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Code of practice

Sheet roof and wall coverings —

Part 12: Copper: Metric units

Sub-Committee BLCP/4/4

Copper roof coverings

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Foreword

This part of the Code of Practice makes reference to the following British Standards and Codes of Practice:

BS 219, *Soft solders*.

BS 747, *Roofing felts*.

BS 1210, *Wood screws*.

BS 476, *Fire tests on building materials and structures — Part 3: External fire exposure roof test*.

BS 2870, *Specification for rolled copper and copper alloys: sheet, strip and foil*.

BS 5268, *Structural use of timber — Part 2: Code of practice for permissible stress design, materials and workmanship — Part 5: Preservative treatments for constructional timber*.

CP 326, *The protection of structures against lightning*.

This metric edition of CP 143, which has been designated Part 12, is the metric version of Part 4 published in imperial units in April 1960.

Part 12 is not a technical revision of the Code and has been prepared as part of the change to the metric system in the Construction Industry, giving values in SI units. For further information on SI units, reference should be made to BS 3763, *“International System (SI) units”*, and PD 5686, *“The use of SI units”*.

Wherever it has been necessary to apply dimensional co-ordination, recommendations of Technical Committee B/94, Modular Co-ordination in Building, have been reflected in this metric version. For further information on dimensional co-ordination reference should be made to BS 4011, *“Recommendations for the co-ordination of dimensions in building. Basic sizes for building components and assemblies”*, BS 4330, *“Recommendations for the co-ordination of dimensions in building. Controlling dimensions”*, and PD 6444, *“Basic spaces for structure, external envelope and internal sub-division”*.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 23 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General

1.1 Scope

This Code deals with methods of covering a roof or wall with copper sheet or strip in accordance with established practice. There are alternative methods of laying which are not included in the techniques described, as they are generally variations of traditional roof practice.

Recommendations are given in regard to the whole of the coverings above the wooden rafters for pitched roofs, and above the joists or the upper surface of the constructional base for flat roofs and walls.

Flashings and gutters are dealt with in so far as they are integral parts of the covering.

The dimensional co-ordination recommendations of Technical Committee B/94, Modular Co-ordination in Building, are embodied where appropriate to the Code.

1.2 Definitions

For the purposes of this Code the following definitions apply.

1.2.1

bay

a unit of sheet covering as laid between rolls or standing seams

1.2.2

capping

a copper strip, covering the top of a batten roll, welted to the edges of the sheets which are dressed up the side of the roll

1.2.3

clips

copper strips, cut to lengths to suit roll or seam, placed at intervals and securely fixed to the roof base, the ends being welted in with the edges of the sheets to hold the cladding in position

1.2.4

corner block

a short triangular wooden fillet tapered in its length, fixed against abutments, where sheets terminate at drips on roofs, walls and gutters

1.2.5

dog-ear

a box-like corner of three dimensions formed by folding a flat copper sheet without cutting

1.2.6

drip

a step formed in a flat roof or gutter across the direction of the fall

1.2.7

drop apron

a separate piece of copper fixed at the verges, eaves or gutters, to form a weathering and welted to the roof sheeting

1.2.8

lining plate

a strip of copper of suitable width which is nailed to the eaves or verges of a roof and engaged with the lower edge of the drop apron to form a secure fixing

1.2.9

lock joint

a single or double welted joint

1.2.10

patina

the thin stable insoluble film which forms on copper on exposure to air. The film consists of some combination of copper oxide, copper sulphate, copper carbonate and copper chloride, depending on atmospheric conditions. The colour varies from black to green according to the relative proportions of the compounds present

1.2.11

roll, common

a shaped core against the sides of which the copper bays are dressed or are turned up

1.2.12

roll, ridge and hip

a shaped core at ridge and hip against which the copper is dressed or is turned up

1.2.13

saddle end

the completion of a batten roll covering or a standing seam against an abutment

1.2.14

spring

the bending of the substructure under load stress and recovery after removal

1.2.15

standing seam

a double welted joint formed between the sides of adjacent bays and left standing

1.2.16

stop end (roll or seam)

the completion of a batten roll covering or standing seam at a drip or eaves

1.2.17 welting

joining copper sheets at their edges by means of folding. Welting may be by single or double folds, such joints being termed single or double welts respectively

1.2.18 work hardening

the reduction of ductility caused by bending or working during manipulation or by movement in service

1.3 Exchange of information and time schedule

The working drawings and specification should be prepared in sufficient detail to afford proper guidance in the preparation of estimates and the execution of the work. Where bills of quantities form part of the contract, they should be prepared in accordance with the Standard Method of Measurement for Building Works or the Scottish Mode for the Measurement of Building Works, as appropriate. There should be a full exchange of information between all concerned with the cladding and the work adjacent to it, in sufficient time to ensure that the covering can be carried out at the proper time and that all necessary provision for fixing has been made in advance. Early arrangements should be made on the site for rainwater disposal. Cladding should be completed before internal finishes are begun.

2 Materials, appliances and components

2.1 Characteristics of material

Bright copper changes colour when exposed to the air. This discoloration is due to the formation of an oxide film which is an important agent in protecting the copper. The preliminary oxidizing process is the first step in the formation of a patina. This patina is usually a bright green colour (considered an enhancement to architectural effect in certain circumstances) but, in some atmospheres, it may be masked to a buff, brown or black colour, dependent on the quantities and nature of the impurities deposited on the surface from the atmosphere. (The patina should not be confused with “verdigris”, which is also of a green or grey colour and is formed by different chemical reaction.)

2.2 Copper

The whole of the cladding including clips, flashings, lining-plates, saddle ends, etc., should be made from copper sheet or strip conforming to BS 2870¹⁾.

