



BS 5534 : Part 1 : 1978

UDC 69.024 : 691.214.2 : 693.695

Confirmed May 1985

Code of practice for
Slating and tiling

(formerly CP 142 : Part 2)

Part 1. Design

Code de bonne pratique pour travaux de couverture en ardoises ou en tuiles
Partie 1. Calcul

Richtlinien zum Verlegen von kleinformatischen harten Dachelementen
Teil 1. Konstruktion

British Standards Institution

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This code of practice represents a standard of good practice but compliance with it does not confer immunity from statutory and legal requirements and bye-laws.

Foreword

This British Standard code of practice is a technical revision of CP 142 : Part 2 : 1971. The code was first published in September 1942, revised in January 1953, April 1968 and converted into a metric version giving values in SI units in October 1971.

This edition provides additional information on the design of slating and tiling to resist wind forces. Wind uplift is of particular importance and will vary over the roof area.

(To save the users of this code from having to prepare detailed calculations, a series of graphs and tables have been prepared based on design wind speeds and covering

*In course of preparation.

the various types of slating and tiling; these are published in BS 5534 : Part 2.*) Revised timber batten sizes and additional recommendations are given on repair and re-covering. Particular attention is given to the design and construction of underlays because of the wind loads to which they are subjected and the protection they provide to the slates or tiles. Also included are revisions to improve clarity and to bring up to date standards and other documents referred to in the code.

Where standards referred to in this code are not yet published in metric units, metric equivalents are given.

British Standard Code of practice for

Slating and tiling

Part 1. Design

Section one. General

1. Scope

This code deals with the design and application of slating and tiling, underlay, boarding, counter battens, battens and their fixings. Weathertightness and thermal resistance are considered.

This code does not deal with stone slab roofing or techniques peculiar to certain parts of the country.

2. References

The titles of the standards publications referred to in this code are listed on the inside back cover.

3. Definitions

The roofing terms used throughout this code of practice have the meanings assigned to them in BS 2717.

Section two. Materials and components

4. Slates and fittings

4.1 Slates. Slates should comply with the requirements of BS 680.

Slates are available in graded thicknesses and in three categories:

- (a) uniform in length and width;
- (b) uniform length but of random width;
- (c) random sizes, viz. random length and width.

4.2 Slate fittings. Ridge and hip components made of slate are not covered by any British Standard but should comply with the quality clauses of BS 680. Evidence should be available to show that the fittings are suitable in other respects for the conditions of exposure.

5. Clay tiles and fittings

5.1 Plain tiles. Clay plain tiles should comply with the requirements of BS 402.

5.2 Single lap tiles. There is no British Standard for single lap tiles.

5.3 Frost resistance. The British Standards for clay tiles do not contain any clauses relating to frost resistance, and evidence should be available to show that the tiles are likely to prove durable under the conditions contemplated.

6. Concrete tiles and fittings

Concrete tiles and fittings should comply with the requirements of BS 473 & 550.

7. Special tiles

Any special tiles such as hip, valley or angle tiles for unusual or unequal pitches, or knee tiles for the intersection of two slopes of a mansard roof, should be particularly specified. The use of special tiles can sometimes be avoided by using alternative materials, e.g. using apron flashing instead of knee tiles.

8. Asbestos-cement slates and fittings

Asbestos-cement slates should comply with the requirements of BS 690.

Asbestos-cement fittings such as ridge or hip coverings are not covered by any British Standard, but should comply with the quality clauses of BS 690 : Part 4. Evidence should be obtained to show that the fittings are suitable in other respects for the conditions of exposure. For health and safety precautions when working with asbestos products, see 54.3 and clause 56.

9. Colour and texture

Slates and tiles, and their fittings, should be supplied substantially similar in colour and texture to the samples agreed with the specifier.

10. Nails and clips

10.1 Nails for slates and tiles. Nails should be clout or slate nails and should comply with the relevant British Standards as given in 10.1.1 to 10.1.3.

10.1.1 Aluminium nails. Aluminium nails should comply with the requirements of BS 1202 : Part 3.

10.1.2 Copper nails. Copper nails should comply with the requirements of BS 1202 : Part 2.

10.1.3 Silicon-bronze nails. Silicon-bronze nails should be round wire nails formed from an alloy of approximately the following composition:

- 96 % copper;
- 3 % silicon;
- 1 % manganese.

The sizes, gauges and weights should be similar to copper nails as set out in BS 1202 : Part 2.

10.2 Clips for slates and tiles

10.2.1 Aluminium alloy. Clips should be NS₄ (Mg₂) alloy, H3 condition, 1.6 mm thick or HS.30 alloy, TB condition, 1.2 mm thick, complying with the requirements of BS 1470.

