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SANS 10400-L:2020

Edition 4

SOUTH AFRICAN NATIONAL STANDARD

The application of the National Building Regulations

Part L: Roofs

WARNING
This document references other documents normatively.

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SANS 10400-L:2020
Edition 4

Table of changes

Change No.	Date	Scope

Foreword

This South African standard was prepared by National Committee SABS/TC 060, *Standards that support the National Building Regulations*, in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

This document was approved for publication in December 2020.

This document supersedes the corresponding parts of SANS 10400-L:2011 (edition 3).

Compliance with this document cannot confer immunity from legal obligations.

Compliance with the requirements of this document will be deemed to be compliance with the requirements of part L of the National Building Regulations, issued in terms of the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977).

SANS 10400 consists of the following parts, under the general title *The application of the National Building Regulations:*

Part A: General principles and requirements.

Part B: Structural design.

Part C: Dimensions.

Part D: Public safety.

Part F: Site operations.

Part G: Excavations.

Part H: Foundations.

Part J: Floors.

Part K: Walls.

Part L: Roofs.

Part M: Stairways.

Part N: Glazing.

Foreword (*concluded*)

Part O: Lighting and ventilation.

Part P: Drainage.

Part Q: Non-water-borne means of sanitary disposal.

Part R: Stormwater disposal.

Part S: Facilities for persons with disabilities.

Part T: Fire protection.

Part V: Space heating.

Part W: Fire installation.

Part X: Environmental sustainability.

Part XA: Energy usage in buildings.

This document should be read in conjunction with SANS 10400-A.

Annex A, B, C and D are for information only.

Contents

The application of the National Building Regulations

Part L: Roofs

1 Scope

1.1 This part of SANS 10400 provides deemed-to-satisfy requirements for compliance with part L (Roofs) of the National Building Regulations.

2 Normative references

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the South African Bureau of Standards.

ISO 9223, *Corrosion of metals and alloys-corrosivity of atmosphere-classification, determination and estimation*.

SANS 457-2, *Wooden poles, droppers, guardrail posts and spacer blocks – Part 2: Softwood species*.

SANS 457-3, *Wooden poles, droppers, guardrail posts and spacer blocks – Part 3: Hardwood species.*

SANS 517, *Light steel frame building*.

SANS 952-1, *Polymer film for damp-proofing and waterproofing in buildings – Part 1: Monofilament and co-extruded products.*

SANS 952-2, *Polymer film for damp-proofing and waterproofing in buildings – Part 2: Laminated (non-woven) products.*

SANS 959-1*, Photovoltaic systems for use in individual homes, schools and clinics – Part 1: Standardized requirements.*

SANS 1022, *Metal roofing tiles*.

SANS 1273*, Fasteners for roof and wall coverings in the form of sheeting.*

SANS 1288, *Preservative-treated timber.*

SANS 1307, *Domestic storage solar water heating systems*.

SANS 1460, *Laminated timber (glulam).*

SANS 1700-7-1/ISO 4014*, Fasteners – Part7: External drive hexagon bolts and screws – Section1: Hexagon head bolts – Product grades.*

SANS 1707-1, *Sawn eucalyptus timber – Part 1: Proof-graded structural timber*.

SANS 1707-2, *Sawn eucalyptus timber – Part 2: Brandering and battens.*

SANS 1783-2, *Sawn softwood timber – Part 2: Stress-graded structural timber and timber for frame wall construction.*

SANS 1783-4, *Sawn softwood timber – Part 4: Brandering and battens.*

SANS 10005, *The preservative treatment of timber*.

SANS 10021,*The waterproofing of buildings (including damp-proofing and vapour barrier installation)*.

SANS 10106, *The installation, maintenance, repair and replacement of domestic solar water heating systems.*

SANS 10177-5, *Fire testing of materials, components and elements used in buildings – Part 5: Non-combustibility at 750 °C of building materials.*

SANS 10237, *The design, testing and installation of self-supporting metal cladding.*

SANS 10243, *The manufacture and erection of timber trusses*.

SANS 10400-A, *The application of the National Building Regulations – Part A: General principles and requirements.*

SANS 10400-B, *The application of the National Building Regulations – Part B: Structural design.*

SANS 10400-C, *The application of the National Building Regulations – Part C: Dimensions.*

SANS 10400-K, *The application of the National Building Regulations – Part K: Walls*.

SANS 10400-N, *The application of the National Building Regulations – Part N: Glazing*

SANS 10400-O, *The application of the National Building Regulations – Part O: Lighting and ventilation*

SANS 10400-R*, The application of the National Building Regulations – Part R: Stormwater disposal.*

SANS 10400-T, *The application of the National Building Regulations – Part T: Fire protection*.

SANS 10400-V*, The application of the National Building Regulations – Part V: Space heating.*

SANS 10400-XA, *The application of the National Building Regulations – Part X: Environmental sustainability – Part XA: Energy usage in buildings.*

SANS 10407, *Thatched roof construction.*

3 Definitions

For the purposes of this document, the definitions given in SANS 10400-A (some of which are repeated for convenience) and the following apply.

3.1
approved installer
installer of a product, system or solution recognised by the manufacturer of the product, system or solution as having acquired the necessary competency skills related to the installation or application of the product, system or solution

3.2
base metal thickness
BMT
thickness of the metal core in coated metal products

3.3
batten
small section timber member, fixed parallel to the line of the eaves, at right angles to the rafters, and onto which tiles or slates are fixed

3.4
bearing
structural support, usually a wall, positioned under the top chord or bottom chord or between the end points of a roof truss, beam or rafter

3.5
brandering
small section timber member which is usually fixed to the underside of a truss chord to support a fixed ceiling

3.6
category 1 building
building which

a) is designated as being of class A3, A4, F2, G1, H2, H3, or H4 occupancy (see Regulation **A20** in SANS 10400-A),

b) has no basements,

c) has a maximum length of 6,0 m between intersecting walls or members providing lateral support, and

d) has a floor area that does not exceed 80 m^2

NOTE 1 Table C.1 of SANS 10400-A:2016 outlines the difference in performance between category 1 buildings and other buildings that have the same occupancy designation in respect of a number of building attributes.

NOTE 2 A building may be classified as a category 1 building for the purposes of one or more parts of SANS 10400. Additional limitations may accordingly be imposed on category 1 buildings. For example, a category 1 building in terms of SANS 10400-T will be restricted to a single storey.

NOTE 3 Fire requirements for category 1 buildings are based on occupants escaping quickly from buildings. The design population for occupancies as set out in table 2 of part A of the Regulations (see SANS 10400-A) should therefore not be exceeded.

3.7
chord
main member that forms the outline of a truss

3.8
clear span
horizontal distance between the opposite faces of supporting walls (see figure 1)

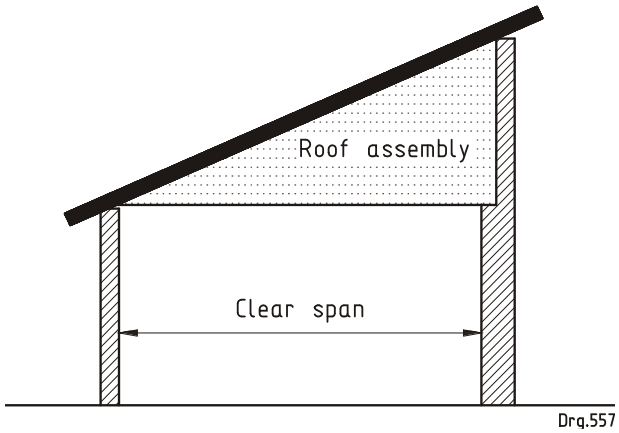


Figure 1 — Definition of clear span

3.9
combustible
flammable material that is not classified as non-combustible when tested in accordance with SANS 10177-5

3.10
competent person
person who is qualified by virtue of his education, training, experience and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of the National Building Regulations

NOTE This is a generic definition, to be used where no other definition is given, or no references are made to other standards. Other parts of SANS 10400 contain definitions of a more specific nature relevant to their disciplines.

3.11
competent person (built environment) person who

a) is registered in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), as either a Professional Engineer or a Professional Engineering Technologist, or

b) is registered in terms of the Architectural Profession Act, 2000 (Act No. 44 of 2000), as a Professional Architect or a Professional Senior Architectural Technologist, and

c) is generally recognized as having the necessary experience and training to undertake rational assessments or rational designs in the field of roofs and roofing

NOTE 1 Any registered person would only be permitted to take responsibility for structures within his area of expertise and in the discipline in which he is registered.

NOTE 2 This is a generic definition, to be used where no other definition is given, or no references are made to other standards. Other parts of SANS 10400 contain definitions of a more specific nature relevant to their disciplines.

3.12
deemed-to-satisfy requirement
non-mandatory requirement, the compliance with which ensures compliance with a functional regulation

3.13
drip
step or groove formed at the underside of a roof slab overhang parallel to the edge of the slab, in the plaster or applied finish

3.14
fall
slope of a roof

3.15
flat roof
roof with a slight fall which is designed and constructed to allow rainwater to be shed by gutters, outlets or to the perimeter of the roof

3.16
functional regulation
regulation that sets out in qualitative terms what is required of a building or building element or building component in respect of a particular characteristic, without specifying the method of construction, dimensions or materials to be used

3.17
heel joint
position on a truss at which the top chords and bottom chords intersect, or where the first vertical web intersects with the bottom chord in stub-ended trusses

3.18
nail plate
steel plate punched to form a nail pattern integral with the plate, and which is used as a structural connector

3.19
non-combustible
inflammable material that is classified as non-combustible when tested in accordance with SANS 10177-5

3.20
pitch
angle of inclination of rafters to the horizontal, or angle of inclination of the surface on which tiles or sheeting is laid

3.21
purlin
horizontal member attached to, and placed perpendicular to, the rafter in order to support roof sheeting materials

3.22
purlin beam
beam that is parallel to the eaves and that serves the purpose of a rafter

NOTE Purlin beams and purlin rafters are members which double as purlins. This form of construction is only practical for sheeted roofs.

3.23
rafter
top chord
horizontal or inclined member that establishes the upper edge of a truss or general roof line

3.24
rafter beam
sloping roof member of engineered or rational design size that supports the roof covering material with or without the use of purlins or battens

3.25
rational assessment
assessment by a competent person of the adequacy of the performance of a solution in relation to requirements including as necessary, a process of reasoning, calculation and consideration of accepted analytical principles, based on a combination of deductions from available information, research and data, appropriate testing and service experience

3.26
rational design
design by a competent person involving a process of reasoning and calculation and which may include a design based on the use of a standard or other suitable document

3.27
roof assembly
building cover and its supporting structure, including any ceiling attached to such structure and any additional components such as insulation

3.28
roof light
component incorporated into the roof assembly to permit the ingress of natural light, and which can be transparent or translucent

3.29
sawn softwood timber
timber derived from trees of the genus *Pinus* grown in Southern Africa and which has been appropriately graded with respect to its intended use

3.30
suitable
capable of fulfilling or having fulfilled the intended function, or fit for its intended purpose

3.31
continuously supported metal cladding systems
metal cladding system which relies totally on support over its whole length

3.32
self-supporting metal cladding systems
metal cladding system which spans between support points, and is capable of withstanding self-weight and imposed loads (See SANS 10237)

3.33
tie beam
bottom chord
horizontal or inclined member that establishes the lower edge of a truss

3.34
total coated thickness
TCT
nominal total coated thickness (TCT) which includes all applied metallic coatings but excludes organic coatings as compared to thickness of metal core in coated metal products (base metal thickness (BMT))

3.35
truss
triangulated combination of members and joints which, when fitted together, form a rigid structural component capable of withstanding loads

3.36
undertile membrane
flexible membrane fitted between the roof support structure and the battens

3.37
web
member that joins the top chords and bottom chords to form triangular patterns that give truss action

4 Requirements

4.1 General

The functional regulations pertaining to roofs contained in part L of the National Building Regulations shall be deemed to be satisfied where

a) All roof and ceilings heights comply with the provisions of 4.3 of SANS 10400-C:2016.

b) Pitched roofs: covering and waterproofing systems are in accordance with the requirements of 4.2.

c) Flat roofs: covering and waterproofing systems are in accordance with the requirements of 4.3.

d) Gutters and downpipes, where provided, are sized in accordance with the requirements of SANS 10400-R.

e) The fire resistance and combustibility of the roof assembly or any ceiling assembly are in accordance with the requirements of SANS 10400-T.

f) Roofing insulation and thermal breaks, where required, shall be determined in accordance with SANS 10400-XA and be installed in accordance with the insulation manufacturer's instructions, by an approved installer or persons with the skill and care normally used by workers working with similar materials.

NOTE 1 SANS 10243 provides guidance on the manufacture, erection and bracing of timber roof trusses.

NOTE 2 Walls supporting roof trusses which do not have a bottom chord in a straight line between the supports, for example scissor or A-frame trusses, should be designed to withstand the horizontal thrusts that develop. Such walls should be designed in accordance with the requirements of SANS 10400-B.

4.2 Roof coverings and waterproofing systems

4.2.1 General requirements

4.2.1.1 Any roof covering and waterproofing system, or part thereof, shall

a) resist the penetration of water to the extent that, any water which might penetrate the roof is of insufficient intensity to run down the inside surface of the roof, or drip onto the ceiling or floor,

b) be capable of being effectively repaired in the event of being damaged, despite aging of the materials; and

c) resist, with an appropriate degree of reliability over its design working life when being suitably maintained,

1) temperatures from −10 °C to +80 °C and rapid reversals of temperature of the order of 60 °C, without deterioration,

2) the effects of UV radiation without the deterioration of its essential properties,

3) the effects of condensation at the under-surface,

4) chemical attack from common atmospheric gases and saline atmospheres in marine environments,

5) the growth of bacteria, lichens, fungi, etc. and

6) any reversible and irreversible movement emanating from the roof structure.

NOTE Accumulated hail or snow on roofs after hail or snow storms should not cause water to penetrate the interior of the building.

4.2.1.2 Products used in roof coverings and waterproofing systems shall preserve their properties satisfactorily, when used in accordance with the manufacturer's recommendations and with normal maintenance specified by the manufacturer, for at least 15 years:

NOTE (from 10400B 4.2.1.1) The design working life of a building other than a category 1 building shall be not less than 30 years in respect of the structural system and non-accessible components, and 15 years for repairable or replaceable components and materials, such as claddings, roofing materials, exterior trims, and integrated components, such as windows and doors.

4.2.1.3 Polymer films used for damp-proofing purposes shall comply with the requirements of SANS 952-1 or SANS 952-2, as appropriate.

4.2.1.4 Metal components used externally should not be in contact with any incompatible metal or material components to prevent corrosion and should be electrolytically isolated from such materials to prevent galvanic action.

NOTE for further guidance see SANS 10237 and annex B.

4.2.2 Metal roof cladding and accessories

4.2.2.1 Continuously supported cladding

All continuously supported metal cladding systems are to be subject to a rational design.

4.2.2.2 Self-supporting cladding

All self-supporting metal cladding systems shall be in accordance with the requirements of SANS 10237.

4.2.2.3 Metal thickness

4.2.2.3.1 The minimum thickness for metal cladding shall be in accordance with the manufacturer's published span tables for the individual profiles, provided such tables comply fully with the requirements of SANS 10237.

4.2.2.3.2 In the absence of any published span tables the minimum base metal thickness for coated steel shall be as detailed in table 1 and for uncoated metal (excluding steel) shall be as detailed in table 2.

4.2.2.3.3 Metal roof tiles shall comply with the requirements of SANS 1022.

Table 1 — Minimum base metal thickness (BMT) of coated steel

1	2	3	4
Profile	**Grade of steel**	**Minimum BMT** mm	**Maximum purlin spacing (double span)**
Corrugated	550 MPa	0,46	900
	275 MPa	0,54	1 200
	230 MPa	0,76	1 400
Other profiles	550 MPa	0,46	1 500
	275 MPa	0,54	1 600
	230 MPa	0,76	1 900
NOTE The connection of the purlins to the supporting structure should be checked to cater for wind uplift in accordance with the manufacturer's specifications.			

Table 2 — Minimum thickness: uncoated metal (excluding carbon steel)

1	2	3	4
Profile	**Metal**	**Minimum thickness** mm	**Maximum purlin spacing mm (double span)**
Corrugated	Aluminium	0,70	1 500
	Stainless steel [a]	0,50	1 100
	Other metal	0,50	1 000
Other profiles	Aluminium	0,60	1 000
	Stainless steel [b]	0,50	1 600
	Other metal	0,50	1 600
[a] For metal roof tiles the minimum BMT shall be 0,36 mm.			
[b] The maximum purlin spacing for corrugated and other profiles is dependent on the sheet gauge, the section profile and the operational performance required. The purlin spacing should be specified in accordance with the manufacturer's instructions.			

4.2.2.4 Durability requirements

The durability requirements for steel cladding shall be as follows:

a) the minimum coating for steel cladding shall be as detailed in table 3;

b) the minimum grade of aluminium or stainless steel shall be as detailed in table 4;

c) all other metals shall be in accordance with the supplier's recommendations; and

d) all zinc, aluminium-zinc or other metallic coated steel roof sheeting utilised within 1 k from the coast (high water mark), or in an aggressive environment will be classified as classification C4 or C5.

Table 3 — Minimum coating mass for unpainted metallic coated steel cladding

1	2	3	4
Corrosivity category	**CSIR classification/ISO 9223**	**Galvanized coating**	**Aluminum/zinc coating**
C1	Desert	Z150	AZ100
C2	Rural/semi-desert	Z200	AZ100
C3	Inland industrial	Z275	AZ150
C4	Medium severe marine	Z275	AZ150
C5	Marine industrial	Z450	AZ200
CX	Severe marine	N/A	N/A

Table 4 — Minimum grade —Aluminium and stainless steel

1	2	3	4
Corrosivity category	**CSIR classification/ISO 9223**	**Aluminium**	**Stainless steel**
C1	Desert	3003, 3004 and 4107 (9107)	3CR12L and 430
C2	Rural/semi-desert	3003, 3004 and 4107 (9107)	
C3	Inland industrial	3003, 3004 and 4107 (9107)	441, 304, 436 and 2001
C4	Medium severe marine	3003, 3004 and 4107 (9107)	444
C5	Marine industrial	3003, 3004 and 4107 (9107)	316, 2304, LDX2101, LDX2104, DX2203
CX	Severe marine	3003,3004 and 4107 (9107)	904L and 2205
NOTE 1 Table 3 and table 4 refer to the macro environments pertaining to the corrosivity of the atmosphere in the various regions of the Republic of South Africa and are therefore of a generic nature only.			
NOTE 2 In addition to the macro environment it is equally important to consider the influence of the micro environment in the vicinity of a building plus internal processes which can be considerably more corrosive than the macro environment. Examples are, but not limited to, fallout from: foundries, certain chemical processes, galvanising plants, fertilizer storage or packing activities, exposure to highly acidic or alkaline gasses or materials, intensive animal farming, etc. Locations in close proximity to informal settlements and major arterial roads experience increased levels of corrosivity.			
NOTE 3 The corrosion resistance of metals and metallic coatings can be enhanced by the addition of a specifically formulated paint coating system. As the thickness and type of metallic coatings plus type and thickness of paint coatings vary considerably when coupled to form a corrosion resistant system in a given environment it is recommended that the coil manufacturer be consulted regarding the performance of a system in a particular environment.			

4.2.2.5 Marking requirements

4.2.2.5.1 All coil used for the manufacture of metal cladding shall carry an indelible distinctive mark at regular intervals containing the following information:

a) the manufacturer’s name;

b) the BMT (base metal thickness);

c) the grade of the base metal;

d) the weight of any metallic coating; and

e) identification of any other coating applied to the cladding material.

4.2.2.5.2 All coil used for the manufacture of metal cladding shall be marked at not more than three metre intervals, on one side, with the manufacturer's name.

NOTE If material is unmarked, a certificate proving that the material complies with the minimum requirements should be provided by an accredited laboratory before being used.

4.2.2.6 Fasteners

4.2.2.6.1 Fasteners shall be durable, corrosion resistant (see 4.2.2.6.4) and compatible with any other materials with which they may be in contact or, if not compatible, shall be electrolytically isolated from such material. The fasteners, shall be suitably coated to achieve the necessary corrosion resistance and compatibility. Such coatings shall remain substantially undamaged by the fixing process.

4.2.2.6.2 For primary fasteners (i.e. fasteners used to attach the cladding to the supporting structural members), neither rivets, mushroom head drive screws/nails nor conventional nails shall be used as primary fasteners.

4.2.2.6.3 For secondary fasteners (i.e. to stitch side laps in cladding or to attach flashings and other ancillary items to the cladding) ,no nails or open rivets shall be used for this purpose.

4.2.2.6.4 The minimum specification for corrosion protection of fasteners shall be equal to or better than the corrosion protection coating to the cladding.

4.2.2.6.5 The manufacturer and coating of fasteners shall comply with SANS 1273.

4.2.2.6.6 Fasteners used for aluminium roof sheet shall be manufactured from a 304 or 316 grade stainless steel, or 5-series aluminium. Other materials may result in galvanic corrosion and premature failure of the substrate. (see table D.1 in annex D).

4.2.2.6.7 Washers shall be manufactured from materials which are compatible with the cladding material. Washers containing significant levels of carbon black are not suited for aluminium or aluminium /zinc coated steel. Selection of washers to match the geometry of the underlying profile and should follow the cladding manufacturer's recommendations.

4.2.2.7 Earthing

Any roof covering of cladding manufactured from metal coil shall be suitably earthed in accordance with SANS 10142-1, by a competent person.

4.2.3 Roof coverings in pitched roofs

4.2.3.1 Roofs shall be provided with a pitch of not less than that given in tables 5 and 6, provided that sheeted roofs without hips and valleys in category 1 buildings may have a roof slope of 5° subject to all end laps in such sheeting being sealed and having a minimum lap of 250 mm.

The slope of valleys in roofs with hips and valleys shall not be less than 11°.

4.2.3.2 Suitable roof coverings shall be specified in accordance with the environmental conditions applicable, and be installed in accordance with the manufacturer's instructions.

4.2.3.3 Suitable roof flashings against any upstand walls, such as gables or parapets shall be specified and installed in accordance with the manufacturer's specifications.

4.2.3.4 Undertile membranes shall be laid so that water can drain between rafters and shall be installed in accordance with the manufacturer's instructions where tiles, slates and shingles are laid

a) in roofs that have a pitch of less than 26°, or

b) in roofs that have a pitch of 45° or steeper, and

c) in those areas between the coastline and an imaginary line 30 km inland, parallel with the coastline, or the top of the escarpment or watershed of the first mountain range inland, if these are less than 30 km from the coastline.

NOTE The entire area of jurisdiction of any local authority, the area of which is cut by the line demarcating these coastal areas, is taken as falling within the coastal area.

4.2.3.5 Thatching shall comply with the materials requirements of, and be installed in accordance with the requirements of, SANS 10407.

4.2.3.6 Deemed to satisfy rules for minimum thickness of thatch and reed layer reflecting climatic regions as defined in SANS 10400-XA are given in table 7.

Table 5 — Minimum roof slopes of sheeted roofs

1	2	3	4
Roof covering	**Minimum angle of slope** degrees	**End laps sealed**	**Unsealed**
All materials except fibre cement		250	
Corrugated	10		
Box rib profiles	7.5		
Corrugated fibre-cement sheets	11		300
	15		275
	17		250
	22		200
	26		150
Specialized long span sheets (metal and fibre cement)	2 to 5, depending upon manufacturer's design and specification	As specified by the manufacturer	
NOTE The manufacturer's instructions should be followed.			

Table 6 — Minimum roof slopes of roofs other than sheeted roofs

1	2	3
Roof covering		**Minimum angle of slope**
Type	**Description**	degrees
Tiles, slates and shingles	Fibre-cement slates: (undertile membrane recommended)	17
	Concrete and clay tiles and shingles: a) with an approved undertile membrane b) without an approved undertile membrane	17,5 26
	Metal tiles: a) with an approved undertile membrane b) without an approved undertile membrane	11 15
	Natural slate on open battens: a) with an approved undertile membrane b) without an approved undertile membrane	17 30
Thatch	Thatch	45 in general but 35 at dormer windows
NOTE 1 When metal roof tiles are used over an existing roof, the existing roof slope may be retained. NOTE 2 An undertile membrane, when properly laid, will provide a highly effective impermeable barrier against the ingress of wind-driven rain and dust. Undertile membranes should therefore be provided on all tiled and slated roofs, irrespective of the slope and also if ceilings are not installed, so as to minimize the effect of wind-blown dust entering through the tiles. NOTE 3 Under strong gusts of wind, the suction force on the roof tiles might exceed the mass of the tiles, requiring the tiles to be securely fixed in order to prevent them from being lifted from the roof. An undertile membrane can substantially lower these pressures and so reduce the risk of wind uplift. NOTE 4 Increasing the slope at the *dormer* windows for thatch to 40° reduces the maintenance requirements in this area. NOTE 5 The manufacturer's instructions should be followed. NOTE 6 Refer to SANS 10062.		

Table 7 — Minimum thickness of thatch and reed layer reflecting climatic regions as defined in SANS 10400-XA

1	2	3	4	5	6	7	8	9
Type	**Climatic zone 1**	**Climatic zone 2**	**Climatic zone 3**	**Climatic zone 4**	**Climatic zone 5**	**Climatic zone 6**	**Min mass of thatch layer per m²** kg	**Min design mass of thatch layer** kg
Fine thatching grass or reed	207	180	175	207	175	196	45	105
Coarse thatching grass or reed	207	180	180	207	180	196	72	120
Water reed	300	300	300	300	300	300	70	125
NOTE The minimum weight is based a thickness of 175 mm. This should be increased proportionally if a thicker layer is used. Design mass of thatch includes poles. Cognisance to be taken of the fire safety risks associated with thatch roofs and their proximity to site boundaries and notional boundaries between buildings. Refer to SANS 10400-T for further clarity.								

4.2.3.7 No more than 2 layers shall be used for fine thatching grass (Second layer is used for re-thatching). For Cape reed and Water reed, only single layer shall be used.

4.2.4 Roof lights

Roof lights shall comply with the requirements of SANS 10400-N, SANS 10400-O, SANS 10400-T and SANS 10400-XA.

4.2.5 In-plane roof lights

4.2.5.1 In-plane roof lights (i.e. where the profile of the translucent material matches that of the cladding material) shall not be wider than a single translucent sheet width of cladding material,

4.2.5.2 The lengths of individual sheets shall not exceed 3,6 m.

4.2.5.3 Roof lights shall be fixed over the adjacent cladding.

4.2.5.4 Roof lights shall have a minimum thickness/mass of:

a) polycarbonate 1,2 mm; and

b) GRP 1,8 kg/m² (profiled).

4.2.5.5 Maximum purlin spacing for in plane roof lights.

Table 8 — Maximum purlin spacing for in plane roof lights

1	2
Profile depth mm	Maximum purlin spacing mm
18 to 25	900
26 to 0	1 000
31 to 55	1 500

4.2.5.6 Sheets to be fastened to the supporting structural members through each crown of the profile (primary fasteners) and side stitched to adjacent cladding at not more than 400 mm spacing (secondary fasteners).

4.2.6 Fasteners

4.2.6.1 Primary shall have a metal and sealing washer of not less than 20 mm diameter. PVC soft washers not to be used with polycarbonate material. Fasteners are to be fitted at a minimum of 50 mm from sheet ends.

4.2.6.2 Secondary shall be M6 bolt or roofing screw or butterfly rivet. Self-tapping screws and pop-rivets may not be used for this purpose.

4.2.6.3 All holes for fasteners are to be drilled with a 2 mm to 5 mm clearance i.e. an M6 fastener will require a hole with a diameter of between 8 mm and 11 mm.

NOTE All roof lights are non-trafficable i.e. cannot be walked on.

4.2.7 Out of plane roof lights

Out of plane roof lights shall be installed in a manner that does not interfere with the structural integrity of the roof support structure.

NOTE “Roof lights” excludes dormer openings designed as part of a roof structure.

4.3 Waterproofing to balconies, terraces and parking decks

4.3.1 General

4.3.1.1 Flat roofs, balconies, terraces and parking decks shall have a fall towards external gutters, outlets or roof edges of not less than 1:80 where there is no interruption in the flow of water, and 1:50 where there is an interruption in the flow. Where two directional falls intersect, the minimum finished fall of 1:80 shall be maintained along the mitre. (See figure 2.)

