ROOFING AND CLADDING SYSTEMS MANUAL

Dimond Roofing, a division of Fletcher Steel Ltd.

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0800 DIMOND
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Dimond Roofing®

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(Long Run Metal Roofing and Cladding)

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For online technical information
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Contact the Dimond Technical Team:
0800 ROOF SPEC (0800 766377)
For Design Advice, Technical Assistance, System Specification Help

Contact your Dimond Sales Centre:
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GENERAL PERFORMANCE STATEMENT

(a) Description:

Dimond long run roofing and wall cladding systems are available in a variety of sheeting materials together with the appropriate fasteners, underlay, supporting netting and perimeter and penetration flashings. Table 2.1A summarises the sheeting material options available.

Please also refer to the Dimond Colour Chart for the full range of available colours in each of the paint coating types. Other materials and thickness may be available upon enquiry.

Table 2.1A Sheeting Material Options

Material	Grade	Thickness (mm)	Metal Coating Available	Prepaint Finish Standards	Relevant
Steel	G550	0.40 or 0.55 BMT	Zinc[1] or Zinc/Aluminium[2] or Zinc/Aluminium/Magnese[4]	Yes	AS1397
	G250/300[3]	0.40 or 0.55 BMT		Yes	
Aluminium (plain or embossed)	5052	0.70 or 0.90 BMT	N/A	Yes	AS1734
	5251	0.70 or 0.90 BMT	N/A	Yes	
Stainless Steel 316	304	0.70	N/A	No	AS1449
	445m[2]	0.70	N/A	No	
Copper	110A	0.55 to 0.70	N/A	No	AS2738
	122A	0.55 to 0.70	N/A	No	
Zinc	Z1	0.70	N/A	No	EN988
GRP	Duraclad®	1.7	N/A	Yes	-

1.Galvsteel™ 2.Zincalume® 3.For some machine-curved products only 4. ZAM BMT. Base Metal Thickness

(b) Scope Of Use:

Dimond long run metal roofing and wall cladding systems are intended for use in constructing the building envelope for commercial buildings and residential buildings subject to the limitations listed below.

(c) Requirements:

Attention to the following details is required to ensure the expected system performance is achieved.	Reference
• The selection of the type and grade of sheeting material and fasteners must be based on the life expectancy required and the severity of the external and internal environments.	2.1.1.2 2.1.1.3 2.1.1.4 2.2.3
• Correct choice of breather type or vapour barrier underlay to suit the building environment.	2.1.3.5
• Site storage that keeps product dry and protected from damage.	
• Sheeting handling that prevents surface damage.	
• Avoidance of excessive spans or insufficient fasteners for the expected loads. Sheeting material must be fastened to all purlin lines.	2.1.3.1 2.1.4
• Correct placement and flashing of penetrations through the roof.	
• Correct layout and installation of the sheeting, underlay and netting.	
• Allowance for thermal expansion and contraction.	2.1.3.4
• Sufficient roof pitch to permit complete surface water drainage.	2.1.4
• Control of allowable contact with dissimilar materials.	2.1.3.3
• Awareness and implementation of maintenance requirements, particularly for surfaces not washed by natural rainfall.	2.1.1.3
• Correct choice of material for collection of drinking water from a Zincalume® or colour finished roof is required.	2.2.1.4

Continued on next page...

(d) NZBC Compliance:

Test information available from Pacific Coilcoaters and BHP NZ Steel, and past history of use of long run metal roofing and cladding products in New Zealand indicate that, provided the product use and maintenance is in line with the guidelines contained in the current literature referenced, Dimond long run metal roofing & wall cladding systems can be expected to meet the performance criteria in clause B2 and E2 of the New Zealand Building Code, for a period of not less than 15 years.

(e) Use Outside the Stated Guidelines:

If the need arises to use Dimond long run roofing & cladding outside the limitations and procedures given in this or other referenced literature, or if any doubt exists on product handling or use, written approval for use must be obtained from Dimond before the project commences.

ENVIRONMENT

AS/NZS 2728: 1997, (Australia/New Zealand Standard – Prefinished / Prepainted Sheet Metal Products for Interior / Exterior Building Applications – Performance Requirements), classifies the atmospheric environment into 7 categories and provides a guide to the selection of prefinished products in these categories.

In Table 2.1B and 2.1C overleaf we have created a guide showing which categories the more common roofing and cladding materials and coatings can be used in. Only 6 of the 7 categories defined by the standard are covered, as the 7th one, Tropical, is not relevant in New Zealand.

For further classification information please refer to AS/NZS 2728:1997

Table 2.1B Atmospheric Classification Definition

Mild	Sheltered areas that are far inland (very few in NZ).
Moderate	Areas that are protected from marine influence. Are inland areas other than those that are far inland.
Industrial	Industrial areas that are inland.
Marine	Large parts of NZ including areas 100m – 400m from the shoreline in sheltered areas (inner harbour and estuaries) and more than 1 km from breaking surf shoreline. Can extend up to 30kms inland depending on topography and prevailing winds.
Severe Marine	Areas that range from 100m to 1km from a breaking surf shoreline. In high wind areas the distance inland will increase. It also includes areas that are less than 100m (but can extend up to 400m depending on prevailing winds) from the shoreline in sheltered areas.
Very Severe Marine	In areas up to and including 100m from breaking surf. Will extend inland 400m or more where strong prevailing winds exist.
Industrial & Geothermal	Areas of high corrosion including chemical plants and geothermal areas.
Severe Chemical Environments (additional to AS/NZS 2728)	Unusually harsh conditions due to moisture generation and/or chemical usage or storage (e.g. cool stores, animal shelters, fertiliser storage). Will require specific material selection for sheeting, fasteners and netting. Contact Dimond for advice.

Table 2.1C Environment Categories and Suitable Sheeting and Fastener Materials

Atmospheric Conditions	Substrates	Prefinished Paint Coating Types	Branded Sheeting Products	Recommended Screw Fastener Material**	Washer Material
Mild Moderate Industrial Marine	Zinc Coated Steel	-	Galvsteel™	Class 4, minimum	Galvanised
	Zinc/Aluminium Coated Steel (150g/m²) Zinc/Aluminium/Magnesium (MagnaFlow™ & MagnaFlow™ X)	-	Zincalume®	Class 4, minimum	Zincalume®
		Polyester, Acrylic	ColorCote® ZinaCore™ MagnaFlow™ COLOURSTEEL® ENDURA®	Class 4, minimum	Post Painted Steel
		PVF²	ColorCote® ZinaCore™ X & MagnaFlow™ X	Class 4, minimum	Post Painted Steel
	Aluminium	-	Plain or embossed finish	304 Stainless Steel or Alum. **	Aluminium
		Polyester, Acrylic	ColorCote® AlumiGard™	304 Stainless Steel or Alum. **	Post Painted Aluminium
		PVF²	ColorCote® AlumiGard™ X	304 Stainless Steel or Alum. **	Post Painted Aluminium
	Stainless Steel	-	-	304 Stainless Steel	304 Stainless Steel
	Copper	-	-	304 Stainless Steel or Bronze	-
	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass	304 Stainless Steel or Alum.	Weatherlok (UV Stabilised PEA)
Severe Marine	Zinc/Aluminium coated Steel (200g/m²)	Polyester	COLOURSTEEL® MAXX®*	Class 4, minimum	Post Painted Steel
	Zinc/Aluminium coated Steel (150g/m²) Zinc/Aluminium/Magnesium	PVF²	ColorCote® ZinaCore™ X* & MagnaFlow™ X	Class 4, minimum	Post Painted Steel
	Aluminium	-	Plain or Embossed	304 Stainless Steel or Alum. **	Aluminium
		Polyester, Acrylic	ColorCote® AlumiGard™	304 Stainless Steel or Alum. **	Post Painted Aluminium
		PVF²	ColorCote® AlumiGard™ X	304 Stainless Steel or Alum. **	Post Painted Aluminium
	Stainless Steel	-	-	304 Stainless Steel	304 Stainless Steel
	Copper	-	-	304 Stainless Steel or Bronze	-
	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass	304 Stainless Steel or Alum.	Weatherlok (UV Stabilised PEA)
Very Severe Marine Industrial Geothermal	Zinc/Aluminium coated Steel (200g/m²)	Polyester	COLOURSTEEL® MAXX®*	Class 5, minimum	Post Painted Steel
	Zinc/Aluminium/Magnesium	PVF²	ColorCote® MagnaFlow™ X	Class 5, minimum	Post Painted Steel
	Aluminium	-	Plain or Embossed	304 Stainless Steel or Alum. **	Aluminium
		Polyester, Acrylic	ColorCote® AlumiGard™	304 Stainless Steel or Alum. **	Post Painted Aluminium
		PVF²	ColorCote® AlumiGard™ X	304 Stainless Steel or Alum. **	Post Painted Aluminium
	Stainless Steel	-	-	316 Stainless Steel	Stainless Steel
	Copper	-	-	316 Stainless Steel or Bronze	-
	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass	316 Stainless Steel or Alum.	Weatherlok (UV Stabilised PEA)
Severe Chemical	Glass Reinforced Polyester (GRP)	Gel Coat	Duraclad®, Webglass (Consult Dimond)	Consult Dimond	Weatherlok (UV Stabilised PEA)

*Use of coil on cut edge protection lacquer may be required. Alum.= Aluminium Alutites for timber only.
** Stainless steel fasteners must be installed with clearance and separation to avoid contact with Aluminium.

WARRANTY

Warranties for commercial applications are issued on a job by job basis. It is imperative that care is taken during the planning process to choose the roofing, wall cladding, guttering and fastener system that will provide the life expectancy in the environment in which it will be installed, as incorrect selection could result in no warranty being available. Any warranty is not Dimond's responsibility and will be subject to the coil suppliers conditions. The site may affect the warranty term and/or product suitability so it is vital that the customer supplies accurate site information and that the designer is fully aware of the suitability of products specified.

To assist you in determining the system that will best meet your warranty expectations Dimond have in place a Warranty Inquiry Service. Your design decisions on product type, material thickness, profile, paint coating type and colour, along with site details including address, distance from sea and degree of exposure will be required to enable us to provide a warranty. To access the service, please contact Dimond on 0800 DIMOND.

All warranties will carry a required maintenance clause, which must be complied with to ensure the warranty remains valid. Often aspects of design such as roof shape and roof pitch can influence the maintenance requirements. Due consideration of these factors during the design process is wise.

As a general guide, provided the materials are correctly selected and installed from Table 2.1C for the environment and coil on cut edge protection lacquer used if required by the coil coater, and building design does not impact on durability, it is reasonable to expect the following warranty periods will be available for your roofing and wall cladding. Please note that no warranty is available for Galvsteel material regardless of which environmental category it is used in.

