

Firmlok[®]

Light structural beams

Quick selection tables
for home improvements



- LYSAGHT FIRMLOK[®] structural beams are light, strong and universal in their application
- A range of connection types and accessories allows you to erect your project with ease
- FIRMLOK is uniform in quality, it doesn't warp or split, it doesn't need painting
- Consistent straightness simplifies alignment



LYSAGHT FIRMLOK structural beams

LYSAGHT FIRMLOK® structural beams consist of two interlocking C-sections.

LYSAGHT FIRMLOK beams are available in three sizes F10011, F15015 & F20020 depending on your application and aesthetic preference.

This publication demonstrates FIRMLOK in its application as roofing members, combined with our range of roof sheeting. Typical applications include patios, carports and awnings.

Colours

FIRMLOK beams are available in ZINCALUME® steel and a range of COLORBOND® steel colours.

The FIRMLOK universal brackets are also available powder coated to match the COLORBOND® steel colours.

‘Unlock the potential of FIRMLOK’ and discover how versatile building can be.

Translucent sheeting

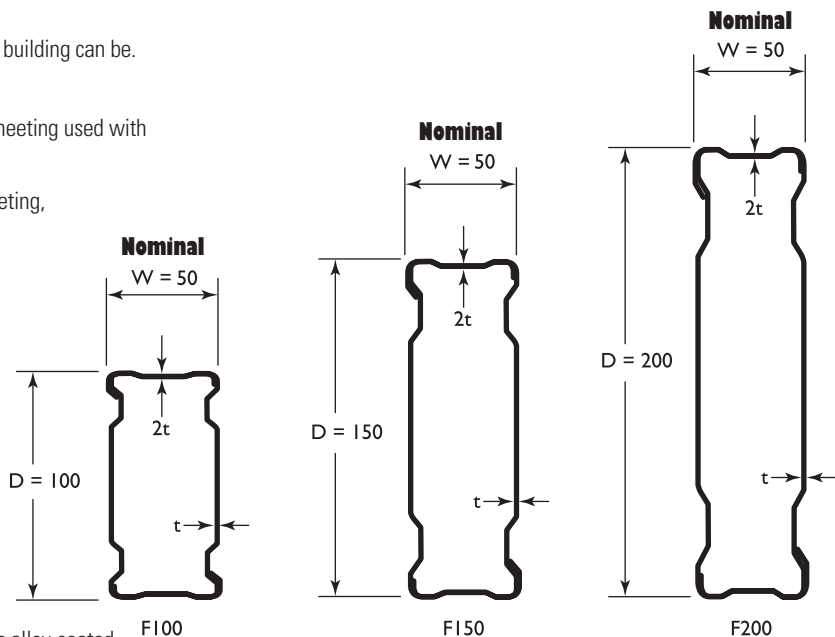
Our cover illustration shows an example of translucent roof sheeting used with FIRMLOK beams.

For instructions on the use and installation of translucent sheeting, refer to the manufacturer’s instructions.

Identification

The format of the number code is:

F	xxx	xx
F = FIRMLOK	xxx = Section depth D (mm)	xx = 2 t x 10 (mm)



Material specifications

FIRMLOK beams are made from ZINCALUME® aluminium/zinc alloy-coated steel complying with AS 1397—2001 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass).

The base metal thicknesses are 0.55, 0.75 and 1.00mm.

The COLORBOND® prepainted steel complies with AS/NZS 2728:2007.

Lengths

Stock lengths may vary from state to state. Please enquire at your local distribution outlet for available lengths.

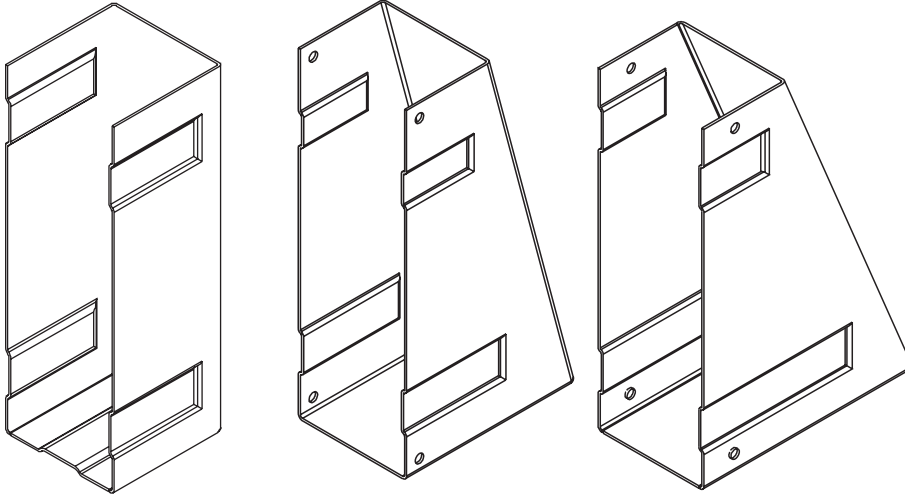
Alternatively, FIRMLOK may be ordered to length (maximum length at 12000mm). Extended lead times may apply.

FIRMLOK Section	Dimensions D x W (mm x mm)	Web Thickness t _w (mm)	Full Section Area A (mm ²)	Mass ZINCALUME®/COLORBOND® (kg/m)
F10011	100 x 50	0.55	234	1.91/(1.94)
F15015	150 x 50	0.75	393	3.17/(3.21)
F20020	200 x 50	1.0	620	4.97/(5.01)

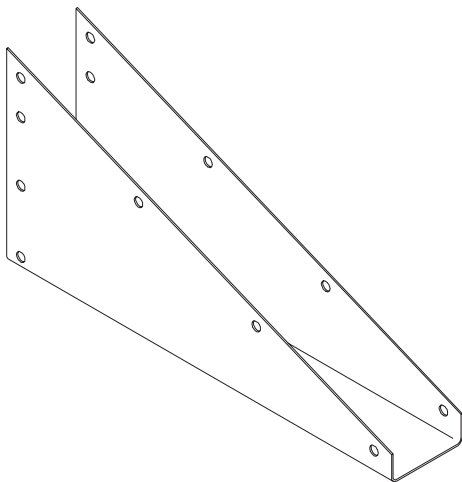
LYSAGHT FIRMLOK accessories

BlueScope Lysaght offers a range of FIRMLOK beam accessories, to ensure design and construction is as easy and stylish as possible. They can be used to complement a LYSAGHT "Quick Selection" roof solution, or purchased individually as part of your individual design.

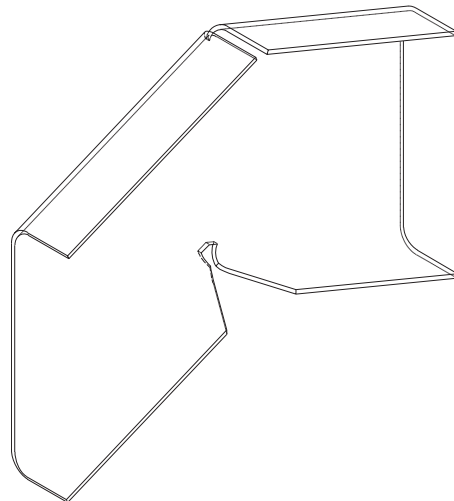
All visible accessories are available powder coated to match the colour of the FIRMLOK beam.



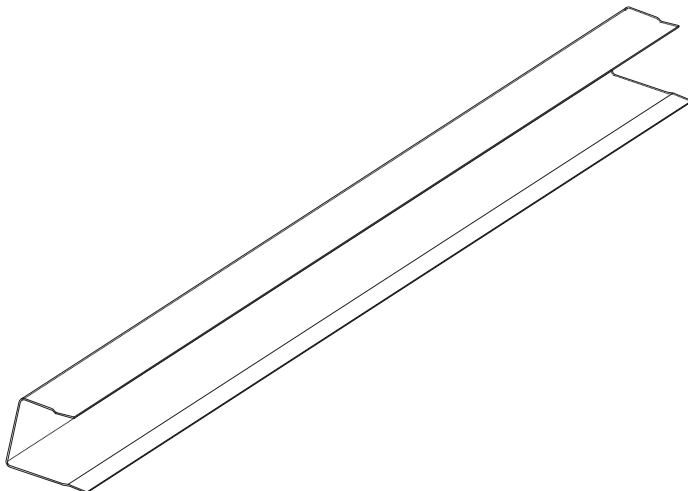
LYSAGHT FIRMLOK universal brackets for different pitches



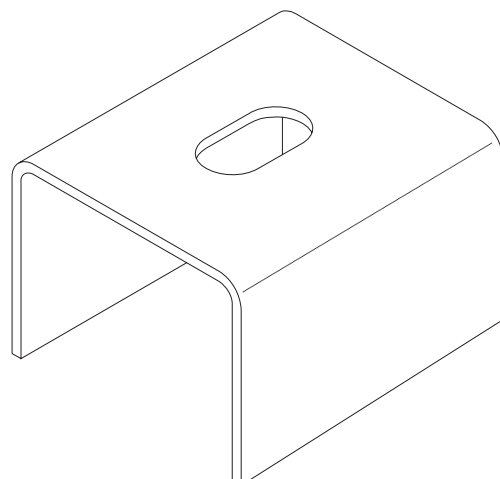
Collar Tie Bracket



LYSAGHT FIRMLOK Apex Bracket



Receiver Channel



LYSAGHT Column Insert

FIRMLOK roofing quick selection tables

Introduction

FIRMLOK Roofing “Quick Selection Tables” provide an easy tool for determining the roof layout of your structure, using FIRMLOK beams and LYSAGHT cladding.

The tables are divided into three sections; Attached Patios, Flat Free-standing structures and Pitched Free-standing structures. Each section comprises of diagrams and span tables. The diagrams assist with selecting your structure type and the tables determine the span of each member.

When using the Quick Selection tables, member designation is important.

- Rafters generally run parallel to the ribs on your cladding and have purlins attached
- Purlins run at ninety degrees to the ribs of your cladding.

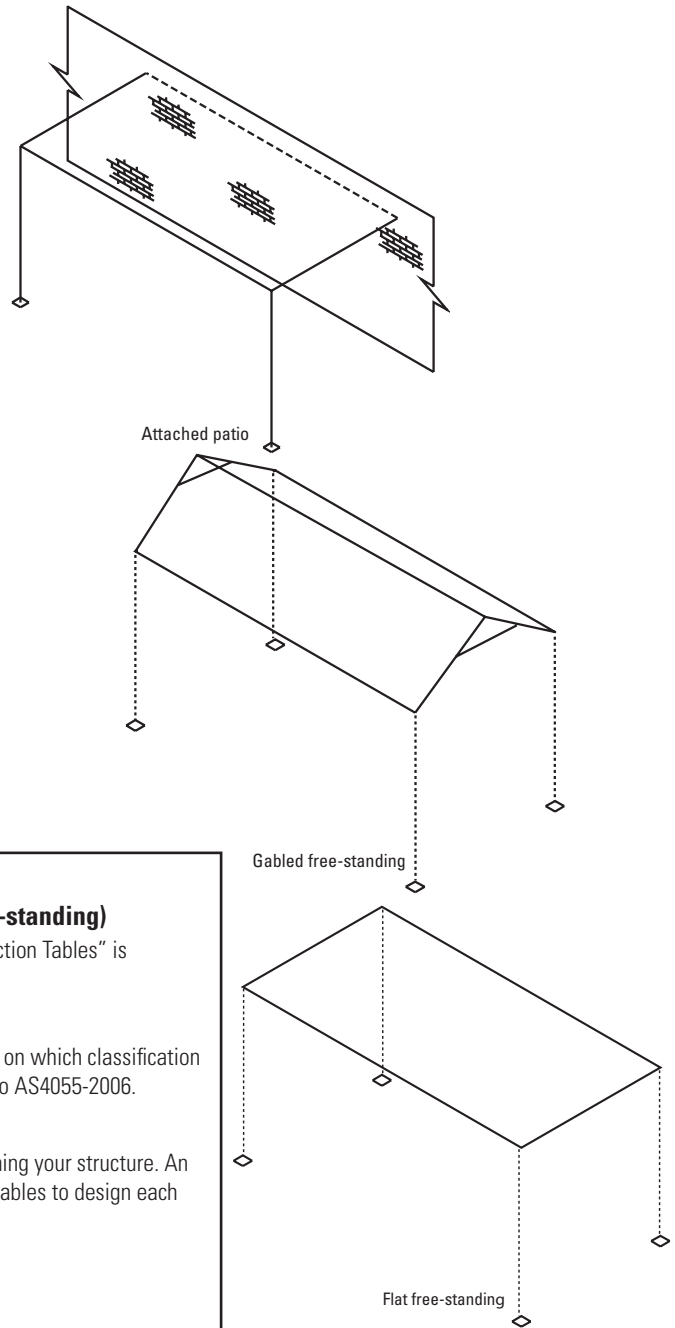
Using LYSAGHT’s FIRMLOK roofing “Quick Selection Tables”

The Quick Selection tables have been developed to be comprehensive and flexible, whilst remaining easy to use. The three sections allow you to design most typical structures with little effort.

Note: The sections for free-standing structures can be used to design similar attached structures, provided correct design of tie back to existing structure is performed.

Translucent sheeting

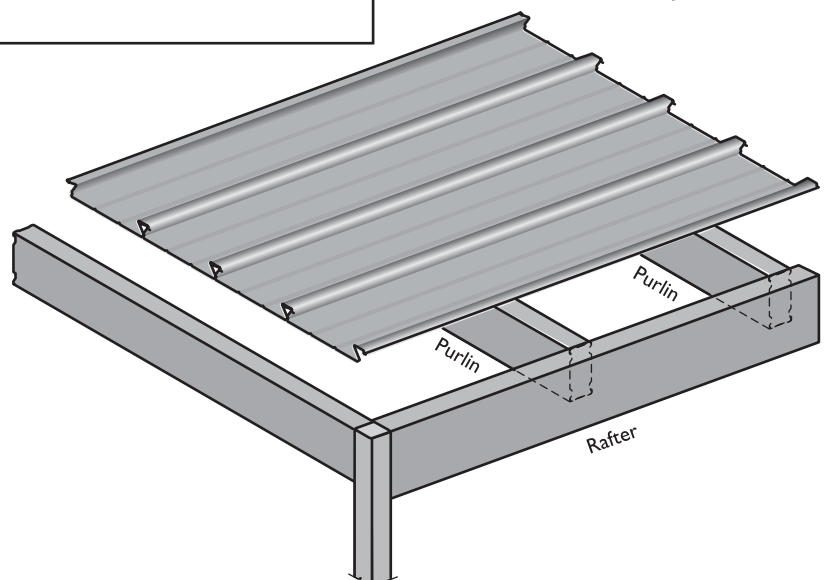
For instructions on the use and installation of translucent sheeting, refer to the manufacturer’s instructions.



To begin, you will need to determine;

- **Structure Type (Patio, Flat free-standing, or Pitched free-standing)**
This will indicate which section of the “Quick Selection Tables” is appropriate to your design.
- **Wind classification (N1& N2, N3 or N4).**
Your local building authority can give you guidance on which classification you should design for. Alternatively, you can refer to AS4055-2006.
- **Structure size The boundary dimensions**
This is all the information you need to begin designing your structure. An experienced user will have no problems using the tables to design each structure.

A first time user may wish to refer to the example at the end of each section.



Design conditions for the tables

General

LYSAGHT FIRMLOK "Quick Selection Tables" have been prepared in accordance with the appropriate Australian standards. Cladding, beam and connection capacities are based on limit state design and testing at BlueScope Lysaght's Technology centre. The following standards have been referred to;

- AS/NZS 4600:2005 Cold formed steel structures
- AS/NZS 1170.0-2002 Part 0: General principles
- AS/NZS 1170.1-2002 Part 1: Permanent, imposed and other actions
- AS/NZS 1170.2-2002 Part 2: Wind Actions
- AS 4055-2006 Wind loads for housing
- AS 1562.1-1992 Sheet roof and wall cladding Part 1: Metal
- AS 4040.2-1992 Methods of testing sheet roof and wall cladding – Resistance to wind pressure for non-cyclone regions

• The tables presented in this booklet are for non-cyclonic conditions only.