10.2.2 Stainless steel. Clips should be A2-70 or 302.S16, 1.2 mm thick, complying with the requirements of BS 1449 : Part 2.

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10.2.3 Other materials. Other alloys, non-ferrous metals or plastics of adequate sustained and fatigue strengths and durability, having regard to the conditions of service, may be used.

10.2.4 Types of clips. Clips are not covered by any British Standard. Evidence should be available to show that the clips are suitable for the conditions of service and that they do not impair the weathertightness of the slates or tiles to which they are to be attached.

10.3 Nails for battens, counter battens, boards, underlays and semi-rigid asbestos-bitumen sheeting. All nails should comply with the relevant clauses of BS 1202. Types of nail for use with battens, counter battens, boards and underlay will vary to some extent with the circumstances, but recommendations for the following purposes are given for general guidance.

10.3.1 Battens and counter battens. Cut nails or wire nails of 3.35 mm or 2.65 mm diameter with smooth, annular ringed shank or helically threaded shanks. The length required and the type will depend upon the conditions of use (see clause 25).

10.3.2 Boarding. 65 mm cut nails or wire nails, oval brad-head or lost-head nails.

10.3.3 Underlay. Extra-large head felt nails of copper, aluminium alloy or hot dip galvanized steel nails of 3.00 mm diameter.

10.3.4 Semi-rigid asbestos-bitumen sheeting. Extra-large head felt nails of copper, aluminium alloy or hot dip galvanized steel nails of 3.00 mm diameter.

11. Boarding and battens

11.1 Moisture content. For boarding, battens and counter battens, there is no need to limit closely the moisture content because drying in situ is not restricted. The wood should be dried to a moisture content not exceeding 22 %, which is attainable normally by air drying.

11.2 Boarding (or sarking). Boarding should be either tongued and grooved or square-edged (strips and boards) complying with the requirements of BS 1297, and plywoods covered by BS 5268 : Part 2, wood-wool slabs to BS 1105, or bitumen impregnated sarking and sheathing insulating board to BS 1142 : Part 3; alternatively manufactured boards of adequate strength, durability and performance may also be used. Direct nailing to boarding is not recommended as good practice (see 23.3) and counter battens should always be used.

11.3 Battens and counter battens. Battens and counter battens should be cut from one of the following species: European and home-grown Redwood, Whitewood and Sitka Spruce, Scots Pine, Canadian Spruce-Pine-Fir, Douglas Fir-Larch and Hemfir. For batten sizes refer to table 3. Wane is admissible on one arris only and should not exceed one-third of the dimension of the surface on which it occurs. Other natural timber defects permitted should be as described in the following clauses of BS 4978 : 1973:

3.4 Deviation in grading

5.2 Knots

5.3.3 Fissures

5.7 Resin pockets

5.9 Wormholes

5.10 Sapstain

5.11 Abnormal defects

12. Hip irons

A hip iron should be formed from steel complying with the requirements of BS 1449 : Part 1, hot-dip galvanized after cutting, forming and holing. It should be not less than 25 mm wide and not less than 4 mm thick for pitches of less than 35° or not less than 6 mm thick for pitches of 35° and over, and should be turned up at the lower end by an amount sufficient to support the hip covering; the straight length extending up the rafter should be not less than 300 mm long, and be provided with two holes and fixed with two 12 gauge hot-dip galvanized screws or nails.

13. Underlays

Underlay fully supported, for example on boarding, should be of bitumen felt of adequate strength and with a vapour permeability of not less than 36 g/m² per 24 h at 25 °C and a relative humidity of 75 %, tested in accordance with BS 3177.

Alternatively, where underlays of vapour permeability lower than the above recommendations are laid over boarding, adequate ventilation should be provided in the space between underlay and boarding, and the underlay should be of the not fully supported type given below.

If not fully supported, for example draped over rafters, underlays should be of 1F reinforced bitumen felt, complying with the requirements of BS 747; other underlays of adequate strength and durability may also be used, such as flexible PVC or polyethylene.

Underlays not fully supported, of flexible PVC or polyethylene film of 0.13 mm thickness should not be used with batten gauges exceeding 100 mm because of their limited resistance to wind uplift loading; for thicker films their suitability for use with batten gauges exceeding 100 mm should be established by evidence of performance as regards strength and extensibility (see 17.3.4.5).

Where insulating material is incorporated in underlays, the insulating material should be durable and damp resistant and should not cause obstruction in the batten and tile space (see 23.5).

