

BS 6229:2018



BSI Standards Publication

**Flat roofs with continuously supported
flexible waterproof coverings –
Code of practice**

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 November 2018. It was prepared by Technical Committee B/546, *Flexible Sheets For Waterproofing*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes [BS 6229:2003](#), which is withdrawn.

Information about this document

This code of practice deals with the overall principles of design, construction, care and maintenance of flat roofs with a continuously supported flexible waterproof covering. It does not deal with metal roof coverings which are now the responsibility of B/542, *Roofing and cladding products for discontinuous laying*.

Since publication of the previous edition of this code of practice ([BS 6229:2003](#)), many changes have taken place in the functional requirements for buildings, in the performance capability of roofing materials and in some aspects of building practice. The original code of practice has, therefore, undergone a comprehensive review and updating.

NOTE Guidance on the methodology of condensation risk analysis is now covered by [BS 5250](#), workmanship is now covered by [BS 8000-4](#) and guidance on sound insulation and noise reduction for buildings is now covered in [BS 8233](#).

Use of this document

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.

In drafting this code of practice it has been assumed the design and construction of the roof is entrusted to appropriately qualified and competent people and the building owner follows the recommendations concerning inspection, care and maintenance of the roof during its service life.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

The word “should” is used to express recommendations of this standard. The word “may” is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word “can” is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this standard. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

Contractual and legal considerations

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.

1 Scope

This revised edition of BS 6229 describes best current practice in the design, construction, care and maintenance of roofs with a flat or curved surface, at a pitch not greater than 10 degrees to the horizontal, with a continuously supported flexible waterproof covering. The supporting structure is either dense and heavy (such as a concrete slab), or consists of framing members supporting a lightweight deck of metal or of timber-based material.

NOTE Provided that the design conditions are similar, many of the recommendations contained in this code of practice apply to roofs at pitches greater than 10 degrees and to those designed as a Green Roof supporting planting.

This British Standard does not apply to certain types of cold stores and high temperature enclosures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

[BS 5250](#), *Code of practice for control of condensation in buildings*

[BS 6100-6](#), *Building and civil engineering — Vocabulary — Part 6: Construction parts*

[BS 6925](#), *Specification for mastic asphalt for building and civil engineering (limestone aggregate)*

[BS 8204-1](#), *Screeds, bases and in situ floorings — Part 1: Concrete bases and cementitious levelling screeds to receive floorings — Code of practice*

[BS 8217](#), *Reinforced bitumen membranes for roofing — Code of practice*

[BS 8218](#), *Code of practice for mastic asphalt roofing*

[BS 8220-1](#), *Guide for security of buildings against crime — Part 1: Dwellings*

[BS 8220-2](#), *Guide for security of buildings against crime — Part 2: Offices and shops*

[BS 8220-3](#), *Guide for security of buildings against crime — Part 3: Storage, industrial and distribution premises*

[BS 8233](#), *Guidance on sound insulation and noise reduction for buildings*

[BS 8747](#), *Reinforced bitumen membranes (RBMs) for roofing — Guide to selection and specification*

[BS 9999](#), *Fire safety in the design, management and use of buildings — Code of practice*

BS EN 300, *Oriented strand boards (OSB) — Definitions, classification and specifications*

BS EN 314-2, *Plywood — Bonding quality — Part 2: Requirements*

BS EN 507, *Roofing products from metal sheet — Specification for fully supported roofing products of aluminium sheet*

BS EN 636, *Plywood — Specifications*

BS EN 1313-1, *Round and sawn timber — Permitted deviations and preferred sizes — Part 1: Softwood sawn timber*

BS EN 1313-2, *Round and sawn timber — Permitted deviations and preferred sizes — Part 2: Hardwood sawn timber*