• Wind Loads - Design Wind speeds have been based on the classification system used in AS4055. Factors used to calculate the design net pressures have been derived from AS1170.2. For each structure, two situations have been considered:

- one side enclosed (typically attached to one side of an existing house) or no more than 50% cross sectional area blocked
- three sides enclosed (typically attached to three sides of an existing house) or more than 75% cross sectional area blocked.

• Flat roofs must have a roof slope no greater than 5 degrees. Roof slopes beyond 5 degrees may experience greater wind loads than have been designed for.

• Pitched roofs must have a roof slope no greater than 22.5 degrees

• Dead Loads - Self weight of both sheeting and FIRMLOK beam have been considered. NO allowance for ceilings have been made.

• Live Loads - A Live load of 0.25kPa has been considered to account for the accumulation of hail. No additional live load has been considered. NO consideration has been made for concentrated loads arising from maintenance. All cladding spans are based on 'No Foot Traffic'.

Serviceability

- Deflection limit adopted for the design of FIRMLOK beams is;
- Dead Load: Span/300
- Wind Load: Span/150
- Live Load: Span/150

For Attached patios

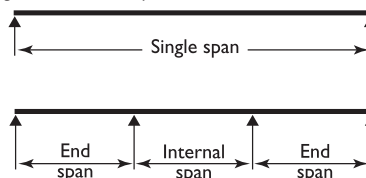
• Deflection limit adopted for the design of claddings is: Span/120 + Pitch/30

• LYSAGHT FLATDEK® cladding spans may result in noticeable deflections under max. loads. At low pitches and situations where deflections are deemed critical, spans should be reduced to 75%.

• The capacity of the existing structure to withstand the additional loads arising from the attached patio must be verified by a suitably qualified engineer. It's advised to check with your local government authority to determine any specific requirements for the attachment to existing structures.

• Patios have not been designed to account for any additional rainwater runoff, other than that falling directly onto its roof area. Rainwater must not be distributed from existing roofs onto patios.

• LYSAGHT FIRMLOK "Quick Selection Tables" have been designed and tested using LYSAGHT components.



Span types

Maximum spans (mm), for wind loading on attached and free roofs, For structures attached on 1 side or <50% of cross sectional area blocked. Flat and Pitched (No Foot Traffic)

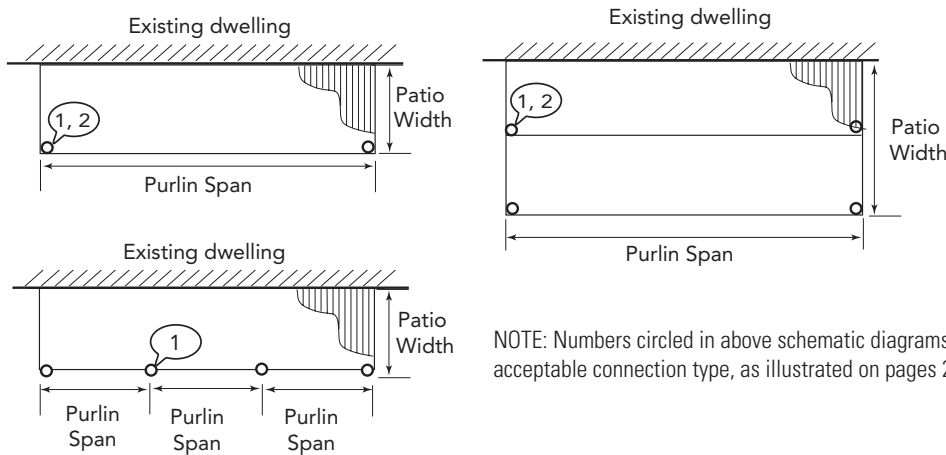
	BMT	Minimum Roof Pitch	Span Type	N2(W33)		N3 (W41)		N4 (W50)		Allowable overhang
				Flat/Pitched	Flat/Pitched	Flat/Pitched	Flat/Pitched	Flat/Pitched	Flat/Pitched	
FLATDEK/ FLATDEK II (Old only)	0.42	2° (1 in 30)	Single	5100	5100	4500	3300			600
			End/Internal	4800	4800	4500	3300			
CUSTOM ORB 3 fast's per sheet per support	0.42	5° (1 in 12)	Single	1800	1800	1800	1800			300
			End/Internal	2700	2700	2700	2500			
TRIMDEK every rib	0.48	2° (1 in 30)	Single	1800	1800	1800	1800			350
			End/Internal	2700	2700	2700	2700			
SPANDEK 3 fast's per sheet per support	0.42	3° (1 in 20)	Single	2400	2400	2400	2400			300
			End/Internal	3000	3000	3000	3000			
KL700HS clip fixed	0.48	2° (1 in 30)	Single	2700	2700	2700	2550			350
			End/Internal	3000	3000	3000	3000			
KL700HS screw fixed (pan)	0.42	1° (1 in 50)	Single	3000	3000	3000	2950			600
			End/Internal	3000	3000	3000	3000			
SPANRIB (Old only)	0.48	5° (1 in 12)	Single	3300	3300	3200	2550			450
			End/Internal	3600	3600	3600	3100			
SPANRIB (Old only)	0.48	1° (1 in 50)	Single	3300	3300	3300	2850			500
			End/Internal	3600	3600	3600	3350			
SPANRIB (Old only)	0.42	2° (1 in 30)	Single	3900	3900	3800	3450			450
			End/Internal	4200	4200	No value present	3600			
SPANRIB (Old only)	0.48	5° (1 in 12)	Single	2700	2500	2300	1800			300
			End/Internal	3600	3600	3300	2600			
SPANRIB (Old only)	0.48	1° (1 in 50)	Single	3000	3000	3000	3000			350
			End/Internal	3000	3600	3600	3600			

Maximum spans (mm), for wind loading on attached and free roofs, For structures attached on 3 sides or 75% of cross sectional area blocked. Flat and Pitched (No Foot Traffic)

	BMT	Minimum Roof Pitch	Span Type	N2(W33)		N3 (W41)		N4 (W50)		Allowable overhang
				Flat/Pitched	W37	Flat/Pitched	Flat/Pitched	Flat/Pitched	Flat/Pitched	
FLATDEK/ FLATDEK II (Old only)	0.42	2° (1 in 30)	Single	5100	4800	4250	3300			600
			End/Internal	4800	4800	4200	3200			
CUSTOM ORB 3 fast's per sheet per support	0.42	5° (1 in 12)	Single	1800	1750	1650	1350			300
			End/Internal	2600	2400	2150	1600			
TRIMDEK every rib	0.48	2° (1 in 30)	Single	1800	1800	1750	1300			350
			End/Internal	2700	2700	2650	2100			
SPANDEK 3 fast's per sheet per support	0.42	3° (1 in 20)	Single	2400	2400	2250	1850			300
			End/Internal	3000	3000	2850	2300			
KL700HS clip fixed	0.48	2° (1 in 30)	Single	2700	2400	2200	1950			350
			End/Internal	3000	3000	2900	2250			
KL700HS screw fixed (pan)	0.42	3° (1 in 20)	Single	2700	2450	2250	1800			600
			End/Internal	2650	2100	1850	1450			
KL700HS screw fixed (pan)	0.48	2° (1 in 30)	Single	2950	2800	2600	2200			600
			End/Internal	3000	3000	2600	1750			
KL700HS screw fixed (pan)	0.42	1° (1 in 50)	Single	2800	2400	2100	1500			450
			End/Internal	3300	3000	2550	1450			
SPANRIB (Old only)	0.48	5° (1 in 12)	Single	3250	2650	2300	1750			500
			End/Internal	3550	3250	2900	1900			
SPANRIB (Old only)	0.42	2° (1 in 30)	Single	3600	3350	3100	na			450
			End/Internal	3750	3500	No value present	2750			
SPANRIB (Old only)	0.48	1° (1 in 50)	Single	2000	1750	1500	1150			300
			End/Internal	2900	2500	2300	1450			
SPANRIB (Old only)	0.48	5° (1 in 12)	Single	3000	3000	2500	2350			350
			End/Internal	3000	3000	2800	1700			

Note: All claddings are crest fastened (rib fixed) unless otherwise stated. The design of posts, anchoring of posts and footings does not fall under the scope of this document. This shall be carried out by a suitably qualified person.

Simply supported patios - no cladding overhang



NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Maximum Purlin Span (simple spans)

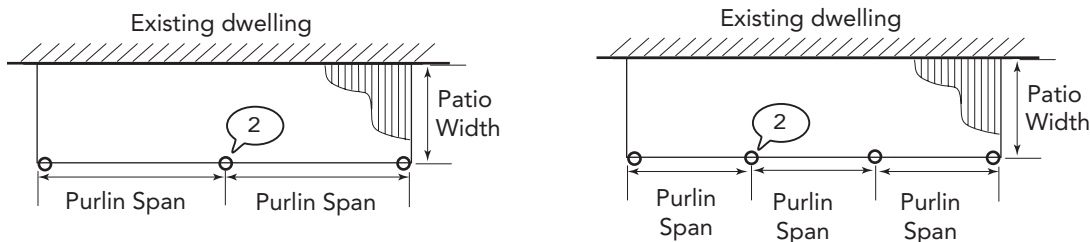
No cladding overhang

Wind Category	FIRMLOK Beam Size	Patio Width															
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000
W33 (N2)	F10011	5134	4831	4589	4389	4220	4075	3947	3834	3734	3642	3560	3484	3414	3350	3290	3234
	F15015	7883	7418	7047	6740	6480	6257	6061	5888	5733	5593	5466	5349	5242	5143	5051	4966
	F20020	10959	10312	9796	9369	9009	8698	8426	8185	7969	7775	7598	7436	7288	7150	7022	6903
W37	F10011	5134	4831	4589	4389	4220	4075	3947	3834	3734	3642	3560	3484	3414	3350	3290	3231
	F15015	7883	7418	7047	6740	6480	6257	6061	5888	5733	5593	5466	5349	5242	5143	5051	4966
	F20020	10959	10312	9796	9369	9009	8698	8426	8185	7969	7775	7598	7436	7288	7150	7022	6903
W41 (N3)	F10011	5134	4831	4589	4389	4220	4075	3903	3736	3588	3456	3338	3231	3134	3046	2964	2888
	F15015	7883	7418	7047	6740	6480	6257	6061	5836	5604	5397	5212	5045	4893	4753	4625	4507
	F20020	10959	10312	9796	9369	9009	8698	8426	8185	7894	7601	7339	7102	6886	6689	6508	6341
W50 (N4)	F10011	4669	4301	3979	3719	3505	3324	3168	3032	2913	2806	2711	2624	2545	2473	2407	2346
	F15015	7169	6726	6218	5810	5474	5189	4945	4733	4545	4379	4229	4094	3971	3858	3754	3659
	F20020	9965	9378	8767	8188	7710	7307	6961	6660	6395	6159	5948	5757	5583	5424	5278	5143
Reduction factor		0.84	0.82	0.81	0.80	0.79	0.77	0.77	0.76	0.75	0.74	0.74	0.73	0.72	0.71	0.71	0.70

Reduction factor

Apply to Maximum Purlin Span when patio is attached on three sides

Continuous patios - no cladding overhang



NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Maximum Purlin Span (continuous spans)

No cladding overhang

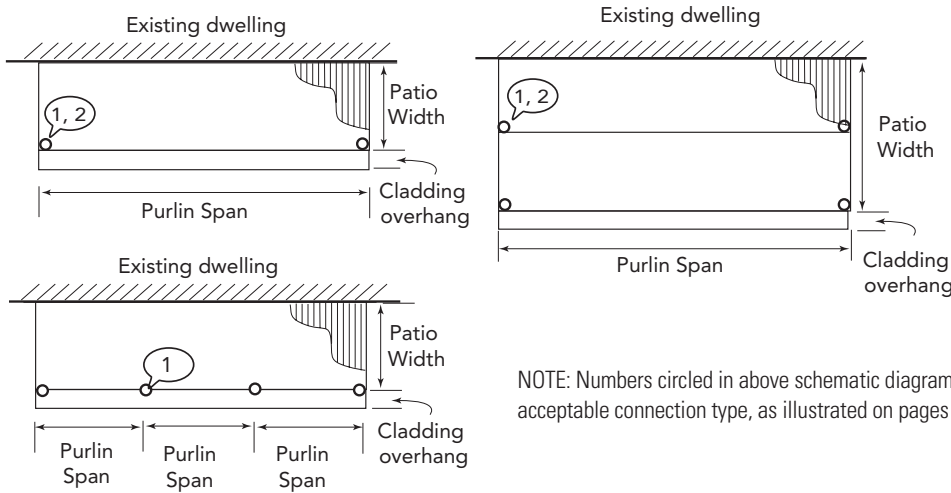
Wind Category	FIRMLOK Beam Size	Patio Width															
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000
W33 (N2)	F10011	6885	6479	6154	5886	5660	5464	5293	5142	5007	4884	4773	4672	4545	4383	4234	4096
	F15015	10571	9948	9449	9038	8690	8390	8128	7895	7687	7500	7329	7173	6976	6720	6484	6265
	F20020	14695	13829	13136	12564	12080	11663	11299	10976	10687	10426	10189	9972	9772	9588	9417	9168
W37	F10011	6885	6479	6154	5886	5660	5387	5091	4825	4590	4380	4190	4018	3861	3717	3584	3460
	F15015	10571	9948	9449	9038	8690	8326	7844	7422	7048	6715	6414	6142	5893	5665	5455	5260
	F20020	14695	13829	13136	12564	12080	11663	11299	10789	10265	9798	9378	8997	8649	8330	8037	7651
W41 (N3)	F10011	6843	6236	5766	5388	5023	4706	4432	4192	3979	3789	3617	3462	3320	3189	3069	2958
	F15015	10571	9770	9026	8329	7736	7232	6797	6416	6080	5779	5508	5262	5038	4833	4645	4470
	F20020	14695	13827	12758	11905	11202	10522	9913	9381	8910	8489	8111	7655	7198	6792	6429	6103
W50 (N4)	F10011	5543	4996	4539	4168	3859	3596	3369	3170	2994	2826	2636	2471	2325	2195	2079	1975
	F15015	8622	7693	6968	6379	5890	5474	5116	4803	4526	4264	3978	3727	3507	3310	3135	2977
	F20020	12254	11152	10152	9329	8645	8064	7354	6732	6207	5758	5369	5030	4731	4465	4228	4015
Reduction factor		0.75	0.72	0.69	0.67	0.64	0.62	0.60	0.59	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.51

Reduction factor

Apply to Maximum Purlin Span when patio is attached on three sides

Note: Some lengths given in the above table may exceed the maximum size available in your area.