14. Mortar

14.1 Materials. The materials for mortar should be as follows:

(a) *Cement.* The cement should comply with the requirements of either BS 12 or BS 146.

(b) *Quicklime and hydrated lime.* Non-hydraulic, semi-hydraulic and magnesian limes should comply with the requirements of BS 890. Hydraulic limes should be sound. Limes which are in accordance with CP 121 : Part 1 are suitable.

(c) *Sand and other fine aggregate.* Aggregates should comply with the requirements of BS 1200 (BS 1198, 1199 & 1200).

(d) *Pigment.* Any pigments incorporated in the mortar should comply with the requirements of BS 1014.

(e) *Water.* The water should not contain soluble or suspended matter in quantities sufficient to affect harmfully the behaviour of the hardened mortar.

(f) *Additives.* Where additives are employed, these should be used in accordance with the manufacturer's instructions (see BS 5075 : Parts 1 and 2).

14.2 Mixes. Mortar should consist of one of the following mixes, the proportions being measured by volume

(a) *Cement/fine aggregate.* 1 cement : 3 fine aggregate. This is the only mix suitable for bedding concrete tiles and accessories; plasticizing ingredients may be added.

(b) *Cement/lime/fine aggregate.* 1 cement : 1 lime : 5 to 6 fine aggregate. Plasticizing ingredients may be used in lieu of lime provided the manufacturer's recommendations are followed.

(c) *Lime/fine aggregate.* 1 hydraulic lime : 2 fine aggregate.

15. Sheet materials

Sheet materials for gutters, flashings, soakers and saddles should be as follows:

(a) *Lead.* Lead should comply with the requirements of BS 1178 and its thickness should be not less than the following:

gutters BS code no. 5, 2.24 mm thick,
flashings BS code no. 4, 1.80 mm thick,
soakers BS code no. 3, 1.25 mm thick,
saddles BS code no. 4, 1.80 mm thick.

(b) *Copper.* Copper should comply with the requirements of BS 2870. Copper used for fully supported gutters should be $\frac{1}{8}$ H, 0.45 mm to 0.7 mm thick depending on gutter width; copper for self-supporting gutters should be $\frac{1}{2}$ H, not less than 0.7 mm thick.

For flashings, soakers and saddles, copper should be in the fully annealed condition and should be not less than 0.55 mm thick.

Further advice on the use of copper is available from the Copper Development Association.

(c) *Aluminium, or aluminium alloy.* Aluminium or aluminium alloy should comply with the requirements of BS 1470 and should be not less than 0.70 mm thick. The materials suitable for gutters, flashings, soakers and saddles are S1, S1A, S1B, S1C and NS3, and the temper should be selected according to the strength and forming properties required.

(d) *Unplasticized PVC sheet (other than for underlays).* Vinyl sheet should be made from unplasticized (rigid) polyvinyl chloride not less than 1.5 mm thick when either fully supported or supported at up to 230 mm centres.

(e) *Semi-rigid asbestos-bitumen sheeting.* This should be in accordance with CP 143 : Part 8.

Section three. Design

16. Weather resistance

16.1 Slates and tiles should seat down properly one with another. The roof covering should be weatherproof and so constructed as not to transmit moisture due to rain or snow to any part of the structure of the building which would be adversely affected by such moisture.

16.2 Snow, when dry and powdery, may drift in between the slates or tiles, and thus enter the roof space, or it may, especially on roofs of low pitch, cause water to be dammed up during a thaw in such a way that it can run over the heads of the slates or tiles. Underlay beneath the roof covering serves as an additional safeguard; when underlay or boarding is omitted, roofs of clay tiles known to be frost resistant (see 5.3) or of slates may be torched on the underside (see clause 26) but in no circumstances should

concrete tiles or asbestos-cement slates be torched with mortar.

16.3 In the design of roofs, especially those at low pitch, it should be borne in mind that roof tiles are tilted up at their lower edges by the tiles below; thus the pitch of each tile is less than that of the common rafter. The pitch is even less in the upper portion of a well-cambered tile. It should also be borne in mind that the pitch of the valley rafters is less than that of the common rafters.

16.4 Design in accordance with the minimum recommendations of this code will ensure that the roof covering is weatherproof in most instances, but for severe conditions of exposure a higher standard of protection may be needed. This may include using a steeper pitch or a greater headlap or fully supported underlay with counter battens and battens.

16.5 Consideration should be given to the best local practice and to any form of treatment that may have been developed to deal with special conditions; in the case of proprietary products, the manufacturer's recommendations should be considered carefully.

