

Design and construction of fully supported lead sheet roof and wall coverings — Code of practice

ICS 91.060.10

Committees responsible for this British Standard

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- Association of British Roofing Felt Manufacturers
- Association of Building Component Manufacturers
- Building Research Establishment (BRE)
- Consumer Policy Committee of BSI
- Institute of Plumbing
- Lead Contractors' Association
- Lead Sheet Association
- Metal Roofing Contractors' Association
- National Federation of Roofing Contractors

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Foreword

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution.

The British Standard has been prepared by Subcommittee B/542/11.

BS 6915:2001+A1:2014 supersedes BS 6915:2001, which is withdrawn. This standard gives recommendations for the design and construction of lead sheet roof and wall coverings as applied to external roof and wall surfaces and fixed in accordance with conventional practice and traditional methods.

Text introduced or altered by Amendment(s) No. 1 (and No 2, respectively) is indicated in the text by tags **A1** **A1** (and **A2** **A2**). Minor editorial changes are not tagged.

The first edition of BS 6915 was classified as a specification but for this revision the committee decided that as the content comprises guidance and recommendations it was appropriate to designate this edition as a code of practice. This edition has been revised and updated to remove details that are no longer suitable and to improve fixing and jointing details in line with current recommended good practice.

Rolled lead sheet manufactured to BS EN 12588 is suitable for use in all the recommendations made in this code of practice.

Sand cast lead sheet, manufactured by established and reputable manufactures, is produced in thicknesses and weights similar to codes 6, 7, 8 and 9 of **A1** BS EN 12588:2006 **A1** and is used mainly for replacement work on old and historic buildings and for ornamental leadwork. It has a relatively smooth surface one side and a sand faced texture the other. The sand face is often used in the manufacture of rainwater goods where a textured finish is required. For all practical purposes where the composition of the metal is similar, there is no significant difference in the working or fixing recommendations of sand cast lead sheet and rolled lead sheet. Where the composition of the metal is different, the manufacturer should be consulted.

A1 A draft application for sand cast lead has been submitted for consideration by Technical Committee B/542/11, *Lead sheet roof and wall coverings*. **A1**

The direct casting method of manufacture of lead sheet (DM lead sheet) may be covered by BBA certificates 86/1764 and 91/2662 [1]. Manufacturers of DM lead sheet should provide working and fixing recommendations which are shown to be adequate by evidence in use. Assurances from reputable manufacturers should be obtained.

Assessed capability. Users of this British Standard are advised to consider the desirability of quality system assessment and registration against the appropriate standard in the BS EN ISO 9000 series by an accredited third-party certification body.

Attention is drawn to BS 6229, which gives recommendations for the design of flat roofs with continuously supported coverings, and BS 5250, which gives recommendations for the control of condensation in buildings.

Additional information concerning specific detailing of lead sheet roof and wall coverings is given in the Lead Sheet Association publication **A1** *Rolled Lead Sheet, The Complete Manual* [2] **A1**.

Annex A is informative.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Attention is drawn to the following statutory regulations:

SI 2002/2676, The Control of Lead at Work Regulations 2002 [3].

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 42, and inside back cover and a back cover.

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0 Introduction

0.1 Pre-contract exchange of information

In order that the work covered in this standard can be executed efficiently and expeditiously, it is desirable that a pre-contract exchange of information (see **0.2** and **0.3**) takes place between the parties concerned.

0.2 General information

There should be a full exchange of information between all concerned with the leadwork 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 provisions for fixings have been made in advance.

General information should include the following:

- a) description and precise location of the site and any unusual conditions or circumstances relating to access to the site;
- b) storage facilities for materials;
- c) availability of temporary lighting, power and water;
- d) hoisting and scaffolding facilities;
- e) safety measures to be provided.

0.3 Working drawings and specifications

The working drawings and specifications should be prepared in sufficient detail to afford proper guidance in the preparation of estimates and execution of the work. They should include details of the construction of the roof and of its covering and finishes in relation to any requirements which may affect them such as:

- a) area and position of roofs to be covered;
- b) height of roofs above ground;
- c) the gradient and direction of falls;
- d) thickness of the lead sheet;
- e) special conditions, e.g. traffic, degree of exposure;
- f) nature and type of substrate;
- g) any unusual method of fixing, including the specification of any proprietary fixings;
- h) details and treatment of flashings, eaves, verges and abutments.

