanized corrugated steel sheeting shall be erected in accordance with CP 143: Part 10 and comply with BS 3083.

Sheets shall be fixed with 1.5 corrugations of side lap and 150 mm minimum of end lap. Sheets shall be fixed at centres not exceeding 300 mm by galvanized drive screws to timber, or hook bolts to steel with galvanized diamond shaped washers and lead or plastic sealing washers. All holes for bolts or screws shall be drilled (not punched) from the underside of the sheets and shall be on the crown of the corrugations. All fixings, bolts, screws, washers, and so on, shall generally comply with BS 1494: Part 1. All holes, cuttings, and so on, exposed after galvanizing shall be treated with cold galvanizing treatment.

3. PART 3 SUMMARY

3.1 Protection

All installed products shall be protected until the completion of the project.

All damaged or broken items shall be repaired or replaced before Practical Completion.

3.2 Cleaning

Upon completion of the roofing installation and prior to Practical Completion, the Contractor shall remove all protective coatings, debris, masking and equipment from the area and leave the works in a condition acceptable to the Engineer.

3.3 Tests

Where practical a water test shall be carried out using a hand held hose at full pressure or by blocking roof outlets temporarily with sand bags and flooding the finished roof to a depth of approx 100 mm for at least 48 hours. Readings of water level shall be taken and the water level topped up periodically. Spaces/voids below shall be checked for leaks or stains and remedial action taken immediately whilst still visible.

3.4 Maintenance and Safety

All materials, coatings and adhesives must be applied using required protective clothing and ventilation. They must be applied under the conditions recommended by the manufacturers.

3.5 Reference Documents

3.5.1 Standards

Reference	Title
BS 1202	Specification for nails
BS 1473	Specification for wrought aluminium and aluminium alloys for general engineering purposes - rivet, bolt and screw stock
BS 1494: Part 1	Specification for fixing accessories for building purposes. Fixings for sheet, roof and wall coverings
BS 2782: Part 3	Methods of testing plastics. Mechanical properties.

	Determination of apparent interlaminar shear strength of reinforced plastics
BS 3083	Specification for hot-dip zinc coated and hot-dip aluminium/zinc coated corrugated steel sheets for general purposes
BS 3837	Expanded polystyrene boards. Boards and blocks manufactured from expandable beads
BS 4154	Corrugated plastics translucent sheets made from thermosetting polyester resin (glass fibre reinforced)
BS 4841	Rigid polyisocyanurate (PIR) and polyurethane (PUR) products for building end-use applications
BS 4868	Specification for profiled aluminium sheet for building
BS 5241	Rigid polyurethane (PUR) and polyisocyanurate (PIR) foam when dispensed or sprayed on a construction site
BS 5534	Code of practice for slating and tiling (including shingles)
BS 6093	Design of joints and jointing in building construction. Guide
BS 6213	Selection of construction sealants. Guide
BS 6399: Part 2	Loading for buildings. Code of practice for wind loads
BS EN 197: Part 1	Cement. Composition, specifications and conformity criteria for common cements
BS EN 485: Part 1	Aluminium and aluminium alloys. Sheet, strip and plate. Technical conditions for inspection and delivery
BS EN 485: Part 2	Aluminium and aluminium alloys. Sheet, strip and plate. Mechanical properties
BS EN 485: Part 3	Aluminium and aluminium alloys. Sheet, strip and plate. Tolerances on dimensions and form for hot-rolled products
BS EN 485: Part 4	Aluminium and aluminium alloys. Sheet, strip and plate. Tolerances on shape and dimensions for cold-rolled products
BS EN 494	Fibre-cement profiled sheets and fittings. Product specification and test methods
BS EN 515	Aluminium and aluminium alloys. Wrought products. Temper designations
BS EN 573: Part 1	Aluminium and aluminium alloys. Chemical composition and form of wrought products. Numerical designation system
BS EN 573: Part 2	Aluminium and aluminium alloys. Chemical composition and form of wrought products. Chemical symbol based designation system
BS EN 573: Part 3	Aluminium and aluminium alloys. Chemical composition and form of wrought products. Chemical composition and form of products
BS EN 755	Aluminium and aluminium alloys
BS EN 1008	Mixing water for concrete. Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete
BS EN 1304	Clay roofing tiles and fittings. Product definitions and specifications
BS EN 1339	Concrete paving flags. Requirements and test methods
BS EN 1396	Aluminium and aluminium alloys. Coil coated sheet and strip for general applications. Specifications
BS EN 10143	Continuously hot-dip coated steel sheet and strip
BS EN 10326	Tolerances on dimensions and shape
BS EN 10327	Continuously hot-dip coated strip and sheet of structural steels. Technical delivery conditions
BS EN 10327	Continuously hot-dip coated strip and sheet of low carbon steels for cold forming. Technical delivery conditions
BS EN 12591	Bitumen and bituminous binders. Specifications for paving grade bitumens