16.6 Over a party wall, where there is a danger that roof coverings may become distorted by differential settlement between the rafters or trusses and the party wall, consideration should be given to the use of compressible non-combustible packing between the top of the party wall and the underside of the roof covering and between adjacent battens in place of mortar, for the purpose of providing an adequate fire-stop.

17. Structural stability

17.1 Dead and imposed loads. Dead and imposed loads should be calculated in accordance with BS 6399 : Part 1.

17.2 Wind loads. Wind loads appropriate to the location in the United Kingdom should be calculated in accordance with CP 3 : Chapter V : Part 2. Account should be taken of the effect of permeability on wind loads acting on slates or tiles as given in 17.2.4 and 17.2.5; wind loads on underlays should be calculated assuming that the underlays are impermeable, as given in 17.2.6. Examples of wind load calculations are given in appendix B.

17.2.1 Design wind speed. The design wind speed V_s should be derived from:

$$V_s = S_1 S_2 S_3 V$$

where

V is the basic wind speed (m/s)

S_1 is the topography factor, normally having a value of 1.0

S_2 is a factor for ground roughness, height above the ground and cladding size to be taken as class A for wind loads acting on slates or tiles and as class B for underlays. For this purpose the height should be taken to the ridge, or alternatively, the roof may be divided into convenient parts and the wind load on each part calculated, using a factor S_2 that corresponds to the height above ground of that part. S_3 is a statistical factor to be taken as 1.0 for permanent buildings

Values for V , S_1 , S_2 and S_3 and their interpretation are given in CP 3 : Chapter V : Part 2 and in 'Wind loading handbook'*

*Newberry C W and Eaton K J, 'Wind loading handbook'. HMSO 1974.

It should be noted that the basic wind speed at a particular site may vary from that given in or interpolated from the data given in CP 3 : Chapter V : Part 2. For confirmation of the appropriate basic wind speed to be used, the local statutory building control authority should be consulted.

17.2.2 Dynamic wind pressure. The dynamic pressure resulting from the design wind speed is given by $q = k V_s^2$, the value of k , according to the units of measurement used, being given in CP 3 : Chapter V : Part 2.

17.2.3 Pressure coefficients for external surfaces.

The pressure coefficient for external surfaces C_{pe} is obtained from CP 3 : Chapter V : Part 2. Tables 1 and 2 give values of C_{pe} for roofs and are derived from CP 3 : Chapter V : Part 2, rearranged to cover maximum values for appropriate wind directions and interpolated for a range of roof pitches, together with additional data from 'Wind loading handbook'*.

Attention is drawn to areas of high local suction occurring near roof edges and around obstructions such as chimney stacks, small dormers or other similar projections above the roof surface.

Tables 1 and 2 apply to rectangular buildings. For other building shapes, guidance on the dimensions to be adopted in applying tables 1 and 2 is given in 'Wind loading handbook'*.

Tables 1 and 2 do not allow for variation in the design wind speed for different directions. Advantage may sometimes be taken of the variation in terrain roughness on different sides of the building which result in different values of S_2 for the different directions of wind; in these cases the value of C_{pe} should be obtained from table 8 or 9 of CP 3 : Chapter V : Part 2 : 1972.

17.2.4 Wind uplift load on slates or tiles. The wind load q_t (per unit area) (see figure 1) acting in a direction normal to the surface of the slates or tiles on a roof fitted with an underlay constructed in accordance with clauses 13, 25 and 48 may be calculated from the equation:

$$q_t = q(C_{pe} - 1) \quad \dots (1)$$

(a negative value of q_t denotes uplift).

This load q_t should be taken to act on all slates or tiles over an area defined by the cover width b and a length at the tail equal to c times the height of the step between courses t (see figure 1 and appendix B). Appropriate values of c are given in table 2A.

For a slate or tile at the eaves which overhangs the fascia by a distance e , which is more than $2t$, the area over which the load q_t acts should be extended to that defined by the cover width b and the length e . Eaves should be filled (see 35.4).

For a slate or tile at the verge, as a separate condition (not applied simultaneously with the load at its tail) the load q_t should be applied to an area defined by a distance $2t$ from its edge and a length equal to the gauge measured from its tail (see appendix B). However, if the slate or tile overhangs the bedding by a distance v (see 37.2) which is more than $2t$, the area over which the load q_t acts should be extended to the area of the overhang defined by v and a length equal to the gauge.

For a roof without an underlay, or where the underlay cannot adequately resist the wind loads given by 17.2.6, the wind load on the slates or tiles should be determined from equation (2) in 17.2.6.

*Newberry C W and Eaton K J, 'Wind loading handbook'. HMSO 1974.