Paint products from different suppliers should not be mixed on the same job. This applies when the roofing is from one material supplier and the flashings from a different material supplier. No warranty would be available on either material.

Warranties only apply to roofing and cladding and guttering situations and not when used as fences, shower liners or planter boxes.

Guideline Warranty Periods

Steel substrate with appropriate paint coating:

- Commercial roofs:
  15 years to perforation of substrate and fastener strength retention.
  15 years to paint coating peeling, flaking or excessive fade.
- Residential roofs (dependent on environment):
  Up to a maximum 30 years to perforation of substrate and fastener strength retention.
  Up to a maximum 20 years to paint coating peeling, flaking or excessive fade.

Aluminium (unpainted):

- Commercial and residential roofs:
  15 years to perforation of substrate.

Aluminium substrate with appropriate paint coating:

- Commercial roofs:
  15 years to perforation of substrate and fastener strength retention.
  15 years to paint coating peeling, flaking or excessive fade.
- Residential roofs:
  30 years up to and including Severe Marine Environments, and 20 years in Very Severe Marine Environments, to perforation of substrate and fastener strength retention.
  15 to 20 years dependent on environment to paint coating peeling, flaking or excessive fade.

Duraclad®

- Commercial and residential roofs and walls:
  20 years to fibre show through or perforation of sheet.

Routine Maintenance

Washing

All metal surfaces must be kept clean for best durability. Warranty conditions require regular washing either by natural rainwater or by manual washing and scrubbing with a soft bristle brush.

The frequency of washing must be sufficient to prevent build up of debris, dirt or salt deposits and will vary depending on location and degree of protection from rainfall.

As a general guide the following frequencies can be used as a starting point.

Environment	Washing Frequency
Moderate / Marine	Every 6-12 months
Severe Marine	Every 3-6 months
Very Severe Marine	Every 3 months

The need to wash can be reduced by building design that avoids the creation of metal roof or wall surfaces that are sheltered from natural rainfall.

- Unwashed areas such as the exposed underside of roofing in soffits are not warranted, but can be specified as double sided paint surfaces to offer better durability to exposed roof undersides. Minimum coil quantities apply. Regular washing of these areas are still required. However they are not covered by the material warranty.

Overpainting

Once new or older pre-finished roofs are overpainted, the original material warranty becomes null and void, due to uncontrolled conditions and workmanship of the roof.

Substrate in Good Condition

Clean the surface and overpaint with 2 coats of an acrylic roof paint system, following the paint manufacturer's instructions.

If the roof or wall cladding has had less than 2 years exposure to weathering, the acrylic paint manufacturer should be consulted for advice on pretreatment of surface to ensure adequate adhesion.

Substrate Requires Refurbishment

Clean the surface and coat any surface corrosion with a suitable conversion treatment and primer, then overpaint with 2 coats of an acrylic roof paint system, following the paint manufacturer's instructions. Check and replace any fasteners exhibiting advanced corrosion.

Rubbing

Hard rubbing on the unpainted Zincalume® surface can cause black marks if the clear coating is worn through. If rubbing is unavoidable we recommend it be kept to a minimum to avoid the wear through of the protective clear coating.

LIFE CYCLE COSTING AND MAINTENANCE OPTIONS

The selection of the most appropriate roofing and wall cladding material to meet cost-performance requirements within a chosen time period should be made with the assistance of Life Cycle Costing comparisons.

Input for these comparisons requires:

- Environment type
- Expected useful life for each material / maintenance option
- Type of regular maintenance (if any) and associated cost
- Material types of sheeting and fastener, and their durability
- Material and installation costs
- Discount rate (%) to convert costs to present value

The following Tables 2.1D, E, F, G provide a guideline comparison for general cases. The Tables are based on:

1. Environment descriptions as defined in Section 2.1.1.2, specific chemical exposure has not been included in the Life Cycle Analysis.
2. Market rates for the sheeting and fastener materials detailed and for installation labour. These rates have been converted to relative costs based on the initial installed cost of unpainted Zincalume®.
3. A choice of three different maintenance options identified on the Tables by the following key:

   R: Replacement Option – No maintenance other than regular washing to keep surface clean. Sheeting and fasteners replaced once the sheeting has reached an advanced state of deterioration, but before perforation and leakage occurs.

   F: Refurbish Option – No maintenance other than regular washing to keep surface clean until surface deterioration is at a point where refurbishment will add to the life of the sheeting rather than leave for later replacement.

   A: Acceptable Appearance Option – Regular washing to keep surface clean, and repainting of the surface to maintain a good standard of acceptable appearance, where this is important (e.g. high visibility walls). Once painted, repainting is required every 8 years.

4. In some cases the F and A maintenance options will eventually include sheeting and fastener replacement. The number of replacements expected in any case is shown on the Tables with shading to the following key.

   No replacement of sheeting and fasteners

   One replacement of sheeting and fasteners

   Two replacements of sheeting and fasteners

5. The relative costs are given as initial installed cost at 0 years (with lowest cost option assigned the relative value of 1.0) and then as the present value of future maintenance costs required to deliver a sheeting life of 20, 30, 40 or 50 years. Present value has been calculated at a discount rate of 10%.
6. The combination of steel and aluminium is based on material with similar load span capability. No account has been taken of extra maintenance that may be required to repair foot traffic damage (which in some case may be higher for aluminium than steel).
7. The costs used for Duraclad® do not include the extra support framing that may be required for this material in comparison with steel or aluminium. Depending on use (e.g. wall cladding versus roofing) this difference may not be significant.

Table 2.1D Relative Life Cycle Costs – Moderate Environment

Roofing/Cladding Options			Relative Life Cycle Cost for Period				
Material		Maintenance					
Sheeting	Fastener		0 Years	20 Years	30 Years	40 Years	50 Years
Zincalume®	Class 3	R	1.00	1.00	1.00	1.09	1.09
Post-painted Zincalume®	Class 3	F	1.32	1.32	1.369	1.43	1.46
		A	1.32	1.54	1.58	1.59	1.62
COLOURSTEEL® ENDURA® or ColorCote® ZinaCore™	Class 3	R	1.21	1.21	1.21	1.27	1.27
		F	1.21	1.21	1.21	1.24	1.25
		A	1.21	1.28	1.32	1.34	1.35
ColorCote® ZinaCore™ X	Class 4	R	1.46	1.46	1.46	1.46	1.50
		F	1.46	1.46	1.46	1.47	1.48
		A	1.46	1.46	1.50	1.53	1.54

Table 2.1E Relative Life Cycle Costs – Industrial / Marine

Roofing/Cladding Options			Relative Life Cycle Cost for Period				
Material		Maintenance					
Sheeting	Fastener		0 Years	20 Years	30 Years	40 Years	50 Years
Zincalume®	Class 3	R	1.00	1.00	1.24	1.24	1.27
Post-painted Zincalume®	Class 3	F	1.32	1.44	1.48	1.50	1.55
		A	1.32	1.54	1.58	1.60	1.65
COLOURSTEEL® ENDURA® or ColorCote® ZinaCore™	Class 3	R	1.21	1.21	1.21	1.31	1.31
		F	1.21	1.21	1.25	1.26	1.27
		A	1.21	1.28	1.32	1.34	1.35
ColorCote® ZinaCore™ X	Class 4	R	1.46	1.46	1.46	1.46	1.53
		F	1.46	1.46	1.46	1.48	1.47
		A	1.46	1.46	1.50	1.53	1.54
COLOURSTEEL® MAXX®	Class 4	R	1.54	1.54	1.74	1.74	1.74
		F	1.54	1.79	1.90	1.95	1.99
Aluminium (unpainted)	304 S/S	R	1.56	1.56	1.56	1.56	1.56
Duraclad®	304 S/S	R	1.52	1.52	1.52	1.59	1.59
		F	1.52	1.52	1.63	1.68	1.72

Table 2.1F Relative Life Cycle Costs – Severe Marine Environment

Roofing/Cladding Options			Relative Life Cycle Cost for Period				
Material		Maintenance					
Sheeting	Fastener		0 Years	20 Years	30 Years	40 Years	50 Years
COLOURSTEEL® ENDURA® or ColorCote® ZinaCore™	Class 4	R	1.23	1.67	1.67	1.77	1.77
		F	1.23	1.42	1.64	1.66	1.67
ColorCote® ZinaCore™ X	Class 4	R	1.46	1.46	1.76	1.76	1.81
		F	1.46	1.57	1.57	1.75	1.77
		A	1.46	1.58	1.64	1.83	1.84
COLOURSTEEL® MAXX®	304 S/S	R	1.54	1.54	1.86	1.86	1.91
		F	1.54	1.91	2.17	2.22	2.27
Aluminium (Unpainted)	304 S/S	R	1.56	1.56	1.56	1.75	1.75
ColorCote® AlumiGard™ X	304 S/S	R	2.158	2.15	2.15	2.15	2.25
		F	2.15	2.15	2.15	2.18	2.24
		A	2.15	2.23	2.26	2.28	2.29
Duraclad®	304 S/S	R	1.52	1.52	1.52	1.59	1.59
		F	1.52	1.52	1.63	1.68	1.72

Table 2.1G Relative Life Cycle Costs – Very Severe Marine Environment

Roofing/Cladding Options			Relative Life Cycle Cost for Period				
Material		Maintenance					
Sheeting	Fastener		0 Years	20 Years	30 Years	40 Years	50 Years
COLOURSTEEL® MAXX®	Class 4	R	1.54	2.06	2.06	2.18	2.18
		F	1.54	1.91	2.23	2.29	2.34
Aluminium (Unpainted)	304 S/S	R	1.56	1.56	1.87	1.87	1.92
ColorCote® AlumiGard™ X	304 S/S	R	2.15	2.15	2.15	2.41	2.41
		F	2.15	2.27	2.30	2.46	2.47
Duraclad®	304 S/S	R	1.52	1.52	1.52	1.59	1.59
		F	1.52	1.52	1.63	1.68	1.72