BS EN 12975	Thermal solar systems and components. Solar collectors
BS EN 13139	Aggregates for mortar
BS EN 13164	Thermal insulation products for buildings. Factory made products of extruded polystyrene foam (XPS). Specification
BS EN ISO 844	Rigid cellular plastics. Determination of compression properties
BS EN ISO 1479	Specification for hexagon-head tapping screws
BS EN ISO 7049	Cross recessed pan head tapping screws
BS EN ISO 9000	Quality management systems. Fundamentals and vocabulary

3.5.2 Codes of Practice

Reference	Title
BS 5427	Code of practice for the use of profiled sheet for roof and wall cladding on buildings
BS 5534	Code of practice for slating and tiling (including shingles)
BS 7021	Code of practice for thermal insulation of roofs externally by means of sprayed rigid polyurethane (PUR) or polyisocyanurate (PIR) foam
BS 8218	Code of practice for mastic asphalt roofing
BS 8219	Installation of sheet roof and wall coverings. Profiled fibre cement. Code of practice
CP 143	Code of practice for sheet roof and wall coverings.
CP 143: Part 10	Code of practice for sheet roof and wall coverings. Code of practice for sheet roof and wall coverings. Galvanized corrugated steel. Metric units

Abbreviations

ACB	Air Circuit Breakers	EIA	Environmental Impact Assessment/Electronic Industries Alliance
ACOP	Approved Code of Practice	EMC	Electromagnetic Compatibility
ACRIB	Air Conditioning and Refrigeration Industry Board	EPDM	Ethylene-propylene-diene-monomer copolymer
ADCM	Acoustic Doppler Current Meters	FA	Fresh Air
AFMA	Australian Fisheries Management Authority	FBA	Factory Built Assembly
AGMA	American Gear Manufacturers' Association	FRP	Fibre Reinforced Polymer
AISI	American Iron and Steel Institute	FSC	Forest Stewardship Council
AS	Acceptance Strength	GANA	Glass Association of North America
ASTA	Association of Short-circuit Testing Authorities	GGBS	Ground Granulated Blast-furnace Slag
ASTM	American Society for Testing Materials	GMS	Galvanized Mild Steel
ATS	Automatic Transfer Switch	GRC	Glass Reinforced Cement/Glass Reinforced Concrete
AWS	American Welding Society	GRP	Glass Reinforced Plastics
BASEC	British Approval Service for Electric Cables	HCFC	Hydrofluorocarbons
BOCA	Building Officials and Code Administrators	HDPE	High Density Polyethylene
BRE	Building Research Establishment Ltd.	HEPA	High Efficiency Particulate Air
BS	British Standards	HFC	HydroFluoroCarbon
BSRIA	Building Service Research and Information Association	HPL	High Pressure Laminate
CBR	California Bearing Ratio	HPPE	Higher Performance Polyethylene
CCTV	Close Circuit Television	HRC	High Rupturing Capacity
CECOMAF	Comité Européen des Constructeurs de Matériel Frigorifique	HSE	Health and Safety Executive
CENELEC	Comité Européen de Normalisation Electrotechnique	HSFG	High Strength Friction Grip
CFC	Chlorofluorocarbons	HV	High Voltage
CIBSE	Chartered Institution of Building Services Engineers	HVCA	Heating and Ventilating Contractors' Association
CHW	Chilled Water	ICBO	International Conference of Building Officials
CI	Cast Iron	IGCC	Insulating Glass Certification Council
CLW	Cooling Water	IGE/UP	Institution of Gas Engineers – Utilization Procedures
CM	Current Margin / Communication cable	IP	Ingress Protection
CMP	Communication cable (Plenum)	ISAT	Initial Surface Absorption Test
CP	Code of Practice	ISO	International Standard Organization
CPC	Circuit Protection Conductor	ITP	Inspection Testing Plan
CPT	Cone Penetration Testing	KD	Kiln Dried
CRS	Categorised Required Strength	kVA	Kilovolt Ampere
CRT	Cathode Ray Tube	LCD	Liquid Crystal Display
CRZ	Capillary Rise Zone	LED	Light Emitting Diode
CT	Current Transformer	LPG	Liquid Petroleum Gas
c(UL)	Underwriters Laboratories Incorporated (Canada)	LS0H	Low Smoke Zero Halogen
DEO	Defence Estate Organisation	LSF	Low Smoke and Fume
DFT	Dry Film Thickness	LV	Low Voltage
DI	Ductile Iron	MCB	Miniature Circuit Breaker
DIN	Deutsches Institut für Normung	MCC	Motor Control Centre
DPC	Damp Proof Course	MCCB	Moulded Case Circuit Breakers
DPDT	Differential Pressure, Differential Temperature	MDF	Medium Density Fireboard
DS	Durability Strength	MDD	Maximum Dry Density
DVR	Digital Video Recorder	MDPE	Medium Density Polyethylene
DW	Ductwork Specification	MEP	Mechanical Electrical Plumbing
EA	Exhaust Air	MICC	Mineral Insulated Copper Covered Cable
ECMA	European Computer Manufacturers Association	MIO	Micaceous Iron Oxide
EA	Exhaust Air	MMI	Man Machine Interface
ECMA	European Computer Manufacturers Association	MOD	Ministry of Defence
ECR	Extra Chemical Resistant	MS	Micro-silica
		MSDS	Material Safety Data Sheet
		MSRPC	Moderate Sulphate Resistance Portland Cement
		N	Nitrogen
		NDFT	Nominal Dry Film Thickness