17.2.5 Wind uplift load on ridge and hip pieces. Ridge and hip pieces should, in addition to having adequate wind uplift resistance, have adequate resistance to overturning and sliding, due account being taken of the likelihood of wind uplift loads acting with varying magnitude over the ridge or hip surface profile. For ridges, the wind uplift load q_t should be assumed to apply over the horizontal projected area of the ridge profile acting vertically, and in addition, as a separate wind load condition, over the vertical projected area of the ridge profile acting horizontally. In the case of hips, similar wind load conditions should be applied, except that the wind uplift load should be applied normal to the pitch of the hip.

17.2.6 Wind uplift load on roof underlays and undercloaks. The wind load q_u (per unit area) acting normal to the plane of the underlay should be calculated from the equation

$$q_u = q(C_{pe} - C_{pi}) \quad \dots (2)$$

where

C_{pi} is the pressure coefficient for the underside.

Underlays and undercloaks should be designed to resist the worst load calculated by considering the appropriate local areas of pressure (see tables 1 and 2).

Normally, for a house roof with a negligible probability of a dominant opening occurring during a severe storm and with an underlay constructed in accordance with clauses 13, 25 and 48, the value of C_{pi} may be taken as 0.2. However, for an undercloak or underlay exposed on its underside at an overhanging verge or eaves, C_{pi} should be taken as 0.8.

Further guidance is given in CP 3 : Chapter V : Part 2 and in 'Wind loading handbook'*.

17.2.7 Wind uplift load on fixings to battens. It should be noted that fixings connecting the underlay or boarding to the roof structure should also be designed to resist the wind uplift load q_u given in equation (2) of 17.2.6; the wind uplift load q_t (17.2.4) should not be added to q_u for this purpose.

17.2.8 Slating and tiling with sealed laps. Slating and tiling which are laid with torching or otherwise sealed at the laps should be regarded for the purpose of calculating wind loads as impermeable coverings; in such cases the wind uplift load on the slates or tiles should be calculated as for underlays (see 17.2.6).

17.2.9 Control of internal pressure. A substantially impermeable ceiling of adequate resistance to internal pressure will help to reduce the internal pressure transmitted to the roof underlay and tiling. Normal ceiling construction in houses, consisting of ceiling boards with sealed edges, will afford such protection provided ceiling hatch covers have sufficient dead weight or mechanical fastening to resist the pressure involved. The extra protection so afforded should not be taken to reduce the pressures given in 17.2.4 to 17.2.8 for design.

17.3 Strength

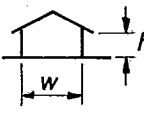
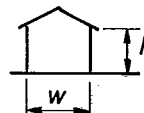
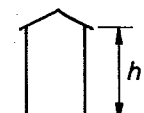
17.3.1 Slates and tiles. These should have adequate strength to support their self weight and the imposed and wind loads. Slates and tiles supplied and laid to the recommendations of this code will normally meet these requirements.

17.3.2 Battens. Battens should have adequate strength to support the dead, imposed and wind loads and have adequate stiffness to satisfy the requirements of alignment and to avoid excessive spring when nailed to slates or tiles.

They should have sufficient width and depth to avoid splitting or penetration of the underlay by nails. Recommended batten sizes are given in table 3. Battens should be not less than 1200 mm in length and

should be of sufficient length to be supported at each end and intermediately by a total of at least three rafters, trusses or walls. Cantilevering or splicing of battens between supports is not permitted. Butt joints over intermediate supports should be staggered.

Table 1. Pressure coefficients C_{pe} for duo-pitch roofs
(For further information see 17.2.3)