NOTE 1 Flat roofs, balconies, terraces and parking decks should be constructed with a fall of 1:80, including cross falls. To ensure that a finished fall of 1:80 is achieved, it might be necessary to provide a limiting design slope of 1:50 in concrete slabs to allow for construction inaccuracies and for deflection under dead loads and imposed loads.

NOTE 2 The required slope can be achieved on a concrete roof by casting or finishing concrete to the required fall, by applying sand-cement screeds to the concrete to achieve the required levels, or by a combination thereof. When laying a screed in the rainy season, especially in winter rainfall areas, consideration should be given to adding a suitable polymer modifier to the screed mix.

NOTE 3 The above-mentioned falls and cross-falls to timber flat roofs should be created in the structure itself.

NOTE 4 SANS 10021 provides guidance on the waterproofing of buildings including damp proofing and vapour barrier installation.

4.3.1.2 Plans and drawings shall clearly designate ridges and valleys and state relative falls as shown in figure 2.

4.3.1.3 Penetrations through roofs, balconies, terraces and parking decks shall, as far as possible, be avoided and be located away from low points. Such penetrations shall not be flexible nor lagged and shall be kept at least 200 mm away from all vertical surfaces, e.g. upstand beams and walls.

4.3.1.4 Plumbing pipes, electrical conduits, air conditioning pipes, etc. shall not be in clusters.

4.3.1.5 Precast panels and precast roof structures shall be designed in such a manner that any subsequent movement of the concrete elements will not impair the performance of the waterproofing system.

4.3.1.6 A suitable method shall be employed to prevent the ingress of water to the interior of the building where access is required to accommodate persons with disabilities. Where such access is not required, a suitable step shall be formed between internal and external areas.

NOTE 1 The height of the step should take account of the requirements for falls to outlets or gutters, finishes and waterproofing systems.

NOTE 2 SANS 10400-S contains guidance on the provision of access for persons with disabilities.

4.3.1.7 Any boards used as a substrate in a flat roof shall be suitably supported and securely fixed on all four sides.

4.3.2 Gutters and downpipes

4.3.2.1 Gutters and downpipes shall comply with the requirements of SANS 10400-R, with a minimum size of downpipe of 75 mm diameter (or equivalent cross-sectional area if not a round pipe).

NOTE It is advisable to have a minimum of two outlets and downpipes on flat roof areas that are enclosed by upstands or walls in case one outlet becomes blocked.

4.3.2.2 Gutters, if provided, shall be so designed that storm water does not penetrate the interior of the building if they become blocked.

4.3.2.3 Outlets in flat roofs, balconies, terraces and parking decks , shall be set flush with the concrete or recessed into the timber decking to prevent ponding around the outlets.

4.3.2.4 The position of all outlets shall be at least 200 mm away from upstands or parapet walls and 1 000 mm away from expansion joints. The minimum size of outlet shall be 75 mm diameter.

4.3.2.5 Rainwater goods, such as rainwater outlets, gutters and downpipes shall be installed in strict accordance with the manufacturer's instructions.

NOTE To calculate the total catchment area of a flat roof, the plan area of flat roof plus the plan area of any other roofs, pitched or flat, that discharge onto the area, plus half the maximum area in elevation of any pitched roofs, plus half the vertical area of exposed walls around the roofs should be added together.

4.3.3 Flat concrete roofs

NOTE The requirements of this subclause do not cover the structural design or the thermal performance of concrete roofs. Concrete roof designs should take into account the thermal properties of the concrete, which may be determined by the thickness and density of the concrete and its built-up waterproofing layer. If a thermally insulating layer is desired, it should be incorporated above the concrete structural deck and attention should be given to the provision of ventilation to allow moist air, which might accumulate below the waterproofing layer, to be vented to the outside air.

4.3.3.1 Unless the expansion joints are designed by a competent person (built environment) to accommodate the flow of water over such joints, twin kerb upstand-type joints (see figure 3) shall be installed over expansion joints in concrete roofs, which shall be located away from outlets.

NOTE Expansion joints should be parallel to the fall of the roof.

4.3.3.2 Drips shall be provided beneath all concrete roof overhangs.

4.3.3.3 All concrete or screeded surfaces to be waterproofed shall be sound, smooth and even in a wood-floated finish to the correct falls and cross falls, and without undulations or any protrusions or contaminants.

NOTE Concrete and screeded surfaces should not be highly polished, e.g. power floated.

4.3.4 Waterproofing systems for flat roofs

4.3.4.1 A waterproofing system shall be designed by a competent person (built environment) and installed strictly in accordance with the manufacturer's instructions, by an approved installer, such that the roof will remain watertight subject to the required maintenance as specified by the manufacturer of the waterproofing membrane or system. Such competent person shall satisfy himself that the materials selected are appropriate for the application, taking into account the degree of exposure of the waterproofing, the protection to the material provided, and the area in which the building is located. See also 4.2.1.3.

NOTE 1 In specifying the waterproof system cognisance should be taken of the Manufacturer's guarantee of watertightness and fit-for-purpose.

NOTE 2 Delamination of the waterproofing system from dense substrates, such as concrete, can occur due to the inability of the substrates to dissipate retained moisture vapour. A less dense sand-cement screed permits the dissipation of any retained moisture vapour and, as a result, delamination is avoided.

NOTE 3 A 20 mm thick sand-cement screed should be laid on top of all lightweight screeds to receive waterproofing as such screeds can be too porous and friable for good adhesion of some waterproofing systems.

NOTE 4 All concrete and screeded surfaces should be left to dry before applying any waterproofing system. Concrete should not contain more than 7 % moisture by weight. Sand-cement or lightweight screeds should not contain more than 10 % moisture by weight.

NOTE 5 The selection of the waterproofing system should take into account the possible damaging effect of plant root systems where the area to be waterproofed will form part of a planted or landscaped area.

4.3.4.2 Where the outlets are not the full-bore outlet type of the coned type, the pipe shall be flanged to allow the waterproofing to be dressed onto a flat surface, not into a round hole.

4.3.4.3 Where penetration of the waterproofing layer by services (overflow pipes, flues, etc.) occurs, subject to the requirements of SANS 10021,particular attention shall be paid to the proper coving and dressing of the waterproof material up against the penetrating element. Penetrations of the waterproofing layer by fixings which will reduce the effectiveness of the waterproofing system shall be avoided, where possible. Any penetration of the waterproofing system shall have remedial measures applied in accordance with the manufacturer's requirements.

NOTE 1 Fixings refers to support systems associated with water tanks, solar absorbers, masts, antennae, and other such similar erections.

NOTE 2 The waterproofing membrane dressed around protruding pipes should be mechanically clamped (e.g. with a hose clamp) around the pipes and then counter flashed over the mechanical clamp.

4.3.4.4 All pipe penetrations through concrete slabs, timber decks, brick or concrete walls, which are to be waterproofed, shall protrude at 90 degrees to the surface (not at angles) for at least 200 mm before taking any necessary bends.

4.3.4.5 Suitable counter flashing cut into the walls to a depth of 50 mm, to prevent delamination of the waterproofing system, shall be provided to waterproofing turn-ups against masonry walls where such waterproofing system is not linked to the stepped damp-proof courses in a cavity wall.

NOTE Refer to figure A.1.

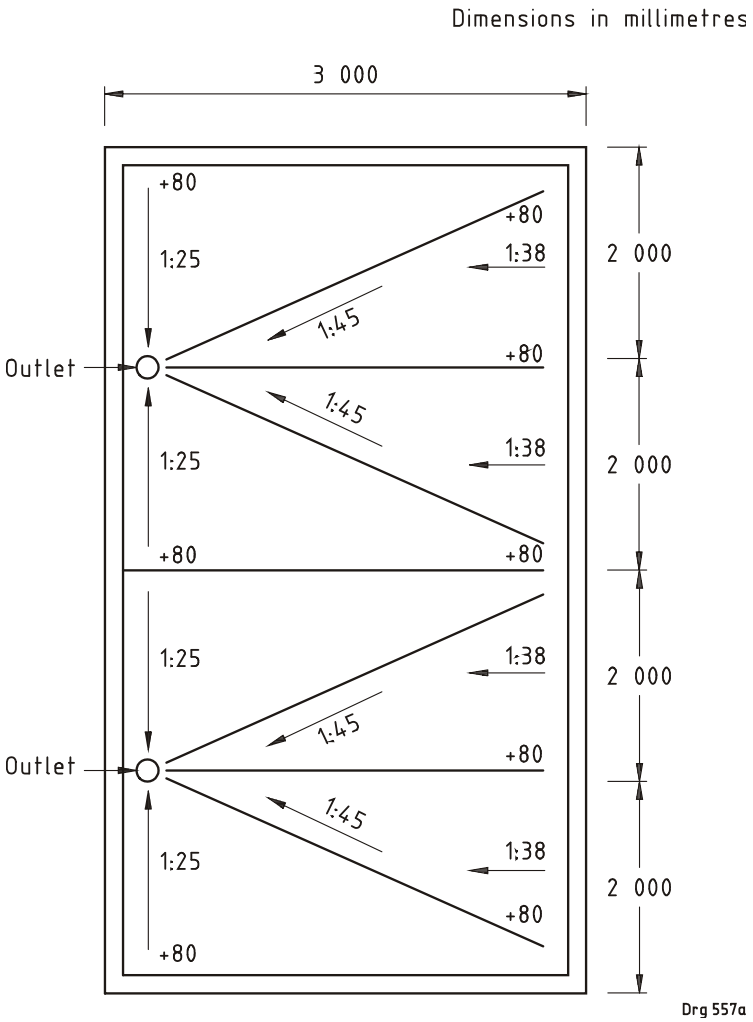
4.3.4.6 Unless a specific waterproofing system does not require them, sand-cement coves with radii of not less than 45 mm shall be formed at all internal corners of horizontal and vertical surfaces or 38 mm timber fillets shall be fixed at all junctions of horizontal and vertical surfaces on timber decks.

4.3.4.7 All external corners or edges where the waterproofing is to be dressed over shall be suitably rounded.

4.3.4.8 Damp-proof courses, where required, shall be installed at a level above the top of all waterproofing turn-ups

NOTE Typical waterproofing details are shown in annex A.

4.3.4.9 The waterproofing turn-up shall be a minimum of 150 mm above the finished roof level.



NOTE Dimensions are provided for illustrative purposes. Levels indicated are with respect to the outlets.

Figure 2 — Drainage of flat roofs

4.3.5 Waterproofing to balconies, terraces and parking decks

4.3.5.1 Where the outlets are not the standard “coned” full-bore outlet type, all pipes/gargoyles should be flanged to allow the waterproofing to be dressed onto a flat surface, not into a round hole. All flanged outlets shall be set flush with the concrete or screeds and recessed into the timber decking to prevent ponding around the outlets. At least two outlets are recommended on balconies and terraces where there are perimeter upstands that are higher than door thresholds.

4.3.5.2 The correct steps in concrete slabs, pre-cast concrete structures, or in timber decking, between the internal and external areas shall be formed. The height of the step will be relevant to the distance of the outlets or gutters from thresholds and walls etc. to allow for screeds to falls, the waterproofing systems and trafficable finishes. The height of all damp-proof courses (DPCs), whether straight in solid walls or stepped as in cavity walls, must be at the level of the top of all waterproofing turn-ups. (They shall not be below the turn-up).

4.3.5.3 In regions of extreme weather conditions (e.g. coastal regions) it is recommended that where DPCs interface with waterproofing systems on flat roofs, balconies, terraces and parking decks etc.

that the membrane used as the DPC should be the same type as the main waterproofing system and overlapped and bonded onto the main waterproofing turn-ups. (Creating a continuous damp-proof course and waterproofing system.)

4.3.5.4 The waterproofing system must be taken underneath all aluminium and timber door thresholds and dressed up the back of the frames or solid angles, higher than the level of external finishes. There shall be no fixings of the frames through the horizontal waterproofing. The waterproofing system underneath the door frames shall link onto the stepped DPCs in the cavity walls or the turn-ups of the waterproofing system against the walls.

4.3.5.5 The waterproofing system shall be taken to the outside edge of all perimeter upstands, parapet walls, etc., and turned down the outside face of the structure by 50 mm.

4.3.5.6 Where other structures, such as planter boxes, water features, brick benches etc., are to be constructed on balconies, terraces and parking decks etc., the roof deck areas shall be totally waterproofed first. The ancillary structures shall then be constructed on top of the waterproofed areas. Where structures are to be built against solid walls, or cavity walls, the waterproofing system shall be taken above the finished heights of such structures, terminated and interfacing with the straight or stepped DPCs in accordance with 4.3.4.5 and 4.3.5.2.

4.3.5.7 All balustrades fixed on the edges of flat roofs, balconies, terraces parking decks etc. shall be waterproofed first before fixing balustrade posts. Balustrade posts shall be suitable flashed and counter flashed to the water proofing system in accordance with the manufacturer's requirements.

NOTE It is recommended that the posts have base plates and are securely fixed, sandwiching the waterproofing system.

4.3.5.8 All expansion joints shall not go across the falls and must be raised out of the water table onto upstands.

4.3.5.9 Any waterproofing systems shall be installed by a competent installer approved by the manufacturer and strictly in accordance with the manufacturer's requirements.

NOTE For Waterproofing/tanking below ground refer to SANS 10400-K.

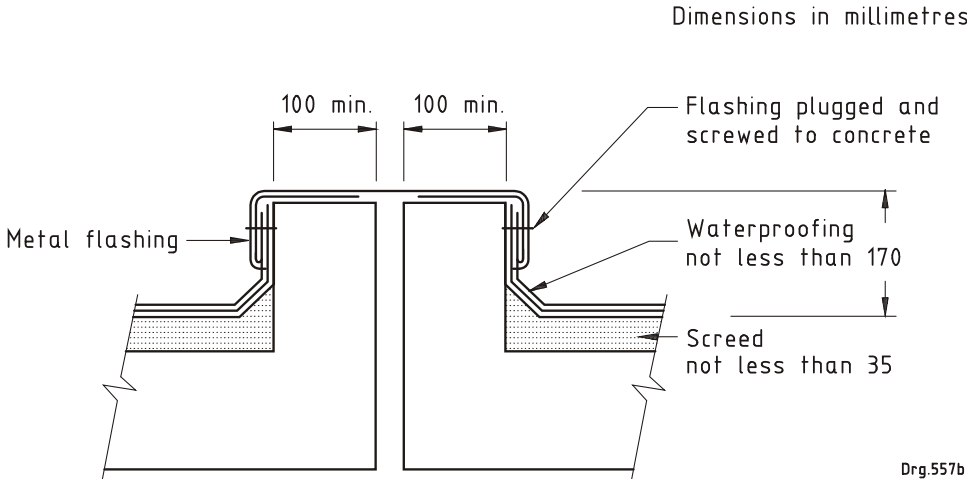


Figure 3 — Twin kerb detail at expansion joint in concrete

4.4 Timber roof construction

NOTE Steel roof assembly is covered by SANS 10400-B as a rational design.

4.4.1 Sawn timber construction (softwood and hardwood)

NOTE Only the commonly available sizes and grades of sawn structural timber (in accordance with SANS 1783-2 and SANS 1707-1 and laminated timber (in accordance with SANS 1460) are given in this part of SANS 10400. The designer should always confirm that the required sizes and grades are currently available in the required quantities. It is especially advisable to check the availability of the 50 mm × 228 mm and 76 mm × 228 mm sizes before specifying these sizes.

4.4.1.1 General

4.4.1.1.1 The recommendations of 4.4.1 apply only to sawn timber roof assemblies that

a) are not subjected to snow loading for a continuous period of 24 h;

b) have trusses that

1) are of the Howe type (see 4.4.1.2), and either mono-pitched or double-pitched, with a clear span that does not exceed 4,0 m or 8,0 m, respectively,

2) are fully triangulated,

3) are used in gable-to-gable construction without any hips or valleys,

4) have roof pitches within the following limits:

i) tiles and slates: between 17,5° and 35°;

ii) metal or fibre-cement sheets: between 15° and 30°;

iii) metal tiles: between 15° and 30°.

5) are supported at the heel joint or at the intersection between a web member and the bottom chord (tie beam) at the end of a truss, and at no other intermediate position (two supports only);

6) are supported at one heel joint and supported at an interior node provided that the length of the cantilever does not exceed 20 % of the span of the truss;

7) Mono-pitched trusses shall not be cantilevered at the high end, and

c) have purlin beams or purlin rafters that have a clear span that does not exceed 8,0 m.

d) and where the maximum wall height shall be in accordance with SANS 10400-K.

4.4.1.1.2 All sawn timber roof and ceiling assemblies shall

a) be constructed in accordance with the requirements of SANS 2001-CT2, SANS 10243, or SANS 10400-B, as applicable,

b) comply with the relevant requirements of SANS 1460, SANS 1783-2 or SANS 1783-4, SANS 1707-1 or SANS 1707-2 and be structurally graded and face-marked in red with the appropriate grade mark, and

c) be treated in accordance with the requirements of 4.4.1.1.3.

4.4.1.1.3 All timber used in a roof structure shall be preservative-treated against the effects of fungal decay and insect attack, in accordance with SANS 10005 and SANS 1288 when used in the areas specified, i.e. in the case of softwoods within the municipal boundaries (coastal areas) identified in figures 4, 5, 6 and 7, and in the case of hardwoods within the borders of South Africa.

The cut areas of treated timber shall be treated with a suitable and registered remedial or supplemental brush-on wood preservative. During transport and installation, impregnated timber shall be protected and so handled that the impregnated shell is not broken through, and the timber is not damaged in any way that might reduce the effectiveness of the preservative.

4.4.1.1.4 The spacing of trusses, rafters and purlins or battens for the different roof coverings shall be in accordance with table 9, or be subject to a rational design.

4.4.1.1.5 Trusses, rafters and purlin beams shall be supported on wall plates of minimum size 38 mm × 76 mm or similar flat bearing surfaces which are levelled and positioned so as to ensure that the ends of such members are vertically aligned. Alternatively, trusses, rafters and purlin beams shall be supported on hangers twice bolted to walls with masonry anchors. Hangers joining timber to timber shall be either nailed in each hole with 32 mm long serrated wire nails or bolted with 12 mm diameter bolts in the holes provided, in accordance with the manufacturer's specifications.

4.4.1.1.6 Pre manufactured hangers shall have the manufacturer's name and load capacity indelibility marked on each connector.

4.4.1.1.7 Metal masonry anchors shall be corrosion resistant, have a diameter and length of not less than 10 mm and 75 mm, respectively, and shall be installed in accordance with the manufacturer's instructions. Such anchors, when embedded in grade 20 concrete for standard test purposes, shall have a safe working load in shear of not less than 2,5 kN certified by the manufacturer.

Figure 4 — Municipal boundaries – Section of KwaZulu – Natal Province

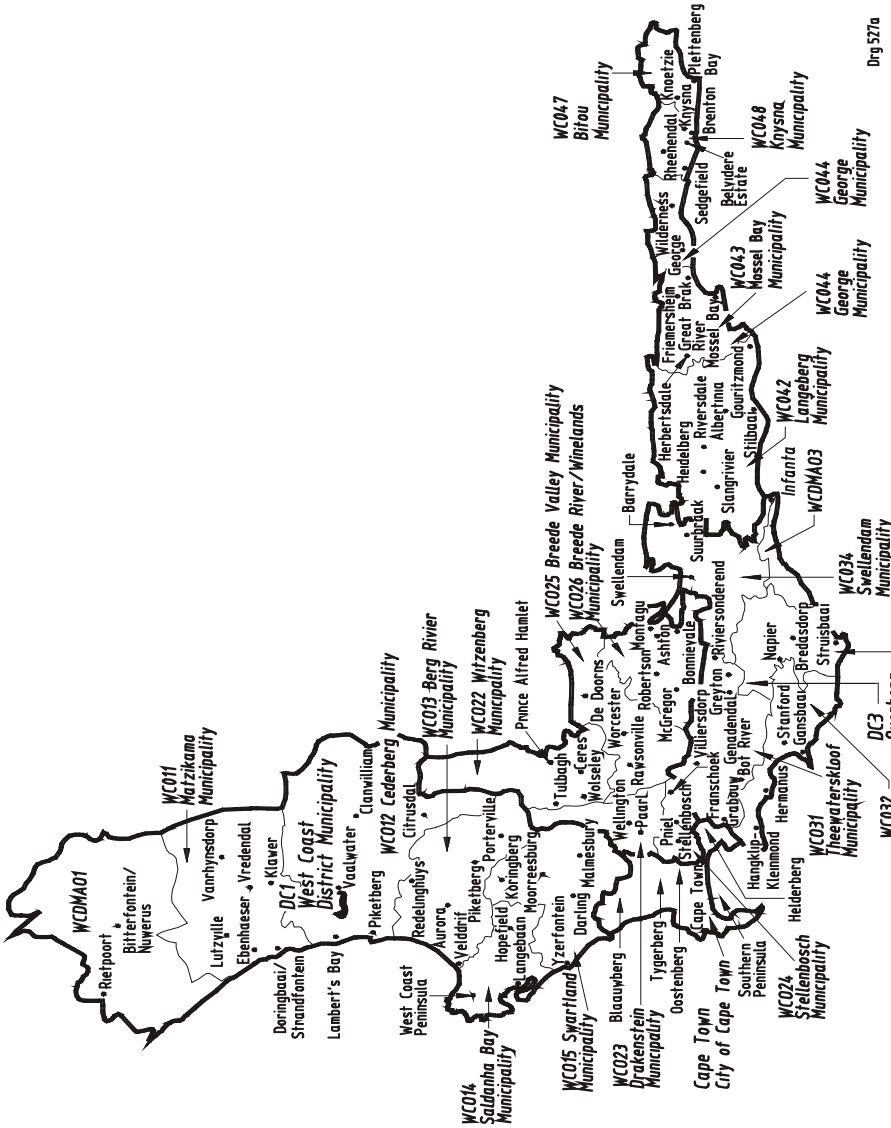


Figure 5 — Municipal boundaries – Section of Western Cape Province

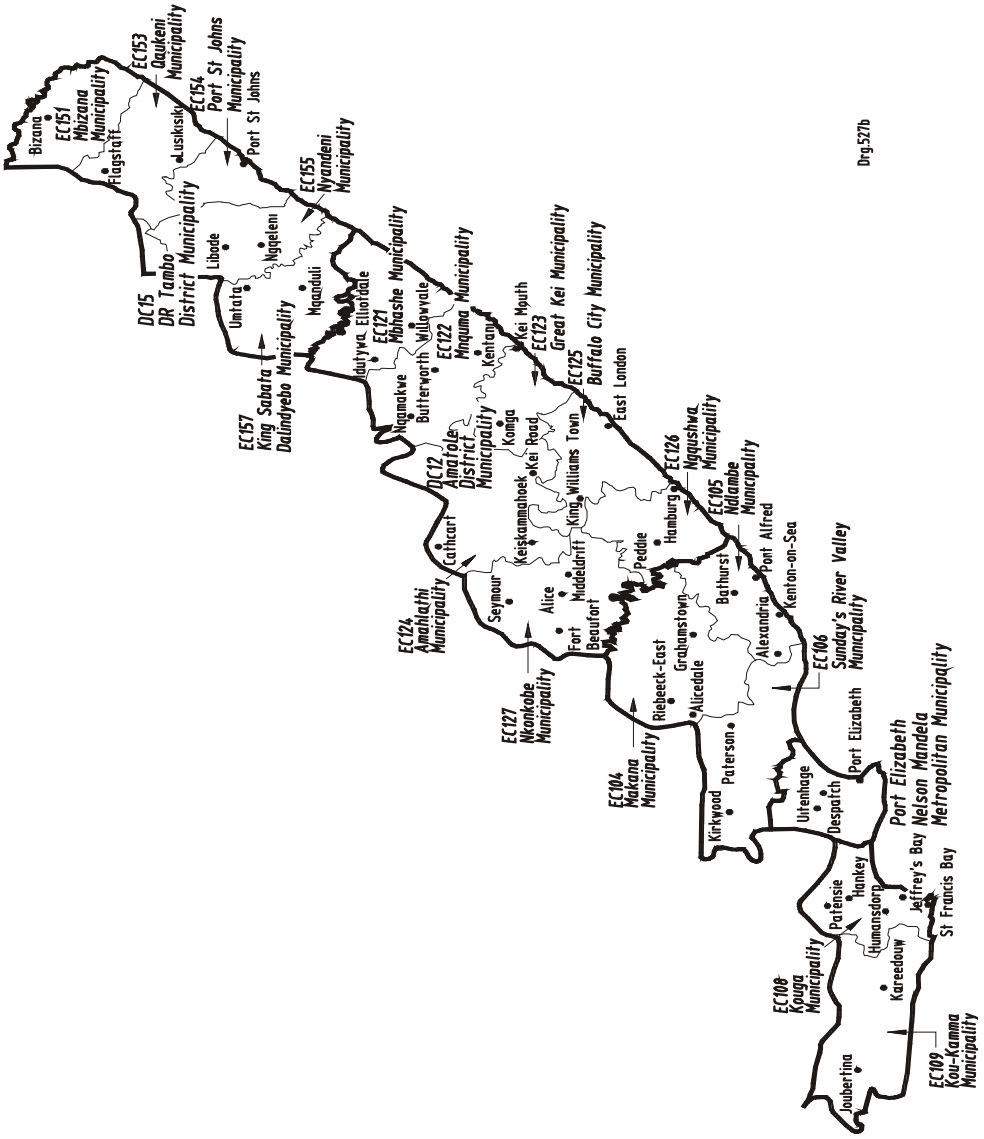


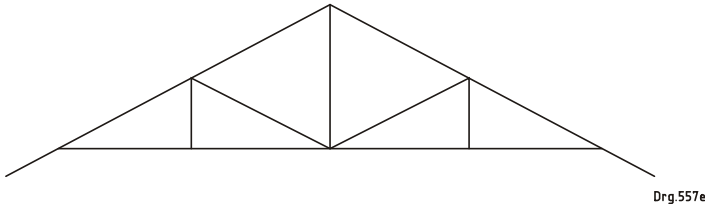
Figure 6— Municipal boundaries – Section of Eastern Cape Province

Figure 7 — Municipal boundaries — Section of Northern Cape Province

4.4.1.2 Trusses

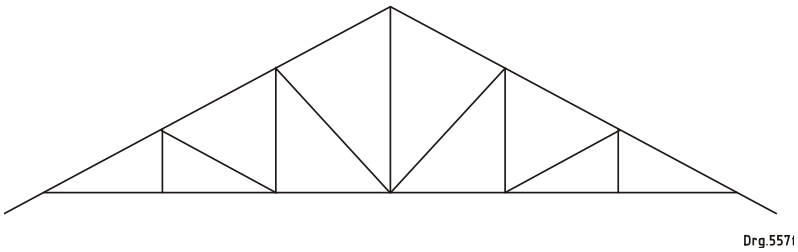
4.4.1.2.1 Mono-pitched and double-pitched nailed and bolted trusses shall be of the Howe type (see figure 8), with the number of bays, bolts at connections, timber sizes and grades, roof pitches and centre-to-centre spacing in accordance with table 9 and figure 9, provided that no panel or web of any truss shall have a length greater than 60 times its least dimension.

NOTE The requirement (member not to exceed 60 times least dimension) limits the length of 38 mm thick members to 2 280 mm. This limitation can, depending upon the pitch of the roof, limit the span of a truss. For example, a 35 mono-pitched tiled roof, with trusses made from 38 mm × 114 mm material, will have a span that does not exceed 3,42 m.

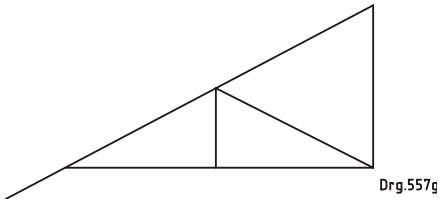


a) Four-bay Howe truss — Maximum clear span of 6 m

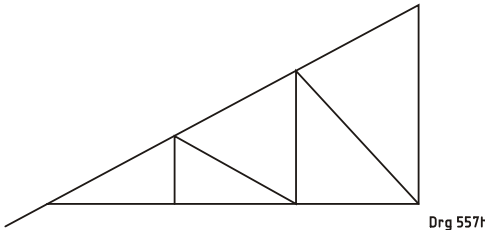
b) Figure 8 — Howe trusses



b) Six-bay Howe truss — Maximum clear span of 8 m



c) Two-bay mono-pitched Howe truss — Maximum clear span of 3 m



d) Three-bay mono-pitched Howe truss — Maximum clear span of 4 m

NOTE 1 No member of any truss should have a length greater than 60 times its least dimension.