DIMOND RECOMMENDED INSTALLERS NATIONWIDE

Current as at January 2021

City	Company name	Contact name	Phone number	Postal address	Website	Email Address
Whangarei/ Northland	Roof Bay Of Islands Ltd	Stefan Dawson Rick Harper	09 407 9288		roofbayofislands.co.nz	info@roofbayofislands.co.nz
Auckland	RoofingSmiths: Distinction Roofing	Jessica Chapman	027 245 2199	5A Wookey Lane Kumeu, Auckland 0810	roofingsmiths.co.nz	jessica@activeroofing.co.nz
Auckland	Fyfe Plumbing and Roofing Ltd	Matthew Dunne	09 445 1451 09 520 2279	level 1, 78 Coates Ave, Orakei	fyfeplumbing.co.nz	admin@fyfeplumbing.co.nz
Auckland	Kiwi Roofing	Paul Connell	09 263 9988	PO Box 76-584, Manukau	kiwiroofing.co.nz	tenders@kiwiroofing.co.nz
Auckland	Paton Roofing Services	Phil Gilmore	09 838 7905	5 Amokura St, Henderson	patonroofing.co.nz	damon@patonroofing.co.nz
Auckland	Reel Roofing	Rob Wells	09 577 4411	PO Box 230074 Botany, AKL	reelroofing.co.nz	rob@reelroofing.co.nz
Auckland	Quix Commercial	Dave Henderson	09 579 9065	PO Box 11161 Ellerslie, AKL	PO Box 35499, Browns Bay, AKL	dave.henderson@quixnz.com
Auckland/ Hamilton	Project Unite	Rena Schuster	07 849 1700 021 368 960	PO Box 20112, Te Rapa, Hamilton 3241	projectunite.co.nz	rena@projectunite.co.nz
Hamilton	Geoff Pickford Roofing	Geoff Pickford	07 856 6804 021 597 216	PO Box 4465, Hamilton East, Hamilton	111 Kent Street, Frankton	geoff@gaproofing.co.nz
Hamilton	Roofing Specialists	Peter Fluhler	07 849 4160	PO Box 4465, Hamilton East 3247	roofingspecialists.co.nz	peter@roofingspecialists. co.nz
Hamilton	Nathan Taranaki Construction Ltd T/A Watertight Construction	Shae Jones	07 846 7244 027 6088 500	PO Box 10-117, Te Rapa	wtcroofing.co.nz	shae@wtcroofing.co.nz
Rotorua	RoofingSmiths: Amalgamated Roofing Ltd	Robbie Milligan	07 345 8588	24 Scott Street Rotorua, 3010	roofingsmiths.co.nz	robbie@amalgamatedroofing.co.nz
Tauranga	Harkin Roofing BOP Ltd	Brad Harkin	07 575 2027	PO Box 4019, Mt Maunganui	harkinroofing.co.nz	office@harkinroofing.co.nz
Tauranga	Roofing the Bay Ltd	Neville Johns	07 572 0920 021 767 448	P.O Box 14205, Tauranga Mail Centre. Tauranga	roofingthebay.co.nz	neville@rtb.co.nz
Tauranga	TH Commercial Roofing Ltd	Terry Hunt	07 579 9400	PO Box 9074, Tauranga 3142	thcroofing.co.nz	admin@thcroofing.co.nz
Hawke's Bay	Martin Roofing	Roger Martin	06 879 8252	PO Box 2131, Stortford Lodge	martinroofing.co.nz	roger@martinroofing.co.nz
Hawke's Bay	Amalgamated Roofing, Hawkes Bay	Jeff Moulder	06 870 7301	PO Box 2551, Stortford Lodge, Hastings	amalgamatedroofing. co.nz	jeff.amalga@xtra.co.nz
Hawke's Bay	Turfrey	Brad Turfrey	0800 182 182	PO Box 529, Waipukurau, 4242	turfrey.co.nz	brad@turfrey.co.nz
New Plymouth	RoofingSmiths: Central Roofing Co Ltd	Duncan Corlett	0800 2766 348	23 Katere Rd New Plymouth 4312	roofingsmiths.co.nz	duncan@centralroofing.co.nz
New Plymouth	Farnsworth Roofing Ltd	Darin Vooght	06 758 1445	PO Box 7058, New Plymouth	farnsworthroofing.co.nz	office@farnsworthroofing.co.nz

DIMOND RECOMMENDED INSTALLERS NATIONWIDE

Current as at January 2021

City	Company name	Contact name	Phone number	Postal address	Website	Email Address
New Plymouth	Millwards Roofing 2020 Ltd	Lee Webb	06 758 5663	PO Box 406	millwardsroofing.co.nz	enquiries@millwardsroofing.co.nz
New Plymouth	Roofing Taranaki Ltd	Grant Stewart	06 758 5663	PO Box 3352, Fitzroy	roofingtaranaki.co.nz	roofingtki@xtra.co.nz
Manawatu	Turfrey	Rich Hutchinson	0800 182 182	597 Tremaine Ave, Palmerston North	Turfrey.co.nz	rich@turfrey.co.nz
Wellington	Turfrey	Rich Hutchinson	0800 182 182	22 Cashew Street, Grenada North	Turfrey.co.nz	rich@turfrey.co.nz
Wellington	Aquaheat Industries	Tim Meulenbroeks	04 232 5179	PO Box 51-031, Tawa	aquaheat.co.nz/classic_metal	wellington@aquaheat.co.nz
Wellington	Premier Roofing Wellington Ltd	Craig Lawn	04 473 1552	PO Box 38-174 Wellington 5045	premierroofing.co.nz	craig@premierroofing.co.nz
Wellington	Tararua Roofing Ltd	Wayne Miscall	04 569 3074	PO Box 44-046, Lower Hutt		tararua@wilprop.co.nz
Tasman - Marlborough	RoofingSmiths: Roofingsmiths Nelson Ltd	John/Sandi Hawke	027 447 0087	2/76 Gladstone Road Richmond 7020	roofingsmiths.co.nz	john@roofsmithsnn.nz
Christchurch	RoofingSmiths: Central Roofing Co Ltd (Summerset)	Duncan Corlett	03 349 7218 027 449 2011	13 Parkhouse Rd Wigram, Christchurch 8042	roofingsmiths.co.nz	duncan@centralroofing.co.nz
Christchurch	RoofingSmiths: CS Roofing Canterbury Ltd	Nathan Maxwell	03 338 0400 021 221 5931		roofingsmiths.co.nz	nathan@csroofingcanterbury.co.nz
Christchurch	Graham Hill Roofing Ltd	Graham Hill Mark Tinning	03 343 1030	PO Box 36-133, Merivale		mark@ghroofing.co.nz
Christchurch	Newfield Roofing Ltd	Barry Newfield	03 335 0077	PO Box 12062, Beckenham	newfieldroofing.co.nz	barry@newfieldroofing.co.nz
Christchurch	Wayman Roofing Services Ltd	Tim Wayman	03 338 0877	PO Box 9354	waymanroofing.co.nz	sales@waymanroofing.co.nz
Timaru	RoofingSmiths: Menzies Group Ltd	Ross Dooley	03 684 8440	6 High St Timaru	roofingsmiths.co.nz	admin.menzies@xtra.co.nz
Wanaka	RoofingSmiths: Roofing Hub Ltd	Dave Strudwick	03 443 2794	PO Box 154, Wanaka 9343	roofingsmiths.co.nz	quotes@roofinghub.co.nz
Queenstown	RoofingSmiths: Roofing Hub Ltd	Dave Strudwick	03 442 2202	160 Glenda Drive Frankton, Queenstown 9371	roofingsmiths.co.nz	quotes@roofinghub.co.nz
Dunedin	RoofingSmiths: CS Roofing (Otago) Ltd	Craig Maley	03 479 0658 027 480 6566	10B Strathallan Street South Dunedin, Dunedin 9012	roofingsmiths.co.nz	craig@csroofingotago.co.nz
Invercargill	CS Roofing Southland Ltd	Keith Ivey	03 218 4394 021 311 800	24 Ettrick Street, Invercargill	csroofingsouthland.co.nz	keith@csroofingsouthland.co.nz
Southland	RoofingSmiths: Paisley & King Roofing Ltd	Brendan Paisley Steve King	03 236 0209	84 Albert St Winton 9720	roofingsmiths.co.nz	paisley.roofers@xtra.co.nz

PROFILE SPAN AND CURVATURE - QUICK GUIDE TABLE 2.1H

This table is a quick reference guide on span and curvature limitations for all Dimond roofing and wall cladding profiles. For detailed Serviceability and Ultimate Limit State design, please refer to Section 2.1.4 – Specific Design by Profile Performance.

Basis to the tables:

Roofing – the spans are for roofs with restricted access or where the serviceability wind load does not exceed 1.2kPa. A restricted access roof is where there is occasional foot traffic, that is educated to walk on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways will be installed where regular traffic is expected and "Restricted Access" signs placed at access points.

Walls – spans are limited by acceptable appearance or an serviceability wind load of 1.0kPa.

Roofing fasteners – average of 4 screw fasteners per sheet per purlin. Based on Hex-head screws without washers. The number of fasteners can be reduced by specific design (refer to Section 2.1.4 – Specific Profile Performance).

Drape curve – radii are limited by acceptable roof appearance, refer to Section 2.4.2.

Crimp and roll curve – radii are limited by machine capabilities.

Overhang – for restricted access roofs. The unsupported area is not intended to be used as an access way.

Product		Thickness BMT	Maximum Span				Minimum radius for drape curve	Minimum radius for crimp or roll curve	Maximum overhang unsupported
			Restricted Access Roofing		Walls				
			End Span	Internal	End Span	Internal			
		(mm)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)
Steelspan 900 Min pitch 3°	Steel (G550)	0.55	2.9	4.3	3.3	5.0	120	N/A	450
		0.75+	4.0	6.0	N/A	N/A	120	N/A	600
	Aluminium H36	0.7+	1.6	2.5	1.7	2.6	N/R	N/A	250
		0.9	2.5	3.8	2.6	3.9	120	N/A	350
	Duraclad®	1.7	1.0	1.5	1.3	1.9	30	N/A	250
Topspan® Min pitch 3°	Steel (G550)	0.4+	2.0	3.0	2.3	3.5	N/A	N/A	250
		0.55	2.9	4.3	3.3	5.0	120	N/A	450
		0.75+	4.0	6.0	N/A	N/A	120	N/A	600
	Aluminium H36	0.7+	1.6	2.5	1.7	2.6	N/R	N/A	250
		0.9	2.5	3.8	2.6	3.9	120	N/A	350
	Duraclad®	1.7	1.0	1.5	1.3	1.9	30	N/A	250
DP955® Min pitch 3°	Steel (G550)	0.4	1.6	2.4	2.0	3.0	N/R	N/A	250
		0.55	2.7	4.0	2.9	4.3	70	N/A	350
BB900 Min pitch 3°	Steel (G550)	0.40	1.5	2.2	1.9	2.9	N/R	N/A	250
		0.55	2.3	3.4	2.7	4.1	90	N/A	350
		0.75	2.7	4.0	N/A	N/A	90	N/A	500
	Aluminium H36	0.7	1.1	1.7	1.6	2.4	N/R	N/A	200
		0.9	1.9	2.8	2.8	3.7	90	N/A	300
	Duraclad®	1.7	0.8	1.2	1.4	2.1	24	N/A	200
LT7 and LT5 Min pitch 3°	Steel (G550)	0.4	1.2	1.8	1.6	2.4	80	900	250
		0.55	1.9	2.9	2.3	3.4	50	400	350
	Aluminium H36	0.7	0.9	1.3	1.2	1.8	80	N/A	200
		0.9	1.5	2.3	1.9	2.9	50	400	300
	Duraclad®	1.7	0.8	1.2	1.3	2.0	24	N/A	200

Note: N/A = not available, N/R = not recommended, * = Roll curve only.
+ = Available only on request, subject to minimum order quantities. Check availability with Dimond
Refer to section 2.1.4: Specific Design by Profile for a manufacturing locality guide for each profile.