Simply supported patios - with cladding overhang



NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Maximum Purlin Span (simple spans)

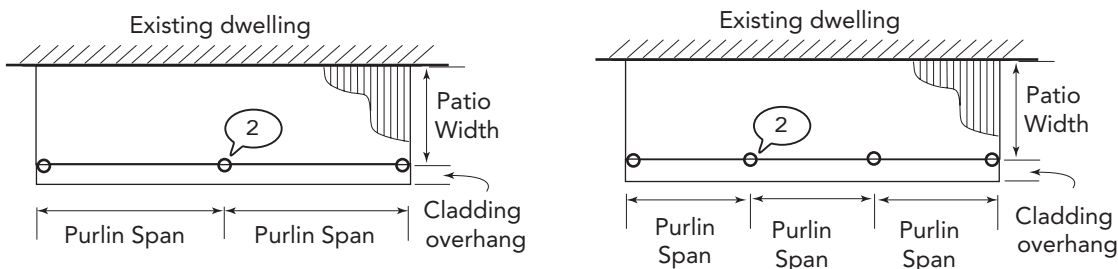
With cladding overhang

Wind Category	FIRMLOK Beam Size	Patio Width															
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000
W33 (N2)	F10011	4220	4075	3947	3834	3734	3642	3560	3484	3414	3350	3290	3234	3182	3133	3087	3043
	F15015	6480	6257	6061	5888	5733	5593	5466	5349	5242	5143	5051	4966	4886	4811	4740	4673
	F20020	9009	8698	8426	8185	7969	7775	7598	7436	7288	7150	7022	6903	6792	6687	6589	6496
W37	F10011	4220	4075	3947	3834	3734	3642	3560	3484	3414	3350	3290	3234	3182	3133	3087	3043
	F15015	6480	6257	6061	5888	5733	5593	5466	5349	5242	5143	5051	4966	4886	4806	4700	4600
	F20020	9009	8698	8426	8185	7969	7775	7598	7436	7288	7150	7022	6903	6792	6687	6589	6472
W41 (N3)	F10011	4220	4075	3903	3736	3588	3456	3338	3231	3134	3046	2964	2888	2818	2753	2692	2636
	F15015	6480	6257	6061	5836	5604	5397	5212	5045	4893	4753	4625	4507	4398	4296	4201	4112
	F20020	9009	8698	8426	8185	7894	7601	7339	7102	6886	6689	6508	6341	6186	6042	5908	5782
W50 (N4)	F10011	3505	3324	3168	3032	2913	2806	2711	2624	2545	2473	2407	2346	2289	2236	2187	2141
	F15015	5474	5189	4945	4733	4545	4379	4229	4094	3971	3858	3754	3659	3570	3488	3411	3338
	F20020	7710	7307	6961	6660	6395	6159	5948	5757	5583	5424	5278	5143	5018	4902	4793	4691

Reduction factor	0.79	0.77	0.77	0.76	0.75	0.74	0.74	0.73	0.72	0.71	0.71	0.70	0.69	0.68	0.68	0.67
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Apply to Maximum Purlin Span when patio is attached on three sides

Continuous patios - with cladding overhang



NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Maximum Purlin Span (continuous spans)

With cladding overhang

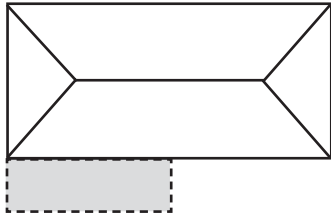
Wind Category	FIRMLOK Beam Size	Patio Width															
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000
W33 (N2)	F10011	5660	5464	5293	5142	5007	4884	4773	4672	4545	4383	4234	4096	3967	3847	3735	3630
	F15015	8690	8390	8128	7895	7687	7500	7329	7173	6976	6720	6484	6265	6061	5871	5694	5528
	F20020	12080	11663	11299	10976	10687	10426	10189	9972	9772	9588	9417	9168	8884	8619	8371	8138
W37	F10011	5660	5387	5091	4825	4590	4380	4190	4018	3861	3717	3584	3460	3346	3239	3139	3045
	F15015	8690	8326	7844	7422	7048	6715	6414	6142	5893	5665	5455	5260	5080	4911	4754	4607
	F20020	12080	11663	11299	10789	10265	9798	9378	8997	8649	8330	8037	7651	7281	6945	6638	6358
W41 (N3)	F10011	5023	4706	4432	4192	3979	3789	3617	3462	3320	3189	3069	2958	2850	2720	2601	2492
	F15015	7736	7232	6797	6416	6080	5779	5508	5262	5038	4833	4645	4470	4302	4105	3925	3760
	F20020	11202	10522	9913	9381	8910	8489	8111	7655	7198	6792	6429	6103	5809	5541	5298	5074
W50 (N4)	F10011	3859	3596	3369	3170	2994	2826	2636	2471	2325	2195	2079	1975	1880	1795	1716	1645
	F15015	5890	5474	5116	4803	4526	4264	3978	3727	3507	3310	3135	2977	2835	2705	2587	2479
	F20020	8645	8064	7354	6732	6207	5758	5369	5030	4731	4465	4228	4015	3822	3647	3487	3341

Reduction factor	0.64	0.62	0.60	0.59	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.51	0.50	0.50	0.50	0.49
------------------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

Apply to Maximum Purlin Span when patio is attached on three sides

Note: Some lengths given in the above table may exceed the maximum size available in your area.

Attached patio example 1



Step 1: Required Information before you start

Determine the wind area you are in.

Select the boundary dimensions.

Will the patio be attached on one or more sides?

Step 2: Cladding Design

Select your cladding.

Select the maximum span LYSAGHT TRIMDEK® roof cladding can do from the table on P5.

Can your cladding span the patio width in one go?

Can the cladding span the patio width in two spans?

Do you want the cladding to overhang?

Step 3: FIRMLOK purlin design

Using the table on p6 'Allowable purlin span (simple spans)' determine whether a purlin can span the full 6400mm.

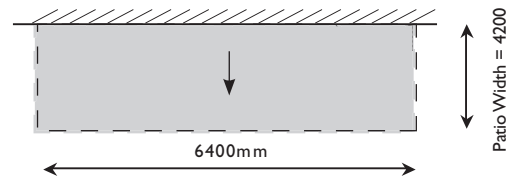
Step 4: Select connection

Determine the type of connection you wish to adopt.

Task:

Determine a suitable patio to cover an existing paved area 4200 x 6400mm.

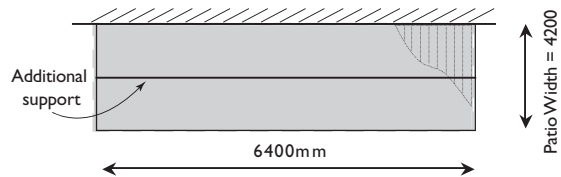
In our example, we will choose wind condition W33 (N2), the boundary is 4200 x 6400mm and we will be attaching on one side only.



We will be choosing TRIMDEK.

TRIMDEK can span 2400mm 0.42bmt or 2700mm 0.48bmt.

2400 & 2700 < 4200mm, therefore TRIMDEK cannot span the width in one span. We will need an extra support.



End spans for TRIMDEK are 3000mm.

$2 \times (3000) = 6000\text{mm} > 4200\text{mm}$.

Yes - TRIMDEK 0.42bmt is OK to span the patio width in two spans.

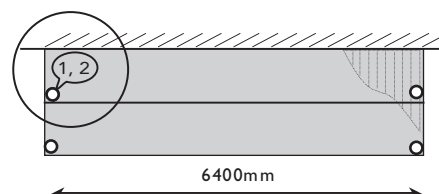
No - we don't want any overhang.

For Wind Category = W33 (N2), Patio Width = 4200mm

From the table, F20020 will span 7775mm > 6400mm, therefore, it will do the span.

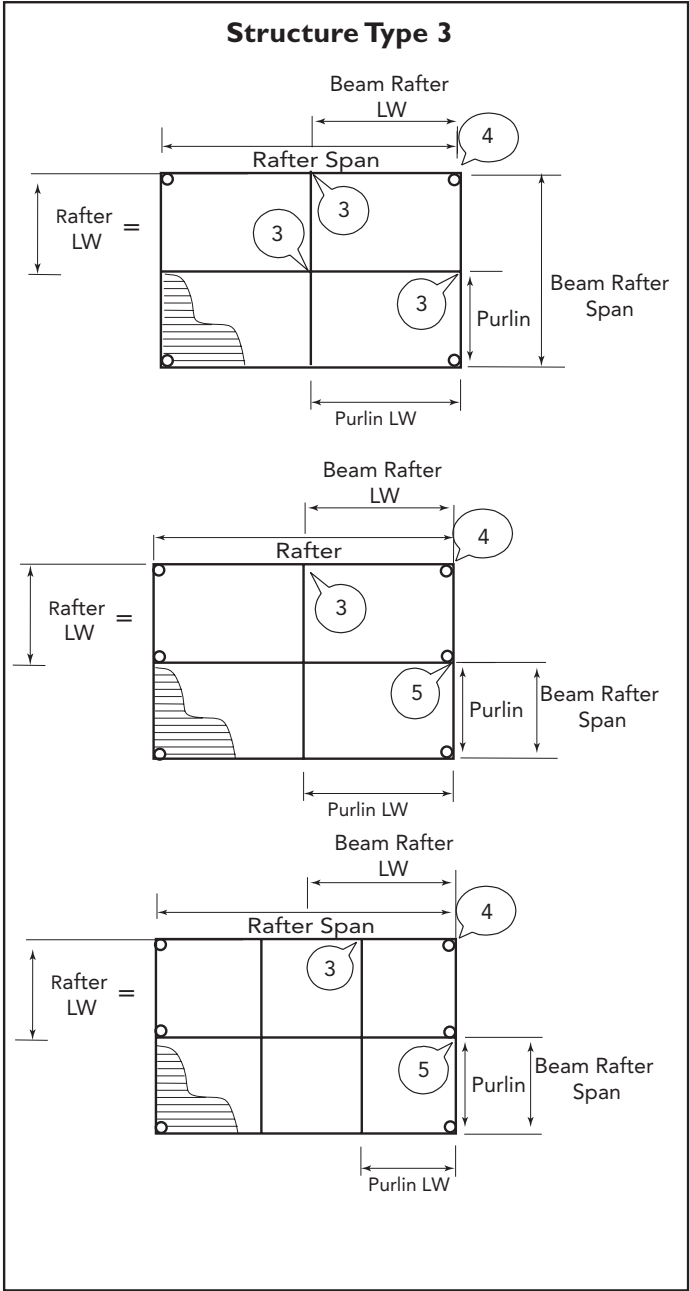
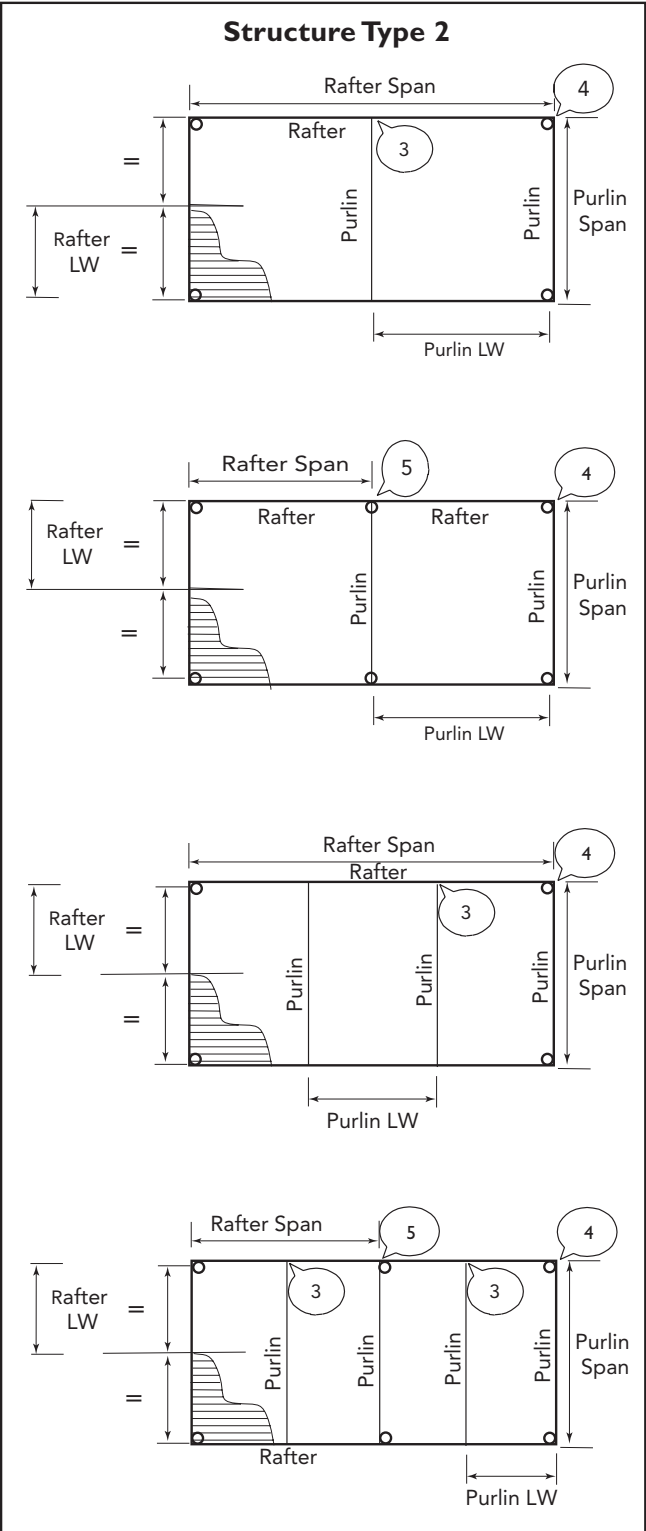
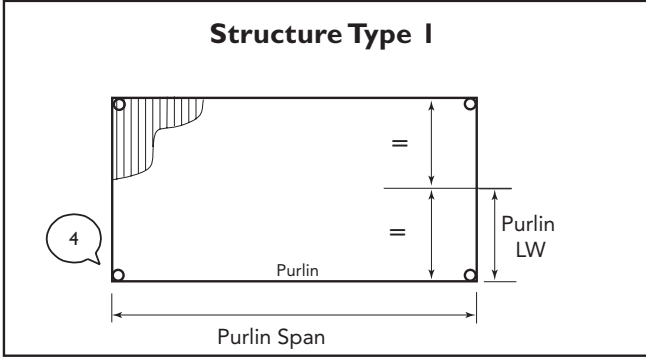
Refer to the diagrams above the table used to select which connection to use. In this case, the table used was allowable purlin span (simple spans) no cladding overhang, and the diagram which resembles your structure should be chosen.

In this case connections 1 or 2 are applicable. See below.



NOTE: Numbers circled in above schematic diagram refers to acceptable connection type, as illustrated on pages 21 - 27.

Free-standing flat roofs



NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21 - 27.

Note:

Structure Type 3 has additional Beam Rafters. The span of these should be obtained from the tables below, using Beam Rafter LW instead of Rafter LW.

Maximum Purlin Span

Wind Category	FIRMILOK Beam Size	Purlin Load Width															
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000
W33	F10011	4075	3834	3642	3484	3350	3234	3133	3043	2963	2891	2825	2765	2710	2659	2611	2567
	F15015	6257	5888	5593	5349	5143	4966	4811	4673	4550	4439	4338	4246	4161	4082	4009	3941
	F20020	8698	8185	7775	7436	7150	6903	6687	6496	6325	6171	6030	5902	5784	5675	5574	5479
W37	F10011	4075	3834	3642	3484	3350	3231	3079	2948	2831	2728	2635	2551	2474	2404	2340	2281
	F15015	6257	5888	5593	5349	5143	4966	4806	4600	4418	4256	4111	3979	3859	3750	3649	3557
	F20020	8698	8185	7775	7436	7150	6903	6687	6472	6215	5986	5781	5595	5426	5272	5130	4999
W41	F10011	4075	3736	3456	3231	3046	2888	2753	2636	2532	2439	2356	2281	2213	2150	2093	2040
	F15015	6257	5836	5397	5045	4753	4507	4296	4112	3949	3805	3675	3557	3451	3353	3263	3156
	F20020	8698	8185	7601	7102	6689	6341	6042	5782	5553	5349	5166	5000	4850	4712	4585	4468
W50	F10011	3324	3032	2806	2624	2473	2346	2236	2141	2057	1982	1913	1793	1688	1594	1510	1434
	F15015	5189	4733	4379	4094	3858	3659	3488	3338	3207	2979	2780	2605	2452	2315	2193	2083
	F20020	7307	6660	6159	5757	5424	5143	4902	4691	4506	4341	4193	4059	3911	3693	3498	3322

Reduction factor 0.77 0.76 0.74 0.73 0.71 0.70 0.68 0.67 0.65 0.64 0.62 0.61 0.60 0.58 0.57 0.56

Apply to maximum purlin span when structure is attached on three sides or 75% of cross sectional area is blocked.