- BS EN 1991-1-1, *Eurocode 1 — Actions on structures — Part 1-1: General actions — Densities, self-weight, imposed loads for buildings*
- BS EN 1991-1-3, *Eurocode 1 — Actions on structures — Part 1-3: General actions — Snow loads*
- BS EN 1991-1-4, *Eurocode 1 — Actions on structures — Part 1-4: General actions — Wind actions*
- BS EN 1992-1-1 + UK National Annex, *Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings*
- BS EN 1993-1-1 + UK National Annex, *Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings*
- BS EN 1994-1-1 + UK National Annex, *Eurocode 4: Design of composite steel and concrete structures – Part 1-1: General rules and rules for buildings*
- BS EN 1995-1-1 + UK National Annex, *Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings*
- BS EN 1999-1-1 + UK National Annex, *Eurocode 9: Design of aluminium structures – Part 1-1: General structural rules*
- BS EN 1999-1-4, *Eurocode 9 — Design of aluminium structures — Part 1-4: Cold-formed structural sheeting*
- BS EN 10346:2015, *Continuously hot-dip coated steel flat products for cold forming — Technical delivery conditions*
- BS EN 12056-3, *Gravity drainage systems inside buildings — Part 3: Roof drainage, layout and calculation*
- BS EN 12524, *Building materials and products — Hygrothermal properties — Tabulated design values*
- BS EN 12620, *Aggregates for concrete*
- BS EN 13055-1, *Lightweight aggregates — Part 1: Lightweight aggregates for concrete, mortar and grout*
- BS EN 13162, *Thermal insulation products for buildings — Factory made mineral wool (MW) products — Specification*
- BS EN 13163, *Thermal insulation products for buildings — Factory made expanded polystyrene (EPS) products — Specification*
- BS EN 13164, *Thermal insulation products for buildings — Factory made extruded polystyrene foam (XPS) products — Specification*
- BS EN 13165, *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PU) products — Specification*
- BS EN 13166, *Thermal insulation products for buildings — Factory made phenolic foam (PF) products — Specification*
- BS EN 13167, *Thermal insulation products for buildings — Factory made cellular glass (CG) products — Specification*
- BS EN 13169, *Thermal insulation products for buildings — Factory made expanded perlite board (EPB) products — Specification*
- BS EN 13170, *Thermal insulation products for buildings — Factory made products of expanded cork (ICB) — Specification*
- BS EN 13707, *Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing — Definitions and characteristics*

BS EN 13859-1, *Flexible sheets for waterproofing — Definitions and characteristics of underlays — Part 1: Underlays for discontinuous roofing*

BS EN 13956, *Flexible sheets for waterproofing — Plastic and rubber sheets for roof waterproofing — Definitions and characteristics*

BS EN 13970, *Flexible sheets for waterproofing — Bitumen water vapour control layers — Definitions and characteristics*

BS EN 13984, *Flexible sheets for waterproofing — Plastic and rubber vapour control layers — Definitions and characteristics*

BS EN 16002, *Flexible sheets for waterproofing — Determination of the resistance to wind load of mechanically fastened flexible sheets for roof waterproofing*

BS EN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation methods*

BS EN ISO 10211, *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations*

BS EN ISO 10456, *Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values*

BS EN ISO 13788, *Hygrothermal performance of building components and building elements — Internal surface temperature to avoid critical surface humidity and interstitial condensation — Calculation methods*

DD CEN/TS 1099, *Plywood – Biological durability – Guidance for the assessment of plywood for use in different use classes*

DD ENV. 1992-1-1, *Eurocode 2: Design of concrete structures – Part 1: General rules and rules for buildings – (together with United Kingdom National Application Document)*

Other publications

[N1] BUILDING RESEARCH ESTABLISHMENT. BRE Scotland Report 443 2006 *Conventions for U-value calculations*

[N2] *The Building Regulations (England and Wales) 2000*, Approved Documents L1 and L2 2013 with 2016 amendments. London: The Stationery Office. www.tso.co.uk

[N3] COMMUNITIES AND LOCAL GOVERNMENT. *Accredited Construction Details* https://www.planningportal.co.uk/info/200135/approved_documents/74/part_1_-_conservation_of_fuel_and_power/6 or for Scotland www.gov.scot/Resource/Doc/217736/0088295.pdf

[N4] BUILDING RESEARCH ESTABLISHMENT. BRE Report BR 497 - *Conventions for calculating linear thermal transmittance and temperature factors* Second edition, 2016

[N5] BUILDING RESEARCH ESTABLISHMENT. SAP 2012 *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* www.bre.co.uk/sap2012

[N6] EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. *Guidelines for European Technical Approval of Inverted Roof Insulation Kits*. ETAG 031-1. EOTA www.eota.eu