Table continued overleaf

Product		Thickness BMT (mm)	Maximum Span				Minimum radius for drape curve (m)	Minimum radius for crimp or roll curve (mm)	Maximum overhang unsupported (mm)
			Restricted Access Roofing		Walls				
			End Span (m)	Internal (m)	End Span (m)	Internal (m)			
V-Rib Min pitch 4°	Steel (G550)	0.40	1.2	1.8	1.9	2.9	20	400	200
		0.55	1.7	2.5	2.3	3.5	16	400	300
	Aluminium H36	0.7	0.9	1.3	1.6	2.4	20	N/A	150
		0.9	1.4	2.1	1.9	2.9	16	N/A	250
	Duraclad®	1.7	0.8	1.2	1.2	1.8	20	N/A	150
Styleline/Hi Five Min pitch 3°	Steel (G550)	0.4	1.0	1.6	1.5	2.2	80	900	200
		0.55	1.5	2.2	2.0	3.0	40	400	250
	Aluminium H36	0.7	0.8	1.2	1.1	1.6	80	N/A	100
		0.9	1.1	1.7	1.7	2.6	40	400	200
	Duraclad®	1.7	0.7	1.1	1.0	1.5	12	N/A	100
Veedek® Min pitch 3°	Steel (G550)	0.4	1.0	1.6	1.5	2.2	N/R	N/A	200
		0.55	1.5	2.2	2.0	3.0	N/R	N/A	250
	Aluminium H36	0.7	0.8	1.2	1.1	1.6	N/R	N/A	100
		0.9	1.1	1.7	1.7	2.6	N/R	N/A	200
	Duraclad®	1.7	0.7	1.1	1.0	1.5	N/R	N/A	100
Six Rib Min pitch 4°	Steel (G550)	0.4	1.0	1.5	1.2	1.8	80	N/A	250
		0.55	1.5	2.2	1.6	2.4	40	N/A	250
Solar-Rib® Min pitch 3°	Steel (G550)	0.55	1.3	1.9	1.5	2.3	90	N/A	50
	Aluminium H36	0.90	0.8	1.2	1.0	1.5	90	N/A	50
Corrugate Min pitch 8°	Steel (G550)	0.4	0.8	1.2	1.0	1.5	12	450*	100
		0.55	1.0	1.5	1.2	1.9	10	450*	150
	Aluminium H36	0.7	0.5	0.8	0.8	1.2	12	450*	75
		0.9	0.8	1.2	1.2	1.8	10	450*	150
	Duraclad®	1.7	0.6	0.9	0.9	1.4	8	N/A	100
Dimondek® 630** Min pitch 3°	Steel (G550)	0.48	2.2	3.3	N/A	N/A	250	N/A	150
		0.55	2.4	3.6	N/A	N/A	250	N/A	250
Dimondek® 400** Min pitch 3°	Steel (G300)	0.55	1.1	1.6	1.2	1.8	70	N/A	250
		0.75	1.5	2.2	1.3	1.9	70	N/A	300
	Aluminium H36	0.9	0.9	1.3	0.9	1.4	70	N/A	200
	Copper 1/2 Hard	0.55	0.9	1.4	1.0	1.5	70	N/A	200
Heritage Tray® Min pitch 3°	Steel (G300)	0.55	0.5	0.5	0.5	0.5	N/A	N/A	0
	Aluminium H36	0.90	0.5	0.5	0.5	0.5	N/A	N/A	0
Eurotray® Lite Min pitch 8° Needs ply substrate	Steel (G300)	0.55	0.4	0.4	0.4	0.4	N/A	N/A	0
Eurotray® Angle Seam Min pitch 5° Needs ply substrate	Steel (G300)	0.55	0.4	0.4	0.4	0.4	40	N/A	0
	Aluminium H36	0.7	0.4	0.4	0.4	0.4	70	N/A	0
	Copper 1/2 Hard	0.7	0.4	0.4	0.4	0.4	40	N/A	0
	Zinc	0.7	0.4	0.4	0.4	0.4	40	N/A	0
Eurotray® Double Standing Seam Min pitch 3° Needs ply substrate	Steel (G300)	0.55	0.4	0.4	0.4	0.4	40	N/A	0
	Aluminium H36	0.7	0.4	0.4	0.4	0.4	70	N/A	0
	Copper 1/2 Hard	0.7	0.4	0.4	0.4	0.4	40	N/A	0
	Zinc	0.7	0.4	0.4	0.4	0.4	40	N/A	0
Eurotray® Roll Cap & Roll Seam Min pitch 5° Needs ply substrate	Steel (G300)	0.55	0.4	0.4	0.4	0.4	N/A	N/A	0
	Aluminium H36	0.7	0.4	0.4	0.4	0.4	N/A	N/A	0
	Copper 1/2 Hard	0.7	0.4	0.4	0.4	0.4	N/A	N/A	0
	Zinc	0.7	0.4	0.4	0.4	0.4	N/A	N/A	0
Audioperf® Ceiling only	Steel (G550)	Refer to full section 2.1.4.22							
EuroPanel® Wall cladding only Needs ply substrate	Zinc	0.7	N/R	N/R	500	500	N/R	N/R	N/R
	Copper 1/2 Hard	0.7	N/R	N/R	500	500	N/R	N/R	N/R
Super Six Min pitch 3°	Duraclad®	1.7	1	1.2	1.4	1.7	28	N/A	250
Dimondclad Rib 20 & 50 Wall cladding only	Steel (G550)	0.4	N/R	N/R	0.9	1.4	N/R	N/A	100
	Aluminium H36	0.7	N/R	N/R	0.9	1.4	N/R	N/A	75
		0.9	N/R	N/R	0.9	1.4	N/R	N/A	100
Baby Corrugate Wall cladding only	Steel (G550)	0.4	N/R	N/R	0.4	0.6	N/R	N/A	75
		0.55	N/R	N/R	0.4	0.8	N/R	N/A	75
Fineline Wall cladding only	Steel (G550)	0.55	N/R	N/R	0.3	0.3	N/R	N/A	N/R
	Aluminium H36	0.9	N/R	N/R	0.3	0.3	N/R	N/A	N/R

Note: N/A = not available, N/R = not recommended, * = Roll curve only.
+ = Available only on request, subject to minimum order quantities. Check availability with Dimond
Refer to section 2.1.4: Specific Design by Profile for a manufacturing locality guide for each profile.
**Ultimate loads apply to the Dimondek® range

ROOF PROFILE FLOW CAPACITY

Theoretical calculation has shown that apart from Corrugate and V-Rib, all other Dimond roofing profiles are capable of accommodating the water from the most intense downpours (200mm/hr), even where total roof runs (ridge to gutter) reach 200m.

The lower rib, multi channel profiles Corrugate and V-Rib, have the following capacity restrictions for the total run of roof.

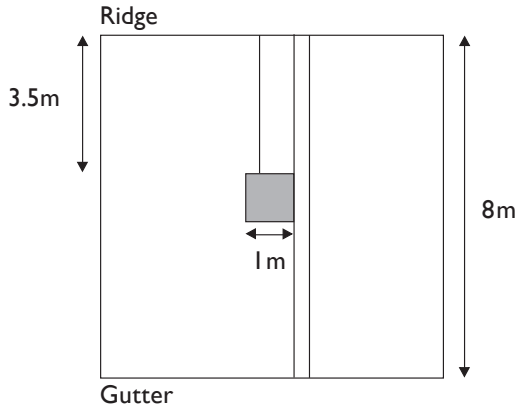
	Max Channel length (m)	Channel width (mm)
Corrugate	25	76
V-rib	80	101.6

(These are the recommended maximum lengths (from ridge to gutter) of the water channels to avoid side lap leakage.)

Where water flows are interrupted (e.g. penetrations, or where water is accumulated and deposited from an upper roof onto a lower roof), care must be taken to calculate the total length of channel within the catchment area that will be diverted to one roofing channel. This calculated length must then be added to the length of channel (ridge to gutter) the water will be diverted into. The total length must not exceed the calculated capacity (maximum channel length) of the profile used. Where it is anticipated that the profile capacity will be exceeded (thereby causing a risk of water flowing under the side flashing), steps must be taken to divert the water flow to a greater number of channels, or select a profile that can better handle the anticipated water flow.

When using all other Dimond profiles, please contact Dimond if the anticipated catchment area (channel length) exceeds 200m.

E.g. where a penetration interrupts the water flow on Dimond Corrugate



Width of penetration.	1m
Divided by the width of a Corrugate channel.	76mm
	1 ÷ .076mm =13.15 channels
Take half this number as only 1/2 the catchment area will be diverted into the channel beside the penetration.	7 channels
Multiplied by the run of roof from ridge to the back of the penetration.	7 x 3.5m = 25.5m
Add the length of one full channel (ridge to gutter), as this channel will carry the water collected from behind the penetration to the gutter.	+ 8
	= 33.5m

As the total amount of channel behind the penetration plus one channel from ridge to gutter exceeds the recommended maximum length of Corrugate channel, the water behind the penetration will need to be diverted into more than one channel to avoid the possibility of side lap leakage, or an alternative profile chosen.

DISSIMILAR MATERIALS

Corrosion from dissimilar materials usage may have two origins:

- Contact between different metals, producing a galvanic cell which causes the more active metal to corrode.
- Water run-off from particular materials on to a metal, causing corrosion.
- Surface oxide, relative surface areas, water purity and environmental factors can influence the outcome, so the consequences may not relate strictly to the well-publicised Galvanic Series.
- Table 2.1I shows which metals and materials can be used together in a roof and/or gutter installation and which should be avoided.

If dissimilar metal usage cannot be avoided then contact and/or water run-off must be avoided by insulating surfaces. Separation by rubber seal or coating the surfaces and maintaining the coating as an effective barrier for the life of the roof will be required. For further important information refer to the MRM code of practice at www.metalroofing.org.nz.