Maximum Rafter Span (simple spans)

Wind Category	FIRMILOK Beam Size	Rafter Load Width																							
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800												
W33	F10011	4389	4207	4131	3959	3924	3761	3753	3597	3608	3458	3484	3339	3375	3235	3278	3142	3059	3192	3126	2985	3043	2917	2855	
	F15015	6740	6460	6342	6079	6025	5774	5762	5523	5541	5310	5349	5127	5182	4967	5034	4825	4901	4698	4782	4583	4673	4479	4574	4383
	F20020	8980	8980	8840	8450	8352	8027	7080	7678	6848	7382	6646	7127	6469	6904	6312	6707	6170	6530	6042	6371	5926	6226	5817	6094
W37	F10011	4389	4207	4131	3959	3924	3761	3753	3597	3608	3458	3484	3339	3375	3235	3278	3142	3059	3192	3126	2985	3043	2917	2855	
	F15015	6446	6460	6116	6079	5839	5774	5598	5523	5386	5310	5198	5127	5028	4876	4876	4825	4736	4698	4609	4583	4479	4383	4383	
	F20020	7579	8980	8889	8027	6634	7678	6416	7382	6228	7127	6082	6228	6228	6082	5914	6707	5780	5656	5656	6371	5541	6226	5433	6094
W41	F10011	4389	4207	4131	3959	3924	3761	3753	3597	3608	3458	3484	3339	3375	3235	3278	3142	3059	3192	3126	2985	3043	2917	2855	
	F15015	6032	6460	5704	6079	5426	5774	5187	5523	4978	5310	4794	5127	4629	4967	4481	4825	4347	4698	4225	4583	4113	4479	4009	4370
	F20020	7102	8755	6745	8297	7909	6217	7574	6013	7279	5837	7018	5677	6785	5531	6574	5373	6382	5273	6207	5157	6046	5049	5898	
W50	F10011	3833	3826	3550	3600	3322	3420	3134	3271	2975	3079	2814	2905	2676	2754	2555	2623	2448	2506	2302	2402	2267	2308	2189	2223
	F15015	5271	5874	4948	5528	4679	5251	4452	5022	4256	4760	4085	4487	3933	4252	3797	4045	3675	3863	3565	3699	3464	3551	3371	3417
	F20020	6300	7692	5984	7236	5725	6856	5502	6532	5304	6232	5128	6006	4968	5788	4824	5593	4692	5416	4570	5256	4458	5089	4355	4904

Reduction factor 0.81 0.84 0.80 0.83 0.79 0.82 0.78 0.81 0.78 0.80 0.77 0.79 0.76 0.78 0.76 0.77 0.75 0.76 0.75 0.74 0.73 0.73 0.73 0.73 0.73 0.73 0.73

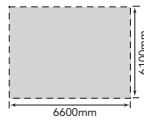
Maximum Rafter Span (continuous spans)

Wind Category	FIRMILOK Beam Size	Rafter load width																							
		1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800												
W33	F10011	5530	5301	5204	4988	4944	4738	4728	4532	4546	4357	4389	4207	4252	4075	4131	3959	4022	3855	3924	3761	3834	3665	3753	3535
	F15015	7455	8139	7078	7659	6774	7275	6522	6959	6307	6691	6117	6460	5946	6258	5789	6079	5644	5919	5511	5774	5387	5617	5271	5453
	F20020	8764	9970	8321	9468	7965	9064	7668	8725	7416	8431	7198	8166	7006	7927	6835	7708	6682	7507	6543	7322	6417	7151	6301	6991
W37	F10011	5496	5301	5148	4988	4861	4738	4619	4532	4411	4281	4229	4041	4069	3833	3926	3651	3798	3491	3682	3347	3570	3217	3445	3099
	F15015	6983	7797	6630	7314	6346	6914	6105	6575	5893	6283	5703	6028	5531	5803	5375	5602	5231	5384	5100	5158	4978	4954	4865	4670
	F20020	8210	9342	7795	8872	7462	8485	7184	8150	6948	7853	6744	7589	6564	7350	6405	7134	6261	6937	6131	6756	6013	6588	5904	6277
W41	F10011	5060	5128	4725	4710	4450	4333	4219	4027	4022	3773	3851	3557	3700	3370	3558	3206	3403	3038	3265	2821	3140	2633	3027	2469
	F15015	6543	7191	6210	6722	5933	6338	5692	6014	5480	5737	5291	5487	5121	5194	4967	4937	4827	4571	4699	4244	4580	3961	4471	3714
	F20020	7693	8755	7305	8297	6992	7909	6733	7574	6512	7279	6320	7018	6152	6785	6003	6574	5868	6143	5744	5704	5629	5324	5521	4991
W50	F10011	4300	4133	3993	3736	3746	3426	3524	3174	3300	2875	3109	2588	2945	2352	2789	2156	2574	1990	2390	1848	2231	1725	2091	1617
	F15015	5777	6127	5449	5696	5173	5282	4937	4866	4731	4325	4551	3893	4390	3539	4195	3244	3872	2994	3596	2780	3356	2595	3146	2433
	F20020	6823	7692	6480	7236	6203	6856	5973	6532	5775	5814	5599	5232	5440	4756	5294	4360	5160	4025	4833	3737	4510	3488	4228	3270

Reduction factor 0.79 0.74 0.78 0.71 0.76 0.68 0.74 0.64 0.72 0.61 0.70 0.59 0.68 0.56 0.66 0.54 0.64 0.62 0.61 0.60 0.58 0.58 0.58 0.58 0.58 0.58

Apply to maximum rafter span when structure is attached on three sides or 75% of cross sectional area is blocked.

Free-standing flat roof: Example 2



Task:

Determine a suitable freestanding carport to cover an existing slabbed area 6100 x 6600mm

Steps

Step 1: Required Information before you start

- Determine the wind area you are in.
- Select the boundary dimensions.
- Will the structure be attached on one or more sides or blocked by 75% or greater?

Worked example

In our example, we will choose wind condition W41 (N3), the boundary is 6100 x 6600mm and the structure is not blocked.

Step 2: Cladding Design

- Select your cladding.
- Select your cladding direction.
- Select the maximum span FLATDEK can do from the table on page 5.
- Can your cladding span the length in one span?
- Can the cladding span the length in two spans?

We will be choosing FLATDEK.

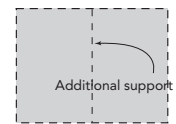
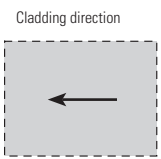
FLATDEK can span 4500mm 0.42mm BMT.

4500 < 6600mm, therefore FLATDEK cannot. We will need an extra support.

End spans for FLATDEK are 4500mm.

2 x (4500) = 9000mm > 6600mm.

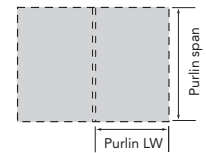
Yes - FLATDEK is OK to span the structure length in two spans.



Step 3: Structure type

Select your structure type from the diagrams on page 9.

We are Structure Type 2.



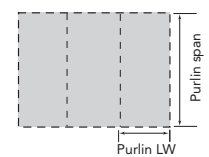
Step 4: FIRMLOK purlin design

- Using the table on page 10 'Maximum Purlin Span' determine whether a purlin can span the full 6100mm at the given spacing.
- Add additional purlin and see if the purlin design is adequate.

Using Structure 2 diagrams: for Wind Category W41 (N3)

Purlin LW = 3300 Purlin span = 6100
F20020 will span 6042 = 6042 ≤ 6100
Therefore, not suitable.

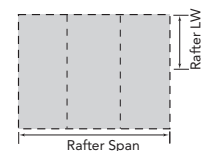
Purlin LW = 2200 Purlin span = 6100
7434 ≥ 6100, therefore OK



Step 5: Rafter design

Using the table on page 10 Maximum Rafter Span (simple spans) determine whether the rafter can span the full length.

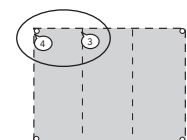
For Wind Category W41 (N3),
Rafter LW = 3050
Rafter Span = 6600mm
Number of intermediate purlins = 2
From the table for F20020 -
Simple span = 7010 ≥ 6100, therefore, it will do the span.



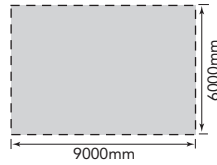
Step 6: Select connection

For your structure type, the diagrams on page 8 indicate which connections you can have.

In this case connections 3 or 4 are applicable.



Free-standing flat roof: Example 3



Task:

Determine a suitable freestanding carport to cover an existing slabbed area 9000 x 6000mm

Steps

Step 1: Required Information before you start

Determine the wind area you are in.

Select the boundary dimensions.

Will the structure be attached on one or more sides or blocked by 75% or greater?

Worked example

In our example, we will choose wind condition W33 (N2), the boundary is 6000 x 9000mm and the structure is not blocked.

Step 2: Cladding Design

Select your cladding.

Select your cladding direction (typically in the largest direction)

Select the maximum span CUSTOM ORB can do from the table on p5.

Can your cladding span the length in one span?

Can the cladding span the length in two spans?

Can the cladding span the length in three spans?

We will be choosing CUSTOM ORB.

CUSTOM ORB can span 1800mm
0.42BMT and 0.48BMT

1800 < 6000mm, therefore CUSTOM ORB cannot span the distance in one span. We will need an extra support.

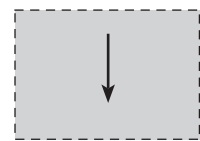
End spans for CUSTOM ORB are 2700mm.
 $2 \times (2700) = 5400\text{mm} < 6000\text{mm}$.

Therefore CUSTOM ORB cannot span the distance in two spans.

$3 \times (2700) = 8100\text{mm} > 6000\text{mm}$.

Therefore, CUSTOM ORB is OK to span the structure length in three spans.

Cladding direction



Step 3: Structure type

Select your structure type from the diagrams on page 9.

We are Structure Type 2.

Step 4: FIRMLOK purlin design

Using the table on p10 'Maximum Purlin Span' determine whether a purlin can span the full 9000mm at the given spacing.

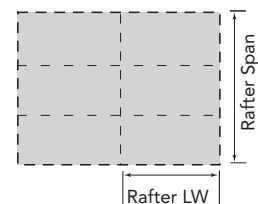
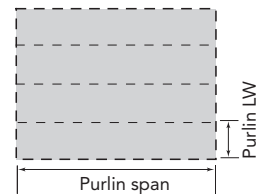
Add additional purlin and see if the purlin design is adequate.

Alternatively, add an additional rafter and review purlin design.
Note: The structure type is now Type 3.

Using Structure 2 diagrams:
for Wind Category W33 (N2)
Purlin LW = 2000 Purlin span = 9000
F20020 will span $7911 \leq 9000$
Therefore, not suitable.

Purlin LW = 1500 Purlin span = 9000
F20020 will span $8698 \leq 9000$
Therefore, not suitable.

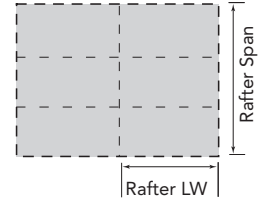
Using Structure 2 diagrams:
for Wind Category W33 (N2)
Purlin LW = 2000 Purlin span = 4500
F20020 will span $7911 \geq 4500$
or F15015 will span $5691 \geq 4500$
Therefore, both are suitable.



Step 5: Rafter design

Using the table Maximum Rafter Span on p10 (simple spans) determine whether the rafter can span the full length.

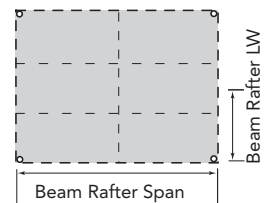
For Wind Category W33 (N2),
 Rafter LW = 4500
 Rafter Span = 6000mm
 Number of intermediate purlins = 2
 From the table for F20020 -
 Simple span = 6226 \geq 6000 , therefore, it will do the span.



Step 6: Beam Rafter Design

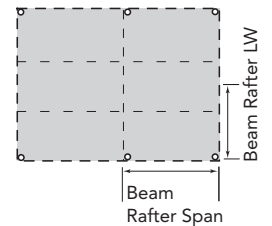
Using the table Maximum Rafter Span on p10 (simple spans) using Beam Rafter load widths instead of beam load Widths determine whether the rafter can span the full length.

For Wind Category W33 (N2),
 Beam Rafter LW = 3000
 Beam Rafter Span = 9000mm
 Number of intermediate purlins = 1
 From the table for F20020 -
 Simple span = 6646 < 9000 , therefore, it will not do the span.



Add post to support beam rafter and review Beam Rafter design.

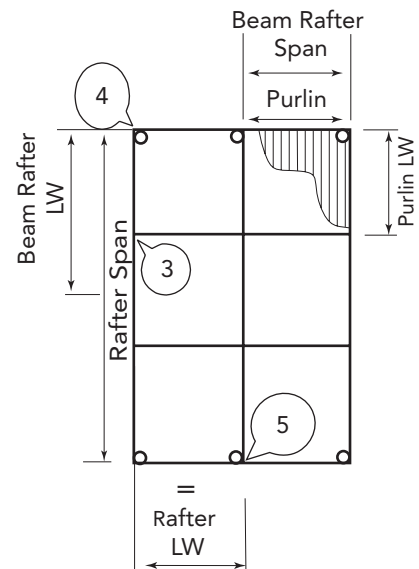
For Wind Category W33 (N2),
 Beam Rafter Span is reduced to 4500mm, therefore OK.



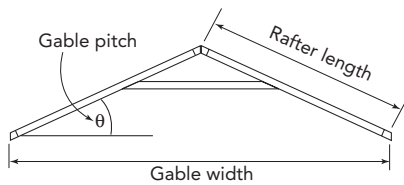
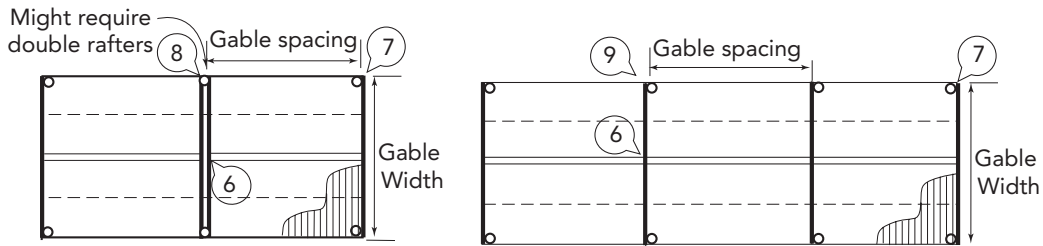
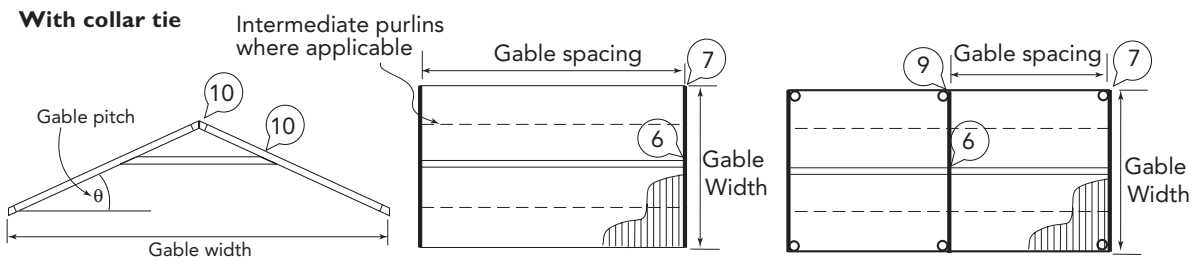
Step 7: Select connection

For your structure type, the diagrams on page 9 indicate which connections you can have.

In this case connections 3, 4 or 5 are applicable. See below.