NOTE 2 See table 9 and figures 15 and 18 for member sizes and bolt arrangements at heel and splice joints.

Figure 8 — Howe trusses *(concluded)*

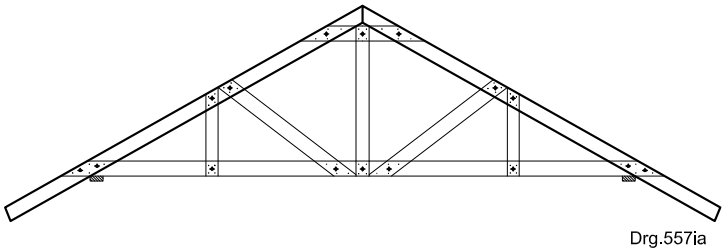
Table 9 — Howe-type roof trusses

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Roof covering	**Pitch of truss** degrees			**Maximum clear span** m	**Maximum centre-to-centre truss spacing** mm	**Bolts at heel and splice joints (number × type)[a]**	**Member sizes and grade of timber in accordance with SANS 1783-2[b, c]**						**Number of bays**
							Top Chord[d]		**Bottom Chord**		**Web**		
	Minimum	**Maximum**	**Recommended**				**Size** mm	**Grade**	**Size** mm	**Grade**	**Size** mm	**Grade**	
Tiles and slates with 38 mm × 38 mm battens spaced at centres that do not exceed 345 mm maximum, and in accordance with the manufacturer's instructions	17,5	35	26	3,0 4,0 5,0	760 (650 where slates or tiles have a self-mass in excess of 55 kg/m^2)	2 × M12	114 114 114	5	114 114 114	5	114	5	4 4 4
				6.0 6.5 7,0 7,5 8,0		3 × M12	152 152 152 152 152		152 152 152 152 152				6 6 6 6 6
Metal or fibre-cement sheets with 50 mm × 76 mm purlins on edge spaced at centres that do not exceed 1 200 mm (see manufacturer's recommendations for maximum spacings for different sheeting and thicknesses)	15	30	17,5	3,0 4,0 5,0	1 200	2 × M12	114 114 114	5	114 114 114	5	114	5	4 4 4
				6.0 6.5 7,0 7,5 8,0		3 × M12	152 152 152 152 152		152 152 152 152 152				6 6 6 6 6

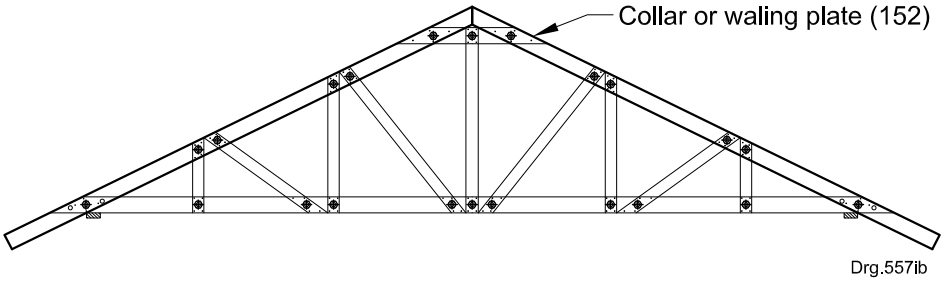
Table 9 *(concluded)*

a	Heel joints shall have 2 or 3 × M12 bolts per joint with 36 × 3.6 mm washers at each end.
b	All timber members shall have a thickness of 38 mm (36 mm if planed).
c	The maximum overhang of a 114 mm Top Chord is 600 mm. The Top Chord needs to be increased to 152 mm if the overhang is greater than 600 mm but less than or equal to 900 mm. The length of the overhang shall not exceed 900 mm.
d	Bolts shall be 12 mm. Bolts conform to SANS 1700-7-1. Cup head bolts are not allowed. Bolts should have 36 × 3,6 mm washers under both the head and the nut.

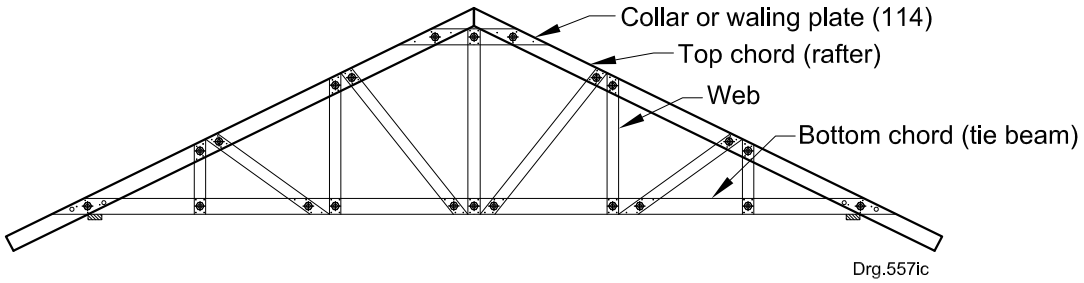
NOTE For any roof covering not referenced above, or any change to the recommended batten or purlin spacing, the manufacturer should be consulted, and the roof truss design should be a considered a rational design.



9(a) 4 bay Howe Truss with 114 members



9(b) 6 Bay Howe Truss with 152 members



9(c) 6 Bay Howe Truss with 114 members

Bolts shall have a diameter of 12 mm and have washers 36 × 3,6 mm under both the head and the nut. Nails shall have a length of 100 mm and shall be clinched over.

Figure 9 — Howe truss joint details

4.4.1.2.2 Bolts and nails, unless otherwise directed, shall not be located closer to the edge of the members than the distances shown in figure 15.

4.4.1.2.3 Trusses shall be supported only at the heel joints (and not on internal walls) as shown in figure 16, except where walls are set back and where extra web members are provided in accordance with figure 17. The setback shall not be more than 20 % of the span.

4.4.1.2.4 Splices may be provided in the tie beam (bottom chord) in accordance with figure 18.

4.4.1.2.5 Roof trusses shall be tied down to the supporting walls and columns by means of a galvanized steel strap or galvanized steel wires which are built into the walls in accordance with figure 19.

NOTE See SANS 10400-K. for additional clarity.

4.4.1.2.6 Rafter (top chord) bracing shall be in accordance with the details shown in:

a) figures 20(a), 21 or 22, and 24, if applicable, in respect of tiled roofs with the connection of diagonal bracing at the wall plate for stub-ended trusses in accordance with figure 17; and

b) figure 20(b), in respect of sheeted roofs.

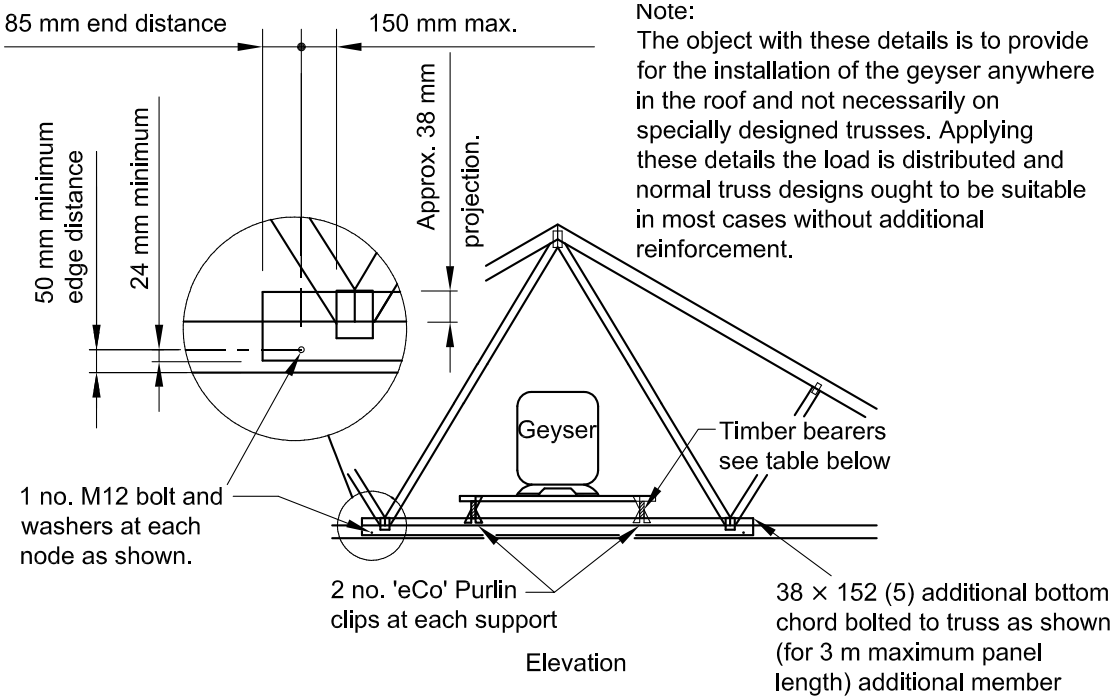
4.4.1.2.7 Bottom chord bracing shall be in accordance with figure 25.

4.4.1.2.8 Permanent continuous runners of size 38 mm × 76 mm shall be provided and fixed to the bottom chord at the centre of each bay where no boarded ceiling, in accordance with the requirements of 4.4.1.6, or timber ceiling is provided.

4.4.1.2.9 Trusses which are not supported at heel joints (see figure 17) shall have runners installed in accordance with figure 26 with cross bracing at intervals that do not exceed 10 m, or T-bracing on each additional web as shown in figure 17.

4.4.1.2.10 It is recommended that water tanks and hot water geyser installations should not be placed in the roof space. Where it is necessary to position these in the roof space, they shall be supported on bearers on internal walls. Where there are insufficient internal walls to support these bearers, the water tank or hot water geyser may be supported on trusses by using a platform. If the geyser capacity exceeds 250 L, a rational design shall be required and shall be certified by a competent person.

NOTE The “deemed-to-satisfy” solution is as shown in figures 10, 11, 12 and table 10.



Note:
The object with these details is to provide for the installation of the geyser anywhere in the roof and not necessarily on specially designed trusses. Applying these details the load is distributed and normal truss designs ought to be suitable in most cases without additional reinforcement.

Geyser capacity (Litres)	Total load including water (Newtons)	Timber bearer sizes		
		750 mm Truss c/c	1 000 mm Truss c/c	1 500 mm Truss c/c
100	1 442	38 x 114 (5)	38 x 114 (5)	38 x 152 (5)
150	2 200	38 x 114 (5)	38 x 114 (5)	38 x 152 (5)
200	2 680	38 x 114 (5)	38 x 114 (5)	38 x 152 (5)
250	3 340	38 x 152 (5)	38 x 152 (5)	38 x 152 (5)

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Figure 10 — Elevation and detail of geyser in roof-space

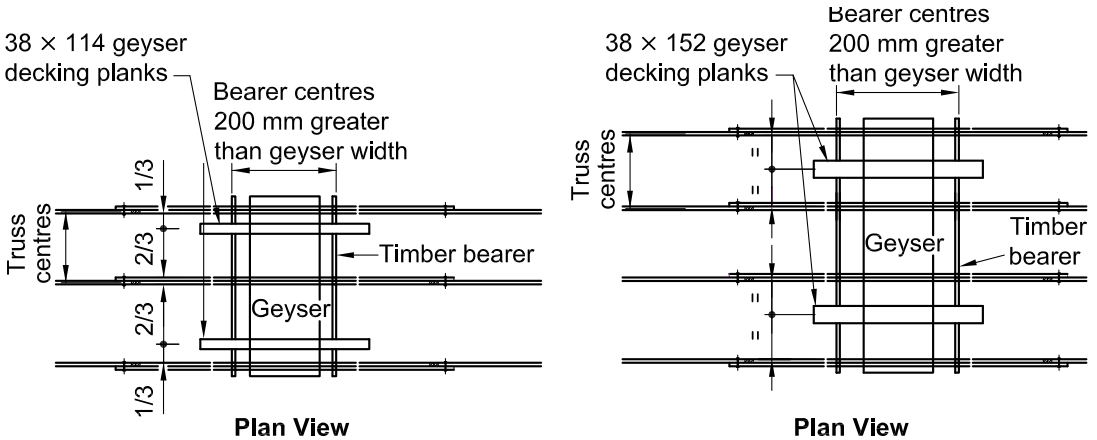

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Figure 11 — Geyser support deck

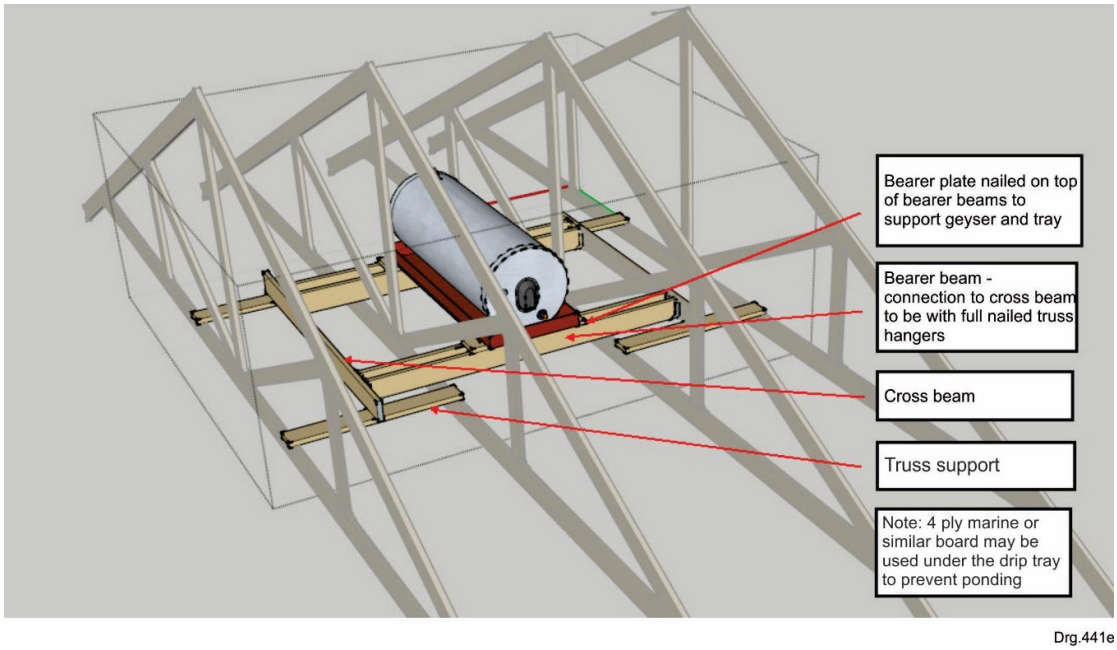


Figure 12 — Geyser placed parallel with trusses

Table 10 — Timber sizes relative to geyser capacity

1	2	3	4	5
Geyser capacity	**Bearer plate**	**Bearer beam**	**Cross beam**	**Truss support**
< 150 L Tiled roof	38 × 114	38 × 114	38 × 114	38 × 114
>150 L < 250 L tiled roof	38 × 152	38 × 152	38 × 152	38 × 152
< 150 L sheeted roof	38 × 114	38 × 152	38 × 114	38 × 152
'>150 L < 250 L sheeted roof	38 × 152	38 × 152	38 × 152	50 × 114

4.4.1.2.11 Where solar geysers, or solar hot water absorber panels, for system larger than 250 L, solar collectors or photovoltaic panels, are to be placed on the roof structure.

4.4.1.2.12 The installation shall be in accordance with SANS 10106 for solar geysers and collectors and SANS 1307 for associated frames and stands.

4.4.1.2.13 The installation shall be in accordance with SANS 959-1, as applicable, for photovoltaic panels.

4.4.1.2.14 The penetration of any pipes through the roof covering shall be, lagged in accordance with the requirements of SANS 10400-XA, suitably flashed and counter-flashed to prevent the ingress of water into the roof space.

4.4.1.2.15 Integrated solar geysers or solar hot water absorber panels, for a 250 L or less system, shall be installed as below or be the subject of a rational design by a competent person.

NOTE The provisions of 4.4.1.2.11 (a), (b) and (c) will apply.

4.4.1.2.16 The solar geyser shall be supported at a minimum of 4 points, spread out over the area of the collectors.

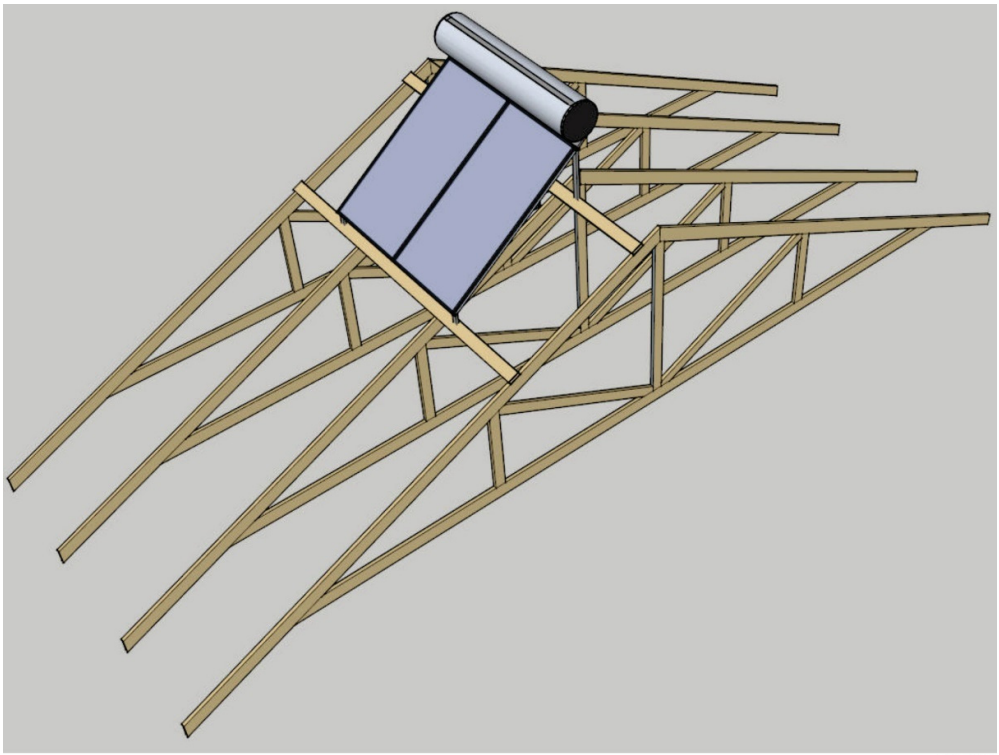
4.4.1.2.17 A spreader beam shall be placed under the top and bottom of the installation. This 50 × 111 beam on flat shall be treated with CCA or Boron. As an alternative Light Weight galvanized Steel or Anodised Aluminium profile which can distribute the weight, may be used (90 × 40 × 0,8 Lipped C-Section ISQ 550 or equivalent). A neutral gasket shall be placed between contact points of metal to metal or metal to timber.

4.4.1.2.18 The beam shall extend at least over 4 trusses for concrete tiled roofs (2 400 mm) or over 3 trusses for a sheeted roof (2 500 mm). See annex C.

4.4.1.2.19 In the case of a sheeted roof, the beams shall coincide with the position of the purlin.

4.4.1.2.20 The beams shall be secured to the roof. This can be done on a tiled roof by using a galvanised strap taken under the tile and secured to each roof truss, and for a sheeted roof with a galvanized self-drilling (self-tapping) drive screw, through the beam, the sheeting, through a spacer under the profile of the sheet and into the purlin. The drive screw should be at least 150 mm × 8 mm.

4.4.1.2.21 The spreader beams shall be placed over the roof covering.



NOTE 1 It is difficult to specify solutions which will accommodate all situations of roof coverings, spans, pitches etc.

NOTE 2 The use of a treated timber support beam over sheeting could lead to accelerated corrosion of the sheeting due to wet conditions between the timber and the contact area of the sheeting. A neutral gasket needs to be placed between the support beams and any contact points, and it is important that maintenance of the sheeting be undertaken at regular intervals to ensure no blocking or damming up of water will occur.

Figure 13 — Typical solar geyser installation (roof covering omitted for clarity)

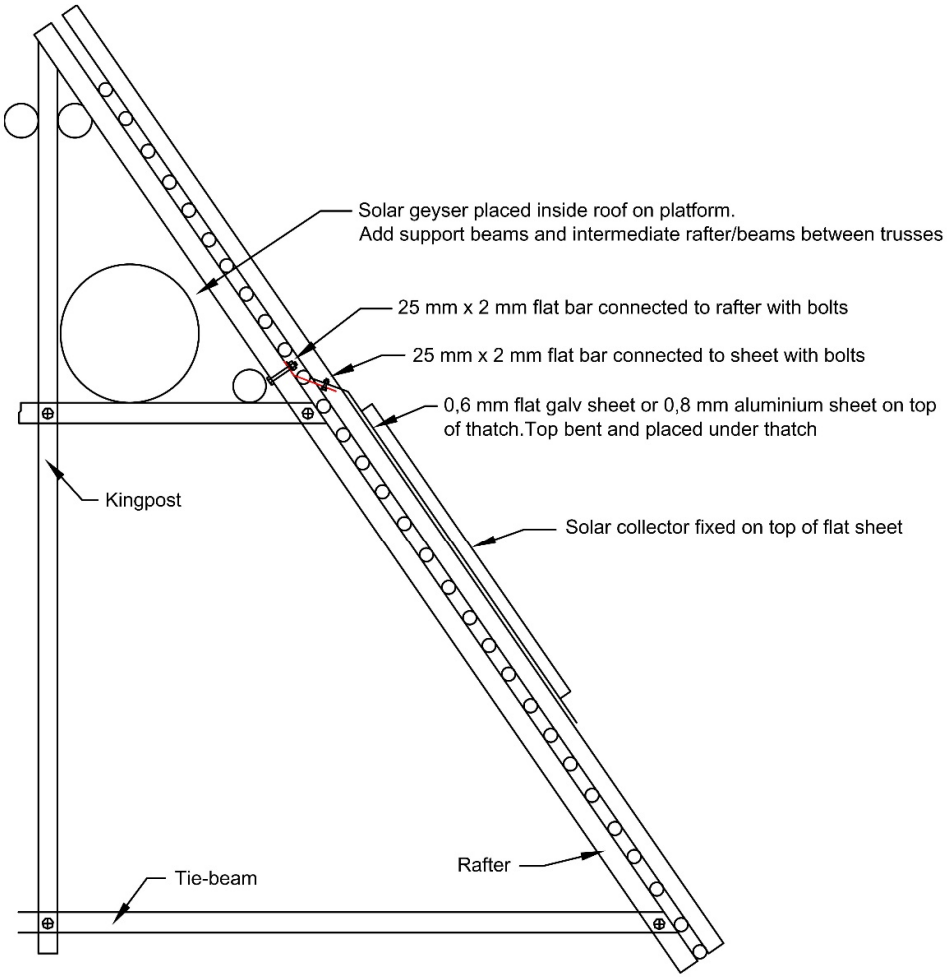


Figure 14 — Typical solar water heater installation on a thatched roof

4.4.1.3 Rafter beams

4.4.1.3.1 Rafter beams shall be in accordance with tables 11 to 15.

4.4.1.3.2 Rafters shall be tied down to the supporting walls and columns by means of a galvanized steel strap or galvanized steel wires which are built into the walls in accordance with figure 19.

NOTE Refer to SANS 10400-K for additional clarity.

4.4.1.4 Purlin rafters and purlin beams

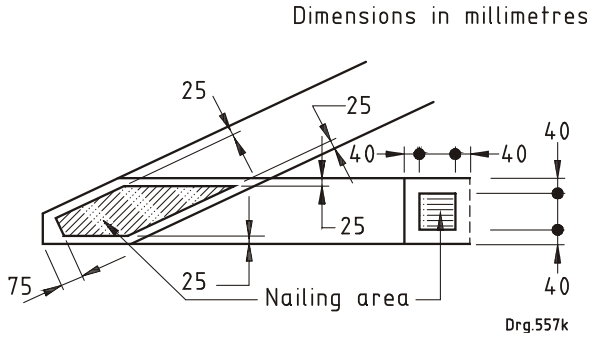
4.4.1.4.1 Where pitched trusses or rafters are not used to support the roofing sheets, purlin beams or purlin rafters shall be in accordance with tables 11 to 15 and erected at the required pitch (see figure 27).

NOTE 1 Purlin beams and purlin rafters are members which double as purlins. This form of construction is only practical for sheeted roofs.

NOTE 2 It is impractical to fix sheeted roofs to purlins of width less than 45 mm. For this reason, members of width less than 32 mm and 38 mm are not included in tables 11 to 15.

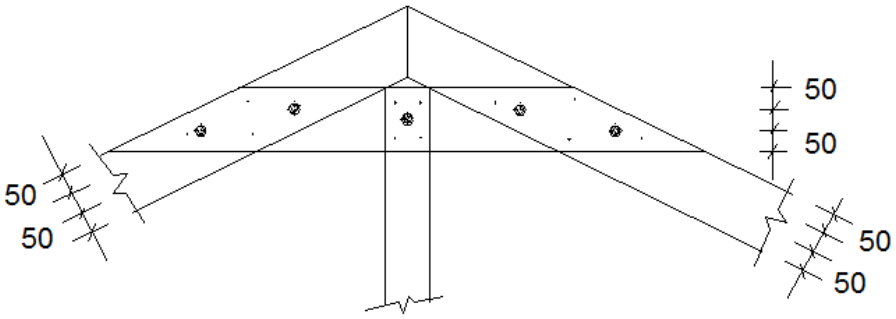
4.4.1.4.2 Purlin rafters and purlin beams shall be tied down to the supporting walls and columns by means of a galvanized steel strap or galvanized steel wires which are built into the walls in accordance with figure 19.

NOTE Refer to SANS 10400-K for additional clarity.