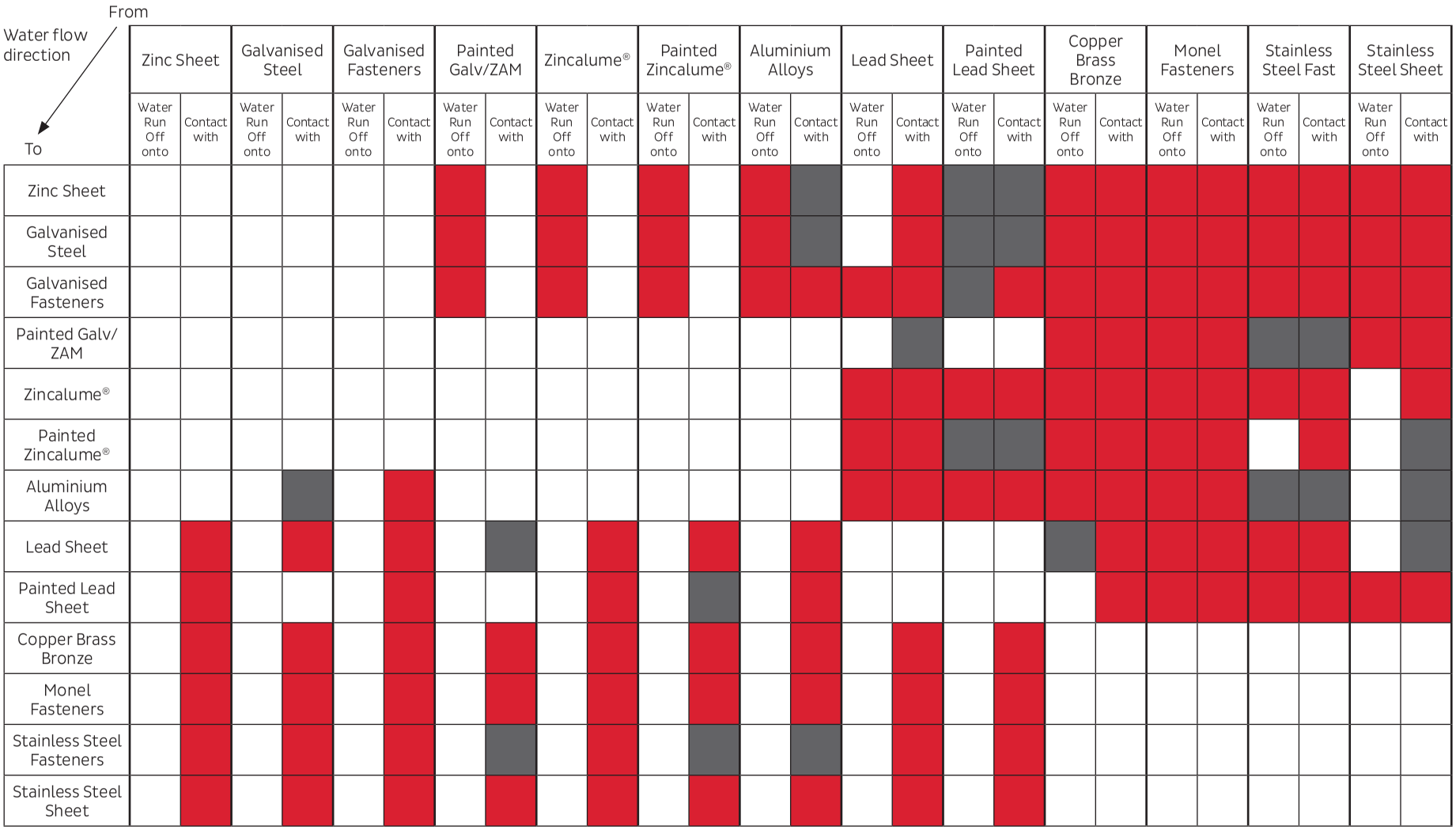
Contact with non-metal materials and water run-off from them can also cause corrosion problems. Well-known examples are:

- Inert catchment – where water running from a non-zinc surface onto unpainted galvanised steel can cause rapid consumption of galvanising. The guilty surfaces include glass, plastic including GRP sheeting, painted or unpainted Zincalume®, painted galvanised steel, concrete tiles and butyl rubber. (The effect is often seen on the unpainted interior surface of galvanised gutters where rust spots will appear at each water drip point).
- Timber – particularly copper treated including treated timber walkways. Any contact with wet timber should be avoided.
- Lime cement and concrete.
- Wet insulation.
- Soot or sulphur.
- Carbon (lead pencil or some black sealing washers), which causes Zincalume® to corrode.
- Galvanised netting must not be used directly under aluminium roofing. Where the galvanised netting has not been correctly isolated and has made or can make contact with the underside of the aluminium roof, pitting of the aluminium will occur. Either avoid using galvanised netting or isolate contact with an inert strip such as Dimond purlin protection strip or install over a vented drainage mat. Building paper cannot be relied upon as an inert strip, especially in severe marine environments.
- When stainless steel fasteners are used through aluminium roofs an oversize clearance hole around the fixing and a profiled metal washer with an EPDM seal must be used. If the fastener is not isolated from the roofing, any moisture, especially salt laden air, creates a corrosive cell between the stainless steel and the aluminium which results in rapid corrosion of the aluminium. Alternatively aluminium fasteners can be used (with an oversize clearance hole around the fixing and a profiled metal washer with an EPDM seal) into non-copper treated timber in place of stainless steel fasteners.
- Clouts or staples must not be allowed to make contact with aluminium roofs.

Table 2.1I Dissimilar Metals Guide – Overleaf

Table 2.11 Dissimilar Metals Guide

Example – Zincalume®: to check the compatibility of Zincalume® with other material, locate Zincalume® along the top (horizontal axis) and check the water run-off and contact columns for compatibility with other materials. This indicates, for example, that water run-off from Zincalume® onto unpainted galvanised steel must be avoided, but that direct contact between Zincalume® and galvanised steel is acceptable.



THERMAL MOVEMENT

The theoretical expansion and contraction movement of long run roofing and cladding sheets due to temperature change of the material can be calculated and then an appropriate fastening method specified.

Only thermal movement along the sheet length need be considered, as thermal movement across the sheet is accommodated by the profile shape.

DESIGN GUIDELINE

(a) Determine The Thermal Expansion Coefficient

Select the appropriate thermal expansion coefficient from the Table 2.1J:

Table 2.1J Thermal Expansion Coefficients

Sheet Material	Thermal Expansion Coefficient $\propto$ (mm/m°C)
Steel	0.012
Aluminium	0.023
Copper	0.017
GRP*	0.029

(* GRP refers to glass reinforced polyester material used to manufacture the Dimond Durolite® and Duraclad® products.)

(b) Determine The Expected Temperature Range

The temperature extremes (from nighttime winter to daytime summer) that the sheet material is expected to attain need to be assessed.

Use the Table 2.1K as a general rule to select the likely maximum and minimum temperatures.

These tabulated values may not be reached in less severe environments (e.g. North Island coastal) but may be exceeded in special circumstances (e.g. sheltered valley Central Otago).

Table 2.1K Guide To Surface Temperatures

Roof Type	Surface Appearance	Guideline Temperature Extremes °C			
		Uninsulated Roof		Insulated Roof	
		Max	Min	Max	Min
Steel or Aluminium	Unpainted	50	-10	60	-15
Steel or Aluminium	Light Colour	50	-10	60	-15
Steel or Aluminium	Dark Colour	65	-10	80	-15
Copper	Unpainted	65	-10	80	-15
Duraclad® (GRP)*	Light Colour	50	-10	60	-15
Duraclad® (GRP)*	Dark Colour	60	-10	70	-15
Natural Lighting (GRP)*	Clear or Tint	45	-10	-	-

(*GRP refers to glass reinforced polyester material used to manufacture the Dimond Durolite® and Duraclad® products.)

(c) Calculate The Theoretical Thermal Movement

Theoretical Thermal Movement (mm) = $\propto$ x ΔT x L

Where $\propto$ = thermal expansion coefficient, mm/m°C

ΔT = (max temp) – (min temp) = expected temperature range, °C

L = roof sheet length, m

Example – Light colour, insulated, steel roof, sheet length 12m

Theoretical Thermal Movement = 0.012 x (60-(-15))x12 = 10.8mm

(d) Specify The Appropriate Fixing Method

The theoretical thermal movement must be accommodated by the method used to fix the roof sheeting to the roof structure. Low rib sheet profiles are less rigid and are therefore able to bow slightly between purlin lines and accommodate more movement than the more rigid, high rib profiles.

Select the appropriate fixing method from Table 2.1L.

Table 2.1L Fixing Methods To Accommodate Thermal Movement

	Theoretical Thermal Movement (MM)			
Fixing Method	HIGH RIB BB900, LT7,® SS900, Topspan®, DP955®, Solar-Rib®	LOW RIB Corrugate, Veedek®, Styleline, V-Rib, Hi Five, Six Rib	Decking	
			DD400	DD630
1. Solid Fix Screw fasteners without oversize holes, profile washers may not be necessary (reference Section 2.1.4)*	Up to 10mm	Up to 13mm	-	-
2. Oversize Holes, One End Top 2/3 of sheet length: screw fasteners without oversize holes, profile washers may not be necessary (refer Section 2.1.4)* Bottom 1/3 of sheet length: screw fasteners with 10mm ø oversize holes, and profile washers with 36mm ø EPDM seals	10 - 15mm	13 - 20mm		
3. Oversize Holes, Both Ends Top 1/4 of the sheet length: screw fasteners with 10mm ø holes and profile washers with 36mm ø EPDM seals. Middle 1/2 of sheet length: screw fasteners without oversize holes, profile washers ma not be necessary (refer Section 2.1.4)* Bottom 1/4 of the sheet length: screw fasteners with 10mm ø holes, and profile washers with 36mm ø EPDM seals.	15 - 20mm	20 - 26mm		
4. Clip Fastening of Decking/Eurotray®	-	-	Up to 30mm	**Up to 80mm

**Consideration must be given to sheet clearances between the building structure to achieve this max amount of movement. Any Natural Lighting sheets need to match this special design. Call 0800 ROOFSPEC to discuss.
*Note that Duraclad® (GRP) sheets require a minimum pre-drilled hole diameter of 2mm greater than the screw diameter, and require washers (refer Section 2.1.4).

(e) Extra Long Roof Runs

Proposed lengths of sheeting that give theoretical thermal movement outside the scope of Table 2.1L will require the sheets to be in two or more separate lengths. The joining of these lengths must accommodate the thermal movement and therefore should be specified to the requirements for a Step Joint – refer specific detail drawings in Section 2.1.4.

(f) Horizontal Cladding

Avoid end laps and use a butt joint with a top hat flashing joiner. Consideration for thermal expansion movement on wall cladding should be made on wall runs above 8m. This may involve the use of a butt joint top hat flashing.

CONDENSATION

Condensation forms on the inside surface of metal roofing and wall cladding when warm, moist air inside the building contacts the colder metal surface.

The amount of condensation that forms depends on the relative humidity of the air, the air temperature and the metal surface temperature.