Gable roofs



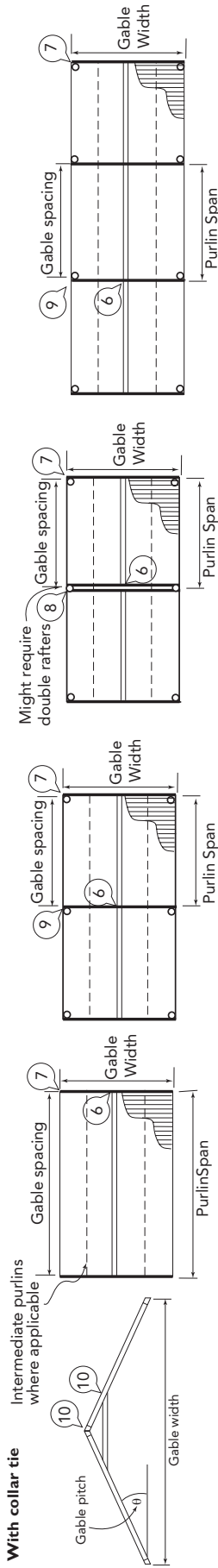
When checking cladding span, rafter length must be calculated using the following formula:
 For a 15° gable pitch, Rafter length = 0.52 x gable width
 For a 22.5° gable pitch, Rafter length = 0.54 x gable width
 Note: These equations are estimations for choosing the cladding only, not precise dimensions for construction.

NOTES:

Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Collar ties must be placed on all gable rafters. Collar ties must always be positioned in accordance with Connection 10. (p26)

Gable width goes to backside of bracket.



Maximum Purlin Span - Gable Structure with Collar Tie

Gable pitch	Wind Category	FIRMLOK Beam Size		Gable Width																			
		3000	3600	3900	4200	4500	4800	5100	5400	5700	6000	6300	6600	7200	7500	7800	8100	8400	8700	9000			
15°	W33 (N2)	F10011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519
		F15015	7792	7549	7333	7140	6966	6807	6662	6529	6406	6291	6185	6085	5991	5903	5820	5741	5667	5596	5529	5464	5403
		F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511
	W37	F10011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519
		F15015	7792	7549	7333	7140	6966	6807	6662	6529	6406	6291	6185	6085	5991	5903	5820	5741	5667	5596	5529	5464	5403
		F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511
W41 (N3)	F10011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519	
	F15015	7792	7549	7333	7140	6966	6807	6662	6529	6406	6291	6185	6085	5991	5903	5820	5741	5667	5596	5529	5464	5403	
	F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511	
W50 (N4)	F10011	4615	4416	4226	4059	3910	3776	3655	3545	3444	3352	3266	3187	3113	3044	2980	2919	2862	2809	2758	2709	2664	
	F15015	7086	6865	6608	6344	6109	5899	5709	5536	5378	5233	5099	4975	4859	4752	4651	4556	4467	4382	4303	4227	4156	
	F20020	9851	9543	9270	8947	8613	8314	8044	7799	7574	7369	7179	7003	6839	6687	6544	6410	6283	6164	6052	5945	5844	
W33 (N2)	F10011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	
	F15015	7678	7438	7225	7035	6863	6707	6564	6433	6312	6199	6094	5995	5903	5816	5734	5657	5583	5514	5447	5384	5323	
	F20020	10673	10339	10044	9779	9541	9324	9125	8943	8774	8617	8471	8334	8206	8086	7972	7864	7762	7665	7572	7484	7400	
W37	F10011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	
	F15015	7678	7438	7225	7035	6863	6707	6564	6433	6312	6199	6094	5995	5903	5816	5734	5657	5583	5514	5447	5384	5323	
	F20020	10673	10339	10044	9779	9541	9324	9125	8943	8774	8617	8471	8334	8206	8086	7972	7864	7762	7665	7572	7484	7400	
W41 (N3)	F10011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	
	F15015	7678	7438	7225	7035	6863	6707	6564	6433	6312	6199	6094	5995	5903	5816	5734	5657	5583	5514	5447	5384	5323	
	F20020	10673	10339	10044	9779	9541	9324	9125	8943	8774	8617	8471	8334	8206	8086	7972	7864	7762	7665	7572	7484	7400	
W50 (N4)	F10011	4531	4318	4132	3968	3823	3692	3574	3466	3368	3277	3194	3116	3044	2977	2914	2855	2799	2746	2697	2650	2605	
	F15015	6982	6753	6460	6202	5973	5767	5582	5413	5259	5117	4986	4864	4751	4646	4547	4455	4367	4285	4207	4134	4064	
	F20020	9706	9402	9112	8745	8419	8127	7863	7624	7405	7204	7018	6846	6686	6537	6398	6267	6143	6027	5917	5813	5714	

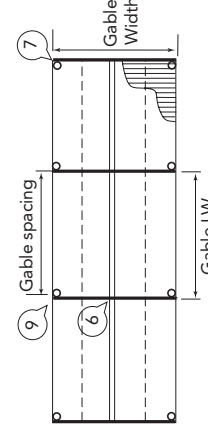
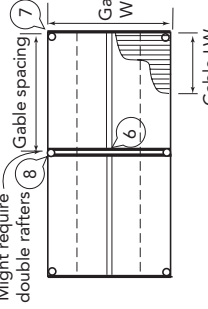
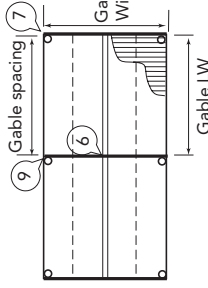
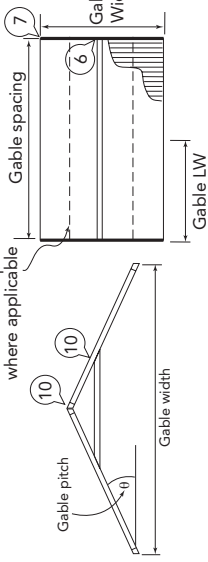
Reduction factor

Apply to maximum purlin span when structure is attached on three sides or 75% of cross sectional area is blocked.

NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

With collar tie

Intermediate purlins where applicable



Maximum Gable Width - Gable with collar tie

Gable Pitch	Wind Category	FIRMLOK Beam	Gable Load Width																																
			0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1																	
15°	W33 (N2)	F10011	4654	4308	4320	4012	4055	3777	3841	3586	3659	3425	3504	3286	3371	3166	3253	3062	3149	2967	3054	2882	2969	2805	2892	2736	2821	2672	2757	2614	2695	2558	2639	2508	
		F15015	7874	7115	7308	6626	6862	6240	6497	5923	6192	5656	5931	5430	5705	5231	5506	5058	5328	4901	5146	4762	4837	4635	4567	4521	4327	4414	4115	4206	3924	4011	3752	3833	
		F20020	10289	10463	9771	9744	9352	9174	9006	8709	8562	8319	7760	7944	7105	7271	6559	6709	6095	6236	5697	5828	5351	5475	5050	5164	4783	4891	4546	4646	4331	4428	4140	4233	
		F10011	4256	3956	3951	3684	3709	3470	3512	3294	3346	3145	3205	3018	3083	2907	2975	2811	2878	2724	2793	2647	2716	2577	2645	2513	2581	2453	2399	2465	2349	2370	2303		
	F15015	7202	6534	6684	6085	6277	5730	5942	5440	5662	5195	5425	4986	5199	4805	4808	4644	4478	4501	4192	4287	3947	4034	3728	3812	3537	3614	3367	3441	3215	3284	3076	3143		
	F20020	9640	9607	9155	8948	8736	8427	7714	7894	6916	7078	6279	6423	5757	5888	5320	5442	4951	5061	4633	4737	4358	4455	4117	4208	3902	3989	3713	3794	3541	3618	3388	3462		
	F10011	6646	6051	6166	5635	5790	5307	5483	5038	5067	4810	4611	4617	4238	4331	3926	4012	3661	3740	3433	3506	3234	3303	3060	3126	2907	2969	2770	2828	2647	2703	2537	2589		
	F15015	8898	8145	8286	7061	7225	6246	6389	5610	5738	5100	5216	4683	4789	4335	4432	4040	4128	3784	3868	3564	3642	3371	3444	3199	3269	3047	3112	2911	2973	2788	2846			
F20020	13340	1139	3101	2923	2911	2753	2757	2614	2627	2496	2452	2395	2266	2309	2112	2154	1980	2019	1866	1903	1766	1800	1679	1712	1602	1632	1532	1561	1470	1497	1412	1439			
22.5°	W33 (N2)	F10011	5653	5185	4988	4830	4349	4445	3866	3951	3489	3564	3186	3255	2938	3000	2730	2788	2554	2606	2401	2452	2268	2316	2152	2197	2050	2090	1957	1996	1874	1913	1799	1835	
		F15015	9584	8775	7116	7308	6626	6863	6240	6499	5924	6192	5658	5931	5429	5704	5231	5504	5057	5327	4902	5168	4762	5024	4636	4895	4520	4775	4414	4664	4316	4562	4228	4468	4143
		F20020	10092	10462	9584	9743	9174	9176	8834	8710	8544	8319	8293	7984	8071	7692	7875	7435	7700	7206	7535	7001	7382	6815	7240	6646	7106	6491	6816	6347	6486	6216	6186	6092	
		F10011	4255	3956	3951	3684	3708	3470	3513	3293	3346	3145	3206	3019	3082	2908	2975	2810	2879	2725	2794	2648	2716	2578	2644	2513	2579	2454	2520	2400	2465	2350	2415	2302	
	F15015	7203	6534	6685	6087	6277	5730	5942	5440	5663	5196	5425	4985	5216	4804	5035	4643	4873	4501	4727	4372	4595	4257	4475	4150	4366	4054	4265	3963	4172	3882	4085	3805		
	F20020	9455	9608	8980	8949	8596	8426	8276	7999	8006	7639	7770	7332	7559	7064	7367	6827	7191	6619	6953	6430	6524	6258	6149	6103	5817	5961	5521	5826	5525	5545	5020	5294		
	F10011	3926	3664	3644	3411	3422	3213	3241	3049	3088	2912	2958	2796	2844	2694	2746	2603	2657	2524	2578	2452	2506	2385	2441	2326	2380	2273	2326	2223	2275	2177	2227	2132		
	F15015	6645	6051	6168	5636	5791	5307	5482	5037	5225	4812	5006	4618	4813	4449	4645	4300	4496	4169	4361	4048	4241	3941	4124	3843	3910	3755	3718	3671	3546	3594	3392	3524		
F20020	8862	8897	8415	8287	8056	7803	7757	7408	7496	7075	7264	6789	7031	6541	6489	6323	6029	6129	5634	5946	5292	5582	4993	5264	4728	4985	4492	4734	4281	4510	4091	4309			
F10011	3341	3139	3101	2923	2910	2753	2757	2613	2626	2496	2515	2395	2419	2308	2336	2230	2260	2162	2191	2101	2130	2045	2040	1994	1942	1948	1855	1905	1778	1863	1705	1787			
F15015	5652	5185	5246	4830	4926	4547	4664	4316	4444	4122	4257	3956	3952	3812	3662	3684	3415	3553	3204	3370	3019	3174	2857	3004	2714	2853	2587	2718	2472	2598	2369	2489			
F20020	7862	7626	7459	7101	7118	6687	6386	6347	6050	5209	5495	4780	5041	4424	4662	4119	4340	3858	4063	3633	3825	3433	3614	3258	3428	3102	3263	2962	3113	2834	2980				

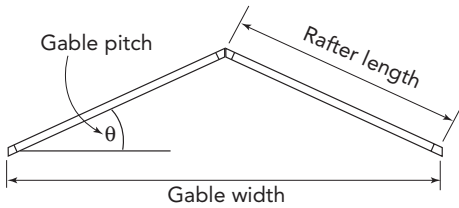
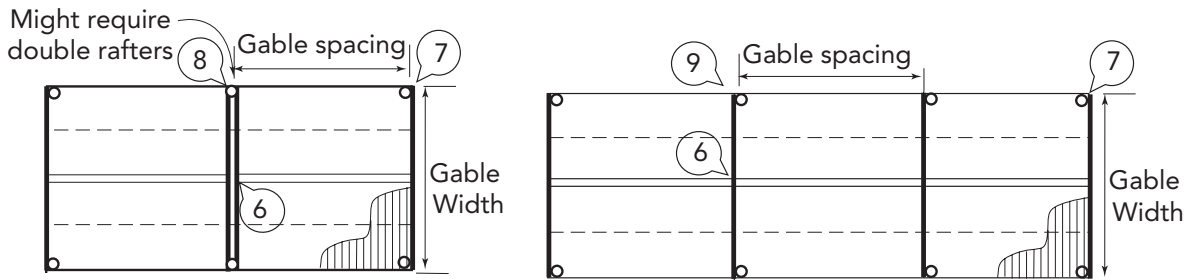
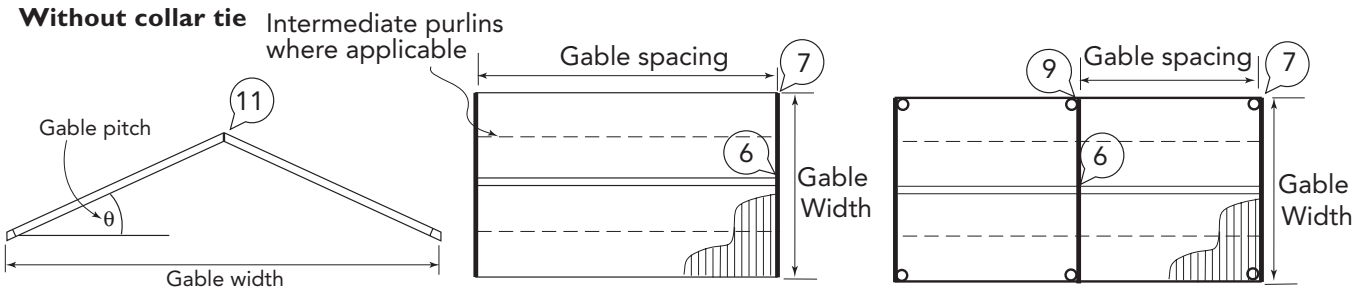
Reduction factor

0.68	0.70	0.65	0.67	0.63	0.65	0.61	0.64	0.60	0.62	0.59	0.61	0.58	0.60	0.58	0.58	0.56	0.58	0.56	0.58	0.57	0.59	0.57	0.58	0.56	0.58	0.57	0.56	0.57	0.56	0.57	0.56	0.57	0.56	0.57	0.56	0.57	0.56	0.57
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

Apply to the maximum allowable gable width when the structure is attached on three sides or 75% of the cross sectional area is blocked.

NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Gable roofs

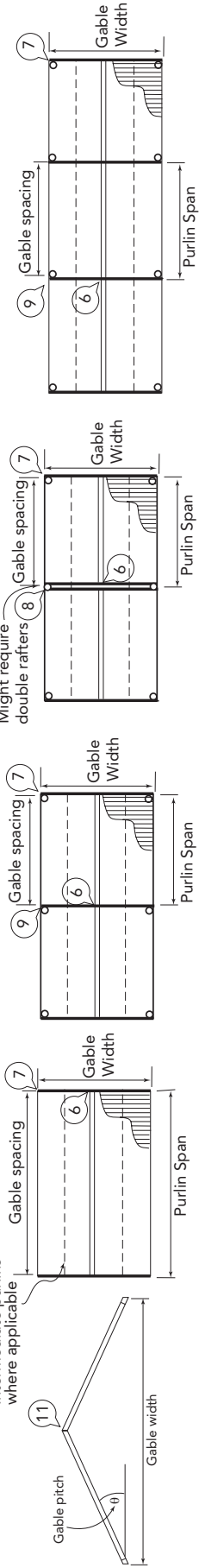


When checking cladding span, rafter length must be calculated using the following formula:
 For a 15° gable pitch, Rafter length = 0.52 x gable width
 For a 22.5° gable pitch, Rafter length = 0.54 x gable width
 Note: These equations are estimations for choosing the cladding only, not precise dimensions for construction.

NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Gable width goes to backside of bracket.