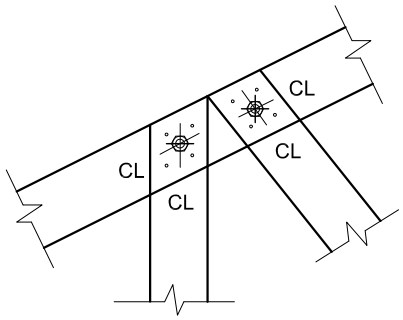
4.4.1.4.3 Nails shall be spaced at least 20 mm away from each other.

a) Minimum nail spacing

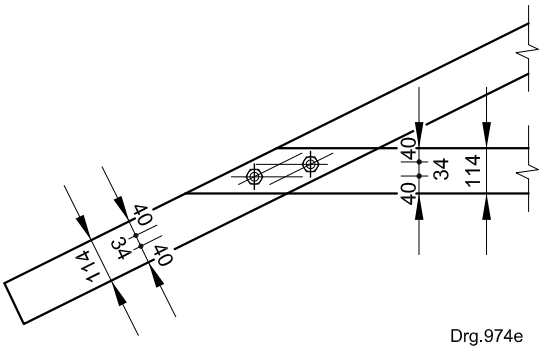


b) Default collar detail

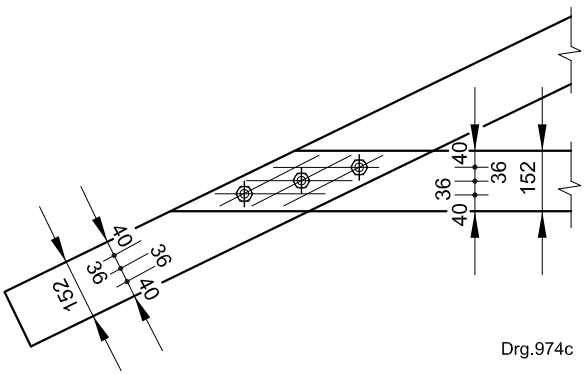
Figure 15 — Nail and bolt spacing in joints between timber members



c) Typical joint details with bolt position dimensions

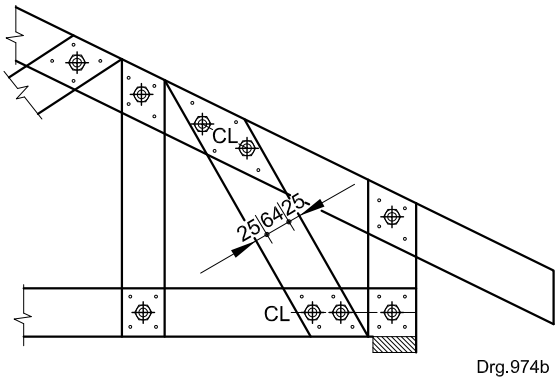


d) Typical heel joint details – 114 members with details

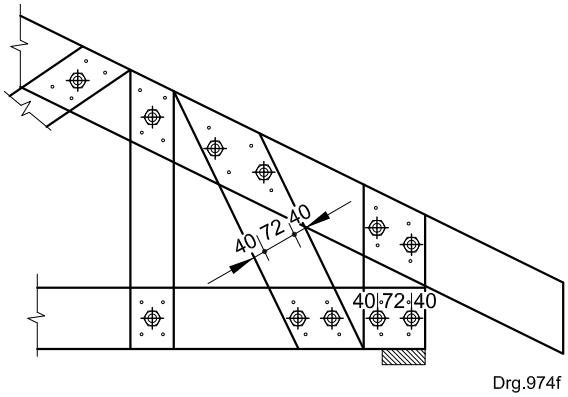


e) Typical heel joint details – 152 members with dimensions

Figure 15 — Nail and bolt spacing in joints between timber members *(continued)*



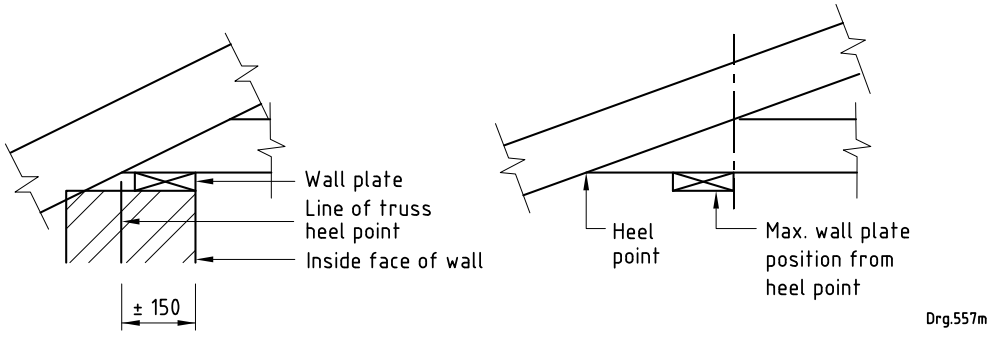
f) Cantilever or stud detail – 114 members with dimensions



g) Cantilever or stud detail – 152 members with dimensions

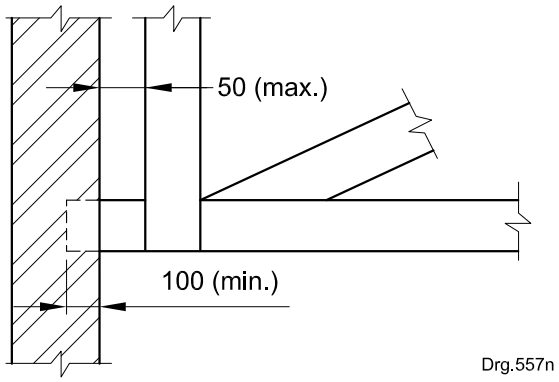
Figure 15 — Nail and bolt spacing in joints between timber members *(concluded)*

Dimensions in millimetres



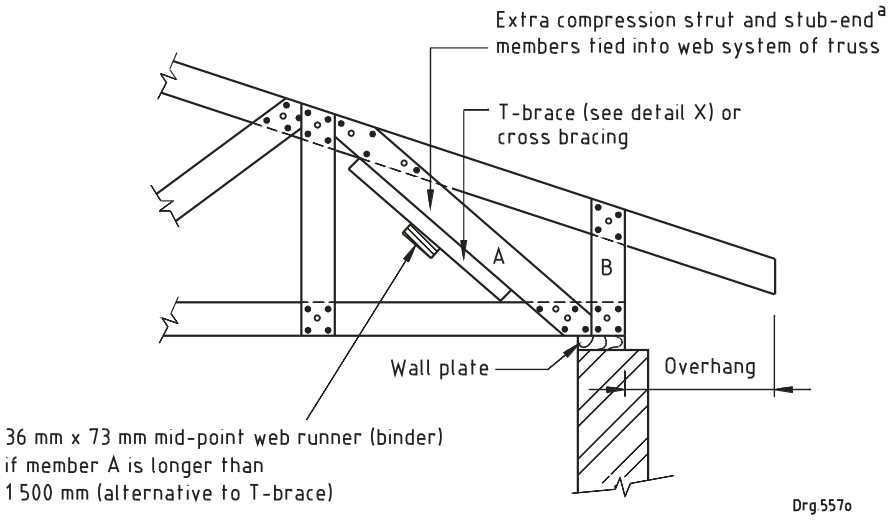
a) Position of wall plates at heel points

Figure 16 — Truss supports



b) End bearing of mono-pitched trusses

Figure 16 — Truss supports *(concluded)*



a) Stub-end trusses

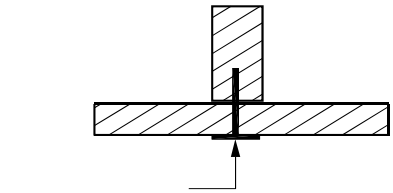
Member A and member B shall be the same size and grade as the top chord. All other web members shall be 111 mm (grade 5). Member A shall be T-braced in accordance with the T-Brace detail X All bolts shall be M12.

[a] Stub end shall be located over a wall plate.

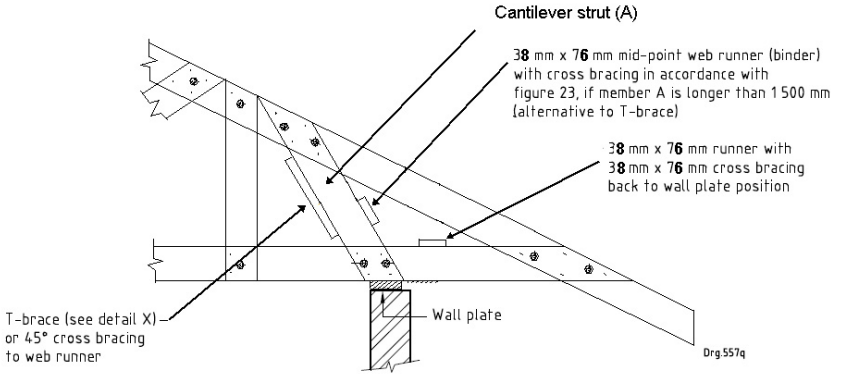
Member A and B shall be the same size and grade as the top chord. Member A shall be T-braced in accordance with the T-Brace detail. All bolts shall be M12 **plus washers.**

36 mm × 73 mm (grade 5)
T- brace

Figure 17 — Supports where truss is not supported at heel joint



b) T-Brace Detail



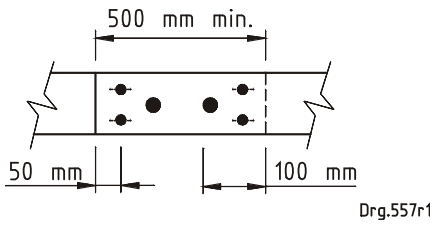
Member A shall be the same size and grade as the top chord. Member A shall be T-braced in accordance with detail X. All bolts shall be M12.

The cantilever support point should be at a node. If this is not possible a cantilever strut (A) must be added

[a] Strut end shall be located over a wall plate.

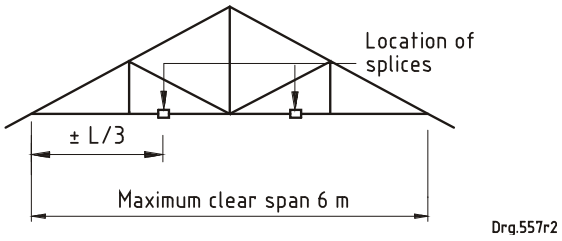
c) Howe truss supported away from heel joint

Figure 17 — Supports where truss is not supported at heel joint *(concluded)*



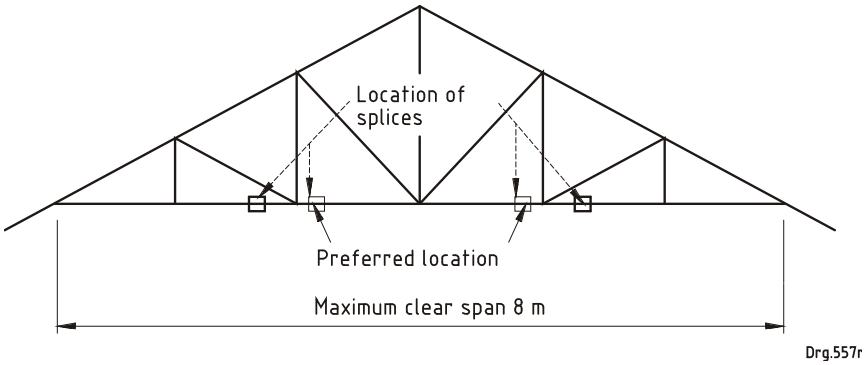
Four 100 mm nails plus two 12 mm diameter bolts + washers

a) Splice detail



b) Double-pitched four-bay Howe truss

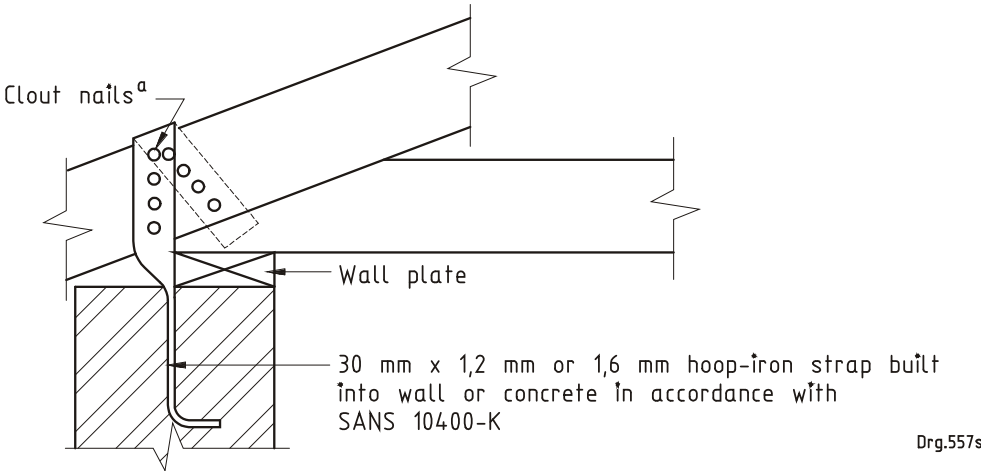
Figure 18 — Splices in Howe trusses



c) Double-pitched six-bay Howe truss

NOTE No splices are permitted in end bays.

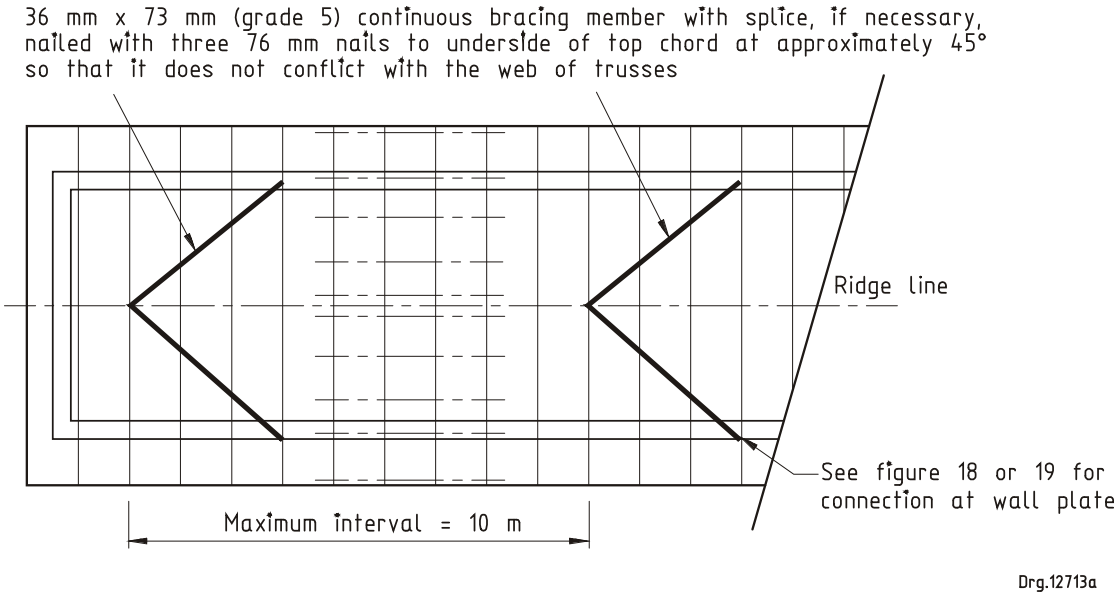
Figure 18 — Splices in Howe trusses *(concluded)*



NOTE A double strand of 2,4 mm diameter galvanized steel wire may be used in place of hoop-iron straps in in heavy roofs only (see SANS 10400-K).

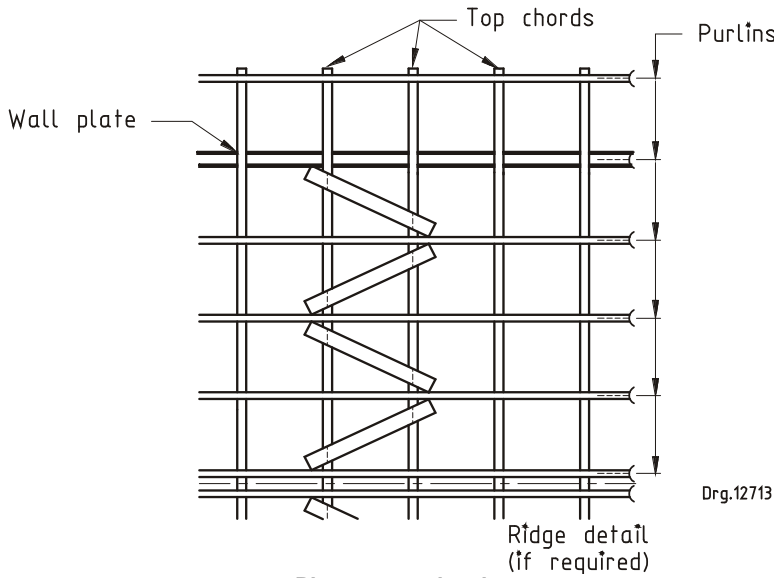
[a] Four 32 mm serrated nails (min.) (for a heavy tiled roof) or eight 32 mm serrated nails (min.) (for a light sheeted roof) or three 75 mm nails.

Figure 19 — Holding-down detail



Plan on top chords

a) Tiled roofs



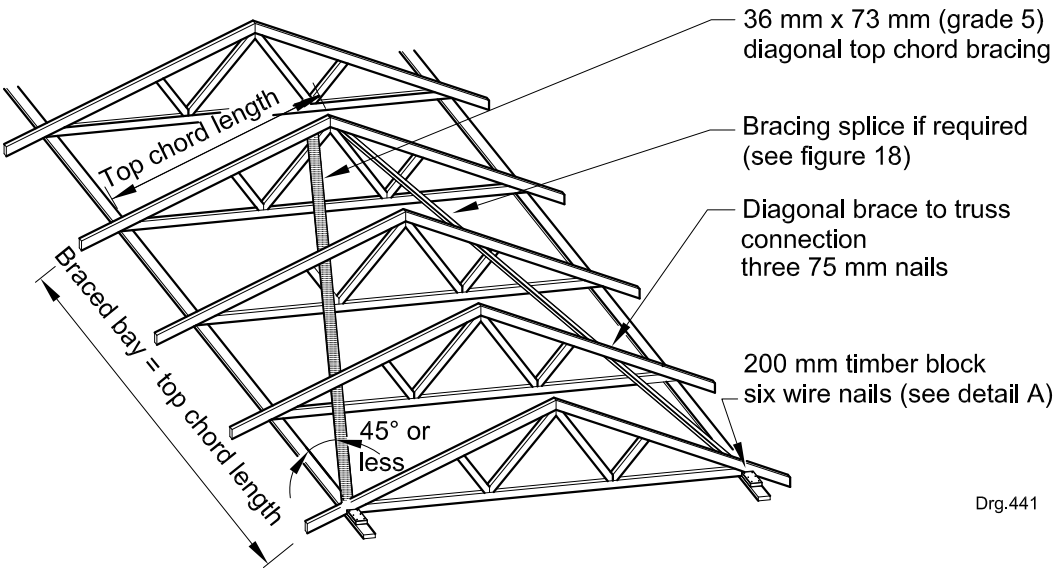
Plan on top chord

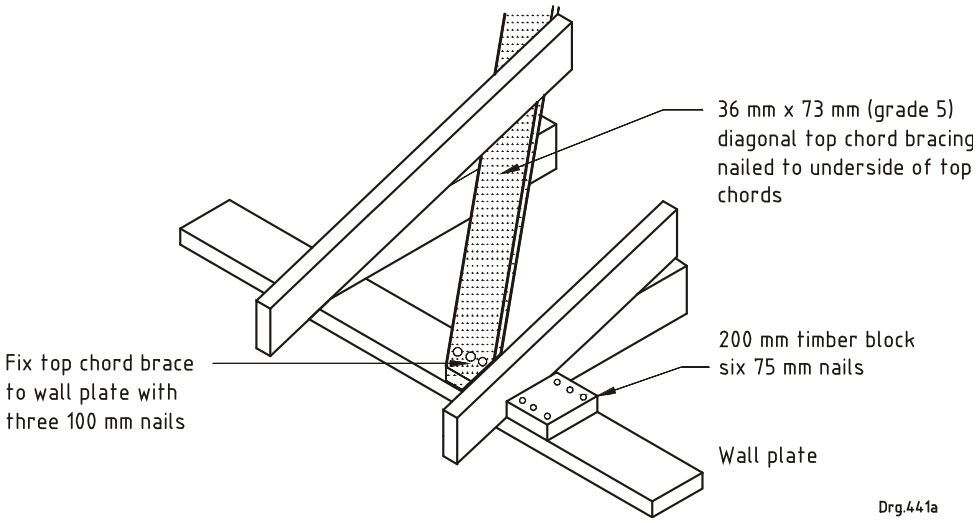
NOTE 1 Bracing should be joined above the wall plate as shown. Three 75 mm wire nails should be provided at each connection. Bracing members shall be 36 mm × 73 mm (grade 5), wire-nailed to the top chord at approximately 45° (“zig-zag” bracing).

NOTE 2 Similar bays should be installed at intervals that do not exceed 10 m.

c) **Sheeted roofs**

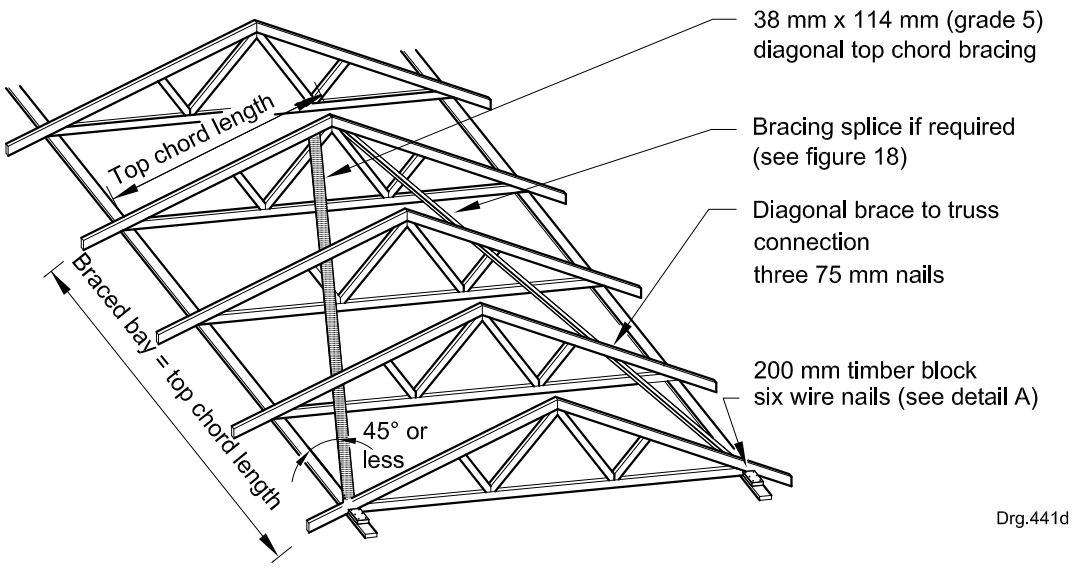
Figure 20 — Top chord bracing for tiled and sheeted roofs that have clear spans that do not exceed 8 m

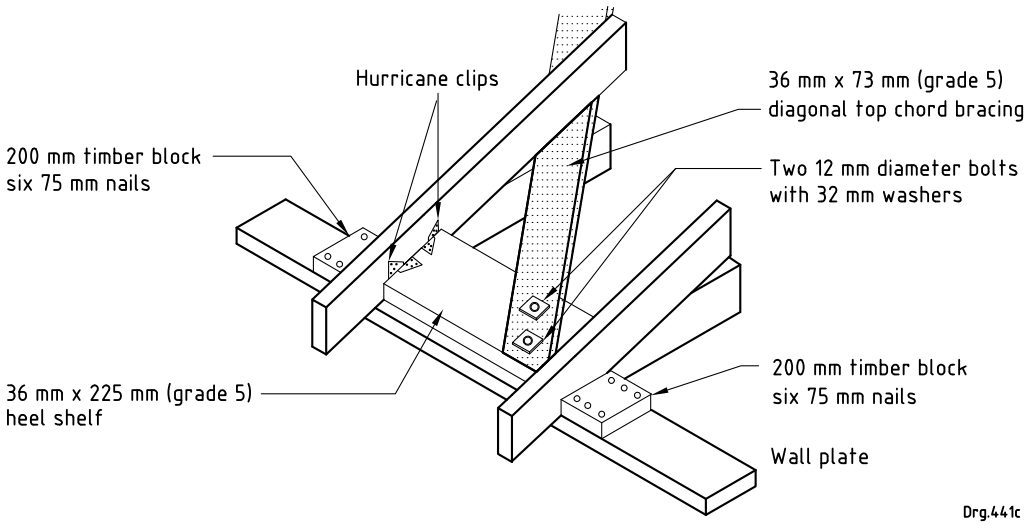




Detail A

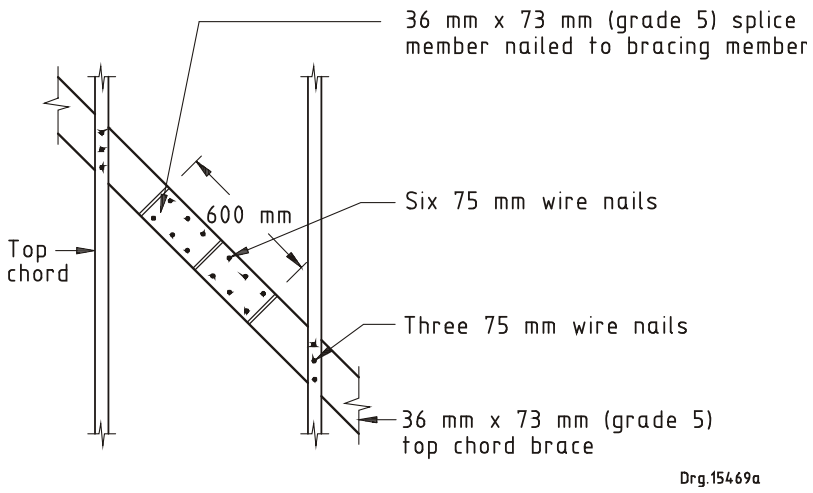
Figure 21 — Top chord bracing connection for tiled roofs that have a clear span that does not exceed 6,6 m



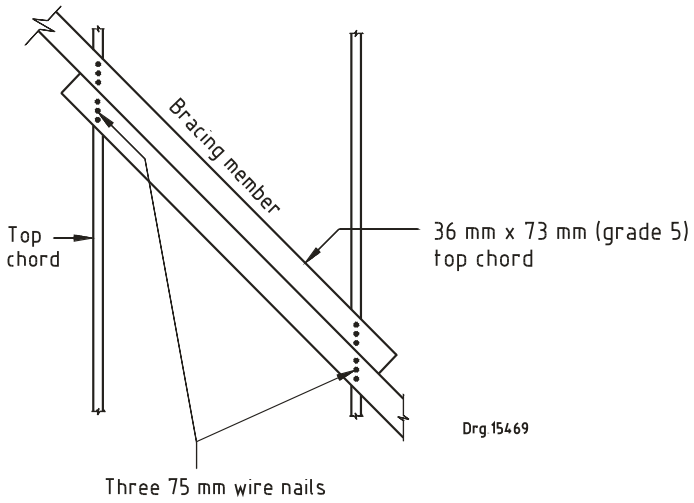


Detail A

Figure 22 — Top chord bracing for tiled roofs that have a clear span that exceeds 6,6 m

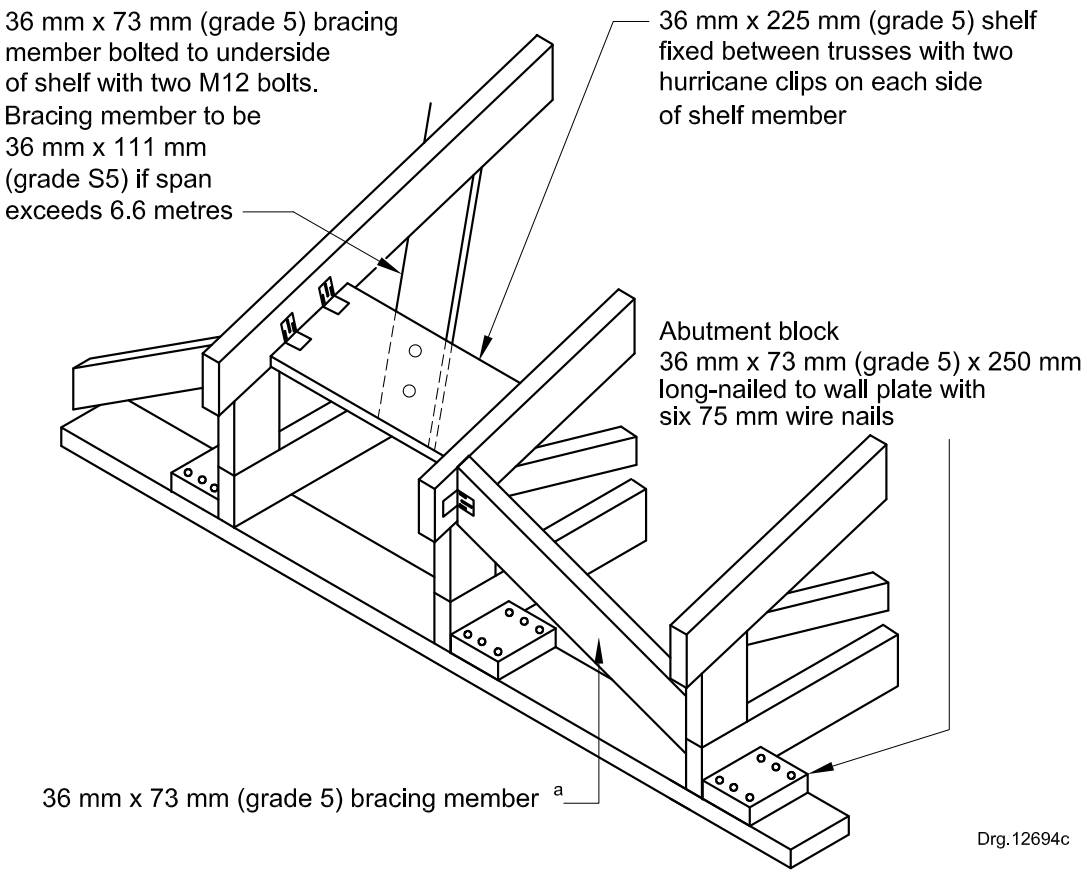


Alternative 1



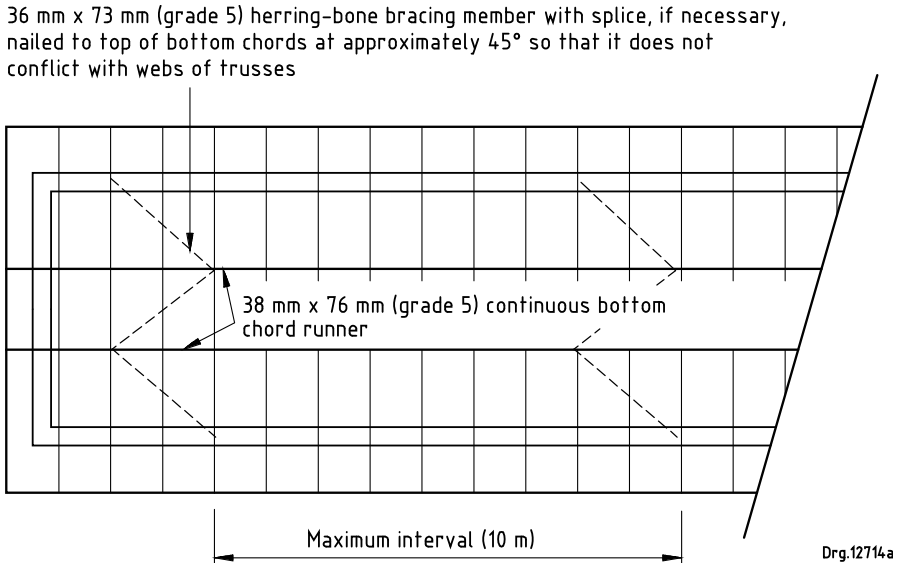
Alternative 2

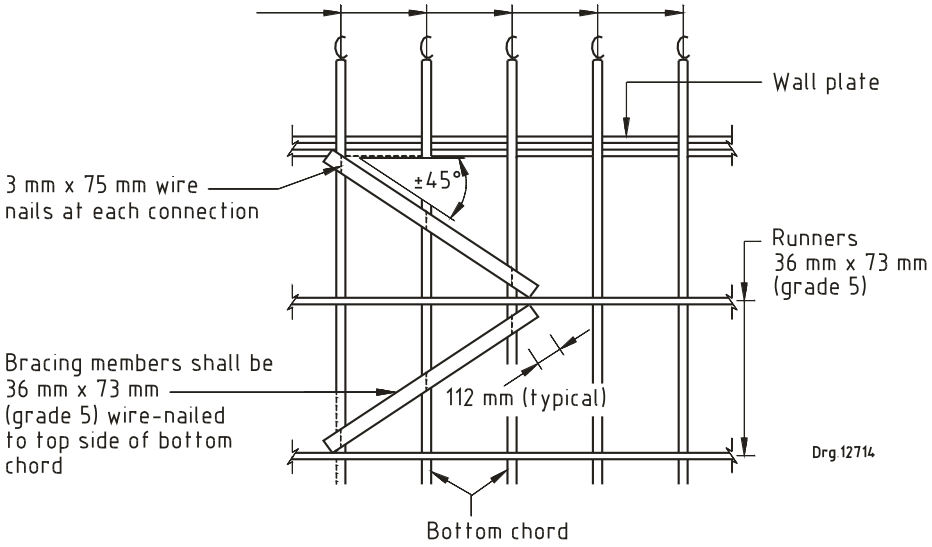
Figure 23 — Details of bracing splices



[a] Provide bracing member on either side of shelf bay complete with abutment block and fixed with four hurricane clips. Where beam infill exists and is structurally sound, these two braces may be omitted.