The correct sizes and gauges are given in Table 1.

2.3 Nails

Nails used in securing the copper clips and the felt underlay should be made from copper wire not less than 2.6 mm thick. The nails should be not less than 25 mm long measured under the head and weigh not less than 1.5 kg per 1 000.

The heads should be flat and not less than 6 mm diameter and the shanks barbed throughout their length.

2.4 Screws

Screws used in securing clips or other components should be made of brass. Where screws are used to secure rolls, steel screws may be used.

All screws should conform to the relevant requirements of BS 1210.²⁾

2.5 Felt

The felt may be either BS 747³⁾, Type 4A (ii) Brown No. 1 Inodorous, or a similar felt which will not adhere to the metal or understructure under temperature changes.

2.6 Solder

For the jointing of eaves, gutters and outlets from cesspools, solder should conform to the requirements of BS 219⁴⁾, Grade A. See also 4.11.5.

3 Design considerations

3.1 Durability

Copper possesses good mechanical properties and has ample strength for roofing purposes.

Copper is very resistant to corrosion by atmosphere and normal building materials. Some new materials may contain agents which are active under certain conditions, and advice as to their suitability should be sought from the copper cladding contractor.

Its life is equal to and often longer than that of other building materials with which it may be used. The durability of a copper roof covering is dependent upon physical considerations such as thickness, mechanical properties and practical methods of fixing and upon resistance to corrosion.

Metals other than lead may suffer from electrolytic corrosion if placed in contact with copper.

¹⁾ BS 2870, “Specification for rolled copper and copper alloys: sheet, strip and foil”.

²⁾ BS 1210, “Wood screws”.

³⁾ BS 747, “Roofing felts”.

⁴⁾ BS 219, “Soft solders”.

3.2 Substructure

3.2.1 General. It is important that the fixings for sheet copper coverings are as permanent as the metal itself.

Cellular or foam concrete does not present a good fixing for items such as screws or nails that secure copper clips for rolls, drips or welts. Suitably treated wood rolls and drip edges, firmly cross spiked to the concrete, should be used.

Where a layer of hard board is used to cover poorly surfaced timber or over rough faced concrete the fixings for the sheet copper must penetrate the hard board and be secured to the substructure.

Where copper sheet is laid on insulating material such as compressed cork or open textured fibreboard, the method of securing the insulating material and the copper sheet should be agreed with the cladding contractor.

An underlay of felt (see 2.5) is necessary to provide a sympathetic surface upon which to lay copper. This will give a barrier between the copper and the substructure and provide a measure of sound and thermal insulation.

3.2.2 Concrete. The surface should be laid to even and correct falls and be provided with a smooth, firm surface. Certain screeds such as those having a sulphate content require a sealing coat of bitumen. Reference may be made to Building Research Station Digests No. 110 and No. 111, published by H.M.S.O.

Provision should be made for securing the copper to the concrete by means of dovetail battens or suitable plugs. Any materials set in the concrete to receive fixing nails or screws should not be subject to decay through retained moisture or condensation.

Dovetail wooden battens should be approximately 50 mm × 25 mm, set flush with the surface and running across the slope at 300 mm to 400 mm centres to take clips for standing seam joints. They are placed at 450 mm to 600 mm centres for securing wood rolls.

Dovetail battens should be pressure treated with wood preservative in accordance with BS 5268-5⁵⁾.

Copper clips may also be secured to the concrete by means of brass screws and a durable plug.

Wood rolls may be secured by rag bolts let into the concrete. The hole in the rolls should be recessed so that the nuts and ends of the rag bolts do not project above the top of the roll.

3.2.3 Timber. For structural aspects and decay of timber, reference should be made to BS 5268-2 and BS 5268-5⁵⁾.

In so far as copper cladding is concerned, the following precautions should be observed.

The timber substructure should be wind-tight, be free from “spring” and present a firm surface. The boarding should preferably be tongued and grooved, well seasoned and wrought, and not less than 25 mm nominal thickness. For slopes less than 20°, the boards should be laid either in the direction of the fall or diagonally. The boards should be fixed securely at centres decided upon between the architect and the copper roofing contractor. The heads of nails used for fixing boarding and rolls should be well punched in and all screws should be countersunk.

3.2.4 Other decking materials. Other decking materials may be used provided that they meet the following requirements:

- 1) freedom from “spring”,
- 2) means for adequate fixing of cleats or rolls,
- 3) wind-tightness,
- 4) a smooth surface,
- 5) enough rigidity to allow firm dressing of the copper without forming indentations,
- 6) no adverse effect upon the metal covering or any other adjacent material,
- 7) dimensional stability.

3.2.5 Falls and drips on roofs. The minimum fall for any copper roof is 1 in 60 (40 mm in 2.4 m). Copper can be laid to all pitches greater than this, including vertical surfaces.

Drips should be used on roofs of 5° pitch or less and should be spaced at not more than 3 m centres and be 65 mm deep.

Where, however, the pitch is 20° or less, any double lock cross welt should be sealed with boiled linseed oil. This is done by painting the edges of the copper with the oil before welting together.

3.2.6 Falls and drips in gutters. Gutters should be laid to a minimum fall of 1 in 80 (30 mm in 2.4 m). Where the sole of the gutter is very wide, it can be broken up by the use of wood rolls, placed longitudinally. The gutters should be designed to carry away the rainfall without flooding.

Where the drips are required in gutters, they should be a minimum depth of 50 mm (Figure 19) and should be spaced at the distances given in Appendix C, which also specifies corresponding gauge of copper to be used.

⁵⁾ BS 5268, “Code of practice for the structural use of timber”, Part 2 “Code of practice for permissible stress design, materials and workmanship” and Part 5 “Preservative treatments for constructional timber”.