Without collar tie
Intermediate purlins where applicable



Maximum Purlin Span - Gable Structure

Gable pitch	Wind Category	FIRMILOK Beam Size	Gable Width																						
			3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000	6300	6600	6900	7200	7500	7800	8100	8400	8700	9000		
15°	W33 (N2)	F10011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519	3479	3519
		F15015	7792	7549	7333	7140	6966	6807	6662	6529	6406	6291	6185	6085	5991	5903	5820	5741	5667	5596	5529	5464	5403	5359	5319
		F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511	7431	7351
		F15011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519	3479	3519
	W37	F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511	7431	7351
		F15011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519	3479	3519
		F15015	7792	7549	7333	7140	6966	6807	6662	6529	6406	6291	6185	6085	5991	5903	5820	5741	5667	5596	5529	5464	5403	5359	5319
		F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511	7431	7351
	W41 (N3)	F10011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519	3479	3519
		F15015	7792	7549	7333	7140	6966	6807	6662	6529	6406	6291	6185	6085	5991	5903	5820	5741	5667	5596	5529	5464	5403	5359	5319
		F20020	10833	10494	10194	9925	9683	9463	9262	9076	8905	8746	8598	8459	8329	8206	8091	7981	7878	7779	7686	7596	7511	7431	7351
		F15011	5075	4916	4776	4650	4537	4433	4339	4252	4172	4097	4028	3963	3902	3845	3790	3739	3691	3644	3601	3559	3519	3479	3519
W50 (N4)	F10011	4615	4416	4226	4059	3910	3776	3655	3545	3444	3352	3266	3187	3113	3044	2980	2919	2862	2809	2758	2709	2650	2591	2532	
	F15015	7086	6865	6608	6344	6109	5899	5709	5536	5378	5233	5099	4975	4859	4752	4651	4556	4467	4382	4303	4227	4156	4085	4014	
	F20020	9851	9543	9270	8947	8613	8314	8044	7799	7574	7369	7179	7003	6839	6687	6544	6410	6283	6164	6052	5945	5844	5743	5642	
	F15011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
W33 (N2)	F10011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
	F15015	7678	7438	7225	7035	6863	6707	6564	6433	6312	6199	6094	5995	5903	5816	5734	5657	5583	5514	5447	5384	5323	5262	5201	
	F20020	10673	10339	10044	9779	9541	9324	9125	8943	8774	8617	8471	8334	8206	8086	7972	7864	7762	7665	7572	7484	7400	7316	7232	
	F15011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
W37	F10011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
	F15015	7678	7438	7225	7035	6863	6707	6564	6433	6312	6199	6094	5995	5903	5816	5734	5657	5583	5514	5447	5384	5323	5262	5201	
	F20020	10673	10339	10044	9779	9541	9324	9125	8943	8774	8617	8471	8334	8206	8086	7972	7864	7762	7665	7572	7484	7400	7316	7232	
	F15011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
W41 (N3)	F10011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
	F15015	7678	7438	7225	7035	6863	6707	6564	6433	6312	6199	6094	5995	5903	5816	5734	5657	5583	5514	5447	5384	5323	5262	5201	
	F20020	10673	10339	10044	9779	9541	9324	9125	8943	8774	8617	8471	8334	8206	8086	7972	7864	7762	7665	7572	7484	7400	7316	7232	
	F15011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	
W50 (N4)	F10011	4531	4318	4132	3968	3823	3692	3574	3466	3368	3277	3194	3116	3044	2977	2914	2855	2799	2746	2697	2650	2605	2560	2515	
	F15015	6982	6753	6460	6202	5973	5767	5582	5413	5259	5117	4986	4864	4751	4646	4547	4455	4367	4285	4207	4134	4064	3994	3924	
	F20020	9706	9402	9112	8745	8419	8127	7863	7624	7405	7204	7018	6846	6686	6537	6398	6267	6143	6027	5917	5813	5714	5615	5516	
	F15011	5000	4844	4705	4582	4470	4368	4275	4190	4111	4037	3969	3905	3845	3788	3735	3684	3636	3591	3548	3506	3467	3428	3389	

Reduction factor

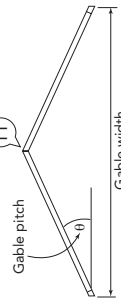
Apply to the maximum allowable purlin span when the structure is attached on three sides or 75% of the cross sectional area is blocked.

NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

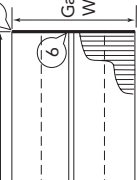
Without collar tie

Intermediate purlins where applicable

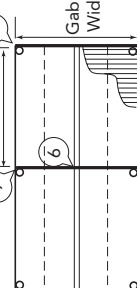
(11)



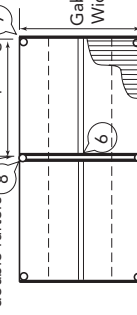
Gable spacing



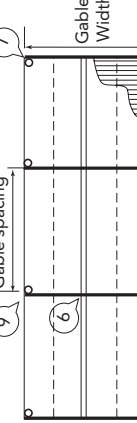
Gable spacing



Might require double rafters



Gable spacing



Maximum Gable Width - Gable without collar tie

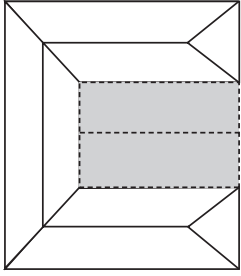
Gable Pitch	Wind Category	FIRMILOK Beam Size	Gable Load Width																															
			0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1														
15°	W33 (N2)	F10011	4482	4565	4092	4167	3788	3858	3543	3609	3340	3402	3168	3226	3021	3077	2892	2946	2780	2830	2678	2728	2587	2635	2506	2552	2430	2475	2361	2405	2299	2341	2241	2282
		F15015	6721	6845	6136	6248	5680	5784	5411	5009	5102	4752	4839	4530	4615	4337	4418	4167	4244	4016	4090	3879	3951	3757	3825	3643	3711	3541	3607	3446	3510	3359	3421	
		F20020	7969	9122	7567	8328	7243	7710	6974	7212	6676	6800	6335	6450	6039	6151	5782	5888	5554	5656	5353	5452	5172	5266	5007	5100	4857	4947	4721	4808	4594	4679	4478	4561
		F15015	5991	6101	5469	5570	5063	5156	4737	4824	4465	4548	4237	4314	4040	4113	3868	3939	3715	3784	3580	3645	3458	3522	3348	3410	3249	3309	3157	3215	3074	3130	2994	3050
		F20020	7467	8133	7090	7424	6748	6874	6313	6429	5952	6062	5647	5751	5384	5483	5154	5249	4951	5044	4772	4861	4609	4694	4546	4632	4410	4508	4285	4382	4171	4269	4067	
		F10011	3562	3628	3251	3311	3010	3066	2817	2869	2654	2705	2519	2565	2401	2446	2299	2341	2208	2251	2129	2168	2055	2094	1992	2028	1932	1967	1878	1913	1828	1860	1781	1814
	F15015	5342	5440	4876	4967	4515	4598	4223	4302	3982	4055	3777	3846	3601	3669	3448	3512	3313	3375	3191	3251	3083	3141	2987	3041	2898	2950	2815	2867	2739	2792	2670	2720	
	F20020	6995	7252	6501	6620	6018	6130	5629	5734	5307	5405	5034	5127	4801	4890	4596	4681	4416	4497	4256	4333	4111	4186	3980	4053	3862	3933	3752	3821	3653	3719	3560	3626	
	F10011	2884	2936	2631	2681	2436	2482	2280	2322	2148	2189	2038	2077	1943	1980	1860	1895	1787	1822	1723	1754	1663	1694	1611	1642	1563	1592	1518	1547	1478	1507	1441	1468	
	F15015	4323	4405	3947	4020	3655	3723	3417	3481	3222	3282	3058	3114	2915	2969	2792	2842	2681	2732	2583	2631	2496	2542	2417	2461	2345	2388	2278	2320	2218	2258	2162	2202	
	F20020	5763	5869	5260	5359	4870	4961	4555	4640	4296	4376	4074	4150	3885	3956	3721	3788	3574	3640	3444	3508	3327	3388	3222	3280	3126	3184	3037	3093	2956	3010	2880	2934	
	22.5°	W33 (N2)	F10011	4481	4688	4091	4279	3788	3962	3542	3705	3341	3494	3169	3315	3021	3160	2892	3025	2779	2907	2677	2801	2587	2705	2506	2620	2430	2541	2361	2470	2299	2404	2239
F15015			6650	7029	6135	6417	5680	5941	5312	5556	5009	5238	4752	4970	4531	4740	4339	4536	4169	4359	4015	4200	3880	4058	3756	3928	3644	3812	3542	3705	3448	3605	3359	3514
F20020			7818	9368	7422	8551	7105	7918	6840	7406	6617	6983	6334	6624	6038	6316	5809	6048	5554	5809	5353	5599	5172	5408	5007	5237	4858	5079	4721	4937	4595	4806	4479	4684
F10011			3995	4178	3647	3814	3376	3531	3158	3304	2977	3113	2825	2955	2694	2816	2578	2696	2478	2591	2387	2496	2306	2411	2232	2336	2166	2265	2105	2203	2049	2143	1997	2088
F15015			5990	6266	5469	5721	5063	5296	4736	4954	4466	4669	4237	4431	4039	4224	3867	4045	3716	3886	3579	3744	3459	3618	3348	3502	3248	3398	3158	3302	3073	2995	3132	
F20020			7325	8352	6955	7624	6657	7058	6312	6602	5952	6225	5647	5905	5383	5630	5153	5390	4952	5179	4771	4991	4610	4821	4464	4667	4329	4529	4207	4401	4096	4283	3993	4176
F10011		3562	3725	3252	3402	3010	3149	2816	2945	2655	2777	2518	2635	2402	2511	2299	2404	2210	2310	2129	2227	2057	2151	1992	2082	1931	2020	1877	1964	1827	1911	1781	1863	
F15015		5342	5588	4876	5100	4516	4723	4224	4418	3982	4165	3777	3951	3601	3768	3448	3607	3313	3465	3193	3339	3084	3226	2986	3123	2897	3030	2816	2945	2740	2866	2670	2794	
F20020		6863	7446	6500	6798	6018	6293	5630	5887	5307	5551	5035	5266	4800	5020	4595	4806	4416	4618	4255	4449	4111	4300	3980	4163	3862	4039	3753	3925	3653	3819	3561	3723	
F10011		2883	3016	2631	2753	2437	2548	2280	2384	2149	2247	2038	2132	1944	2033	1861	1946	1789	1870	1722	1802	1665	1741	1611	1685	1563	1635	1519	1589	1478	1547	1441	1508	
F15015		4324	4523	3947	4128	3655	3821	3418	3575	3222	3370	3058	3198	2916	3049	2790	2919	2681	2805	2583	2701	2496	2611	2417	2528	2345	2452	2278	2384	2217	2319	2162	2262	
F20020		5763	6027	5261	5503	4871	5094	4557	4765	4296	4492	4074	4263	3886	4063	3720	3891	3574	3738	3444	3601	3328	3479	3221	3368	3125	3269	3038	3176	2956	3091	2881	3014	

Reduction factor

Apply to maximum gable width when structure is attached on three sides or 75% of cross sectional area is blocked.

NOTE: Numbers circled in above schematic diagrams refer to acceptable connection type, as illustrated on pages 21-27.

Gable roof: Example 4



Task: Determine a suitable gable structure to cover an internal paved area 5100 x 4800mm.

Steps

Step 1: Required Information before you start

- Determine the wind area you are in.
- Select the boundary dimensions.
- Will the structure be attached on one or more sides or blocked by 75% or greater?

Worked example

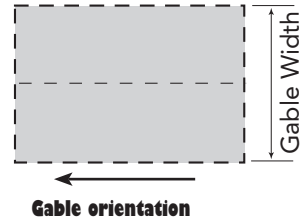
In our example, we will choose wind condition W33 (N2), the boundary is 5100 x 4800mm and the structure is attached on three sides. (i.e. blocked)

Step 2: Cladding Design

- Select your cladding.
- Select your gable orientation (Gable width is typically in the shortest direction)
- Select your roof pitch.
- Select the maximum span SPANDEK can do from the table on page 5.
- Can your cladding span the length in one span?

We will be choosing SPANDEK.

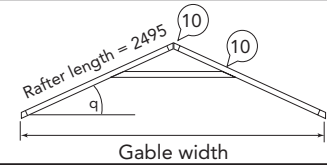
We will be choosing a 15° roof pitch. SPANDEK can span 2700mm 0.42BMT and 2950 0.48BMT. The rafter length for this gable is 2495mm, hence 0.42 or 0.48BMT will do it in one span.



Step 3: Structure type

- Select whether you want your gable with or without a collar tie.

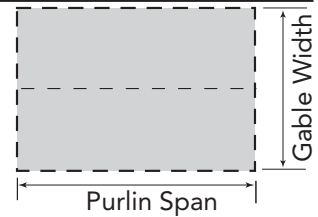
We have a collar tie.



Step 4: FIRMLOK purlin design

- Using the table on page 15 'Allowable purlin span' gable structure, determine whether a purlin can span the full 5100mm at the given spacing.

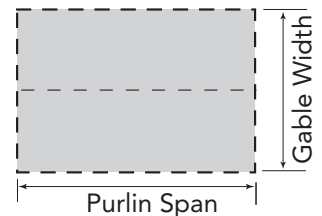
For our structure, Purlin Span = 5100 Gable width = 4800mm. F15015 will span 6662 (0.79) = 5262 ≥ 5100. Therefore, purlin can span the full length.



Step 5: Gable design

- Using the table Allowable Gable Width on p16 (Gable with collar tie) determine whether a gable at each end is satisfactory.

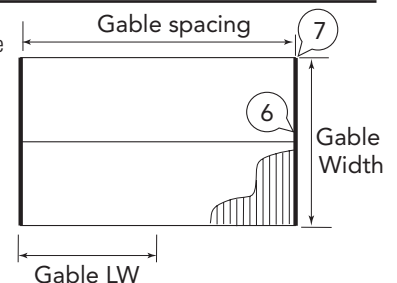
For our structure, Gable LW = 2550 Gable Width = 4800. Number of intermediate purlins = 0. From the table, for F15015 allowable gable width is = 6344 x 0.61 = 3838 < 4800 hence 15015 is not suitable. For F20020 allowable gable width = 8784 x 0.61 = 5314 > 4800 hence F20020 is suitable.



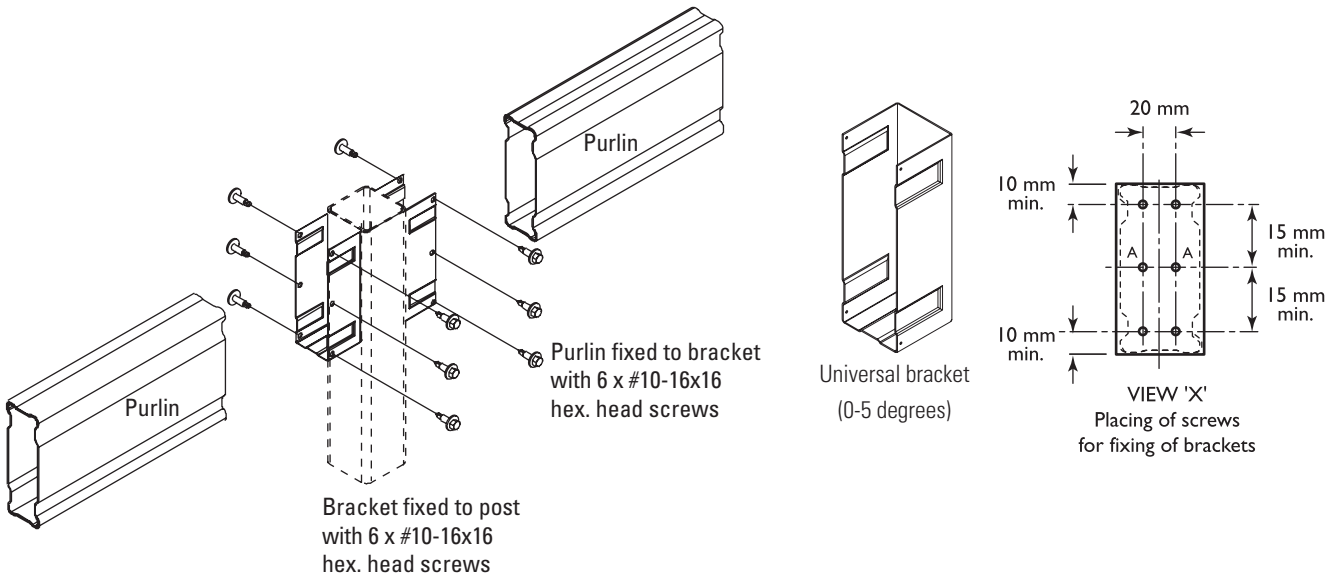
Step 6: Select connection

- For this structure type, the diagrams on page 11 indicate which connections you can have.