To minimise the effects of condensation through design choice, the following must be considered:

(a) Roofing Underlay

Specify a breather type underlay complying with NZS 2295 under metal roofing to absorb condensation that drips from the underside of the roofing. Roofing underlay should also always be used to cover roof space insulation. Breather-type underlays should be selected from the options in Table 2.1M.

Table 2.1M Breather-Type Underlays

Performance Required	Bitumac 710	Thermakraft 213	Bitumac 750	Framegard G3
Suitable as roofing underlay	No	Yes	Yes	No
Suitable as wall wrap	Yes	Yes	Yes	Yes
Requires netting or strapping for support	No (used on walls only)	Yes (over 1200mm span only)	Yes	No (used on walls only)
Can be unsupported on spans up to 1200mm	No	No	Yes	No
Fire retardant lining to NZBC Clause C3 requirements	No	No	No	Yes
Suitable for wet, wind, exposed situations	No	Yes	Yes	No

(b) Vapour Barrier

A material that is to a large degree impermeable to water vapour (foil or plastic covered, reinforced paper) can be used under insulation to restrict the amount of moist air reaching the cold metal surface (refer Section 2.4.3).

To achieve an effective vapour barrier all laps must be taped. Refer 2.4.3.1.3.

Vapour barriers should not be relied upon to achieve a total elimination of water contacting the metal surface.

The effectiveness of the vapour barrier to prevent condensation is determined by how effectively the vapour barrier surface temperature is kept above the moist air dew point by the use of insulation.

Continued on next page...

(c) Ventilation

Airflow to remove moist air from the building or roof space must be considered in cold climates and in buildings where moisture is generated within the building space. Consider specifying either natural draft open ridge or Ampelair ventilation (refer Section 2.4.4), or forced air ventilation using powered fans.

Ridge ventilators are partly open to the weather to allow sufficient airflow and may allow rain droplets to enter the building in high wind conditions.

Where there is no internal ventilation within the roof space there must be ventilation between the roof and the underlay.

This may mean leaving the ridge or eave filler strips out to allow air movement.

In enclosed applications such as swimming pool covers with internal ceilings or processing plant buildings with ceilings, that may create a build-up of moisture or pollutants, there must be adequate ventilation to minimise any corrosion risk on the ceiling or roof underside.

To minimise the corrosion risk, this may include allowing for frequent air changes by installing suitable fan and air extraction systems and/or specifying Duraclad®.

(d) Roofing and Cladding Material

The metal roofing and cladding material must be chosen to have sufficient resistance on the inside surface to degradation by exposure to the level of condensation expected.

In harsh industrial environments the durability of the internal surface may dictate the material used.

FLASHING DESIGN

General (2.1.3.6.1)

When considering the flashings for your job be aware that our range of standard flashings (see Section 2.2.4) are a small sample of what is possible. Below is a summary of the issues and the limitations that should be considered when detailing specific flashing shapes.

The material used will be:

Table 2.1N

	Thickness (mm)	Grade
Steel	0.55mm	G300
Aluminium	0.9mm	5052/5251 - H34

Copper and stainless steel are available upon request. Please contact Dimond on 0800 DIMOND (0800 346 663) to check availability.

The girth of the flashing will be limited in one direction to 1219mm maximum (coil width). Where one dimension is 1219mm or less, the recommended maximum length (the other dimension) is 6m. Lengths longer than 6m should be avoided, as thermal expansion issues will be accentuated with flashings.

Where flashing shapes are complex or bulky, it is recommended the maximum lengths be kept to 3m to assist with handling and installation of the product.

As the flashing shapes are created by mechanical folding there are certain limitations relating to the angle of the folds and the distance between two folds that need to be considered. The tightness that the material can be folded back on itself will also limit the options. The limitations will vary depending on material type including whether the material is painted. To confirm that your specific detail can be manufactured, please consult with Dimond on 0800 DIMOND during the planning stage.

Flashings running across sheet profiles must be finished to minimise the gap created over profile pans or troughs. This is achieved by notching the front downturn of the flashing over the sheet profile ribs, or on the Corrugate Profile a soft edge to the flashing can be used (refer Section 2.2.4.3). Notching should be specified as “flashing to be notched on site”.

When Duraclad® is the selected roof or wall material, aluminium flashings are normally recommended. In some chemical environments a check on the suitability of aluminium should be made.

Other things to consider in the design and installation of flashings:

- flashings must shed moisture to the outside of the building;
- flashings must not retain moisture (all flashing surfaces must maintain a minimum 3º fall);
- all flashing surfaces to be no wider than 300mm in one plane unless strengthening ribs are incorporated or there is additional support underneath;
- the cover provided shall be sufficient to ensure wind driven moisture does not enter the building (see Table 2.1.O). Flashings may be used either with or without compressible foam strip. When installed correctly the foam strip will restrict air flow and carriage of water under the flashing.
- where several 6m lengths of flashings are lapped end to end and joined by rivets and sealant, consideration must be given to accommodating thermal expansion if the assembled length exceeds 18m for steel or 12m for aluminium.
- details showing flashing placement for steps in long runs of roofing are shown in the detail drawings for each profile

Change of Pitch (2.1.3.6.2)

Where there is a change of pitch in the roof, there are two options to create a watertight junction between the roofs.

A – include an apron flashing.

B – run the upper roof over the lower roof.

Option A is recommended and relies on flashing cover widths as shown in Table 2.1.O. This option must be used where the profile of the upper roof is different to the lower roof.

Option B while aesthetically more appealing relies on care being taken to align upper and lower sheets. However, there are certain limits which must be understood. This option is only suitable where the change in pitch is less than 20º and the lower roof can extend up under the upper roof by at least 150mm. Care will be required to avoid contact between the upper and lower sheet to ensure scratching does not occur. Movement of the top sheet through thermal expansion will also need to be considered. Maintenance is critical to remove any build-up of debris between the sheets and avoid unseen corrosion.

Whichever option is chosen, the top end of the lower sheet must be stop ended.

Fixings (2.1.3.6.3)

As the flashings are usually located at the perimeter of the structure, they are often subjected to the highest wind pressures. Accordingly the fixing patterns used must adequately accommodate the expected wind loads.
Where a flashing covers the roof or wall cladding, the primary fastening must penetrate through to the support structure (purlin or girt). The location of the fasteners used to secure the roof will be suitable to fasten the flashing.

Where thermal expansion is being accommodated at the ridge, primary fastenings should not be used to hold the flashing. Other options such as clips will be required.

Where the flashing covers a barge or parapet in low and medium wind zones, the fastener should be spaced at no more than 1m centres along the vertical face. In high wind zones and above (over 45m/sec), the maximum spacing should not exceed 500mm.

Where secondary fastenings (a fixing that secures the flashing to roof sheet only) are used to fasten the laps and provide additional hold down (side lap stitching), stitching screws are recommended. If aluminium rivets are used, the minimum diameter shall be 4.8mm.

Penetrations (2.1.3.6.4)

When designing penetrations it is critical to understand the issues that exist when a hole is cut in the roof sheeting. Where holes exceed 200mm in either direction the structure will need to be strengthened to ensure structural integrity is maintained and fixing points for the flashing are provided. Consideration must also be given to the additional weight that may be applied to the roof structure through the placement of plant (air conditioning units) on the roof.

It is also necessary to consider the effect the penetration will have on the flow of water down the roof. In instances where large penetrations are installed, the water from several pans may be channelled into one pan beside the penetration. If the flow capacity of the pan is exceeded, flooding of the side lap may occur, or water may dam back up the sheet and flood over the back flashing positioned above the penetration.

Please consider the potential catchment area and subsequent flow rate and where necessary direct water across several pans to ensure water flow does not create a leakage issue. See Section 2.1.3.2 for the flow capacity of each profile.

Continued on next page...

Table 2.1.O Effective Minimum Cover of Flashing Over Roof Sheet (mm)

Flashing Type	Min. Flashing Cover Dimension over Roof or Cladding (mm)	
	Low, medium or high wind zones where roof pitch is 10° or greater	For all pitches in very high wind zones and above, and for all wind zones where roof pitch is less than 10°
Ridge - transverse over roofing	130	200
Barge - parallel with ribs - parallel with corrugate - vertically down smooth face sheet - vertically down profiled face sheet	 1 rib 2 corrugations 50 75	 2 ribs 3 corrugations 75 100
Apron - transverse over roofing - parallel with ribs - parallel with corrugate - vertically up smooth face sheet - vertically up profiled face sheet	 130 1 rib 2 corrugations 50+ hem or 75 75+ hem or 100	 200 2 ribs 3 corrugations 75+ hem or 100 100+ hem or 125
Parapet - vertically down smooth face sheet - vertically down profiled face sheet	 50 75	 75 100

Notes:

Dimension excludes any soft edge or turn down to roofing.

Wall cladding must finish within 25mm above any apron flashing to allow clearance and avoid dirt building up.

In high wind areas a profiled foam seal can be used under the ridge or apron flashing, over the roofing, to create a pressure differential chamber to avoid moisture being driven in. The foam seal should be placed adjacent to the stop end at the head of the sheet.

All roof and wall cladding profiles are to be stop ended at the top end of the sheet on all pitches.

The cover dimensions given above are the cover over the roof or wall cladding not the leg length of the flashing.

On profiles other than Corrugate where cover over 2 ribs is required, flashings must cover at least one rib plus the trimmed side of the sheet turned up to the full height of the rib.

REFLECTANCE VALUES

Light Reflectance Values (LRV) refers to the total quantity of visible light that when illuminated by a light source is reflected by a surface. LRV runs on a scale from 0% (absolute black) to 100% (perfectly reflective white). However the amount of reflectivity will vary depending on the angle of incidence of the light onto the cladding surface and this must be taken into consideration in using these values.

NB: Slight variations in values may occur between different batches of product due to manufacturing tolerances.