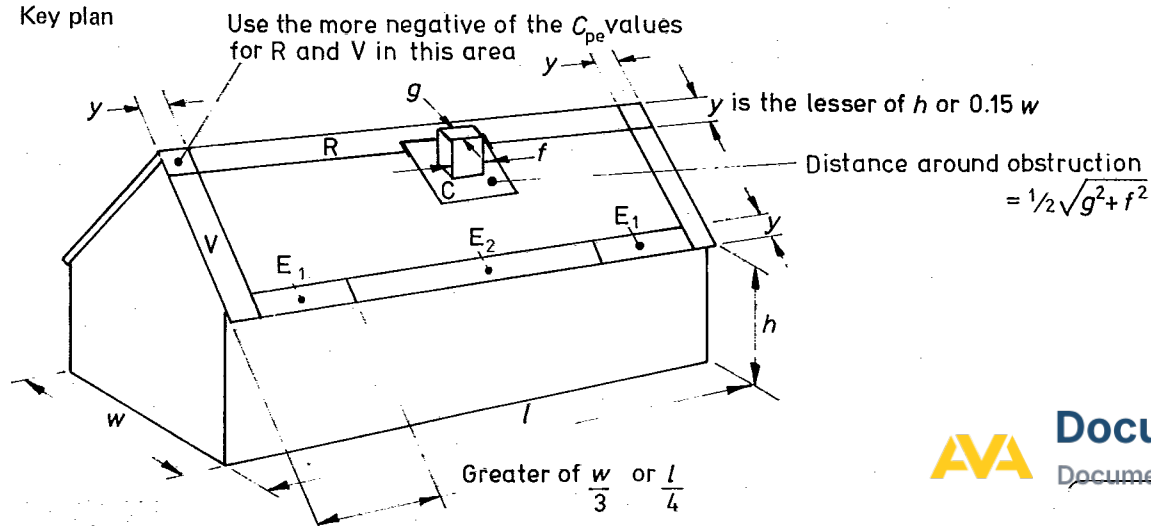
Building height ratio	Roof pitch*	General roof areas	Local areas of pressure				
			V	R	E ₁	E ₂	C
$\frac{h}{w} \leq \frac{1}{2}$ 	degrees						
	12½	-1.0	-1.3	-1.2	-1.3	-1.0	-1.2
	15	-0.8	-1.2	-1.2	-1.1	-0.8	-1.2
	17½	-0.6	-1.1	-1.2	-0.9	-0.8	-1.2
	20	-0.4	-1.0	-1.2	-0.7	-0.7	-1.2
	22½	-0.4	-1.0	-1.2	-0.7	-0.7	-1.2
	25	-0.4	-0.9	-1.2	-0.7	-0.7	-1.2
	27½	-0.4	-0.9	-1.2	-0.7	-0.7	-1.2
	30	-0.4	-0.8	-1.2	-0.7	-0.7	-1.2
	35	-0.4	-0.8	-1.1	-0.7	-0.7	-1.2
	45	-0.5	-0.7	-1.1	-0.7	-0.7	-1.2
	60	-0.6	-0.7	-1.1	-0.7	-0.7	-1.2
$\frac{1}{2} < \frac{h}{w} \leq \frac{3}{2}$ 	12½	-1.0	-1.9	-1.2	-1.9	-1.5	-1.2
	15	-0.9	-1.8	-1.1	-1.8	-1.5	-1.2
	17½	-0.8	-1.7	-1.1	-1.7	-1.5	-1.2
	20	-0.7	-1.5	-1.0	-1.5	-1.5	-1.2
	22½	-0.6	-1.4	-1.0	-1.4	-1.4	-1.2
	25	-0.5	-1.3	-1.0	-1.2	-1.2	-1.2
	27½	-0.5	-1.2	-1.0	-1.0	-1.0	-1.2
	30	-0.5	-1.0	-1.0	-0.8	-0.8	-1.2
	35	-0.5	-0.8	-0.8	-0.8	-0.8	-1.2
	45	-0.5	-0.8	-0.8	-0.8	-0.8	-1.2
	60	-0.5	-0.8	-0.8	-0.8	-0.8	-1.2
$\frac{3}{2} < \frac{h}{w} < 6$ 	12½	-0.7	-1.9	-1.2	-1.9	-1.9	-1.2
	15	-0.8	-1.8	-1.2	-1.8	-1.8	-1.2
	17½	-0.8	-1.7	-1.2	-1.7	-1.7	-1.2
	20	-0.8	-1.5	-1.2	-1.5	-1.5	-1.2
	22½	-0.9	-1.5	-1.2	-1.4	-1.4	-1.2
	25	-0.9	-1.5	-1.1	-1.3	-1.3	-1.2
	27½	-1.0	-1.5	-1.1	-1.2	-1.2	-1.2
	30	-1.0	-1.5	-1.0	-1.0	-1.0	-1.2
	35	-0.6	-1.3	-0.9	-0.9	-0.9	-1.2
	40	-0.5	-1.0	-0.8	-0.8	-0.8	-1.2
	50	-0.5	-0.8	-0.8	-0.8	-0.8	-1.2
	60	-0.5	-0.8	-0.8	-0.8	-0.8	-1.2

NOTE. h is the height to eaves or parapet and w is the lesser horizontal dimension of a building.

These coefficients are derived from table 8 of CP 3 : Chapter V : Part 2 : 1972 and interpolated to give values for intermediate roof pitches. For the general areas the condition $\alpha = 0^\circ$ has been adopted.

*Slated or tiled roofs covered by this code cannot necessarily be used at all of the pitches listed.