Figure 24 — Connection of diagonal bracing at wall plate for stub-end trusses

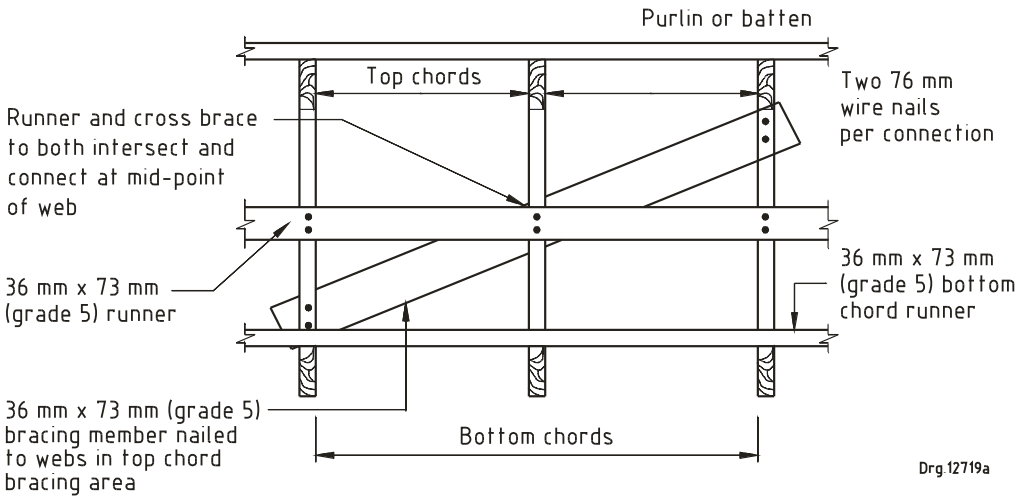




Plan on bottom chords

NOTE There are two 75 mm wire nails at each connection.

Figure 25 — Bottom chord bracing for sheeted and tiled roofs



Runners and cross bracing shall be on opposite sides of webs, where possible (blocking out might be necessary).

Figure 26 — Typical runner/binder and cross bracing

Table 11 — Maximum clear spans for sawn softwood rafter beams that have a pitch of less than 26°

1	2	3	4	5
Nominal timber size mm	**Timber grade**			
	Maximum rafter clear span			
Type of roof covering	**Rafter spacing**			
Tiles or slates[a]	**600 mm**	**760 mm**	**600 mm**	**760 mm**
38 × 114	2,0	1,8	2,2	2,0
38 × 152	2,8	2,4	3,0	2,8
38 × 228	4,3	3,8	4,7	4,3
50 × 152	3,1	2,8	3,4	3,1
50 × 228	4,8	4,4	5,1	4,8
76 × 228	5,4	5,2	–	–
Metal or fibre-cement sheets	**Rafter spacing**			
	1 000 mm	**1 400 mm**	**1 000 mm**	**1 400 mm**
38 × 114	2,2	1,8	2,5	2,1
38 × 152	3,0	2,5	3,5	2,9
38 × 228	4,5	3,8	5,3	4,4
50 × 152	3,4	2,8	4,0	3,4
50 × 228	5,2	4,3	6,0	5,1
76 × 228	6,3	5,3	–	–
Metal tiles	**Rafter spacing**			
	1 000 mm	**1 200 mm**	**1 000 mm**	**1 200 mm**
38 × 114	2,2	2,0	2,6	2,3
38 × 152	3,0	2,7	3,5	3,2
38 × 228	4,5	4,1	4,3	4,8
50 × 152	3,4	3,1	4,0	3,6
50 × 228	5,2	4,7	6,0	5,5
76 × 228	6,3	5,7	–	–

[a] Maximum mass of tiles or slates, including battens or purlins, shall not exceed 65 kg/m^2.

Table 12 — Maximum clear spans for laminated SA Pine rafters that support tiled or slated roofs that have a pitch of less than 26°

1	2	3
Nominal timber size	**Maximum rafter clear span**	
	Rafter spacing	
mm	**600 mm**	**760 mm**
32 × 133[a]	2,0	1,8
45 × 133[a]	2,5	2,2
70 × 133[a]	3,0	2,7
32 × 166	2,6	2,3
45 × 166	3,2	2,8
70 × 166	3,8	3,5
45 × 200[a]	3,9	3,5
70 × 200[a]	4,9	4,2
45 × 233	4,6	4,1
70 × 233	5,3	4,9
70 × 266[a]	6,1	5,7
70 × 300	6,9	6,4
70 × 333[a]	8,0	7,1
70 × 366	8,0	7,8
70 × 400[a]	8,0	8,0
100 × 400	8,0	8,0
Laminated beams shall comply with the requirements of SANS 1460. Laminated beams shall be grade 5 or higher. The maximum mass of tiles or slates, including battens or purlins, shall not exceed 65 kg/m^2.		
[a] Commonly available sizes.		

Table 13 — Maximum clear spans for laminated SA Pine rafters that support profiled metal or fibre-cement sheeting or metal tiles that have a pitch of less than 26°

1	2	3	4	5
Nominal timber size	**Maximum rafter clear span**			
	Rafter spacing			
mm	**750 mm**	**900 mm**	**1 000 mm**	**1 200 mm**
32 × 133[a]	2,5	2,2	2,1	1,9
45 × 133[a]	3,0	2,8	2,6	2,3
70 × 133[a]	3,8	3,5	3,3	3,0
32 × 166	3,1	2,8	2,7	2,4
45 × 166	3,8	3,5	3,3	3,0
70 × 166	4,8	4,4	4,1	3,8
45 × 200[a]	4,6	4,2	4,0	3,6
70 × 200[a]	5,3	5,3	5,0	4,6
45 × 233	5,4	4,9	4,7	4,2
70 × 233[a]	6,7	6,2	5,8	5,3
70 × 266[a]	7,7	7,0	6,7	6,1
70 × 300	8,0	7,9	7,5	6,8
70 × 333[a]	8,0	8,0	8,0	7,5
70 × 366	8,0	8,0	8,0	8,0
70 × 400[a]	8,0	8,0	8,0	8,0
Laminated beams shall comply with the requirements of SANS 1460. Laminated beams shall be grade 5 or higher.				
[a] Commonly available sizes.				

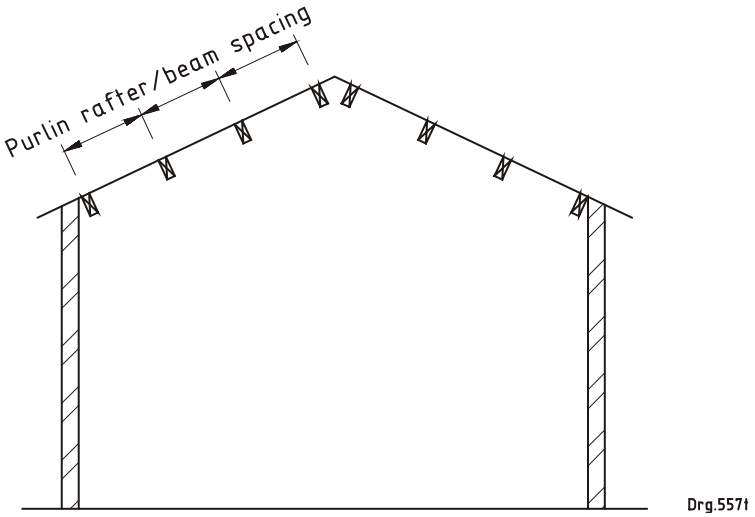


Figure 27 — Typical arrangement of purlin rafter/purlin beam construction
(see tables 11 to 15)

Table 14 — Maximum clear spans for sawn SA Pine/purlin rafters/purlin beams that support profiled metal or fibre-cement sheeting

1	2	3	4	5	6	7	8	9
Nominal timber size	**Maximum clear span**							
	Purlin rafter or purlin beam spacing							
	750 mm		**1 000 mm**		**1 200 mm**		**1 400 mm**	
	Timber grade							
mm	**5**	**7**	**5**	**7**	**5**	**7**	**5**	**7**
50 × 152	4,0	4,7	3,4	4,0	3,1	3,6	2,9	3,4
50 × 228	6,0	6,8	5,2	6,0	4,7	5,5	4,3	5,1
76 × 228	7,2	–	6,3	–	5,7	–	5,3	–

Table 15 — Maximum clear spans for laminated SA Pine purlin rafters/purlin beams that support profiled metal or fibre-cement sheeting

1	2	3	4	5
Nominal timber size	**Maximum clear span**			
	Purlin rafter or beam spacing			
mm	**750 mm**	**900 mm**	**1 200 mm**	**1 500 mm**
45 × 133[a]	3,0	2,8	2,3	2,1
70 × 133[a]	3,8	3,5	3,0	2,7
45 × 166	3,8	3,5	3,0	2,7
70 × 166	4,8	4,4	3,8	3,4
45 × 200[a]	4,6	4,2	3,6	3,2
70 × 200[a]	5,8	5,3	4,6	4,1
45 × 233	5,4	4,9	4,2	3,8
70 × 233	6,7	6,2	5,3	4,8
70 × 266[a]	7,7	7,0	6,1	5,4
70 × 300	8,0	7,9	6,8	6,1
70 × 333[a]	8,0	8,0	7,5	6,7
70 × 366[a]	8,0	8,0	8,0	7,6
70 × 400[a]	8,0	8,0	8,0	8,0
Laminated beams shall comply with the requirements of SANS 1460. Laminated beams shall be grade 5 or higher. [a] Commonly available sizes.				

4.4.1.5 Battens and purlins

4.4.1.5.1 Battens and purlins shall be continuous over at least three rafters (i.e. two rafter spacings) and shall be fixed to every rafter that they cross. Battens of size 38 mm × 38 mm shall be nailed to rafters with 75 mm wire nails and 38 mm × 50 mm battens shall be set on edge with 90 mm wire nails. Purlins shall be fixed to rafters in accordance with figure 28. The sizes and spacing of battens and purlins shall be in accordance with table 9.

NOTE The term “on edge” refers to the purlin being placed such that the bearing surface of the purlin is that of the side having the smaller dimension.

4.4.1.5.2 Battens shall be spliced in accordance with the details in figure 29. The ends of battens and purlins shall be sawn square and butt-jointed centrally over the rafter member so as to provide adequate bearing and fixing. Alternatively, battens may be spliced in close proximity to rafters by means of nailed splices or connector plates.

4.4.1.5.3 Joints in battens shall be arranged so that not more than one batten in three is joined on any one rafter or truss.

4.4.1.5.4 Purlins shall be spliced in accordance with the details shown in figure 30. Splices shall be located in close proximity to rafters and shall be staggered so that there is not more than one splice in three consecutive purlins.

4.4.1.5.5 Purlins and batten splices shall not be located within 1,5 m of the gable ends, or closer than 1.5 m from a ridge line in a hip or closer than 1,5 m to a valley line.

4.4.1.5.6 For profiled metal sections, maximum spans for battens, brandering and purlins, for different loading conditions, shall be in accordance with the manufacturer’s specifications or according to the design solution of a competent person.

4.4.1.6 Ceiling assembly

4.4.1.6.1 Brandering shall comply with the requirements of SANS 1783-4 or SANS 1707-2 and shall be installed in accordance with the relevant requirements of SANS 2001-CT2. Where eucalyptus brandering is used, it shall be treated against the effects of rot, fungus and insect attack with CCA (Copper Chrome Arsenate) or a similar approved preservative, for example Boron, in accordance with the requirements of SANS 10005 and SANS 1707-2.

4.4.1.6.2 Timber brandering of size 38 mm × 38 mm is required to support gypsum plasterboard, fibre-cement board or similar board and shall be securely spiked to the supporting timbers with 75 mm wire nails at centres that do not exceed 400 mm. Cross brandering shall be cut in between the longitudinal brandering and skew nailed to the same, using 75 mm wire nails at centres that do not exceed 900 mm. The size and spacing or timber brandering for ceilings shall be in accordance with comply with table 16.

Table 16 — Minimum Brandering sizes for Truss/Beam Spacing

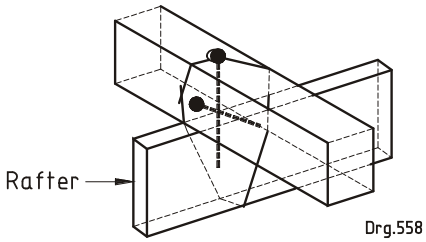
1	2	3
Truss / beam spacing mm	**Softwood branders** mm	**Hardwood branders** mm
<1 000	38 × 38	32 × 32
1 000 to 1 200	38 × 50 on edge	38 × 38
1 200 to 1 400	50 × 50	38 × 50 on edge
Ceilings	Brander spacing mm	Fixing @ 150 mm cc
6.4 mm gypsum board ceiling	400	Clout nail or screw
9 or 9,5 mm gypsum board ceiling	500	Clout nail or screw
9 or 9,5 mm gypsum board ceiling plastered	400	Screw
12 or 12,5 mm gypsum board ceiling	400	Clout nail or screw
12 or 12,5 mm gypsum board ceiling plastered	400	Screw
4 mm fibre-cement board ceiling	450	Clout nail or screw
6 mm fibre-cement board ceiling	600	Clout nail or screw
Wall cladding	Brander spacing mm	Fixing @ 150 mm cc
6,4 mm gypsum board lining	400	Clout nail or screw
4 or 6 mm fibre-cement lining	600	Clout nail or screw

4.4.1.6.3 Steel brandering shall be in accordance with table 17, the manufacturers specifications or subject to the design of a competent person

4.4.1.6.4 Steel brandering shall be installed as indicated in table 17:

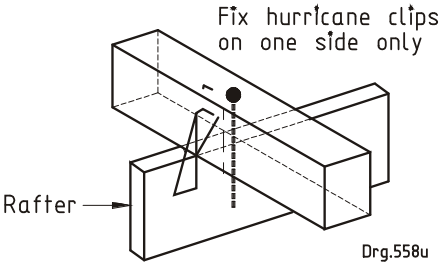
Table 17 — Installation of steel brandering for different types of ceiling

1	2	3
Type of ceiling	**Steel brandering**	**Board fixing**
4 mm fibre cement	450 mm centres in one direction only	25 mm × 3,5 mm chipboard screw
6 mm fibre cement	600 mm centres in one direction only	25 mm × 3,5 mm chipboard screws at 150 mm centres
6 mm and 6,5 mm board M strip	400 mm centres in one direction only	25 mm drywall screws spaced at 150 mm centres
6 mm and 6,5 mm board plastered ceilings	300 mm centres in one direction only	25 mm drywall screws spaced at 150 mm centres
9,95 mm board flush jointed ceiling	500 mm centres in one direction only	25 mm drywall screws spaced at 150 mm centres
9,5 mm board flush plastered ceiling	400 mm centres in one direction only	25 mm drywall screws spaced at 150 mm centres
12 mm to 12,5 mm board flush jointed ceiling and plastered	600 mm centres in one direction only	25 mm drywall screws spaced at 150 mm centres



One 100 mm skew nail and one 125 mm straight nail, tied with double-strand 2,4 mm galvanized wire at each connection.

a) Tied connection

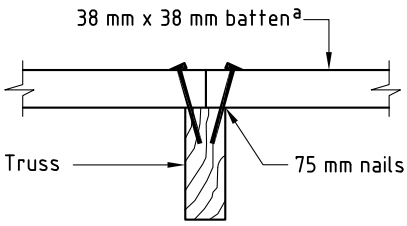


All hurricane clips shall be fully nailed with 32 mm clout nails, and with one 125 mm straight nail at each connection.

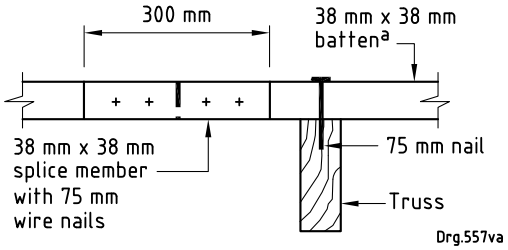
b) Hurricane clip connection

NOTE For aesthetic purposes, the hurricane clip connections are usually used at eaves overhangs, whilst wire is often used for connections hidden by ceilings.

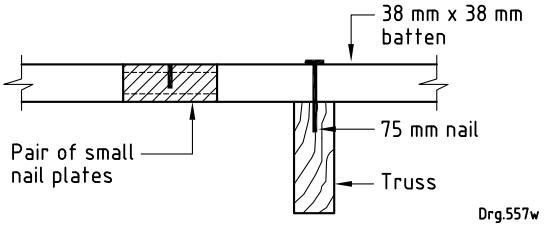
Figure 28 — Purlin to rafter connection details



a) Batten splice (general practice)



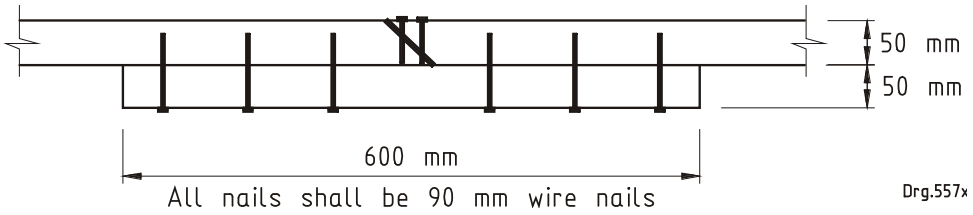
b) Nailed timber splice



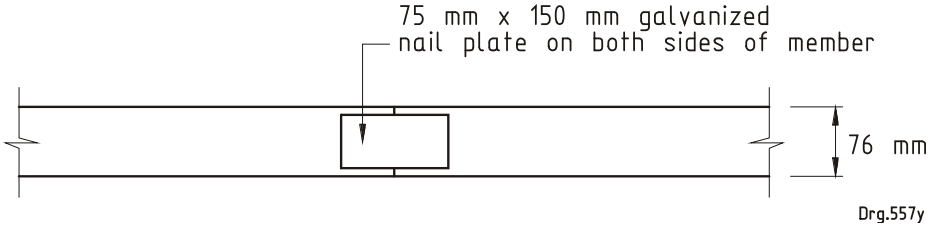
c) Connector plate splice

[a] Joints in battens shall be staggered so that not more than one in three is spliced on any one rafter. Connector plate splice shall be in accordance with SANS 1783-4.

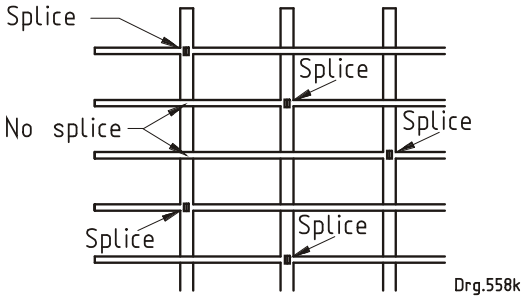
Figure 29 — Splicing of battens and purlins



a) Block purlin splice



b) Plated purlin splice



Joints in battens shall not be within 1,5 m of gable ends and shall be staggered so that not more than one in three is spliced on any one rafter.

c) Batten splice layout

Figure 30 — Typical layout of batten and purlin splices

4.4.2 Pole construction

4.4.2.1 Thatched roofs constructed of poles shall:

a) be of gable-to-gable construction,

b) without any hips, valleys or dormer windows,

c) have a pitch of 45°, and

a) have a clear span that does not exceed 6 m.

The construction shall be in accordance with figures 31, 32 33 and 34 and tables 18, 19 and 20.

4.4.2.2 Poles shall comply with the requirements of SANS 457-2 (softwoods) or SANS 457-3 (hardwoods) and shall be treated in accordance with the requirements of SANS 10005. Poles which have cracked or split pole ends within one pole diameter location of a bolt location, shall not be incorporated into such structures.

4.4.2.3 When poles are reshaped or re-sawn to a different length, the end grain of the exposed ends shall be treated with a suitable and registered remedial or supplemental brush on wood preservative and in accordance with the manufacturers specifications. In the case of hardwood poles that have been cross-cut on site, a new nail-plate that covers at least 60 % of surface area of the pole end, shall be re-attached to the cross-cut end to prevent and minimize the development of excessive end checks. The replacement nail plates shall comply with the minimum requirements as specified in SANS 457-3.

Table 18 — Batten spacing thatched roofs

1	2	3
Batten	**Minimum length of thatch or reed** mm	**Maximum batten centres**[b] mm
Tilting fillet[a]	–	50
First batten from the tilting fillet	–	200
Second batten from the tilting fillet	–	150
Second batten from the top	–	150
All other battens	800, 1 200, 1 500	200, 300, 350
[a] The maximum batten centre is measured from the end of the tie beam. [b] The maximum batten centre is determined by the length of the thatch by 4.		

4.4.2.4 Laths used in thatched roof construction shall have a minimum diameter of 25 mm, shall comply with the preservative-treatment requirements of SANS 1288, and shall be spaced in accordance with the requirements of SANS 10407.

4.4.2.5 Pole rafters shall have a clear span in accordance with table 19.

4.4.2.6 Pole trusses and rafters shall be tied down to the supporting walls and columns by means of galvanized steel wires, which are built into the walls in accordance with the requirements of SANS 10400-K. Connections to pole columns to pole ring beams shall be in accordance with figure 32

4.4.2.7 All poles shall be measured at the thin end and poles to be used as structural members shall have a diameter of at least 100 mm.