COLOURSTEEL® Range (2.1.3.7.1)

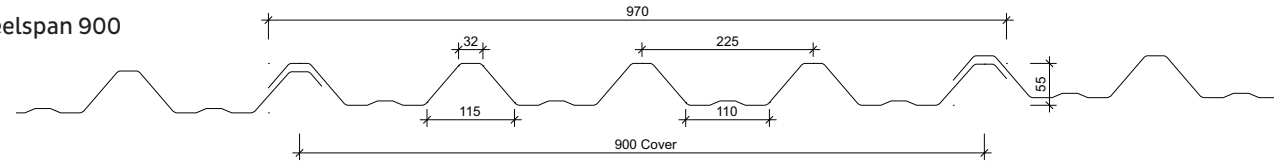
COLOURSTEEL® Colour	LRV %	COLOURSTEEL® Colour	LRV %
Cloud	74	Mist Green	25
Desert Sand	49	New Denim Blue	11
Ebony	5	Permanent Green	11
FlaxPod	7	Pioneer Red	13
Grey Friars	10	Sandstone Grey	27
Gull Grey	51	Scoria	10
Ironsand	8	Slate	9
Karaka	8	Thunder Grey	12
Lichen	27	Titania	68
Lignite	11	Windsor Grey	7

ColorCote® Range (2.1.3.7.2)

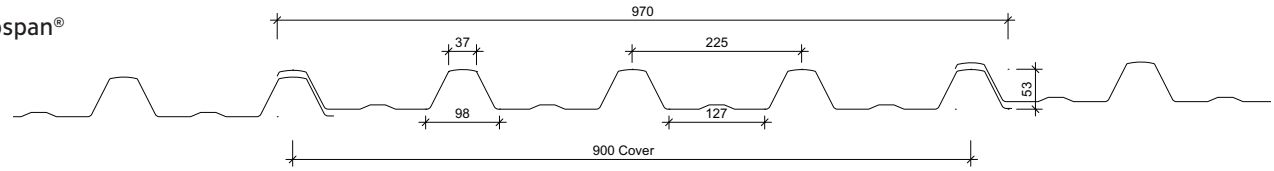
ColorCote® Colour	LRV %	ColorCote® Colour	LRV %
Black	5	Pacific White	77
Bone White	56	Pebble	31
Desert Sand	46	Permanent Green	10
Forest Fern	13	Pioneer Red	16
Grey Flannel	20	Poppy	27
Grey Friars	11	Rivergum	17
Gull Grey	46	Sandstone Grey	25
Ironsand	9	Scoria	11
Karaka	8	Seabird	12
Lancewood	7	Slate	9
Lazerite Blue	14	Slate Blue	9
Lichen	24	Smokey	29
Lignite	9	Smooth Cream	66
Metallic Gunmetal	No LRV	Storm Blue	12
Metallic Silver	No LRV	Terracotta	24
Mist Green	23	Threadbow White	77
Mudstone	15	Thunder Grey	12
New Denim Blue	12	Titania	65
Nimbus	20	Weathered Copper	11
Off White	69	Windsor Grey	8
Pacific Cloud	69		

DIMOND STEELSPAN 900 AND TOPSPAN® PROFILE PERFORMANCE

Steelspan 900



Topspan®



Cover (mm)	900
Sheet width (mm)	970
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet width for aluminium +0, -15. If sheet cover widths are critical, advise Dimond at time of order.

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options Profile	Steel			Aluminium*		Duraclad®
	Topspan®	Both	Both	Both	Both	Both
Thickness (BMT) mm	0.4*	0.55	0.75*	0.7	0.9	1.7 (total thickness)
Nominal weight/lineal metre (kg/m)	4.12	5.55	7.47	2.31	2.96	2.70
Drape curved roof - min. radius (m)	n/r	120	120	n/r	120	30
Purlin spacings for drape curved roof (m) (1)	n/r	2.4	2.4	n/r	2.4	1.5
Machine crimp curved - roof min. radius (mm)	n/a	n/a	n/a	n/a	n/a	n/a
Unsupported overhang (2) (mm)	250	450	600	250	350	250

*Available only on request, subject to minimum order quantities. Check availability with Dimond.

(1) 0.4mm BMT not recommended for internal ceiling applications.
(2) Recommended maximum purlin spacing at minimum radius.
(3) Based on 1.1kN point load support, but not intended for roof access.
n/r – not recommended
n/a – not available

Roll-forming facility at:	Hamilton – Steelspan 900 Christchurch – Topspan®
Manufacturing location for Duraclad®:	Auckland
Sheet lengths:	Steelspan 900 and Topspan® are custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

STEELSPAN 900 AND TOPSPAN® LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof		Restricted-Access Roof			Non-Access Roof or Wall	
G550 Steel 0.40mm* Topspan® only	End Span	1200	1300	1500	1800	2000	2200	2300
	Internal Span	1800	2000	2200	2700	3000	3300	3500
	Serviceability	3.4	2.7	2.6	2.0	1.6	1.5	1.3
G550 Steel 0.55mm	End Span		2000	2300	2400	2900	3300	3400
	Internal Span		3000	3500	3600	4300	5000	5100
	Serviceability		2.3	1.8	1.7	1.3	1.0	0.9
G550 Steel 0.75mm*	End Span		2800	2900	3400	4000	4100	4300
	Internal Span		4200	4400	5200	6000	6200	6600
	Serviceability		2.3	2.2	1.8	1.5	1.3	1.1
5052, H36* Aluminium 0.70mm	End Span		1100	1200	1400	1600	1700	
	Internal Span		1700	1800	2100	2500	2600	
	Serviceability		2.6	2.4	2.0	1.6	1.4	
5052,H36 Aluminium 0.90mm	End Span		1700	1800	2100	2500	2600	
	Internal Span		2600	2700	3200	3800	3900	
	Serviceability		2.2	2.0	1.5	1.2	1.0	
Duraclad® 1.7mm (note 4)	End Span				900	1000	1100	1300
	Internal Span					1500	1600	1900
	Serviceability Ultimate	N/R	N/R			- 4.4	- 3.6	- 2.4

*Available only on request, subject to minimum order quantities. Check availability with Dimond.

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 4 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Duraclad®
   – Serviceability Limit State loads are not applicable to the Duraclad® material, as it does not experience permanent deformation.
   – System must include Safety Mesh if intended for use as a Restricted-Access roof. Refer Section 2.2.1.8.
5. N/R = not recommended.
6. End span capacities given in this table are based on the end span being 2/3 of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of Steelspan 900 and Topspan® are determined from the Steelspan 900 and Topspan® Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines. The capacities given do not apply for cyclonic wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.

9. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Steelspan 900 and Topspan® should be screw fixed to either timber or steel purlins. The use of the appropriate length of 14g roofing screw will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Roofing Span Capacity Chart.

Purlin Type	Screw Fastener			
	Roofing Rib		Wall Clading Pan	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	100	T17 - 14 - 10 x 100	50	Roofzip M6 x 50 HG-Z4
Steel	95	Tek - 14 - 10 x 95	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the purlins or for wall cladding fixing onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 4 screw fasteners/sheet/purlin without the use of load spreading washers (except for 0.4mm steel, 0.7mm aluminium and Duraclad® material, which must be fitted with profiled metal washers and 36mm EPDM seals).

Profiled metal washers are recommended for use:

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section 2.1.3.4 Thermal Movement.
3. Wherever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Use in serviceability categories (1) or (2) can allow the reduction of fasteners to 2 screw fasteners/sheet/purlin by using 2 fasteners/sheet/purlin. If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.5.

Long spans may require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

Design Example

Restricted access roof, 0.55mm G550 steel Steelspan 900 has a maximum end span of 2900mm and a maximum internal span of 4300mm. The following distributed load capacities apply.

	4 fasteners/sheet	2 fasteners/sheet
End Span	2900mm	2900mm
Internal Span	4300mm	4300mm
Serviceability	1.3 kPa	0.6 kPa

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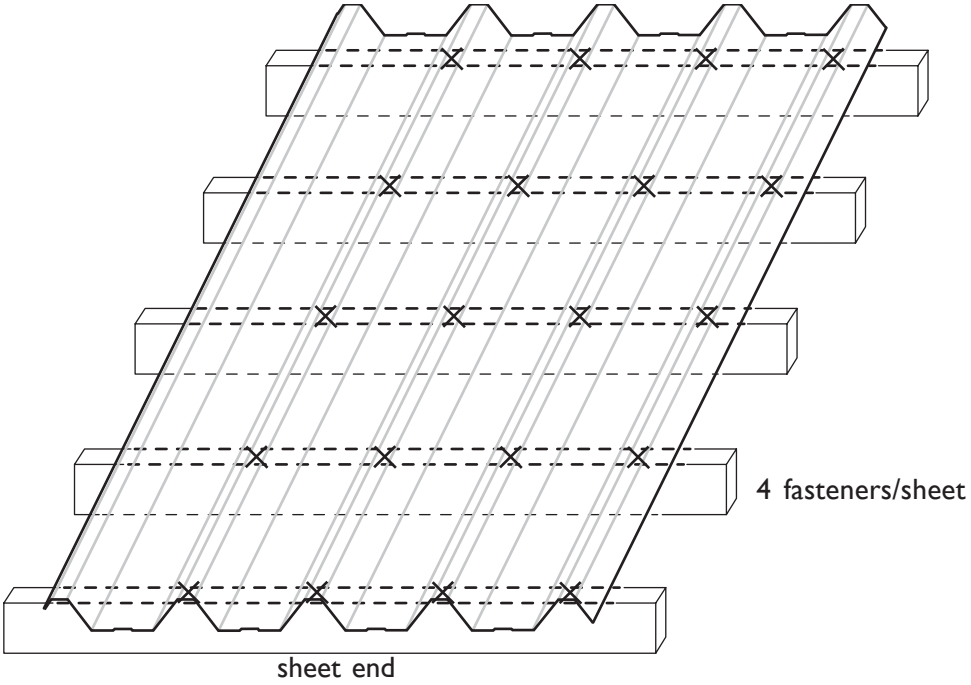
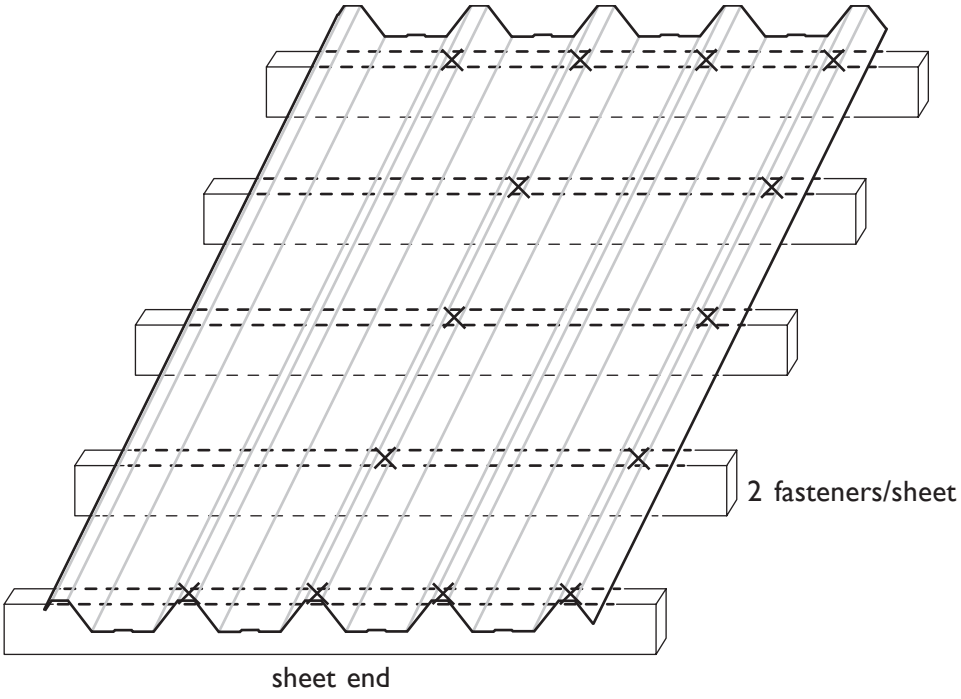
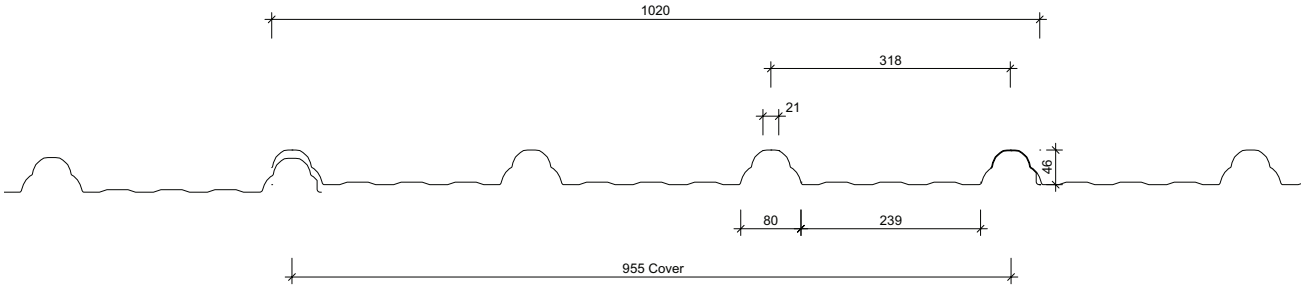
DIMOND STEELSPAN 900 AND TOPSPAN®
FASTENER LAYOUT OPTIONS