In this case connections 3 or 4 are applicable. See below.



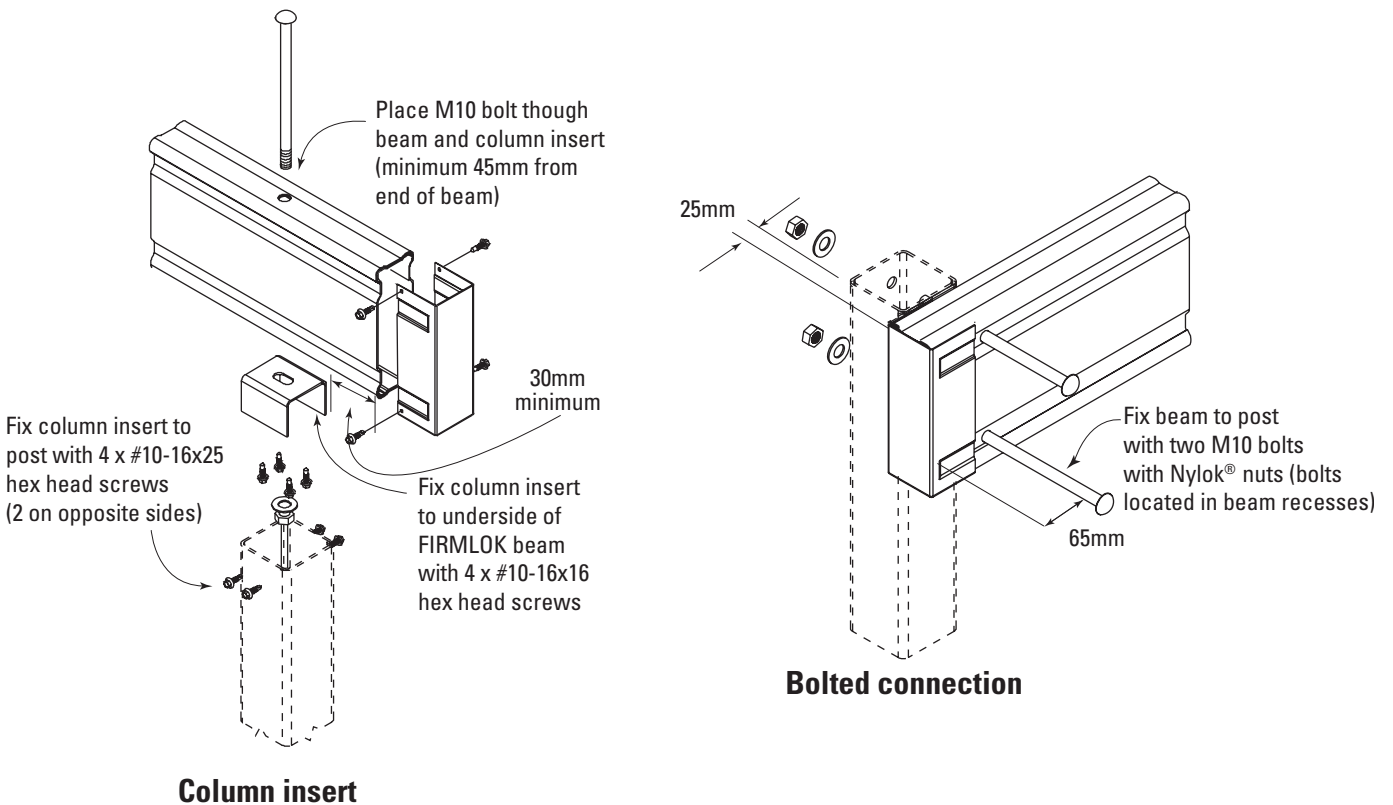
Connections



Connection 1

(Simple spans)

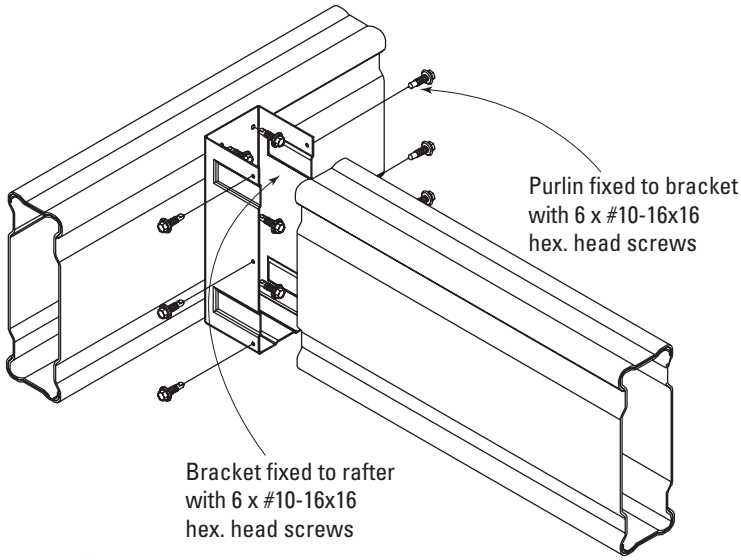
LYSAGHT FIRMLOK universal brackets



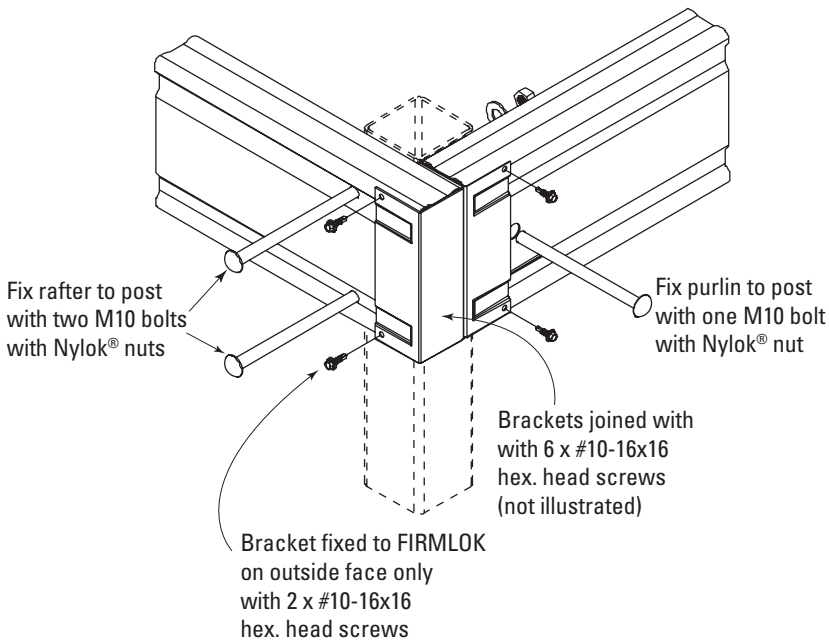
Connection 2

(Continuous spans)

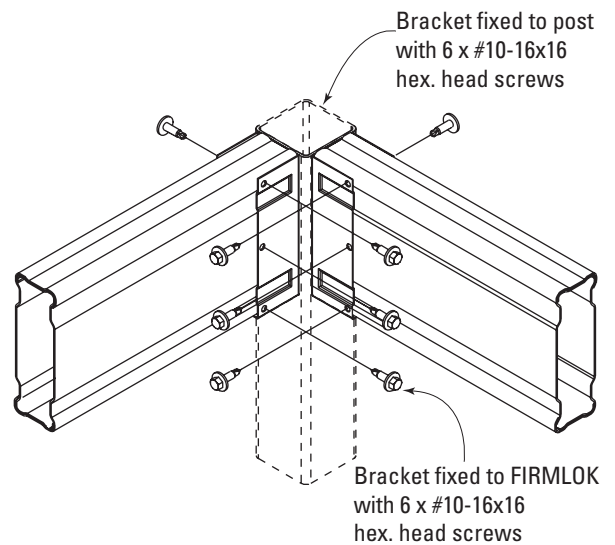
LYSAGHT column insert or bolted connection



Connection 3
(Purlin to rafter or rafter to beam connection)

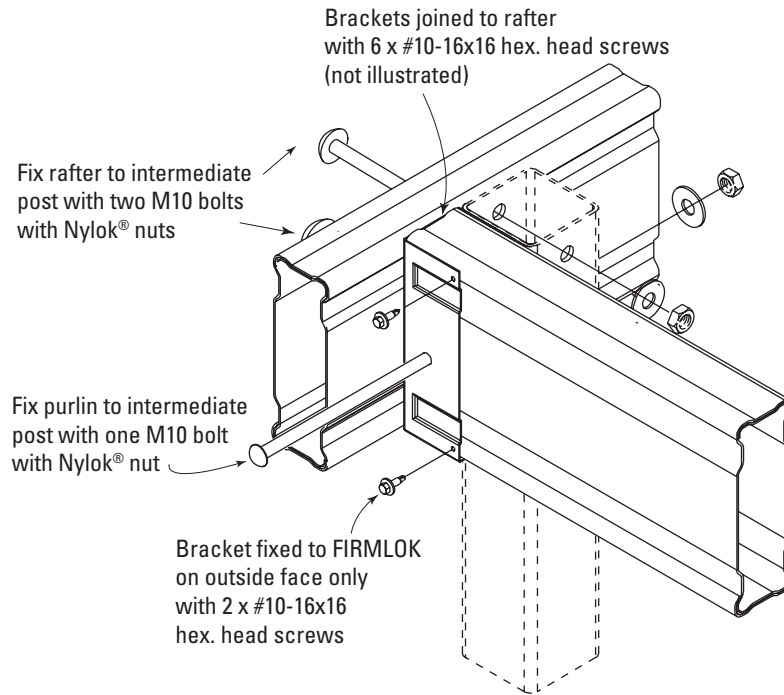


Connection 4
(Typical bolted corner connection)

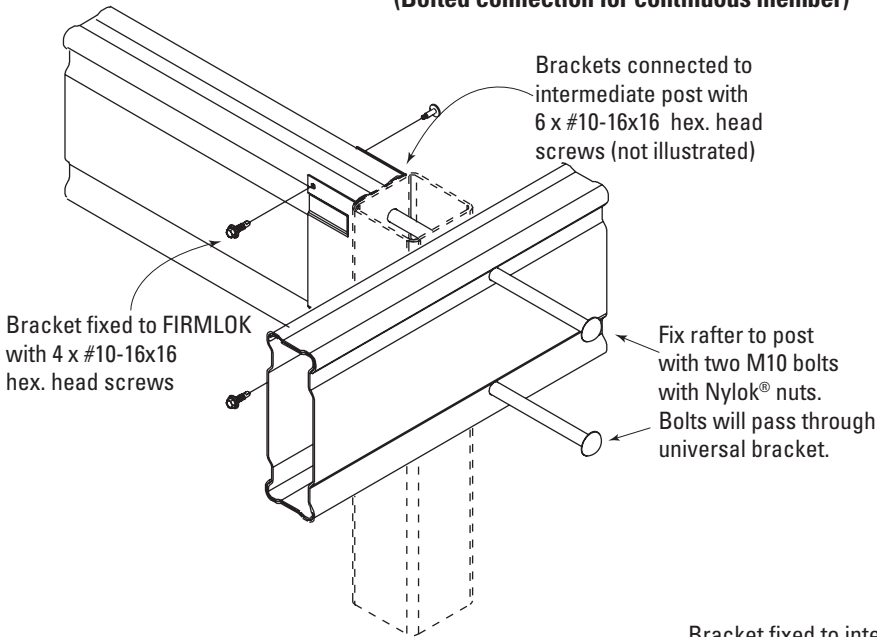


Connection 4
(Typical screwed corner connection)

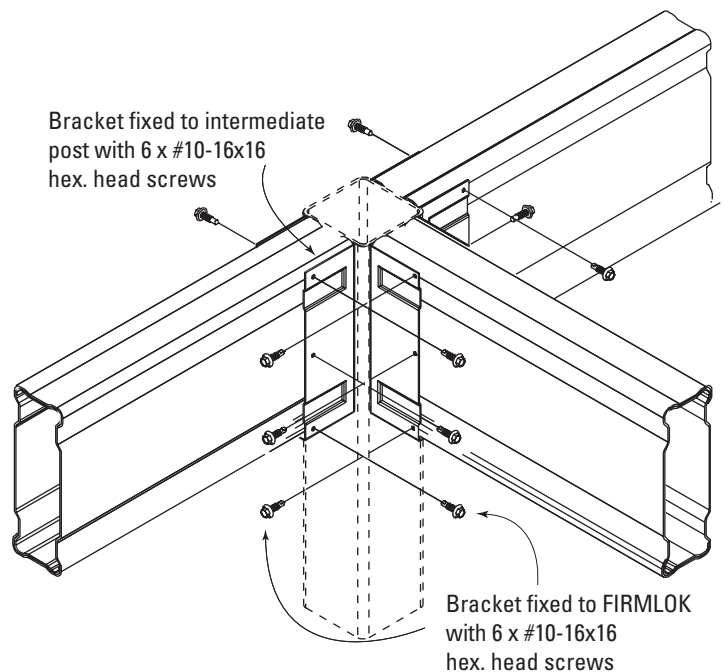
Connection 5
(Intermediate post connection)



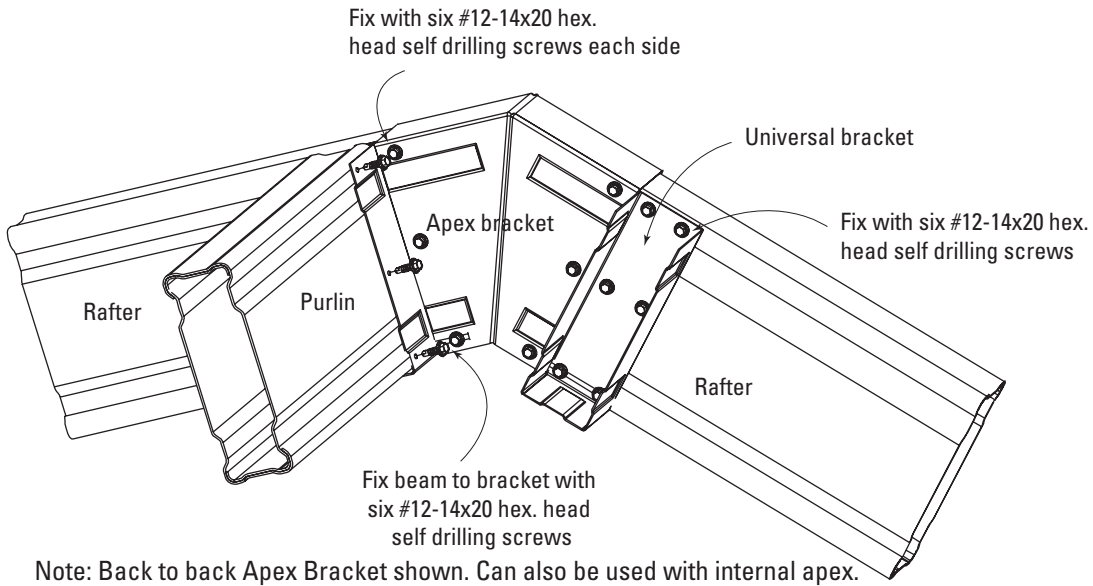
Connection 5
(Bolted connection for continuous member)



Connection 5
(Screwed connection for continuous member)