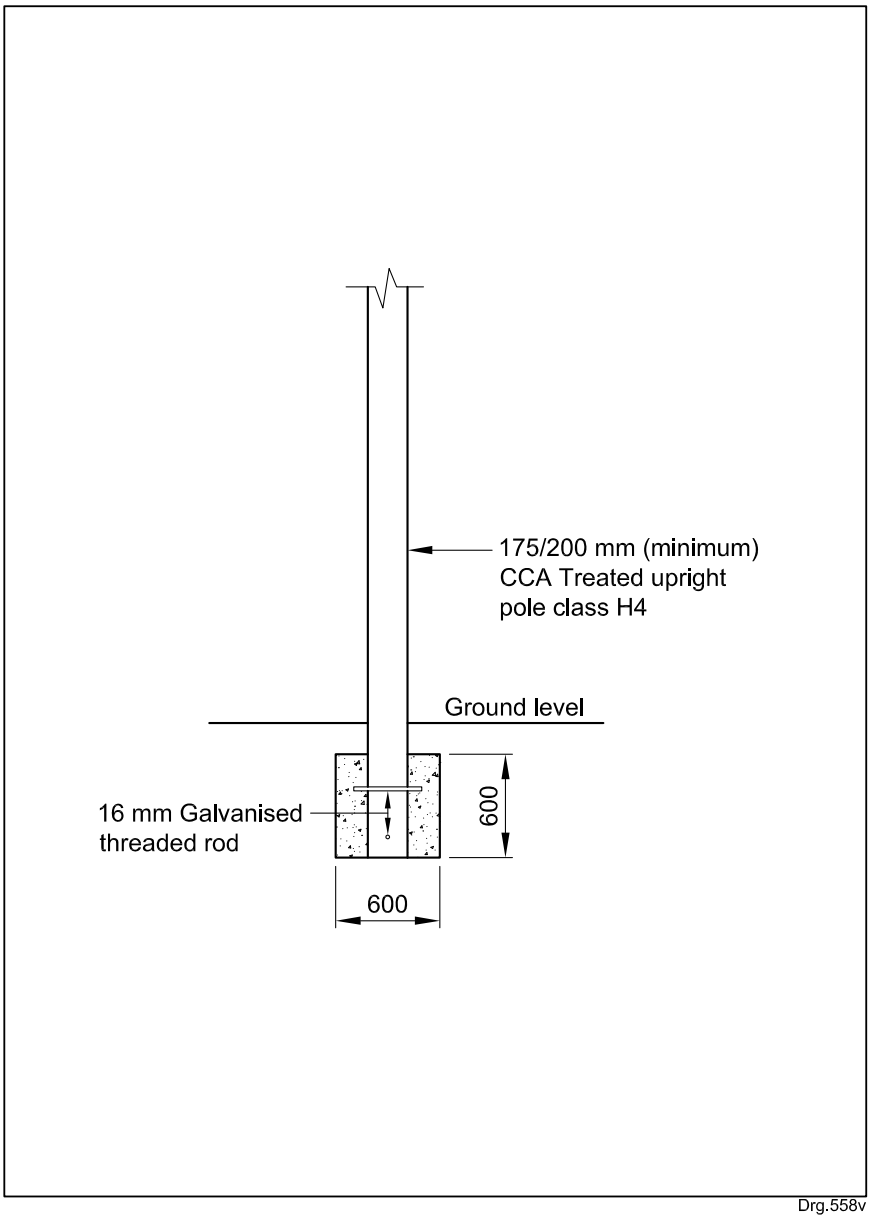


Figure 31 — Planting detail of pole upright

4.4.2.8 Upright pole columns shall be spaced at no more than 3,5 m centres and not be less than 175 mm in diameter.

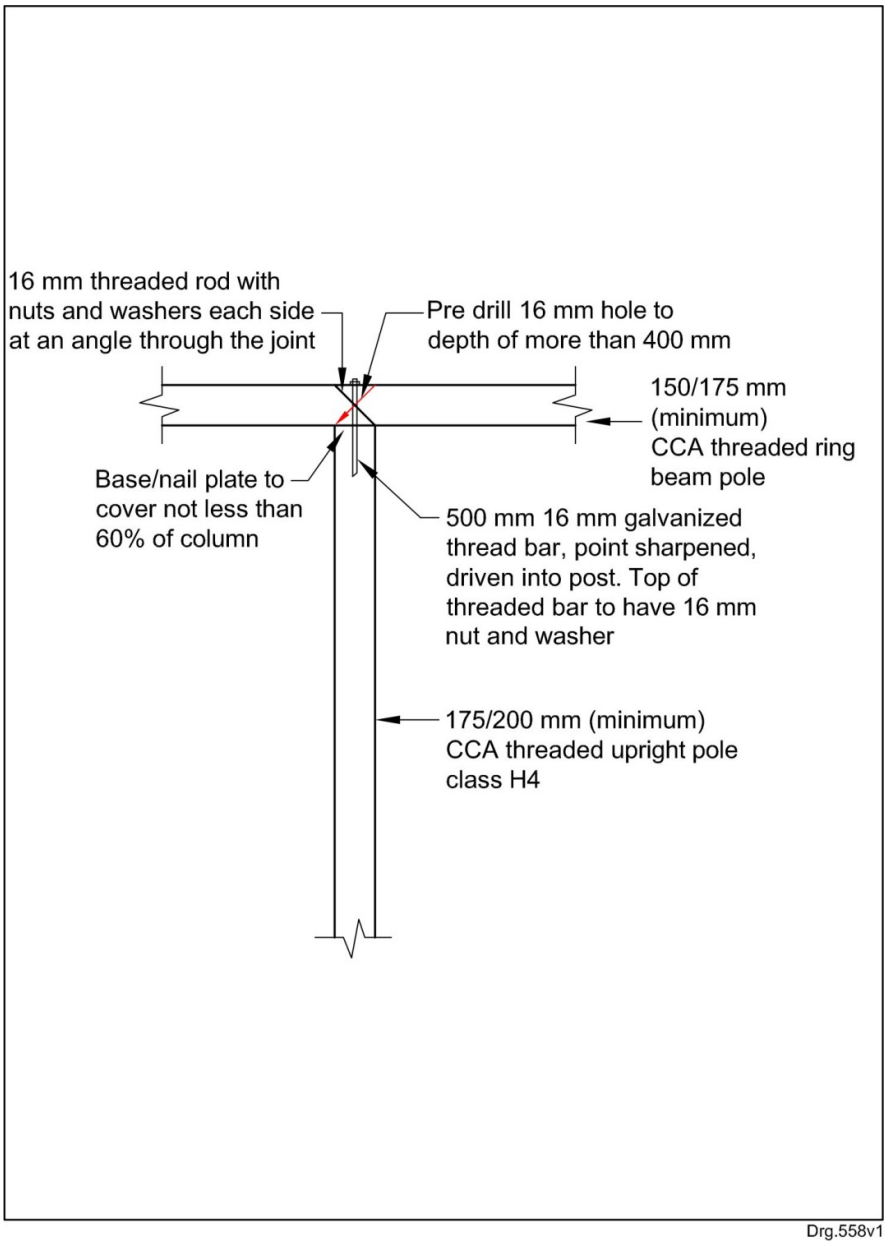


Figure 32 — Ring beam connection to upright pole

4.4.2.9 Pole ring beams shall be placed on top of upright columns and not bolted to the side of columns.

4.4.2.10 No pole ring beam shall be less than 150 mm in diameter.

Table 19 — Maximum clear spans for gum pole rafters

1	2	3	4
Type of roof covering	**Diameter of pole** mm	**Maximum clear span** m **Rafter spacing**	
		750 mm	**900 mm**
Tiled roofs that have a pitch of less than 26°	100 to 125	2,7	2,5
	125 to 150	3,5	3,3
	150 to 175	4,4	4,1
Sheeted roofs that have a pitch of less than 26°	100 to 125	3,8	3,5
	125 to 150	4,8	4,5
	150 to 175	5,8	5,5
The maximum mass of the tiles or slates, including battens or purlins, shall not exceed 65 kg/m^2.			

4.5 Fire safety requirements

4.5.1 The fire safety requirements of any roof or ceiling assembly (or both), complete with light fittings or any other component which penetrates the ceiling, and the degree of non-combustibility of such assembly shall comply with the relevant requirements in SANS 10400-T and SANS 10400-V, as applicable.

4.5.2 No part of the roof or ceiling assembly, subject to the requirements of SANS 10400-T, made of wood or any other combustible material, shall pass through a separating element of a building

4.5.3 Insulation materials shall comply with the requirements of SANS 10400-T.

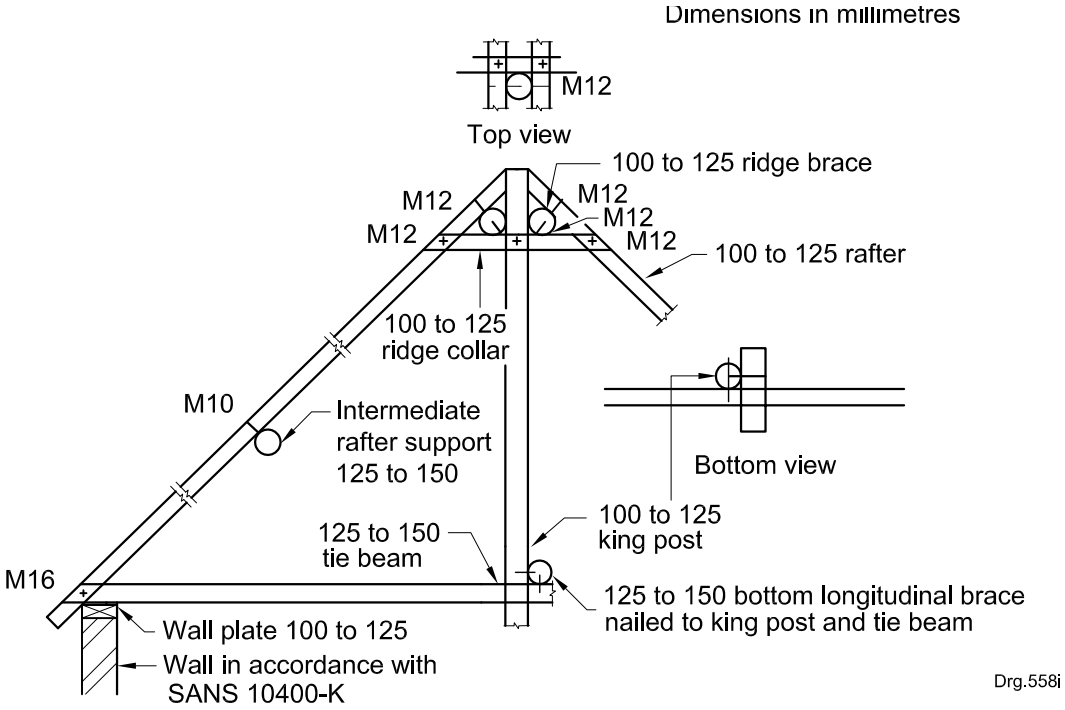
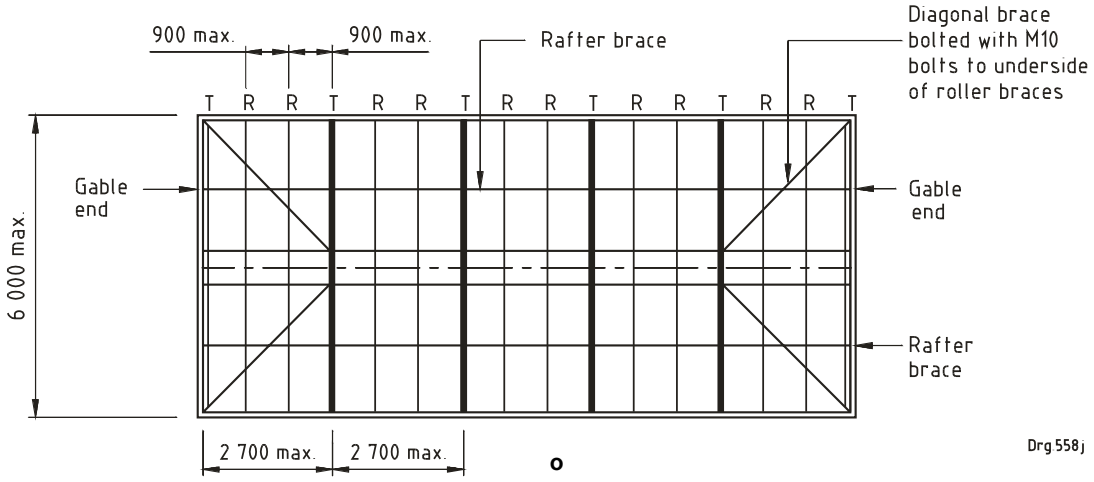


Figure 33 — Elevation of truss for thatch roofing in gable-to-gable rectangular buildings that have a clear span that does not exceed 6,0 m



T = truss
R = rafter

NOTE The diameter of the pole is 100 mm to 125 mm.

Figure 34 — Plan of truss for thatch roofing in gable-to-gable rectangular buildings that have a clear span that does not exceed 6,0 m

Table 20 — Sizes of members for thatched roofs constructed of poles

1	2
Member	**Size**
Rafters	100 mm to 125 mm for truss clear spans ≤ 6 m
Ridge brace	100 mm to 125 mm
Ridge collar	100 mm to 125 mm
King post	100 mm to 125 mm
Bottom chord	125 mm to 150 mm (tie beam)
Rafter brace	125 mm to 150 mm
NOTE Pitch = 45°.	

4.6 Light steel structures and extensions (standards roofs)

4.6.1.1 Light steel structures shall be in accordance with SANS 517.

4.6.1.2 The allowable spans for cold-formed steel sections used in rafter beam, purlin rafters and purlin beam type roofs shall comply with the requirements of table 21, or be subject of the design of a competent person

4.6.1.3 Any light steel structure shall be suitably earthed in accordance with SANS 10142-1 for wiring requirements and SANS 62305 lightning protection, if so required, by a competent person.

Table 21 — Span table for steel lipped channel section purlins or rafters

Span Table for steel Lipped Channel section purlins or rafters (Spans in mm)

Section Size		Design type & Loading									
Size Designation	Profile corner Radius	Purlin Design Purlins spaced at 2,0 m c/c Metal Sheeting (0.05 kN/m2) Deflection Limit -200 Roof Pitch				Purlin Design Purlins spaced at 1,4 m c/c Fibre Cement sheeting (0.26 kN/m2) Deflection Limit - 250 Roof Pitch				Rafter Design Rafters at 0,76 m c/c Cement Tile (0.51 kN/m2) Deflection Limit - 250 Roof Pitch	
		10°		15°		15°		22.5°		17.5°	26°
		Restrained	Unrestrained	Restrained	Unrestrained	Restrained	Unrestrained	Restrained	Unrestrained		
90x40x9x0.8FH	4	2584	2272	2617	2105	2477	1992	2539	1817	2422	2402
75x50x20x2.0	4	3188	**3032**	3243	**2928**	3069	2897	3147	2805	3010	2977
75x50x20x2.5	5	3407	3313	3450	**3207**	3265	3079	3347	2980	3202	3167
75x50x20x3.0	4.5	3601	3500	3645	3435	3451	3252	3537	3145	3384	3347
100x50x20x2.0	4	4009	**3525**	4059	**3327**	3842	3349	3939	3118	3767	3727
100x50x20x2.5	5	4272	**3870**	4325	**3649**	4094	3560	4197	3313	4015	3972
100x50x20x3.0	4.5	4520	4188	4576	**3963**	4332	3759	4441	3496	4248	4202
125x50x20x2.0	4	4775	**3905**	4834	**3636**	4576	3615	4691	3288	4487	4439
125x50x20x2.5	5	5094	**4291**	5158	**3991**	4882	3842	5005	3492	4788	4736
125x50x20x3.0	6	5361	**4617**	5428	4254	5138	4027	5267	3658	5038	4984
150x50x20x2.0	4	5513	**4220**	5582	**3882**	5284	3774	5417	3391	5181	5125
150x50x20x2.5	5	5887	**4639**	5960	4236	5642	4010	5784	3602	5533	5473
150x50x20x3.0	6	6200	4915	6278	4439	5942	4202	6092	3772	5827	5764
175x50x20x2.0	3	6252	**4512**	6330	**4108**	5992	3893	6143	3478	5876	5812
175x50x20x2.5	5	6659	4867	6742	4351	6382	4119	6542	3678	6258	6190
175x50x20x3.0	6	7018	5101	7105	4558	6726	4314	6895	3852	6595	6524
200x50x20x2.0	3.6	**6884**	4702	**7014**	4180	6655	3956	6822	3523	6526	6455
200x50x20x2.5	4.4	7429	5000	7521	4443	7120	4206	7299	3745	6982	6906
200x50x20x3.0	5.1	7842	5247	7939	4661	7515	4412	7704	3927	7370	7290

Notes: 1 The designs are based on the assumption that twisting or overturning restraint is provided.
2 Spans shown under (Restrained) => Designed for the condition of the purlin restrained in the roof plane by the sheeting or sag rods.
3 The values shown in Bold type are based on steel stress criteria while otherwise based on deflection criteria.

Annex A
(informative)

Principal waterproofing details

A.1 Figures A.1 to A.15 show a few principal waterproofing details and should be adapted to suit the relevant situation. More principal waterproofing details can be obtained from experienced and reputable specialist waterproofing contractors, or waterproofing material manufacturers/suppliers.