NEMA	National Electrical Manufacturers' Association	WBP	Weather and Boil Proof
NFPA	National Fire Protection Association	W/C	Water Cement Ratio
NRC	Noise Reduction Coefficient	WIS	Water Industry Specification
NS	Norwegian Standard	WP	Water Proofing
O/D	Outside Diameter	WRAS	Water Regulations Advisory Scheme
ODP	Ozone Depletion Potential	XLPE	Cross Linked Polyethylene
OFS	Oil Fired (Appliance/Equipment) Standard	XPS	Extruded Polystyrene Foam
OFTEC	Oil Firing Technical Association		
O&M	Operation and Maintenance		
OPC	Ordinary Portland Cement		
PD	Published Documents		
PE	Polyethylene		
PFA	Pulverised Fuel Ash		
PFC	Power Factor Correction		
PIR	Polyisocyanurate		
PM	Project Manager		
PTFE	Polytetrafluoroethylene		
PUR	Polyurethane		
PVC	Polyvinylchloride		
PVC-u	Unplasticised Polyvinylchloride		
PWTAG	Pool Water Treatment Advisory Group		
QA/QC	Quality Assurance/Quality Control		
RA	Return/Recycled Air		
RAL	Reichsausschuß für Lieferbedingungen und Gütesicherung		
RCCD	Residual Current Circuit Breaker		
RCD	Residual Current Device		
R&D	Research and Development		
REFCOM	Register of Companies Competent to handle refrigerants		
RPM	Reinforced Plastic Mortar		
RPZ	Reduced Pressure Zone		
RTD	Resistant Temperature Detector		
RTR	Reinforced Thermosetting Resin		
SA	Supply Air		
SBCCI	Southern Building Code Congress International (Incorporated)		
SBS	Styrene-butadiene-styrene		
SDR	Standard Dimension Ratio		
SIS	Swedish Institute of Standards		
SP	Super-plasticizing		
SPDT	Single Pole Double Throw		
SRPC	Sulphate Resistance Portland Cement		
SS	Structural Strength		
SSPC	Steel Structures Painting Council		
TIA	Telecommunication Industry Association		
TRA	Trussed Rafter Association		
UL	Underwriters Laboratories Incorporated		
ULPA	Ultra Low Penetration Air		
UP	Unsaturated Polyester Resin		
UPS	Uninterruptible Power Supply		
UTP	Unshielded Twisted Pair		
UV	Ultra Violet		
VC	Vitrified Clay		
VR	Video Recorder		