In the case of existing buildings a site inspection should normally be carried out.

1 Scope

This British Standard gives recommendations for the design and construction of fully supported coverings of rolled lead sheet, conforming to BS EN 12588, applied to external wall and roof surfaces.

NOTE For the application of sand cast and direct method (DM) lead the advice of the relevant manufacturers should be sought for recommendations on the design and installation of their products (see Foreword). The colour coding system used for rolled lead sheet does not apply to sand cast or DM lead.

The recommendations apply primarily to fixing the lead in situ and cover the design and fixing of the whole of the covering above the substructure that supports it, including the design and fixing of gutters and flashings.

References are made to coverings that are based on the use of preformed panels to which the main principles of design also apply. General information on the properties of lead roof coverings is given in Annex A.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 1202-1, *Specification for nails — Steel nails*.

BS 1202-2, *Specification for nails — Part 2: Copper nails*.

BS 1210, *Specification for wood screws*.

BS 5250, *Code of practice for control of condensation in buildings*.

BS 6229, *Code of practice for flat roofs with continuously supported coverings*.

BS EN 636-3, *Plywood — Specifications — Part 3: Requirements for plywood for use in exterior conditions*.

BS EN 1172, *Copper and copper alloys — Sheet and strip for building purposes*.

BS EN 10088 (all parts), *Stainless steels*.

BS EN 12588:2006 , *Lead and lead alloys — Rolled lead sheet for building purposes*.

BS EN 29453, *Soft solder alloys — Chemical compositions and forms (ISO 9453)*.

3 Terms and definitions

For the purposes of this British Standard the following terms and definitions apply.

3.1

substrate

roof construction element over which the lead sheet is laid and to which it is attached

3.2

bay

unit of sheet covering as laid between rolls, standing seams or drips

3.3

clip

narrow strip of metal used in roll joints, standing seams and double welts for securing sheet roofing

3.4

drip

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

3.5

lead capped dot

fixing for securing lead sheet roofing by means of screw and washer covered with a cap, leadwelded to the sheet [see Figure 1b)]

3.6**soldered dot**

fixing, wiped with solder, for securing lead sheet roofing by means of screw and washer sunk into a depression formed in the surface [see Figure 1d)]

3.7**lead dot**

fixing for securing lead sheet roofing to masonry, achieved by pouring molten lead through a dot into a dovetailed sinking masonry

3.8**lead button**

lead fixing composed of a hemispherical die cast lead dome which is secured by a fixing tool to a serrated brass washer held by a screw [see Figure 1c)]

3.9**lead wedge**

tapered piece made by either casting or folding pieces of lead, used to secure flashings to masonry walls

3.10**lap**

distance which sheets lap over adjoining pieces

3.11**overcloak**

upper layer of sheet roofing at a drip, roll joint seam or welt

3.12**undercloak**

layer of sheet roofing below an overcloak

3.13**patina**

thin, stable film of oxide or other metallic compounds forming on metal surfaces exposed to air

3.14**wood-cored roll**

shaped section, usually of wood, around which sheet roofing is dressed

3.15**roll joint**

joint that accommodates movement between two pieces of sheet roofing

3.16**hollow roll joint**

roll joint without a solid core section

3.17**secret tack**

tack soldered or leadwelded to the back of lead sheet roofing and passed through a slot cut in the substrate on its inside

3.18**standing seam**

joint in metal sheet roofing in which the adjoining edges are turned up perpendicular to the surface, welted together and left upstanding

3.19**torus roll**

solid roll joint at the intersection formed by the change of pitch in a mansard roof [see Figure 2a) and Figure 2b)]

3.20

welt

method of joining by folding over the edges of metal sheets, engaging the folded portions and dressing down flat

3.21

box gutter

gutter, with parallel sides, not less than $\sqrt{A_1}$ 225 $\sqrt{A_1}$ mm wide and 100 mm deep [see Figure 3a) and Figure 3b)]

3.22

tapered valley gutter

gutter where the pitched roof merges into the sole of the gutter and widens towards the highest point

3.23

catch pit

box formed at the low point of a gutter which allows a small pressure head of water to build up and increase the flow of the rainwater to the downpipe

3.24

chute outlet

form of outlet discharging through a parapet wall into a hopper head and external downpipe