Key plan



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Table 2. Pressure coefficients C_{pe} for monopitch roofs of rectangular buildings with $\frac{h}{w} < 2$
(For further information see 17.2.3)

Roof pitch*	General roof areas		Local areas of pressure					
	H	L	H ₁	H ₂	L ₁	L ₂	V	C
degrees								
12½	-1.0	-1.0	-1.9	-1.2	-1.9	-1.5	-2.0	-1.2
15	-1.0	-1.0	-1.8	-1.0	-1.8	-1.4	-2.0	-1.2
17½	-1.0	-1.0	-1.8	-1.0	-1.8	-1.4	-2.0	-1.2
20	-1.0	-1.0	-1.8	-1.0	-1.8	-1.4	-2.0	-1.2
22½	-1.0	-1.0	-1.8	-1.0	-1.4	-1.2	-2.0	-1.2
25	-1.0	-0.9	-1.8	-1.0	-0.9	-0.9	-2.0	-1.2
27½	-1.0	-0.8	-1.8	-1.0	-0.8	-0.8	-2.0	-1.2
30	-1.0	-0.8	-1.8	-1.0	-0.8	-0.8	-2.0	-1.2

*Slated or tiled roofs covered by this code cannot necessarily be used at all of the pitches listed.

Key plan

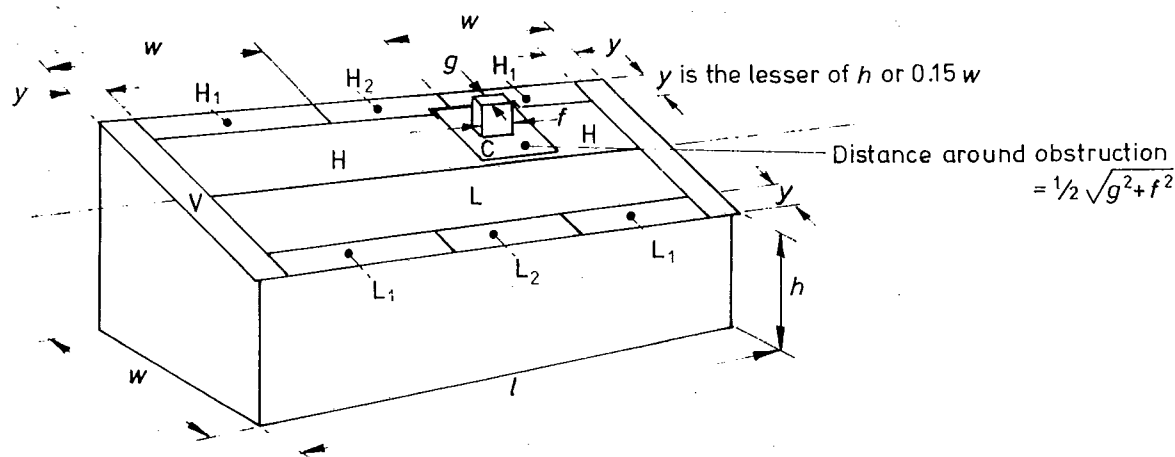
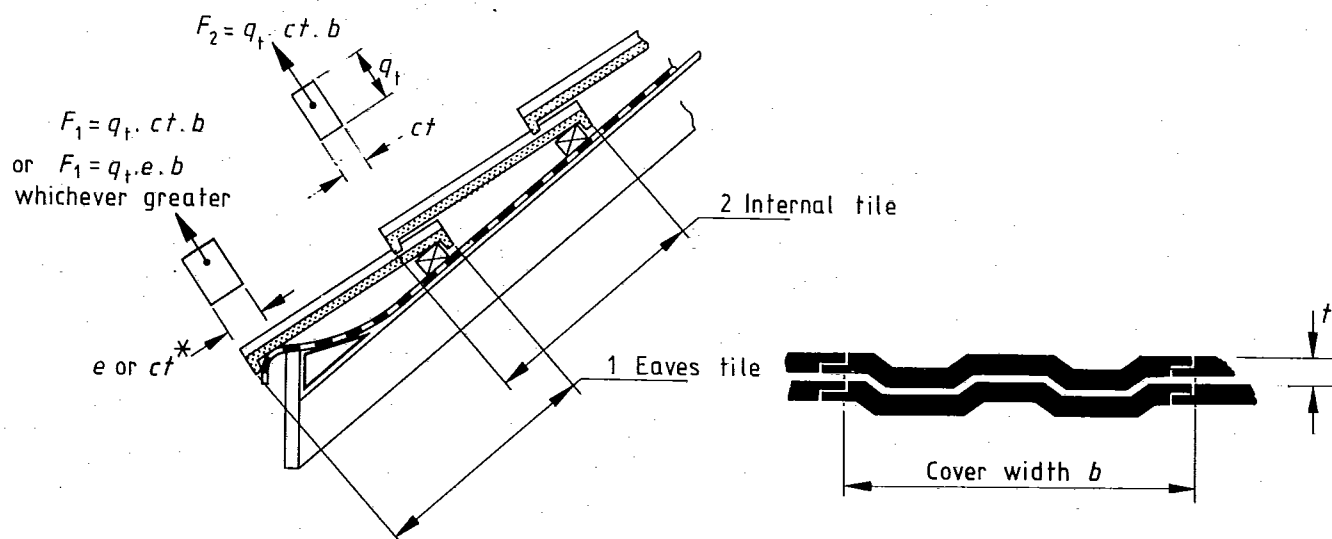