[N7] BRITISH BOARD OF AGREEMENT. BBA Information No 4, *Inverted roofs – Drainage and U value calculations*

[N8] *The Building Regulations 2010, Site preparation and resistance to contaminants and moisture, Approved Document C* [England]

[N9] *The Building Regulations 2010 (and 2012 amendments), Site preparation and resistance to contaminants and moisture, Approved Document C* [Wales]

- [N10] Technical Handbook 6, Clause 6.2.1 [Scotland]
- [N11] Technical Booklets F1 and F2, Table 2.3 [Northern Ireland]
- [N12] Building Bulletin 93 (BB93) *Acoustic Design of Schools - Performance Standards*
- [N13] CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION. CIRIA Report 127, *Sound Control for Homes*
- [N14] *The Building Regulations (England and Wales) 2010*. Approved Document B (Fire Safety) – Volume 2: Buildings other than dwellinghouses (2006 edition incorporating 2010 and 2013 amendments). London: The Stationery Office. www.tso.co.uk
- [N15] NATIONAL FEDERATION OF ROOFING CONTRACTORS (NFRC). *Safe2Torch Guidance for the safe installation of torch-on reinforced bitumen membranes and use of gas torches in the workplace*.
- [N16] BUILDING RESEARCH ESTABLISHMENT. *Wind scour of ballast on roofs*. 1986. BRE Digest 311 (DG 311). Watford: BRE. www.brebookshop.com
- [N17] MASTIC ASPHALT COUNCIL (MAC). *Mastic asphalt - The technical guide*. Hastings: The Mastic Asphalt Council. www.masticasphaltcouncil.co.uk
- [N18] SINGLE PLY ROOFING ASSOCIATION (SPRA). *Guide on design criteria for single ply roofing membranes*. London: The Single Ply Roofing Association. www.spra.co.uk
- [N19] LIQUID ROOFING AND WATERPROOFING ASSOCIATION (LRWA). *Code of practice for the specification and use of liquid applied waterproofing systems for Roofs, Balconies and Walkways*. August 2018. LRWA Guidance notes can be found at: www.lrwa.org.uk
- [N20] EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. *Liquid applied roof waterproofing kits – Parts 1–8*. ETAG 005. EOTA www.eota.eu

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in [BS 6100-6](#) and the following apply:

3.1 breather membrane

continuous layer of highly vapour permeable, but air impermeable, material to permit the movement of water vapour in cold roof constructions

NOTE The level of vapour permeability required is defined in [BS 5250](#).

3.2 condensation

conversion of water vapour to liquid water

3.2.1 condensate

liquid water produced by condensation

3.2.2 harmful condensation

interstitial or surface condensation likely to cause damage to the building fabric, to degrade its thermal performance or to support mould

3.2.3 interstitial condensation

condensation which occurs within or between layers of a roof system

3.2.4 surface condensation

condensation which occurs on surfaces visible within the building

3.3 cricket

wedge of material (usually thermal insulation) to divert the flow of rainwater on a roof

3.4 dew point

temperature at which air becomes saturated with water vapour and condensation occurs

3.5 firrings

battens intended to provide drainage falls or ventilation of a roof void

3.6 layers

3.6.1 air and vapour control layer (AVCL)

continuous layer of low permeability material to control the movement of air and water vapour

NOTE Formerly referred to as VCL in [BS 6229:2003](#).

3.6.2 waterproof layer

layer of impermeable flexible material

3.6.3 water flow reducing layer (WFRL)

robust vapour permeable layer to restrict the flow of water in an inverted roof system

NOTE It also prevents fines from being washed below the insulation, which can damage the waterproofing system or block the roof drainage system.

3.7 roofs

3.7.1 blue roof

roof designed to attenuate the rate at which rainwater is drained from the roof and is allowed to enter the drainage system

3.7.2 flat roof

roof with a weathered surface at no more than ten degrees (10°) to the horizontal

3.7.3 green roof/roof garden

roof on which vegetation or a habitat for wildlife is established

NOTE These can be installed over warm, inverted and uninsulated flat roof constructions.

3.7.4 zero fall roofs

roofs with a slope which lies between 0 and 1:80

3.8 roof deck

support structure of profiled metal or timber

3.9 roof slab

support structure of in situ or pre-cast concrete