3.25

leadwelding

leadburning

fusion welding of pieces of lead without the use of solder or flux

3.26

splash lap

part of the lead overcloak of a drip or roll joint extending on to the flat surface of an adjoining roofing sheet

Dimensions in millimetres

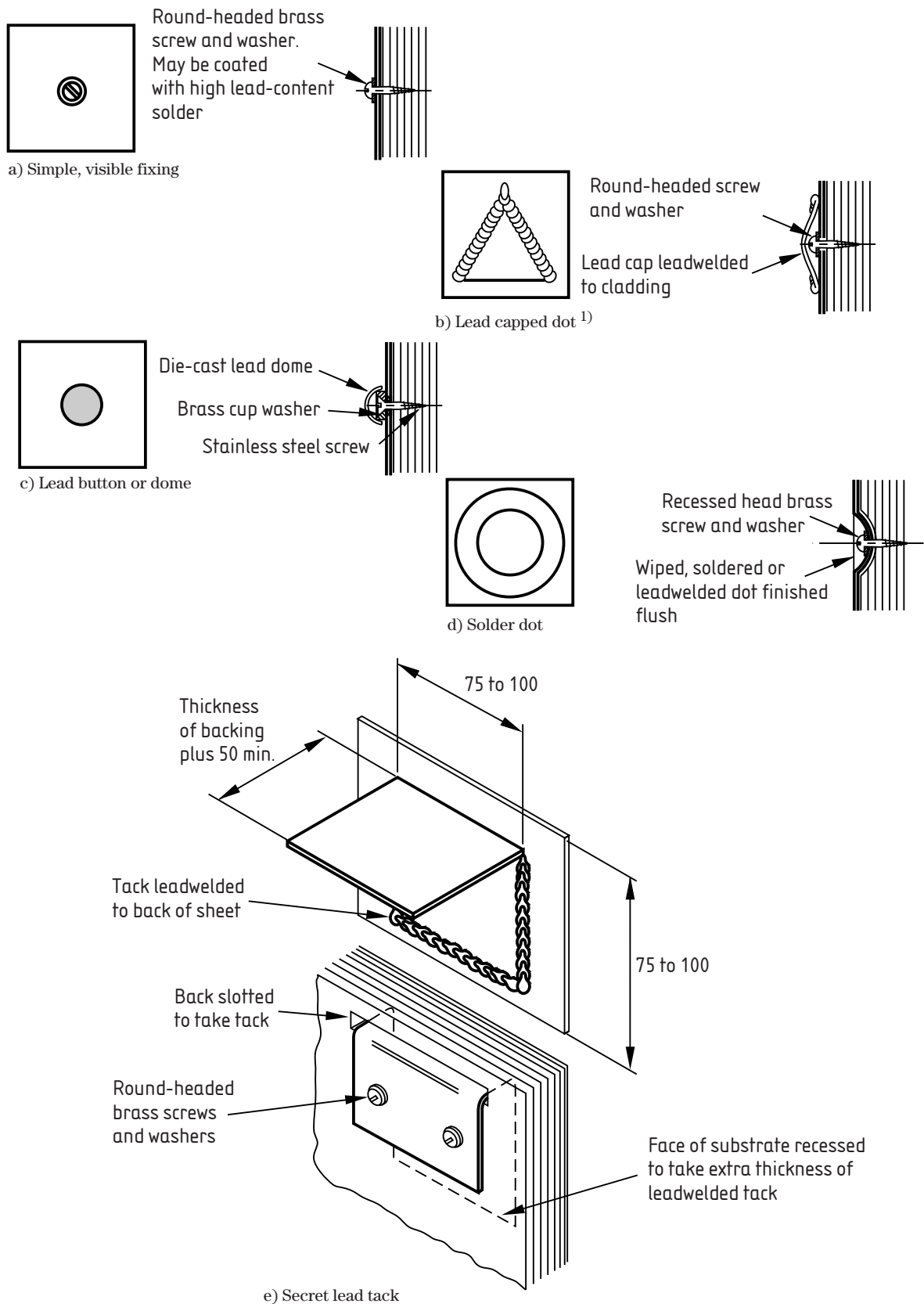
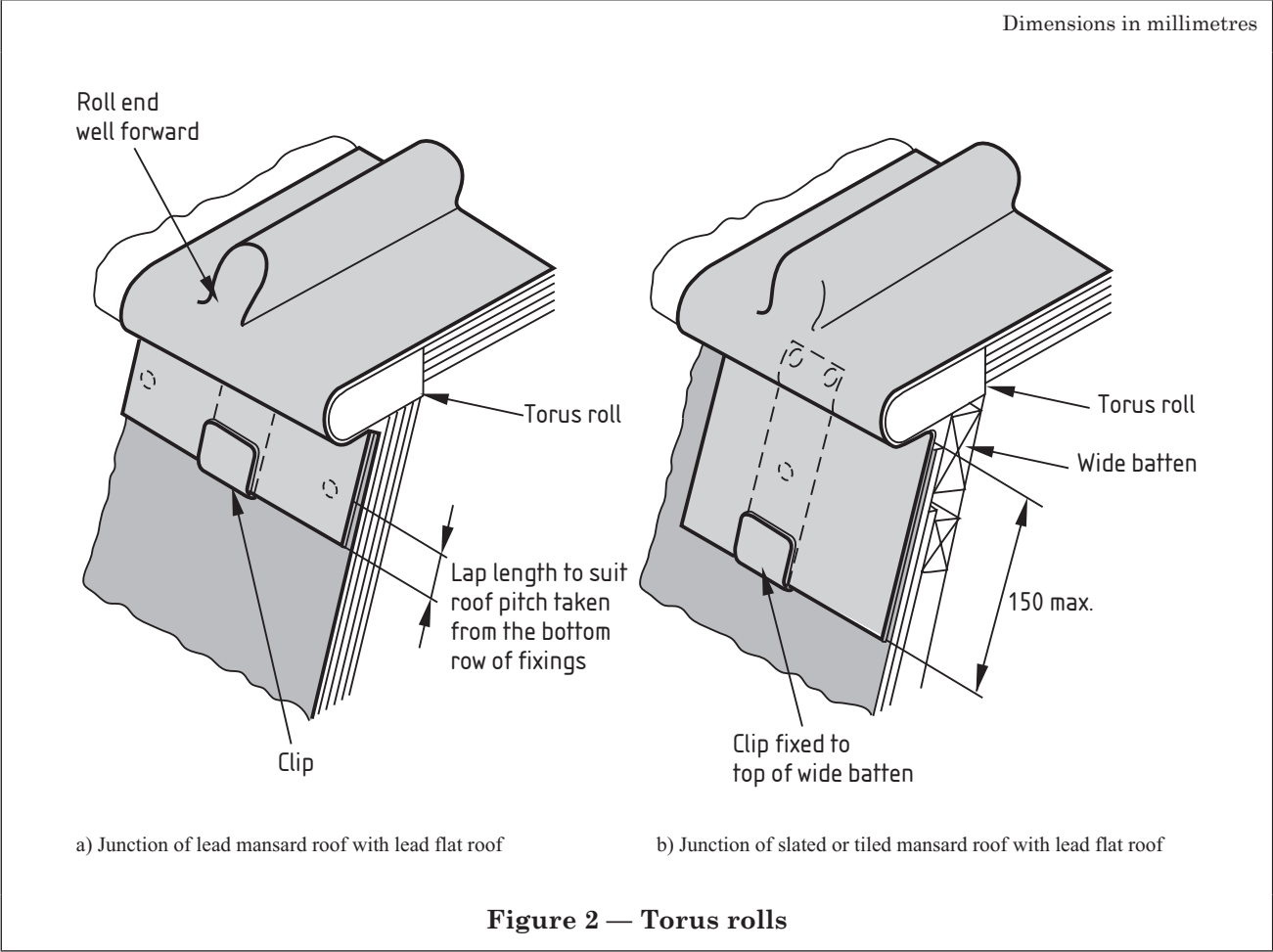
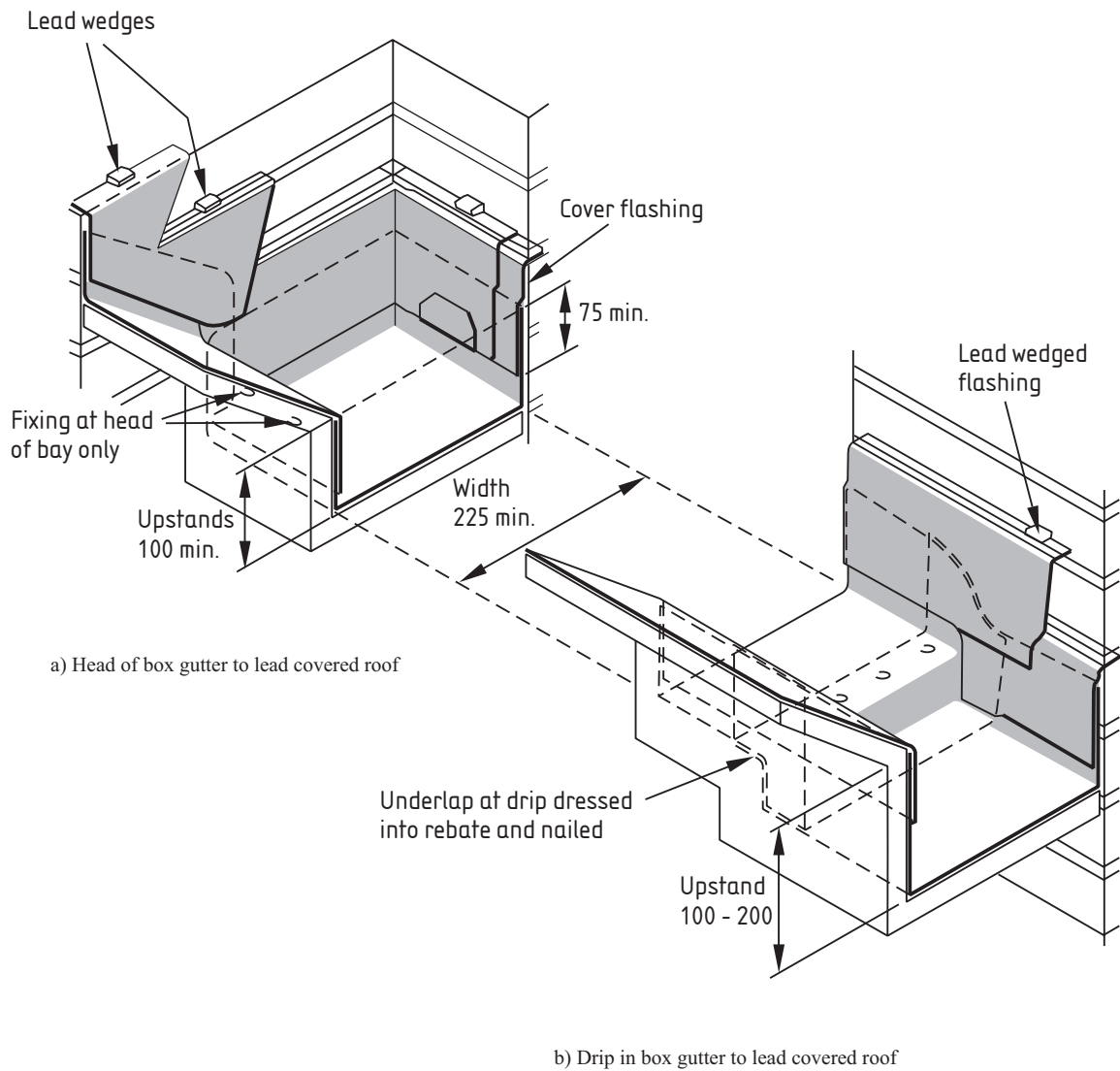