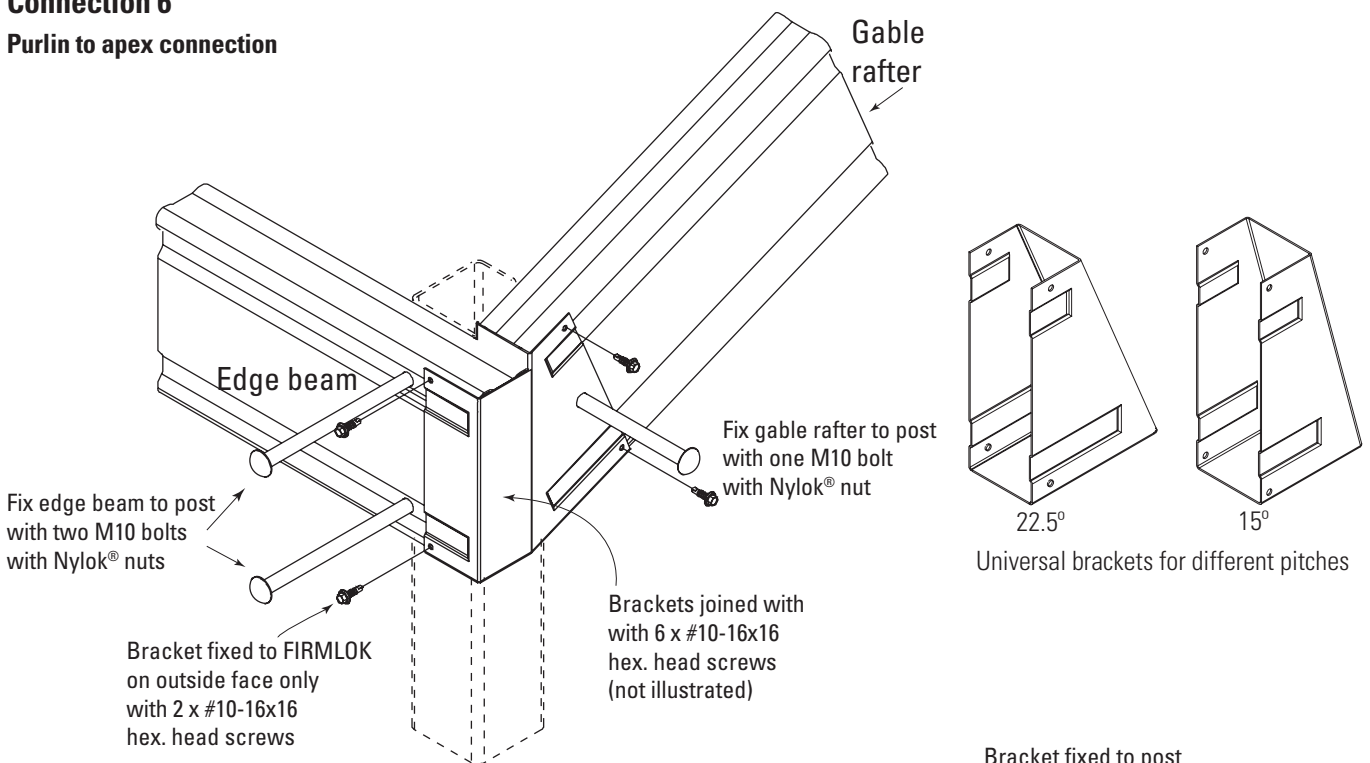


Connection 5
(Screwed connection for simple spanned member)



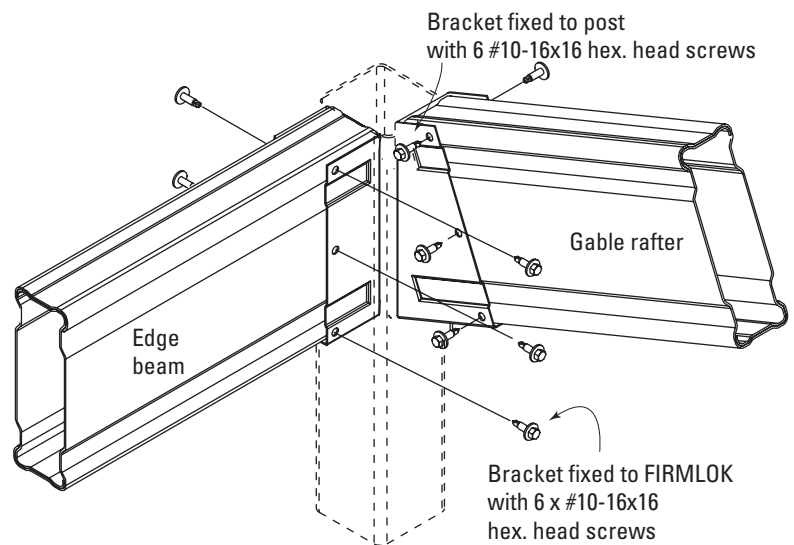
Connection 6

Purlin to apex connection



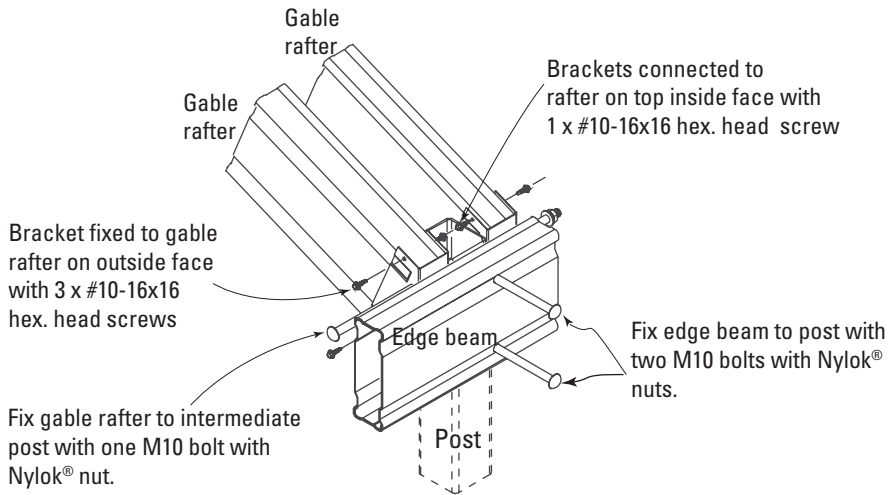
Connection 7

(Gabled corner connection - bolted)



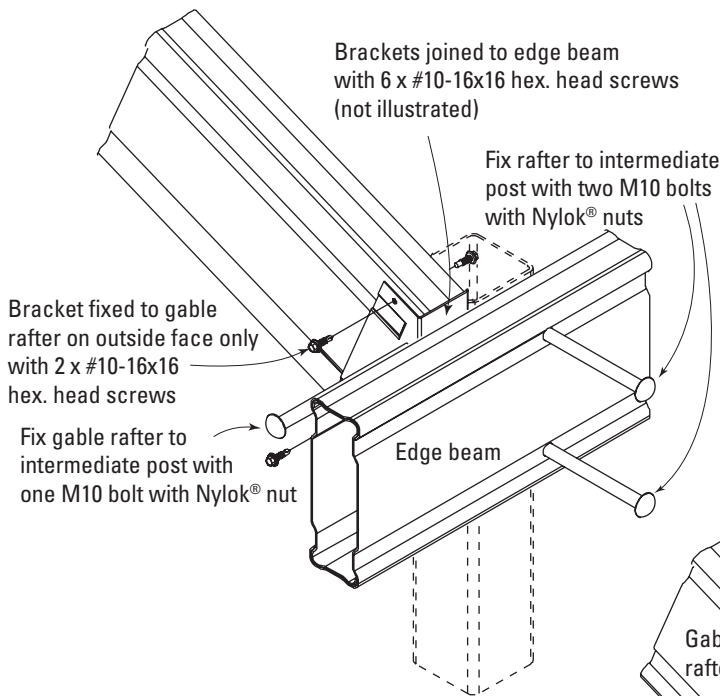
Connection 7

(Gabled corner connection - screwed)



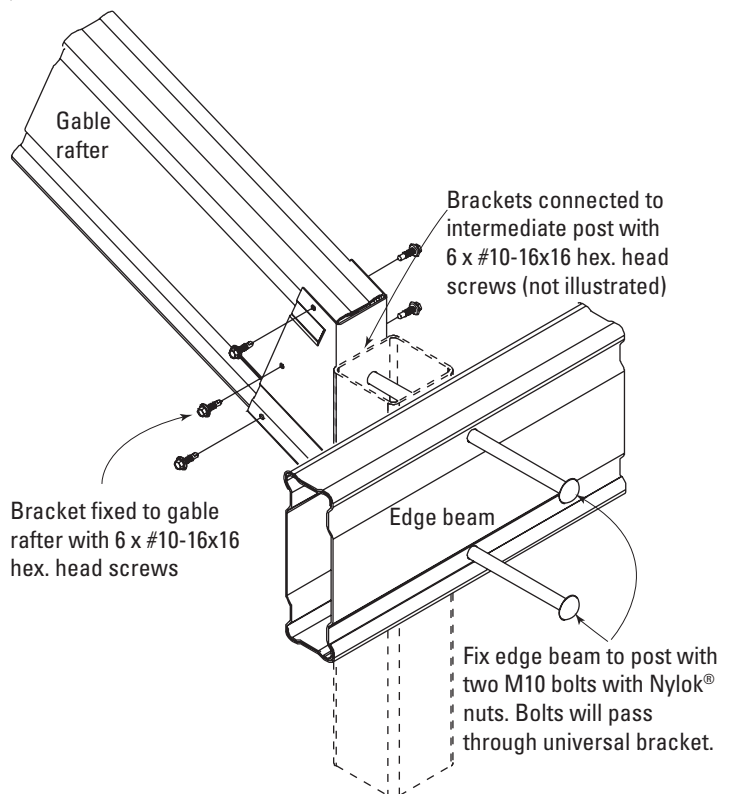
Connection 8

(Intermediate gable connection -twin rafter with post)



Connection 9

(Bolted intermediate gable connection - with post)

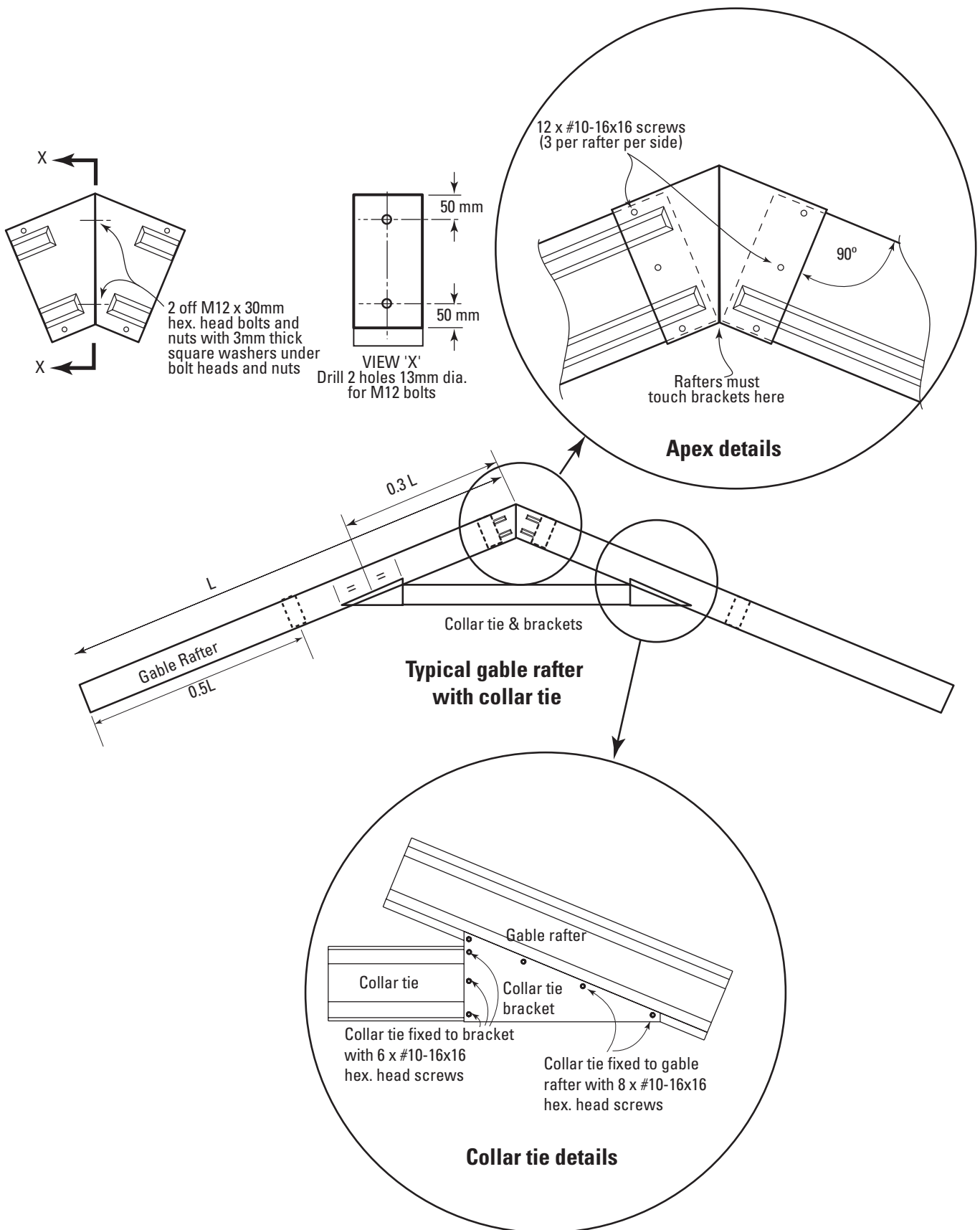


Connection 9

(Screwed intermediate gable connection - with post)

Connection 10

Gable with collar tie - Apex and collar tie connection



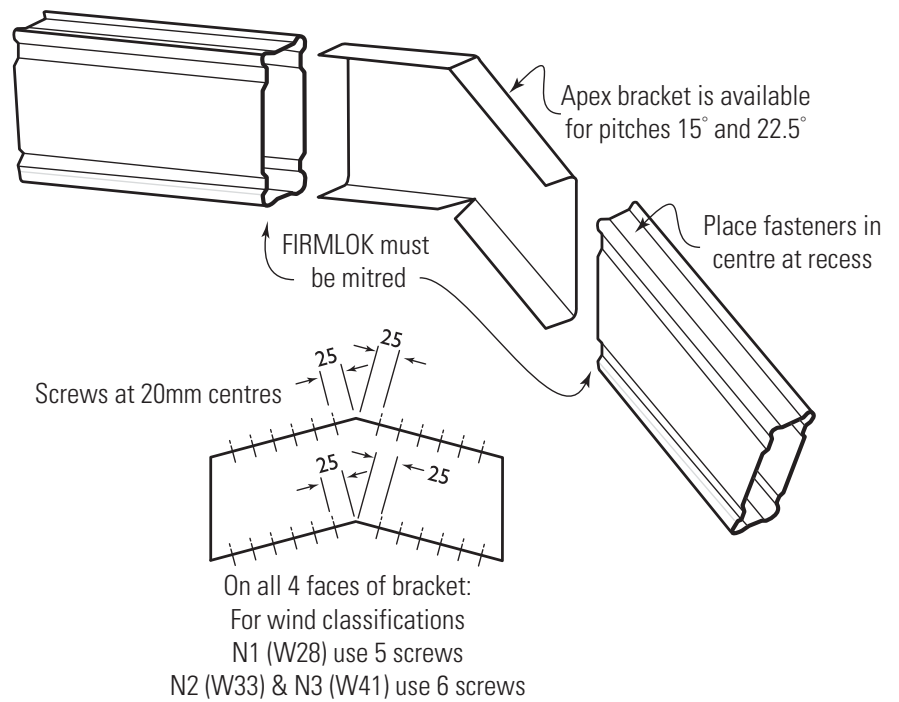
Connection 11

Gable without collar tie - internal apex connection

LYSAGHT FIRMLOK apex brackets

For each bracket use:

- 24 x 12 -14 x 20 screws for wind classifications





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