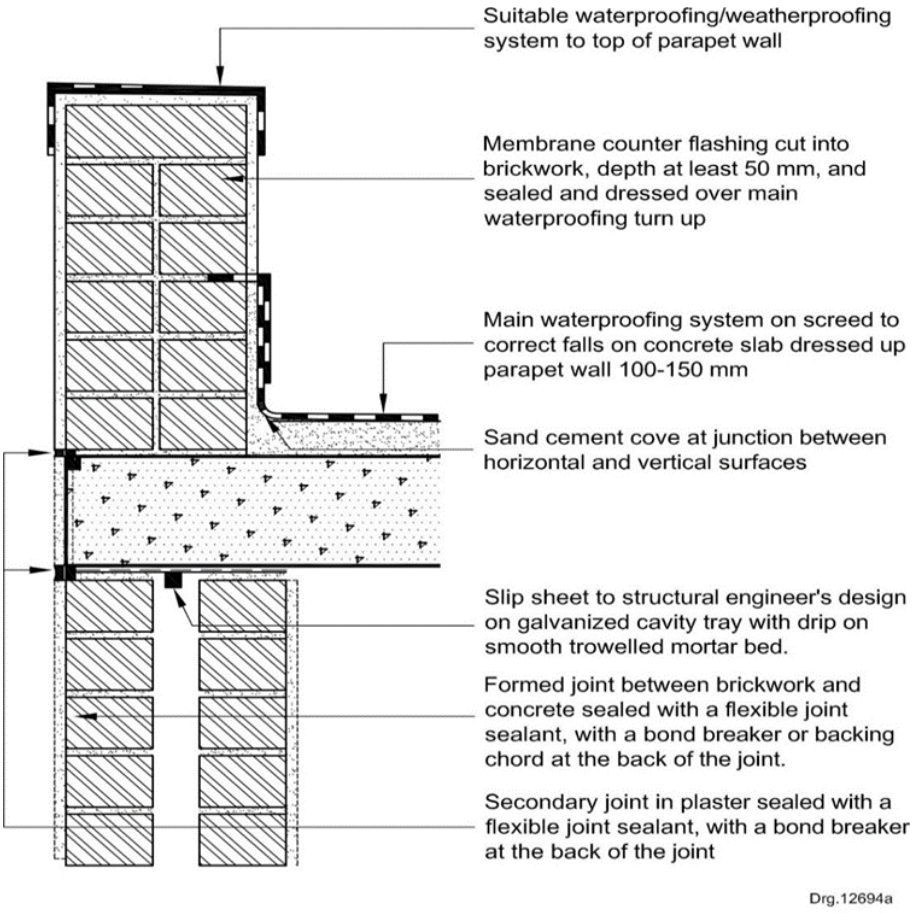


Figure A.1 — Brick pararet around flat roof

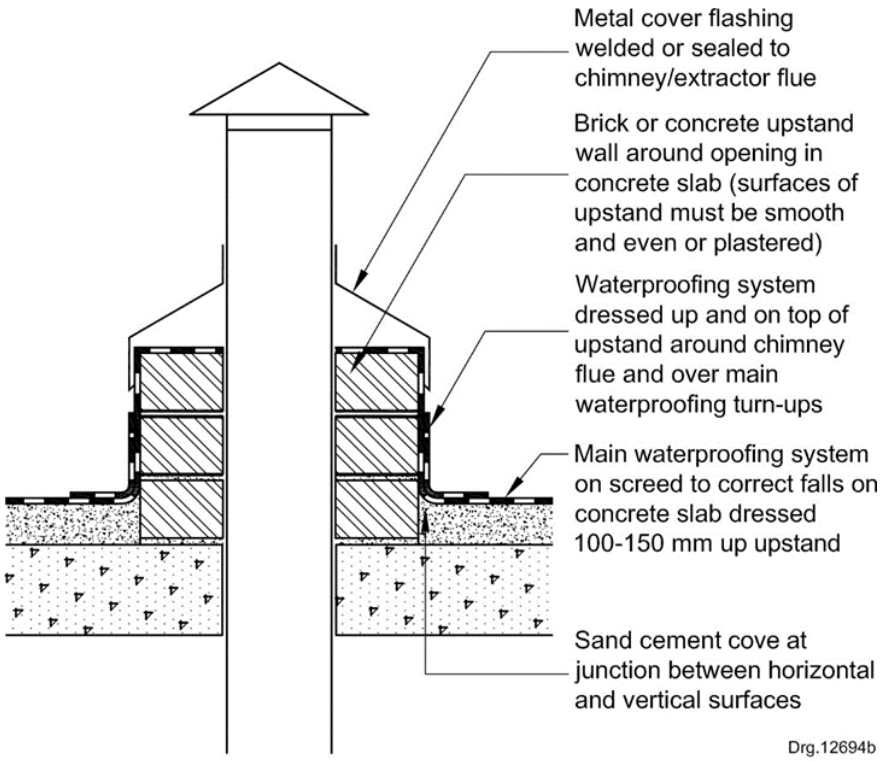


Figure A.2 — Chimney flue or extract flue

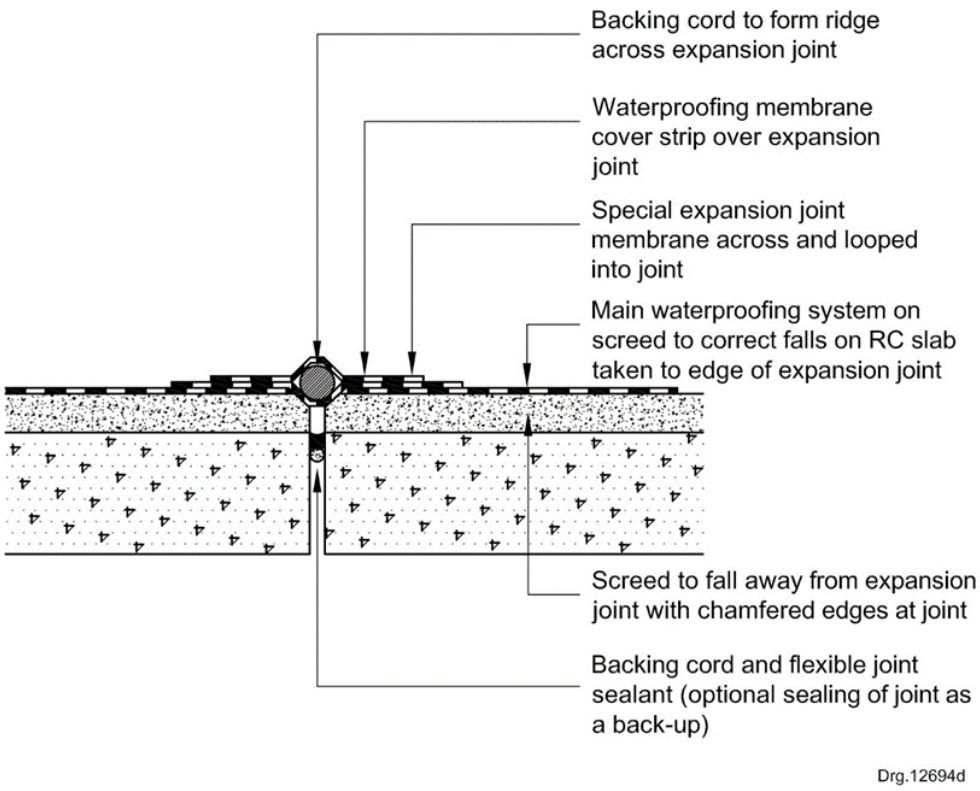


Figure A.3 — Expansion joint on exposed roof deck with no upstand

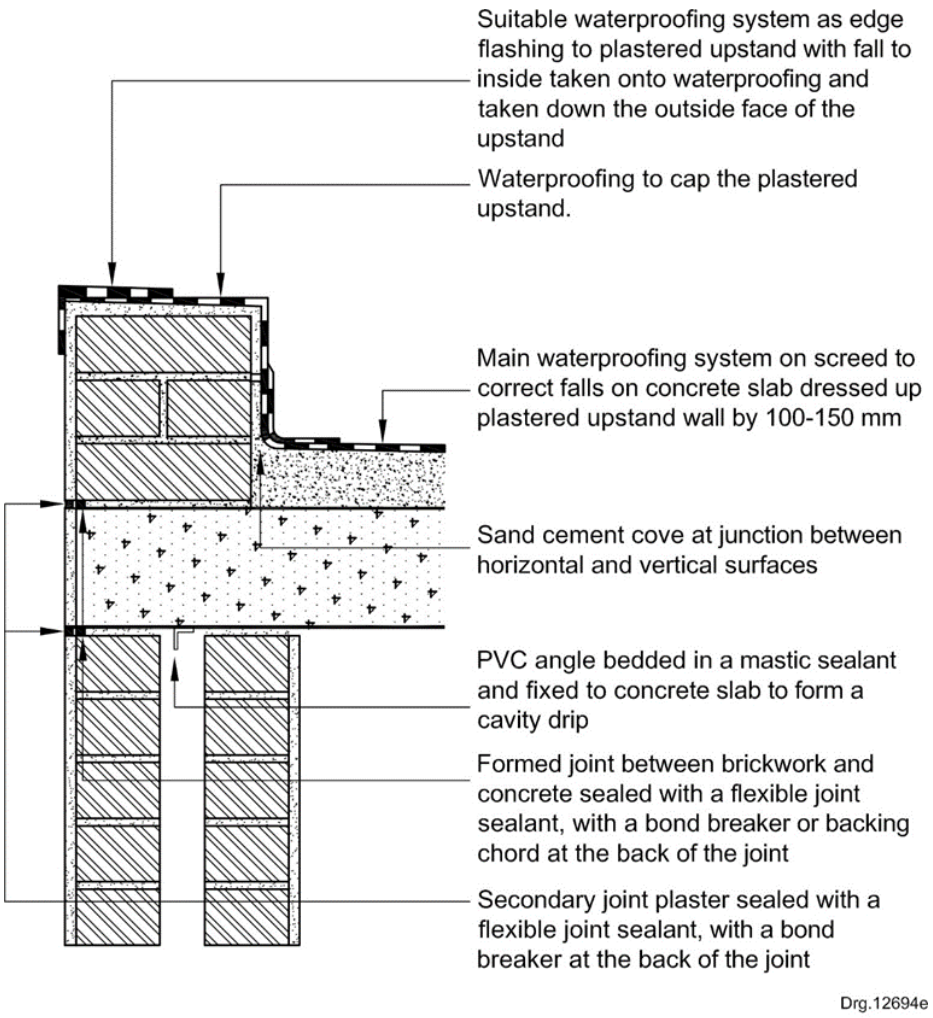


Figure A.4 — Brick upstairs around flat roof

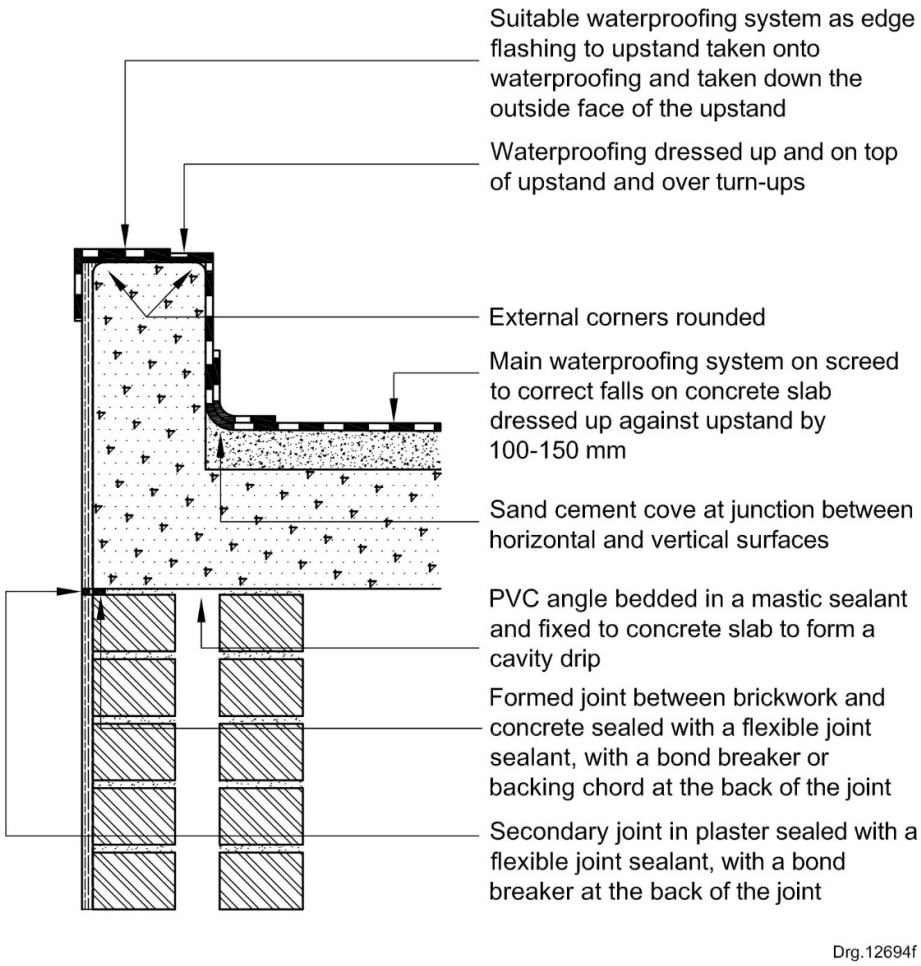


Figure A.5 — Concrete upstand around flat roof

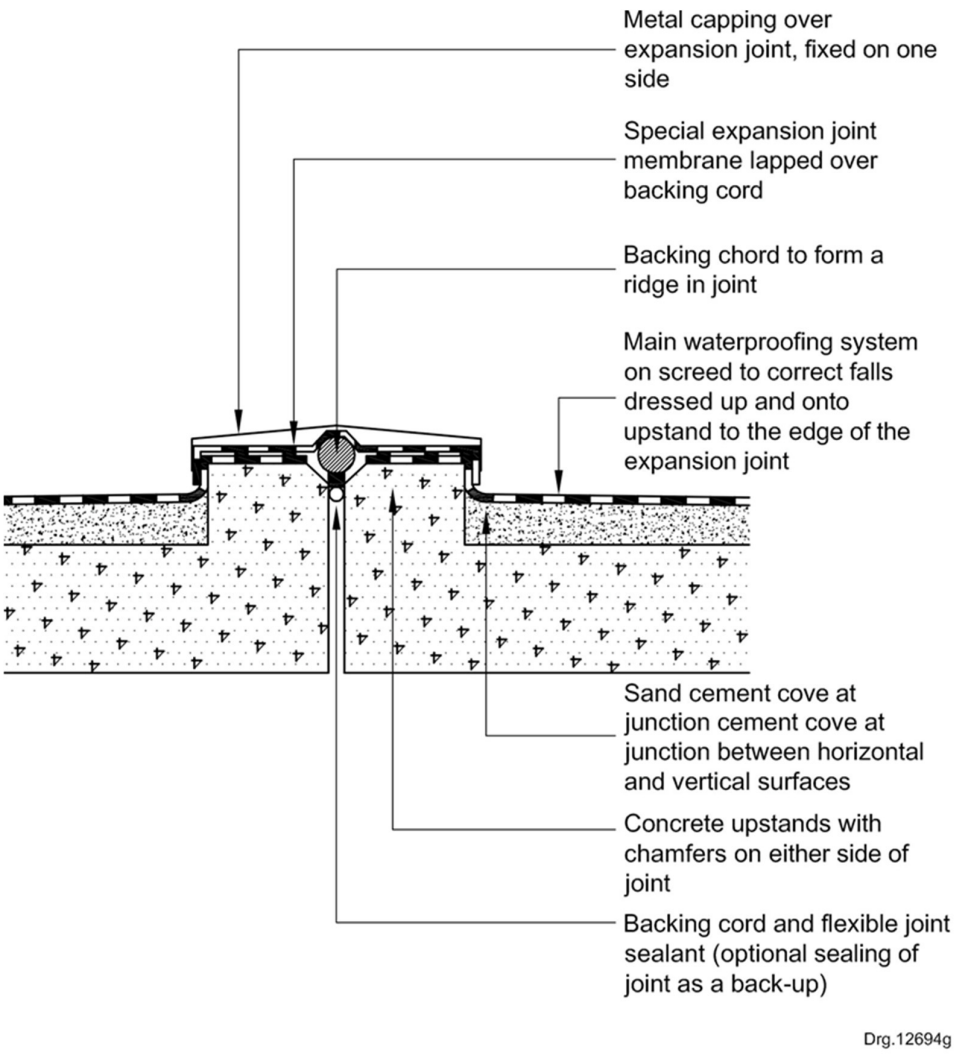


Figure A.6 — Expansion joint on exposed roof deck with metal capping

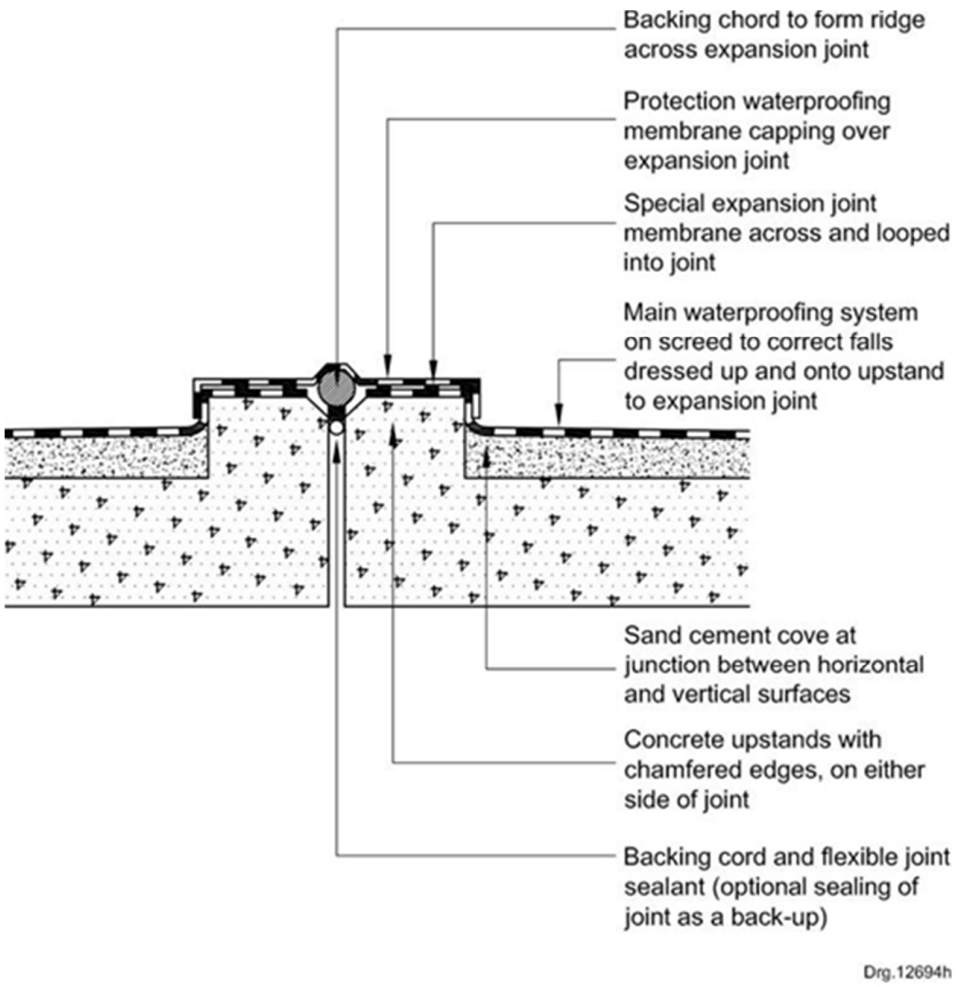


Figure A.7 — Expansion joint on exposed roof deck

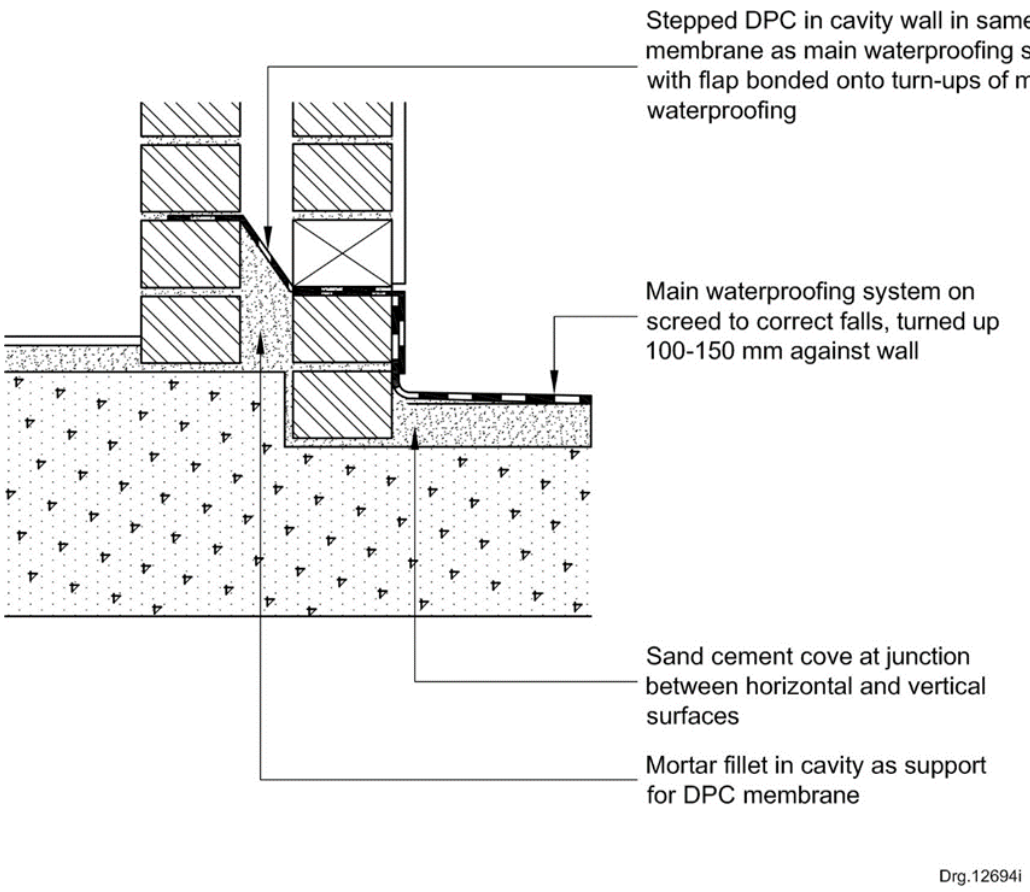


Figure A.8 — Interface of stepped DPC and waterproofing on flat roofs

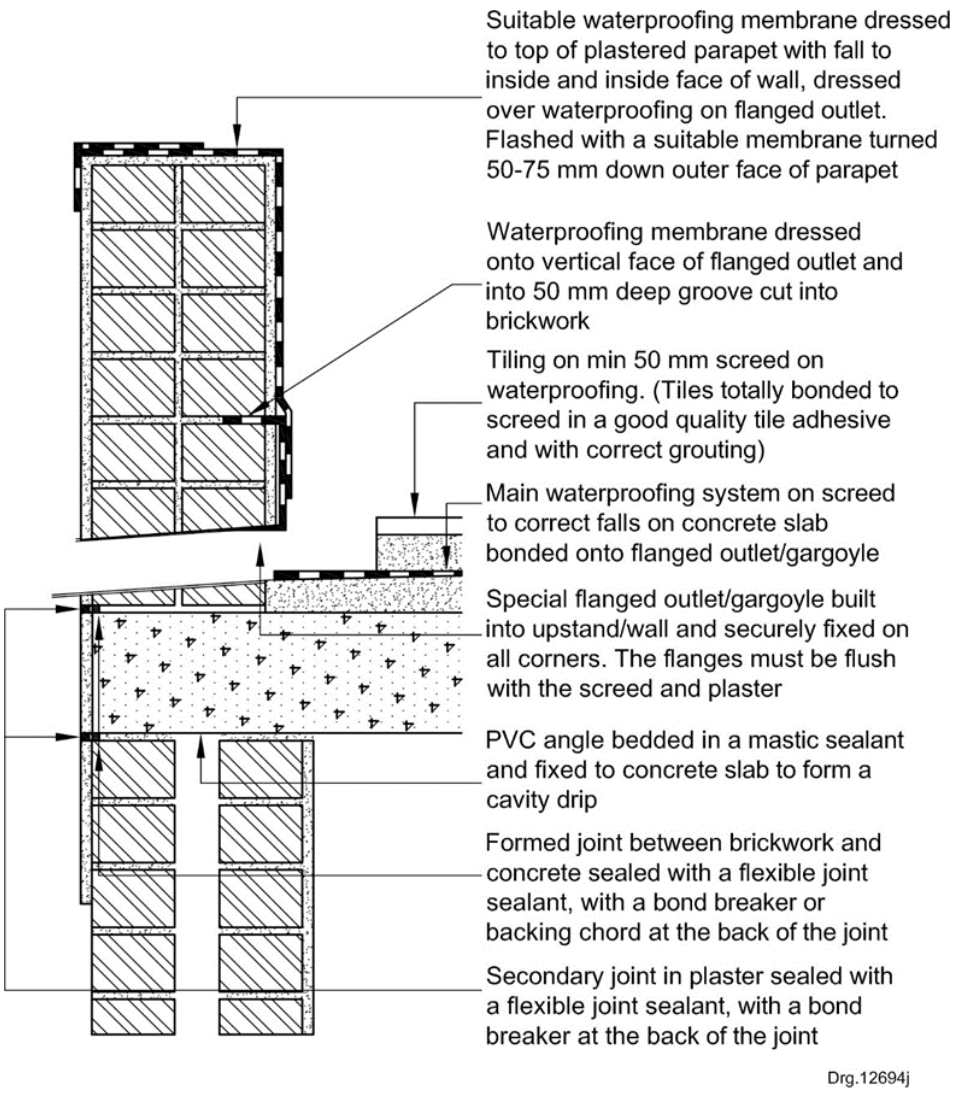


Figure A.9 — Outlet/Gargoyle through parapet wall

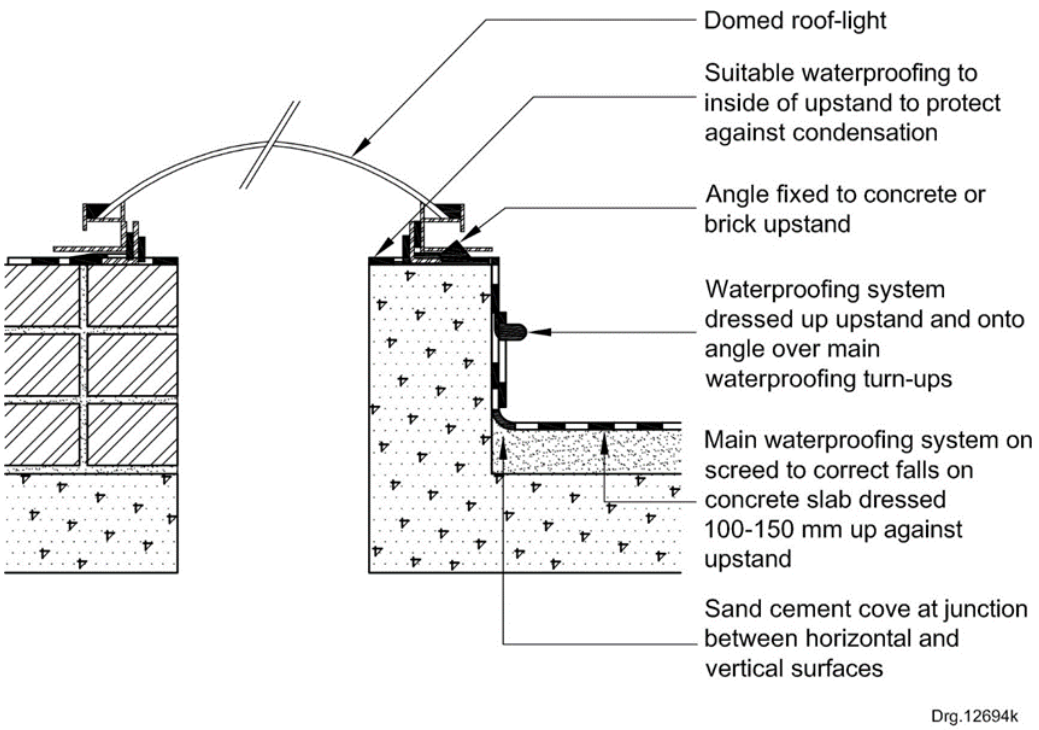


Figure A.10 — Domed roof lights

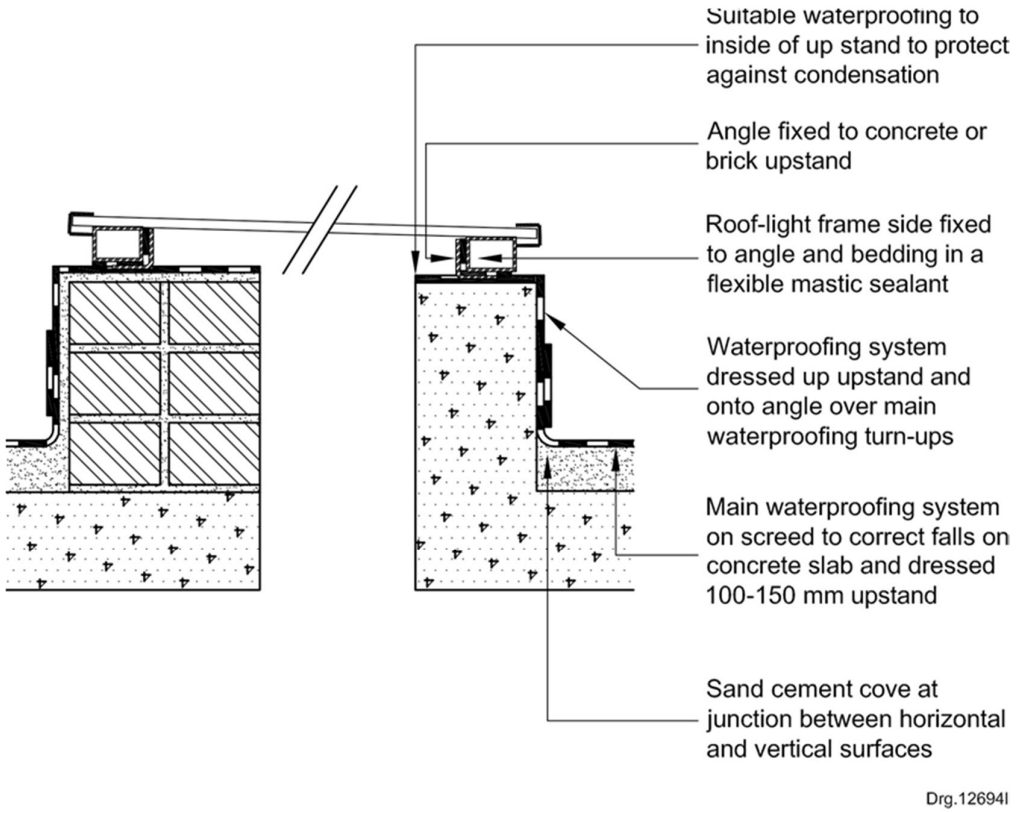


Figure A.11 — Roof lights

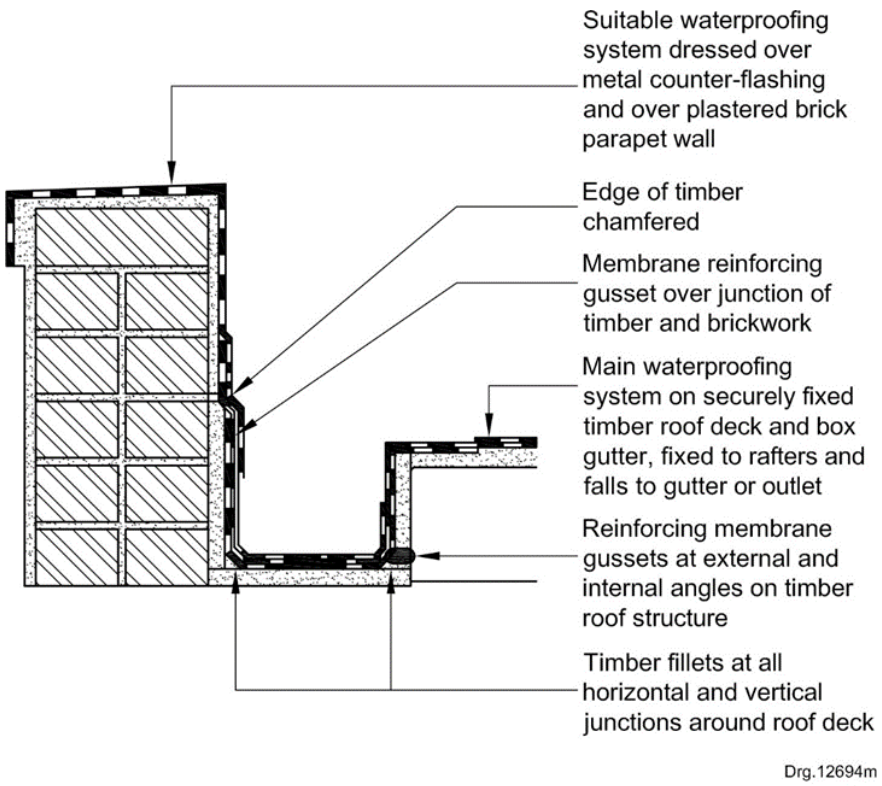


Figure A.12 — Junction of timber box gutter and walls

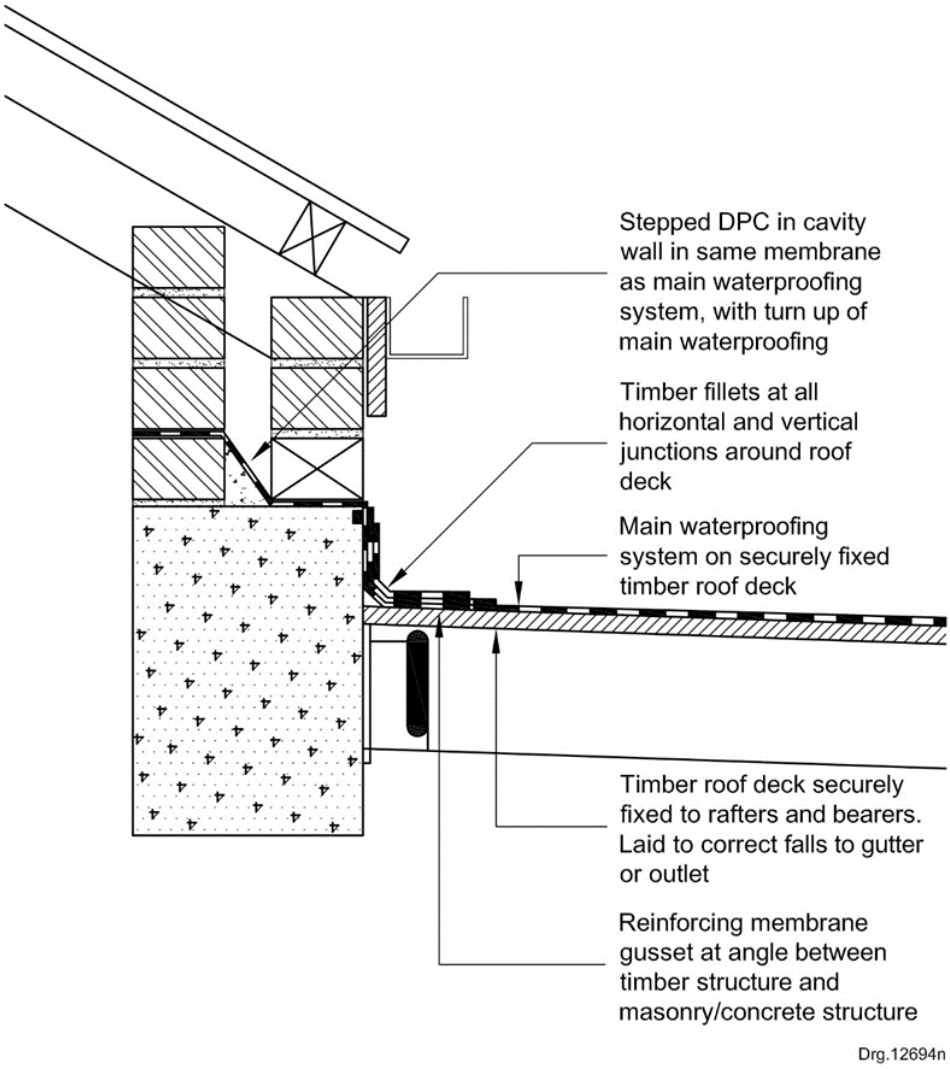


Figure A.13 — Junction of timber roof deck and cavity walls

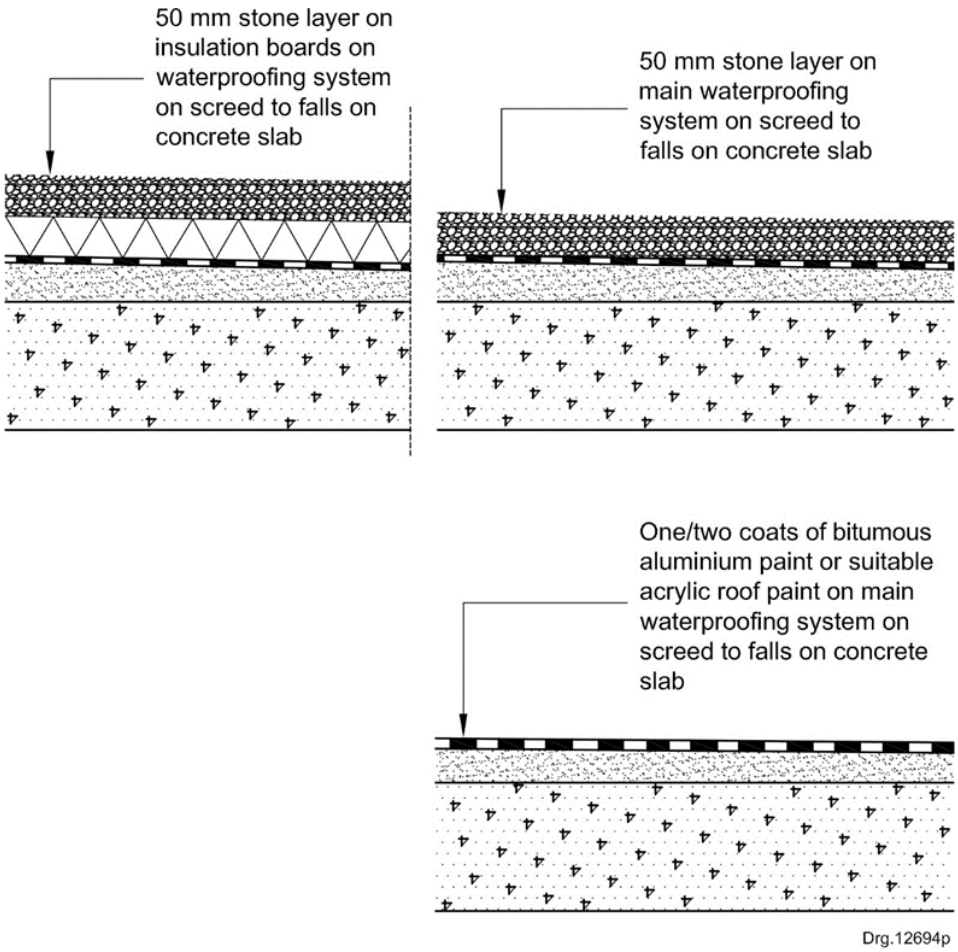


Figure A.14 — Junction of timber roof deck and walls

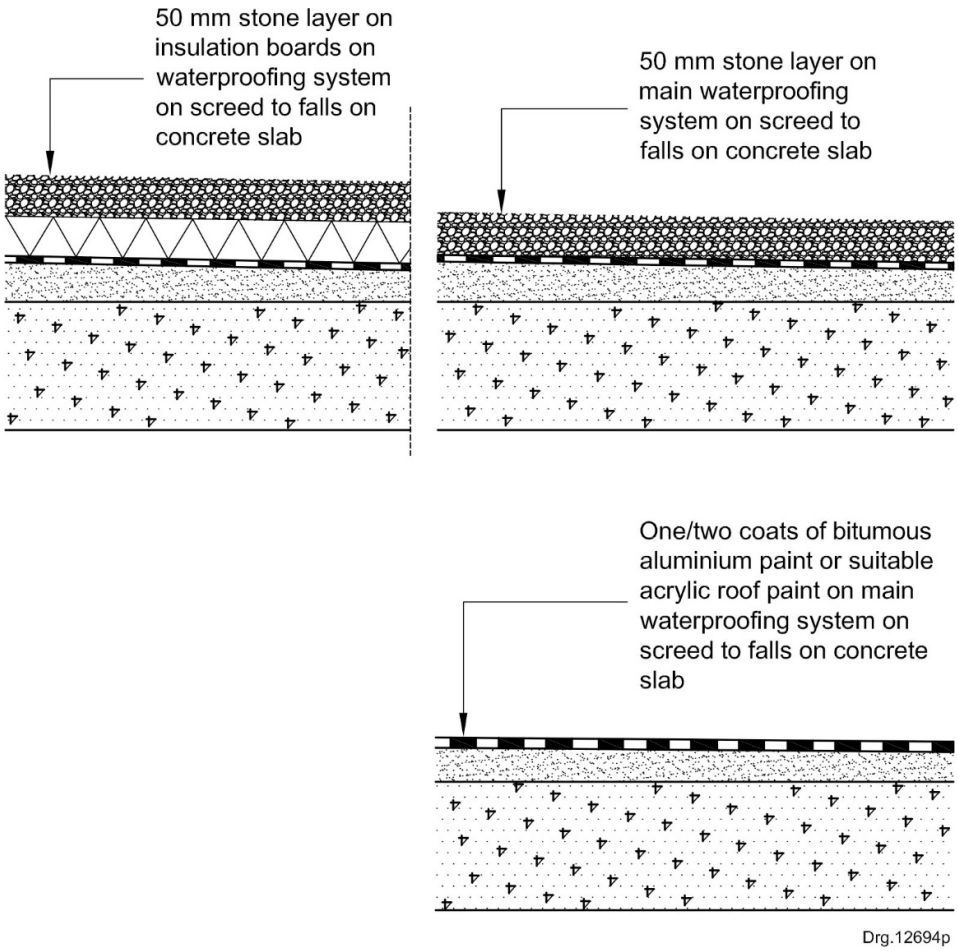


Figure A.15 — Various protective roof finishes

Annex B
(normative)

Standard flashing details for metal cladding

B.1 General

B.1.1 The following diagrams illustrate the minimum requirements for flashings to be used with generic pierce-fix metal cladding profiles.