Figure 1 — Intermediate fixings



A1

Dimensions in millimetres

**Figure 3 — Box gutters**

A1

4 Materials and accessories

4.1 Clips

4.1.1 General

Clips should be of copper, tinned copper, stainless steel or lead.

4.1.2 Copper clips

Copper or tinned copper clips should be not less than 50 mm wide and be cut from copper sheet of not less than 0.60 mm thickness, conforming to BS EN 1172, soft temper in welts, seams and rolls, and of $\frac{1}{4}H$ temper elsewhere.

4.1.3 Stainless steel clips

Stainless steel clips should be cut from 50 mm wide fully annealed stainless steel strip of not less than 0.375 mm thickness. The strip should conform to BS EN 10088. It may be terne coated if exposed to view.

4.1.4 Lead clips

Lead clips should be not less than 50 mm wide and not less than the thickness of the lead sheet used for the roofing and cladding work.

4.2 Nails

4.2.1 General

Nails should be of copper or stainless steel and should be $\boxed{A_1}$ large headed annular ring $\boxed{A_1}$ nails conforming to BS 1202-1 and -2. The shanks should be annular ring, helical ring or serrated.

4.2.2 Nail sizes

Nails should be not less than 20 mm long. For heavy duty fixings they should be not less than 3.35 mm diameter and for light duty fixings they should be not less than 2.65 mm diameter, the nail head being approximately three times the shank diameter.

4.2.3 Stainless steel nails

Stainless steel nails should be of austenitic stainless steel, excluding free machining grades.

4.3 Screws

Screws should be brass or stainless steel conforming to BS 1210 and not less than 19 mm long and 3.35 mm in diameter.

4.4 Battens

Battens for fixing to concrete, brickwork and blockwork substrates should be of softwood treated to protect them from the effects of moisture by a method of pressure impregnation and should have the following minimum dimensions:

- a) across the fall: 75 mm $\times$ 25 mm;
- b) with the fall: 50 mm $\times$ 25 mm.

4.5 Underlay

The type of underlay material used for lead sheet should:

- a) allow for thermal movement by reducing the amount of drag between the substrate and the lead sheet;
- b) help to protect the lead sheet by providing a barrier against corrosive attack from stone, concrete or discharge from timber and roof condensation;
- c) provide an even surface and level out any imperfections such as nail heads, board edges and knots which could damage the lead;
- d) fully support the lead sheet so that it cannot sag or be punctured;
- e) provide a sound reducing layer in periods of heavy rain;
- f) reduce the risk of moisture being trapped between the lead and the substrate;
- g) be free of any substance which could be deleterious to lead sheet.

4.6 Solder

Solder should conform to BS EN 29453.

NOTE Generally solder is only used for soldered dots or where leadwelding or bossing is impracticable.

5 Roof construction: substructure

5.1 General

The overall design of flat roofs should conform to BS 6229. Particular attention should be paid to the recommendations for prevention of condensation and for minimum finished falls.

Substrates for lead sheet coverings should offer a continuous surface free from spring and be strong enough to support the lead and hold the fixings permanently, as recommended in 5.2, 5.3 or 5.4 as appropriate.

NOTE If the potential life of the lead covering is to be achieved all elements of the construction should have a similar life span capability.

5.2 Timber

The timber substrate for lead coverings fixed in situ should be softwood boarding or plywood of external quality in accordance with BS EN 636-3 and of minimum thickness $\overline{A_1}$ 18 $\overline{A_1}$ mm. Where lead is laid on a hardwood substructure, precautions should be taken to avoid contact between the hardwood and the lead and the penetration of the acid vapours from the timber to the underside of the lead.

5.3 Concrete, screeds and masonry

The surface of concrete, screeds and masonry should have a smooth finish. An underlay should be provided to isolate the lead from the substrate.

5.4 Thermal insulation boards

Insulation boards should be of sufficient rigidity to withstand toe and knee pressures during the laying of the lead sheet. Lead sheet is not normally fixed directly on to thermal insulation materials because of the need to provide for ventilation (see BS 5250). However, where direct fixing is required it should be determined whether the fixings will be strong enough to hold the lead permanently in position.

In most cases softwood battens of equal thickness to the insulation board should be provided where required for fixing the lead sheet.

5.5 Ventilation

Ventilation should be provided beneath timber decking supporting lead sheet to control the level of condensation in accordance with BS 5250 and BS 6229.

6 Design considerations

6.1 Lead covering

6.1.1 General

Lead roofing, wall coverings and gutter linings should be designed as separate pieces of lead sheet of limited size with weathertight joints and fixed to allow for thermal movement.

6.1.2 Flat roofs (up to and including 10° slope)

According to the thickness of lead used, the maximum spacing of joints should be as shown in Table 1. Joints in the direction of the fall should be wood-cored or hollow roll joints. Drips should be used for the joints across the fall.

6.1.3 Pitched roofs (over 10° slope) and wall claddings

According to the thickness of lead being used and the slope of the surface, the maximum spacing of joints should be as shown in Table 2 or Table 3 as appropriate. Joints in the direction of fall should be wood-cored rolls, hollow rolls, welts or standing seams. Laps should be used for the joints across the fall.

Standing seams should only be used for pitched roofs of slope 80° and above and on vertical surfaces.

Welts should only be used on pitched roofs where there is no risk of their being submerged by the flow of rainwater.