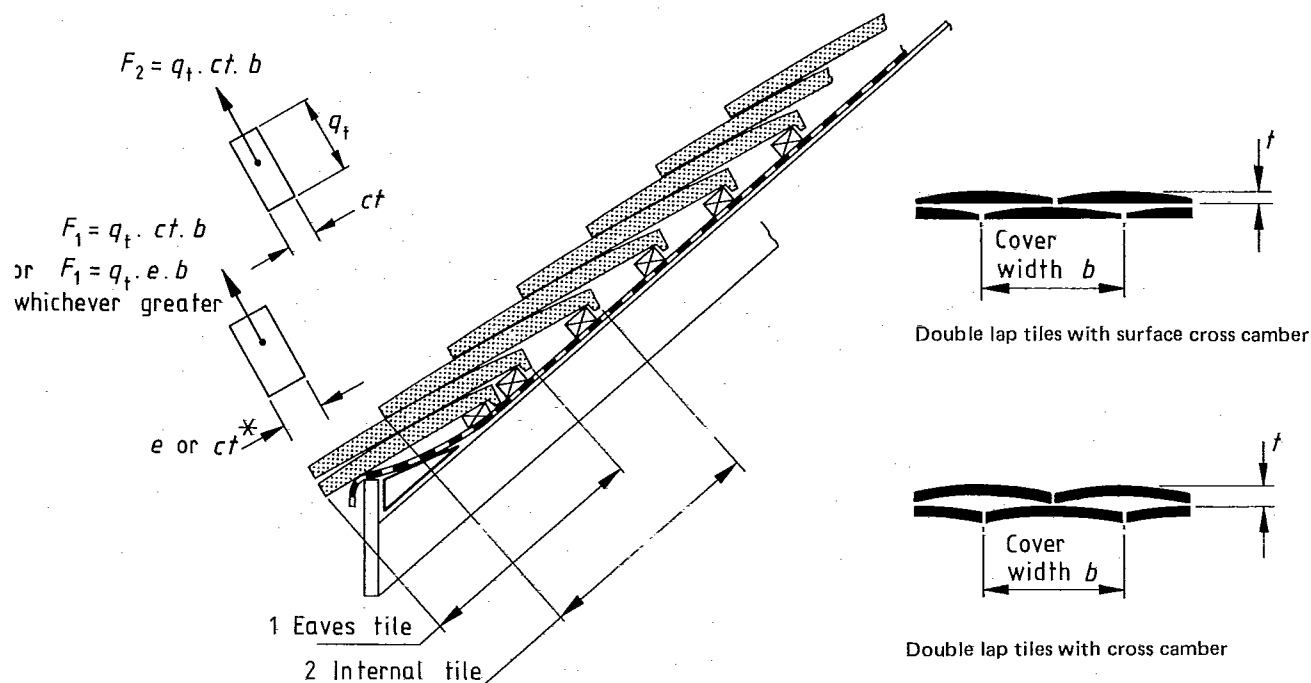
Table 2A. Step height factor c for calculating wind uplift load on slates and tiles

Covering	Value of c
(a) Plain double lap clay and concrete tiles longitudinally cambered, height of step between courses not exceeding 20 mm	1.2
(b) Single lap tiles, slates, asbestos-cement slates, and double lap tiles not included in (a)	2.0



(a) Single lap tiles

t is the height of the step between courses as shown
 F_1 is the wind force acting on an eaves tile
 F_2 is the wind force acting on all other tiles
 C is the step height factor (see table 2A)
 $= 2.0$ for single lap tiles and slates,
 $= 1.2$ for plain double lap longitudinally cambered tiles with $t \leq 20$ mm



(b) Double lap tiles or slates

* e is defined in 17.2.4.

Figure 1. Wind uplift loading on slates and tiles