B.1.2 For concealed-fix and standing seam profiles please refer to the details published by the individual manufacturers of the various profiles.

B.2 Material

B.2.1 Metal thickness

B.2.1.1 Flashings shall be fabricated from material of a thickness as detailed in table-B.1.

TableB.1 — Minimum thickness of flashing

1	2	3	4
Building type	**Coated steel (BMT)**	**Aluminium**	**Other metals**
Category-1	0.36 mm	n/a	n/a
Domestic residence Dwelling house	0,46 mm	0,70 mm	0,50 mm
All other types	0,54 mm	0,80 mm	0,60 mm

B.2.2 Coating requirements/material grade

B.2.2.1 The minimum coating to steel flashings shall be identical to that of the cladding to which it is to be attached (see 4.2.2.3.1).

B.2.2.2 All flashings attached to aluminium, stainless steel or other metal cladding shall be of the identical alloy or grade to that of the cladding to which it is to be attached (see table 4).

B.2.2.3 Where for esthetic reasons flashings are made from a material other than that of the cladding to which they are to be attached the material shall be electrochemically compatible (see table D.1 and table D.2).

B.3 Fasteners

B.3.1 Flashings may be attached to cladding with either stitching screws or sealed blind rivets. Screws are recommended for flashings fixed in areas subject to high wind loading such as corners, gable ends and ridges.

B.3.2 Fasteners shall comply with the requirements of 4.2.2.6.

B.4 Valley flashing

B.4.1 In order to avoid the risk of a capillary syphon and/or a corrosion pocket the roof cladding is not to be in direct contact with the upper surface of a valley flashing.

B.5 counter flashing

B.5.1 Counter flashing shall be inserted into a groove of sufficient depth to accommodate the returned edge of the horizontal leg of the flashing (see figure B.5) and secured in position with a bead of suitable sealant. Mortar is not a suitable sealant as it can damage aluminum and the metallic coatings to steel flashings.

B.6 Joints

B.6.1 Individual lengths of flashing may be joined by overlapping or by utilizing butt straps. All joints shall be mechanically fixed with fasteners. The length of the overlap or butt strap shall be not less than

a) Roof 150 mm, and

b) Side 100 mm.

B.6.2 Rainwater shall flow over an overlap and not into it.

B.6.3 Joints in transverse flashings are to be sealed with a suitable sealant.

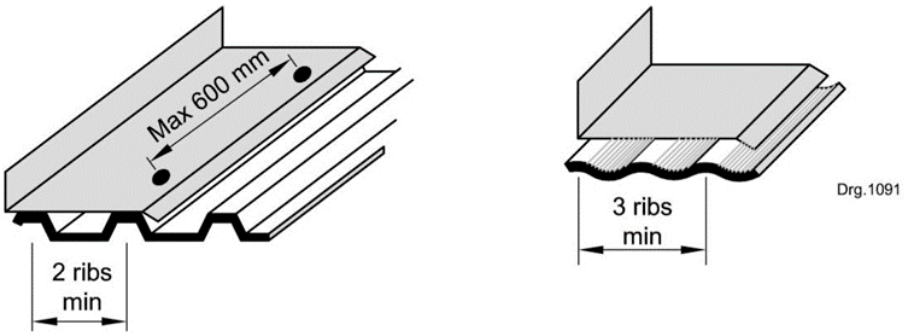
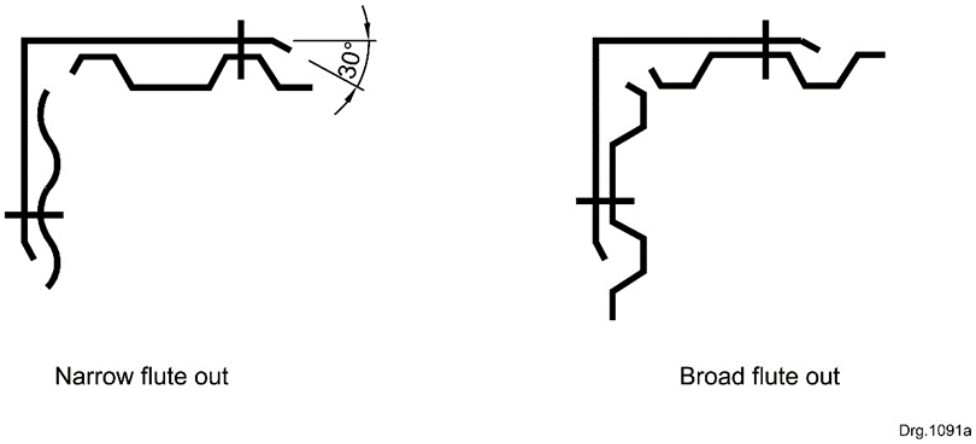
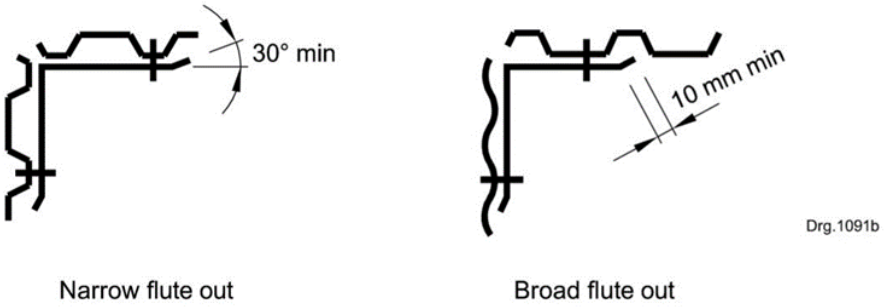


Figure B.1 — Standard flashings details



External corner



Internal corner

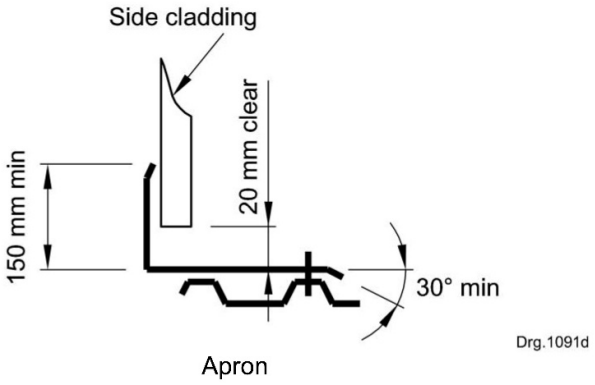
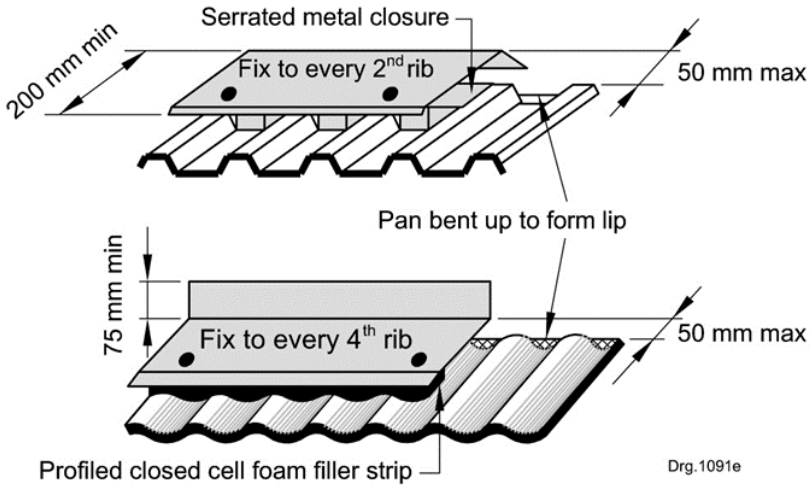
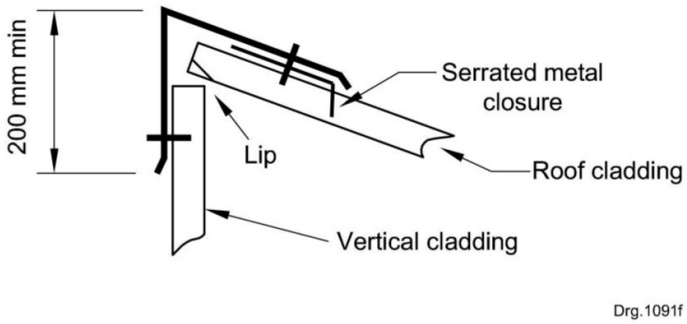
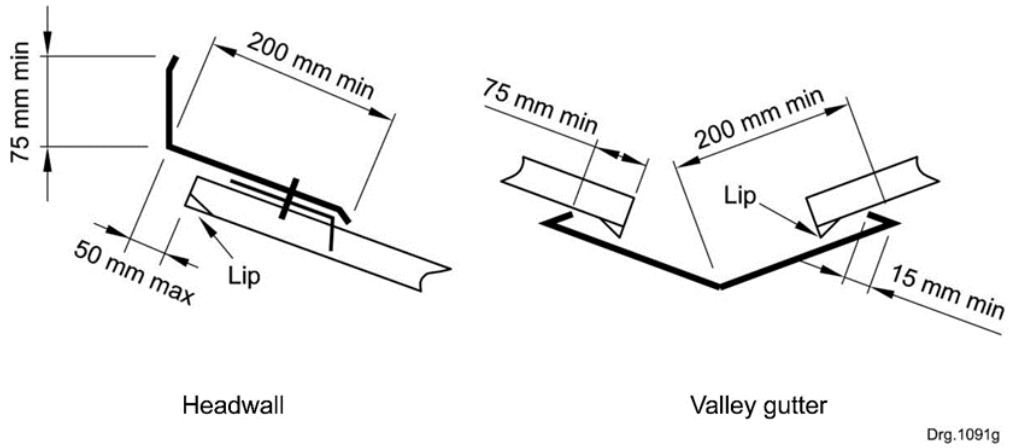


Figure B.2 — Transverse flashings



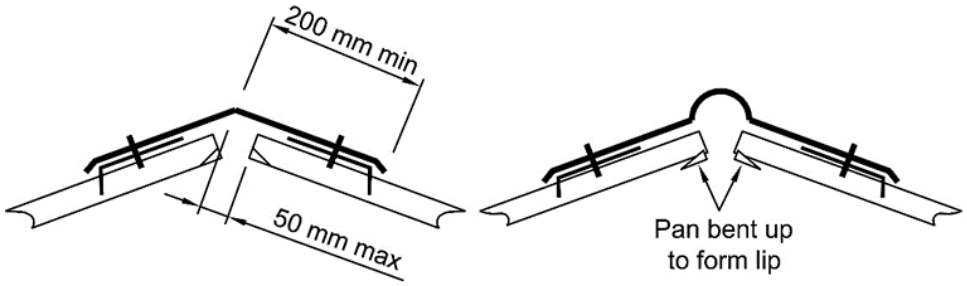


Apex



Headwall Valley gutter

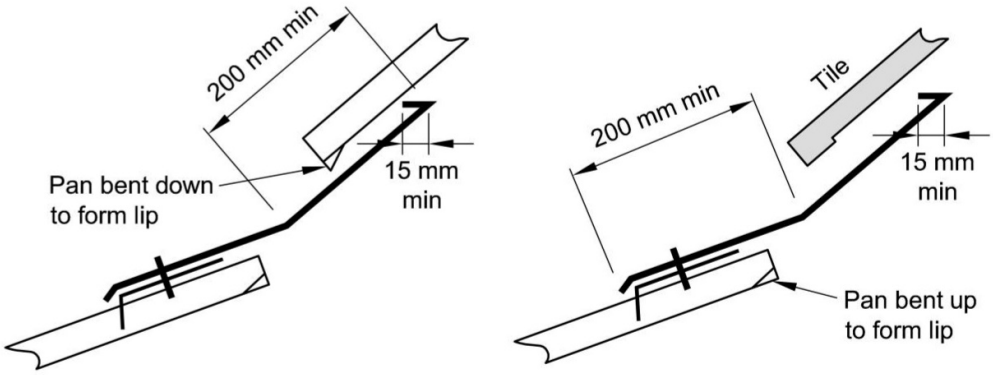
Figure B.2 — Transverse flashings *(continued)*



Straight

Roll top ridge/ Hip

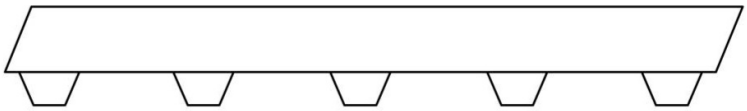
Drg.1091h



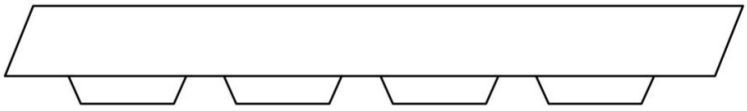
Cladding to cladding

Tiles to cladding

Drg.1091i



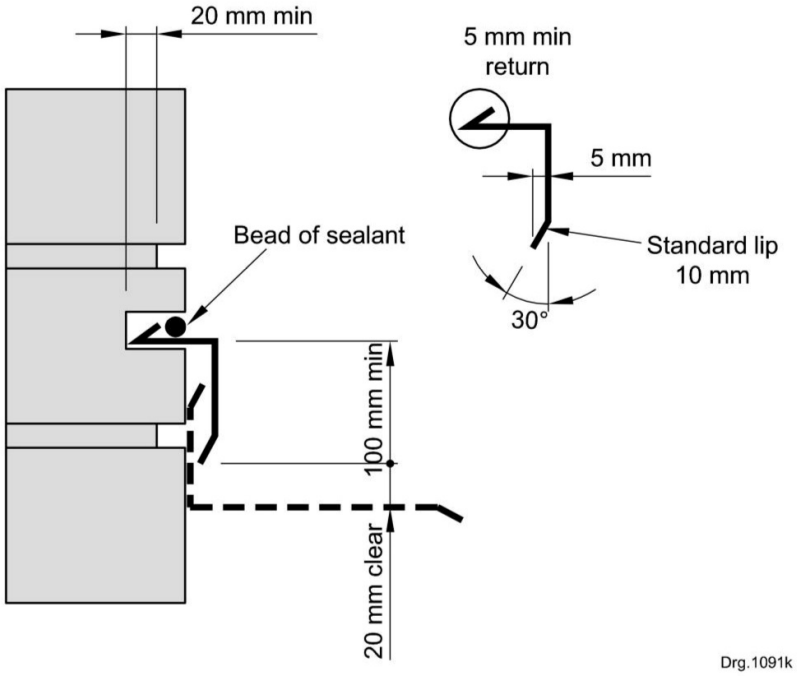
Narrow Flute Closure



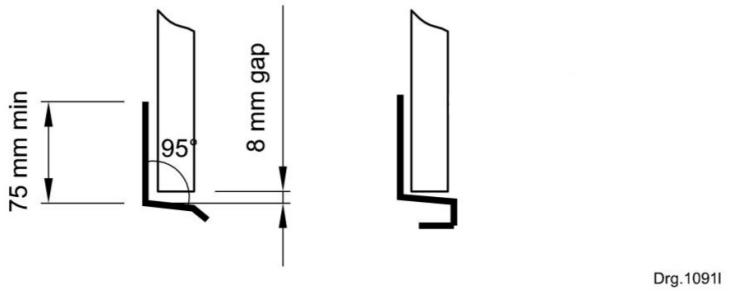
Drg.1091j

Broad Flute Closure

Figure B.2 — Transverse flashings *(continued)*



Counter flash



Drip Flashings

Figure B.2 — Transverse flashings *(continued)*

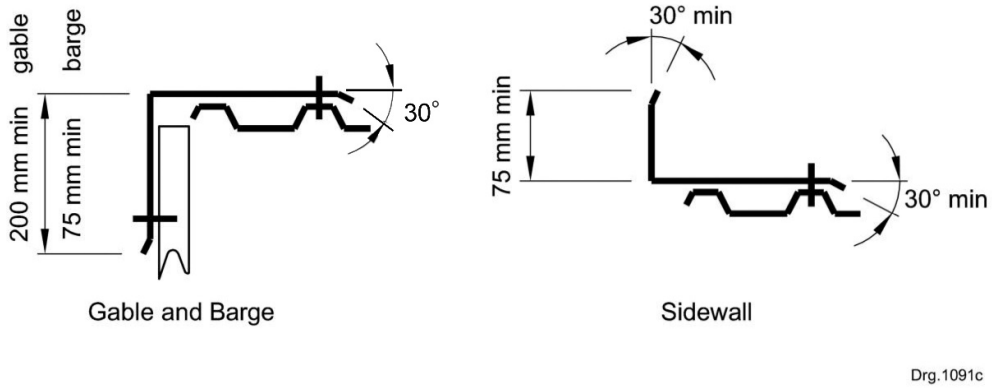


Figure B.2 — Transverse flashings *(concluded)*

Annex C
(informative)

Standard flashing details for concrete tiled roofs

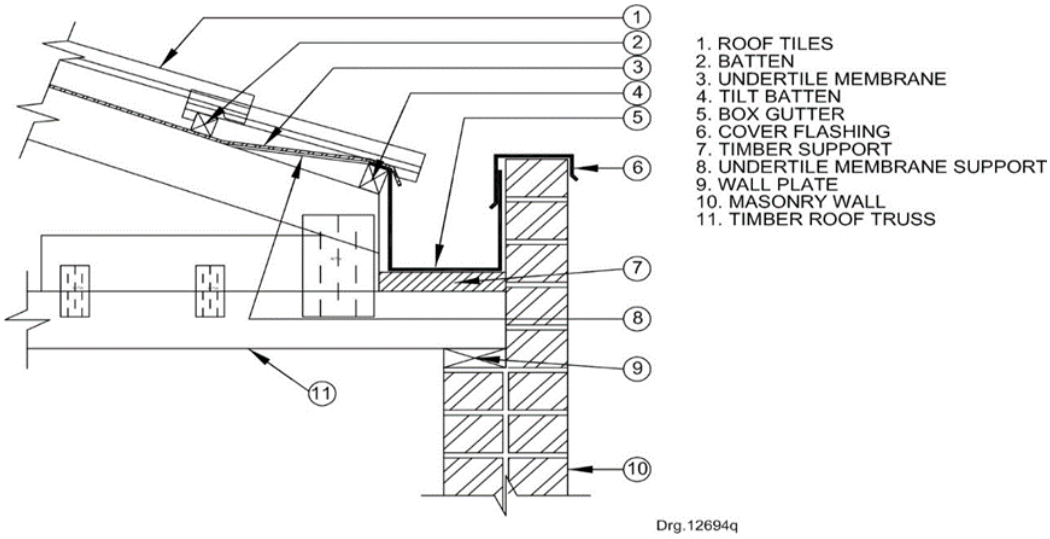


Figure C.1 — Box gutter detail

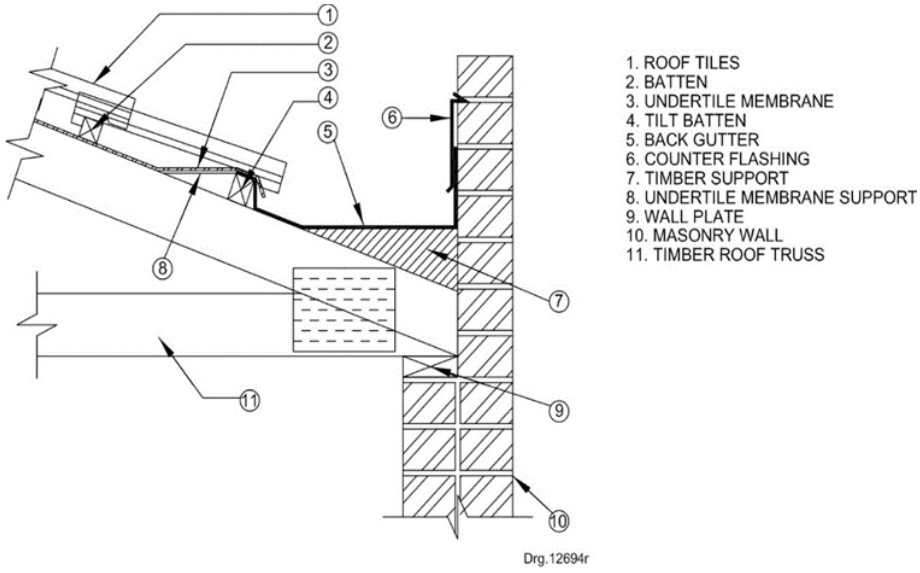
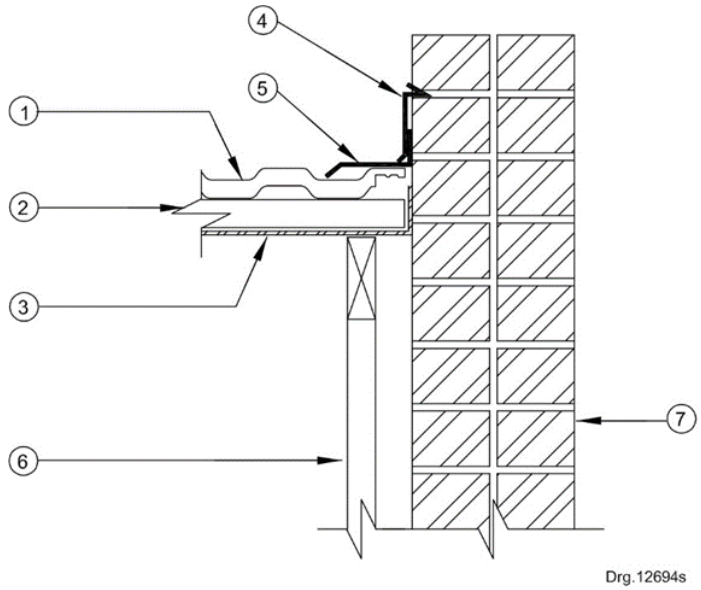
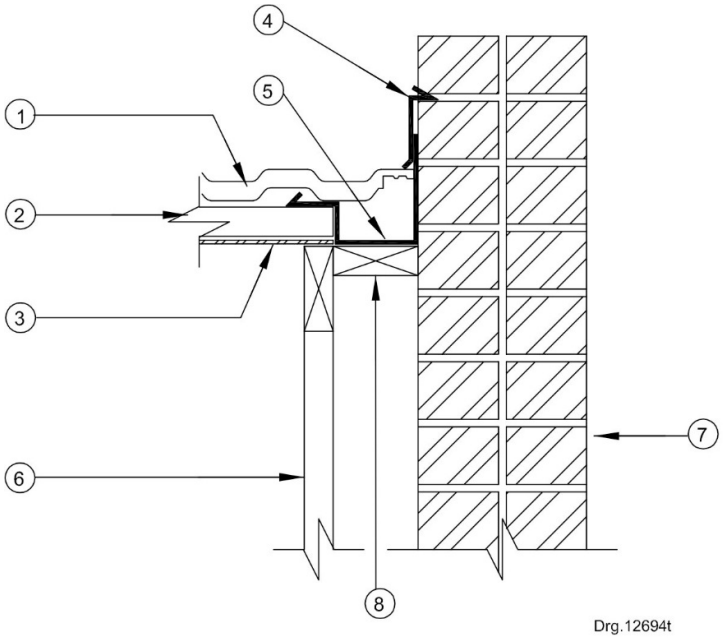


Figure C.2 — Back gutter



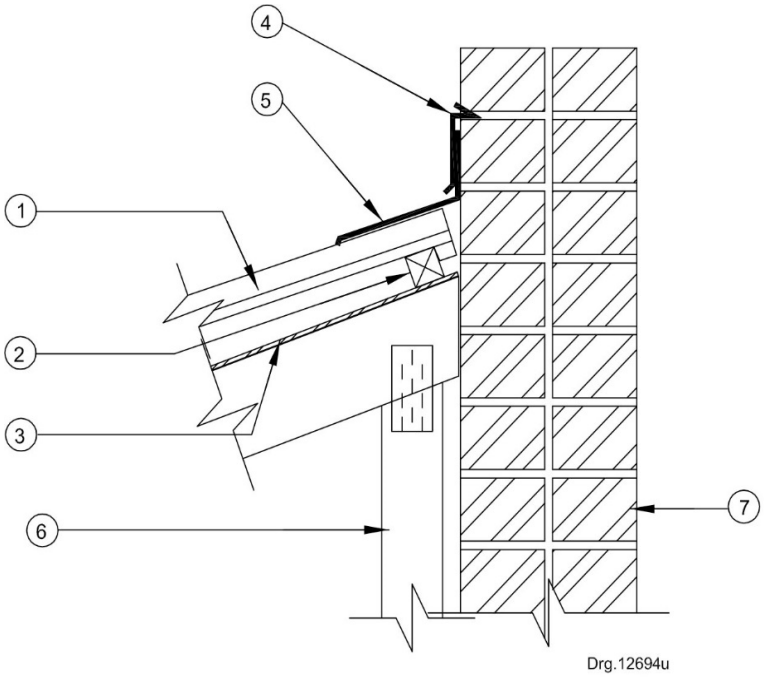
1. ROOF TILES
2. BATTEN
3. UNDERTILE MEMBRANE
4. COUNTER FLASHING
5. SIDE WALL FLASHING
6. TIMBER ROOF TRUSS
7. MASONRY WALL

Figure C.3 — Side wall flashing



1. ROOF TILES
2. BATTEN
3. UNDERTILE MEMBRANE
4. COUNTER FLASHING
5. CONCEALED GUTTER
6. TIMBER ROOF TRUSS
7. MASONRY WALL
8. TIMBER SUPPORT

Figure C.4 — Concealed gutter flashing



1. ROOF TILES
2. BATTEN
3. UNDERTILE MEMBRANE
4. COUNTER FLASHING
5. APRON FLASHING
6. TIMBER ROOF TRUSS
7. MASONRY WALL

Figure C.5 — Apron flashing

Annex D
(informative)

Compatibility of metals and metal coatings

Table D.1 shows the compatibility of materials in direct contact and table D.2 shows acceptability of drainage from an upper to lower surface.

Table D.1 — Compatibility of materials in direct contact

1	2	3	4	5	6	7	8	9	10
Lower surface	**Upper surface**								
	Galvanized	Galv+paint	Al/Zn	Al/Zn+paint	Aluminium	Stainless steel	Copper	Lead	Unseasoned or wet timber
Galvanized	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Galv+paint	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Al/Zn	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Al/Zn +paint	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Aluminium	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Stainless steel	No	No	No	No	No	Yes	No	No	No

Table — D.2 — Acceptability of drainage from an upper to lower surface

1	2	3	4	5	6	7	8	9	10	11	12
Lower surface	**Upper surface**										
	Galvanized	Galv+paint	Al/Zn	Al/Zn+paint	Aluminium	Stainless steel	Copper	Lead	Fibre cement and Cement tiles	Slate and Glazed tiles	Glass and Plastic
Galvanized	Yes	No	No	No	No	No	No	Yes	Yes	No	No
Galv+paint	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Al/Zn	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Al/Zn +paint	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Aluminium	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Stainless steel	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Bibliography

Standards

ISO 9224, *Corrosion of metals and alloys-corrosivity of atmospheres-guiding values for the corrosivity categories*.

SANS 10062, *Fixing of concrete interlocking roofing tiles.*

Other publications

CSIR. *A guide to good thatching practice*. Boutek report No. Bou/E9806. CSIR, 1998.