DIMOND DP955® PROFILE PERFORMANCE



Cover (mm)	955
Sheet width (mm)	1020
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, −0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, −0mm.

Material Options Profile	Steel	
Thickness (BMT) mm	0.4	0.55
Nominal weight/lineal metre (kg/m)	4.12	5.55
Drape curved roof - min. radius (m)	n/r	70
Purlin spacings for drape curved roof (m)(1)	n/r	2.7
Machine crimp curved - roof min. radius (mm)	n/a	n/a
Unsupported overhang (2)(mm)	250	350

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/r – not recommended
n/a – not available

Notes:

1. Where purlin spacings for roofing exceed 1.5m for 0.4mm or 2m for 0.55mm, the sidelap must be fastened in accordance with Section 2.3.2
2. When notching flashings around the DP955® rib, use straight cuts rather than follow the curve rib shape

Roll-forming facility at: Auckland and Christchurch

Sheet lengths: DP955® is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

Refer Section 2.1.3.4.

DP955® LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof			Restricted-Access Roof			Non-Access Roof or Wall	
G550 Steel 0.40mm	End Span			800	1100	1300	1600	1800	2000
	Internal Span			1400	1700	2000	2400	2700	3000
	Serviceability			2.3	1.9	1.6	1.3	1.1	1.0
G550 Steel 0.55mm	End Span	1600	1800	2000	2200	2400	2700	2900	
	Internal Span	2400	2700	3000	3300	3600	4000	4300	
	Serviceability	2.0	1.8	1.6	1.4	1.3	1.2	1.1	

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 3 screw fasteners/sheet/purlin with load spreading washers.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. End span capacities given in this table are based on the end span being $^{2}/_{3}$ of the internal span.
5. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.
6. **System Design**
   Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines. The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.

7. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

DP955® should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g or 14g screw will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Span Capacity Chart.

Purlin Type	Screw Fastener			
	Roofing Rib		Wall Cladding Pan	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	100	T17 - 14 - 10 x 100	50	Roofzip M6 x 50 HG-Z4
Steel	75	Tek - 14 - 14 x 75	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the purlins or for wall cladding fixed onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 3 screw fasteners/sheet/purlin with the use of load spreading washers and 36mm dia EPDM seals.

Profiled metal washers are recommended for use:

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section 2.1.3.4 Thermal Movement.
3. Wherever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Where screws are used without load spreading washers, the profile's load span ability is reduced by 60%.

Long spans above 1.5m for 0.4mm and 2.0m for 0.55mm require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

Design Example

Restricted access roof, 0.55mm G550 steel DP955® has a maximum end span of 2700mm and a maximum internal span of 4000mm. The following distributed load capacities apply.

	3 fasteners/sheet
End Span	2700mm
Internal Span	4000mm
Serviceability	1.2 kPa

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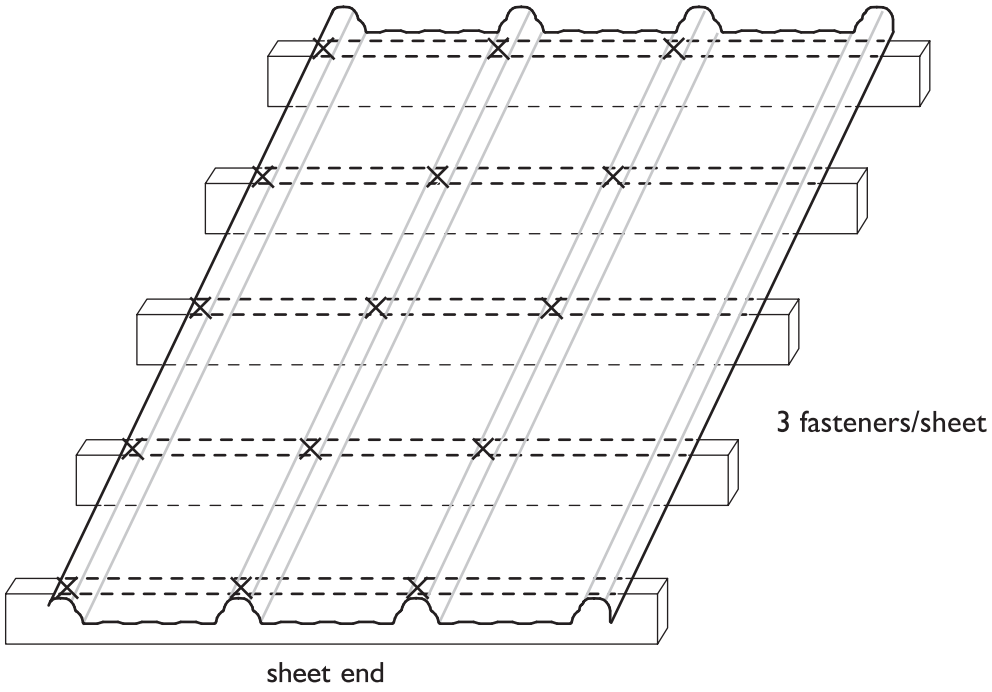
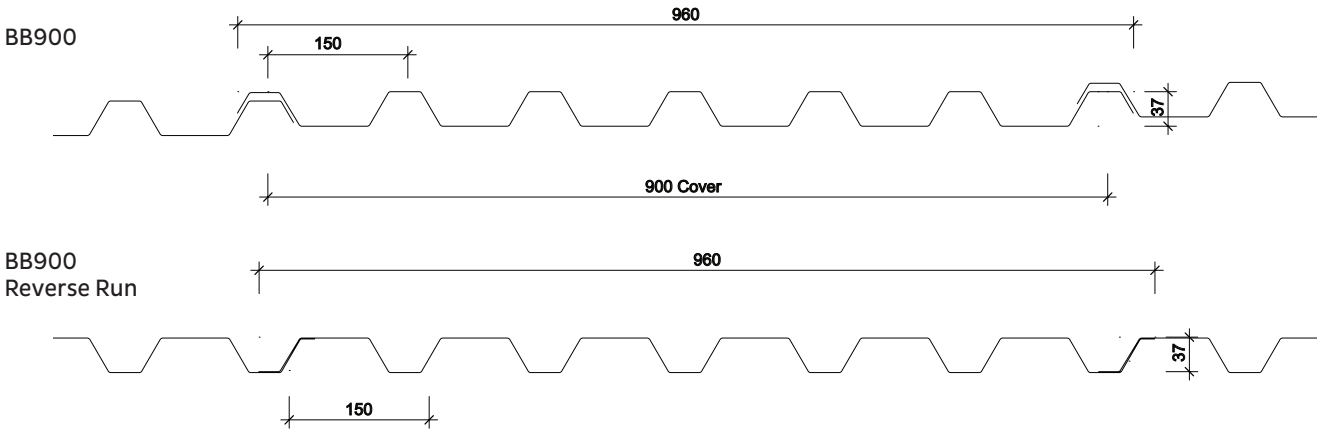
DIMOND DP955®
FASTENER LAYOUT OPTIONS



DIMOND BROWNBUILT 900 (BB900) PROFILE PERFORMANCE



BB900 Reverse Run Profile (for wall cladding only). Lapped sheet shown dotted.

Cover (mm)	900
Sheet width (mm)	960
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet width for aluminium +0, -15. If sheet cover widths are critical, advise Dimond at time of order.

Sheet length: +10mm, –0mm. For wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options Profile	Steel			Aluminium		Stainless Steel	Duraclad®
Thickness (BMT) mm	0.4	0.55	0.75	0.7	0.9	0.55	1.7 (total thickness)
Nominal weight/lineal metre (kg/m)	4.12	5.55	7.47	2.31	2.96	5.36	2.90
Drape curved roof - min. radius (m)	n/r	90	90	n/r	90	n/r	24
Purlin spacings for drape curved roof (m)(1)	n/r	2.4	2.4	n/r	2.4	n/r	1.2
Machine crimp curved - roof min. radius (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Unsupported overhang (2)(mm)	250	350	450	200	300	350	200

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/r – not recommended
n/a – not available

Roll-forming facility at: Auckland

Manufacturing location for Duraclad®: Auckland

Sheet lengths: BB900 is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

Refer Section 2.1.3.4.

BROWNBUILT 900 LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof		Restricted-Access Roof			Non-Access Roof or Wall		
G550 Steel 0.40mm	End Span		800	1100	1300	1500	1500	1700	1900
	Internal Span		1200	1600	1900	2200	2300	2600	2900
	Serviceability		4.0	3.3	2.6	2.0	1.8	1.6	1.2
G550 Steel 0.55mm	End Span		1600	1700	2000	2300	2400	2500	2700
	Internal Span		2400	2500	3000	3400	3500	3800	4100
	Serviceability		3.7	3.5	2.7	2.0	1.9	1.7	1.5
G550 Steel 0.75mm	End Span		2000	2100	2400	2700	2800	3000	
	Internal Span		3000	3200	3600	4000	4200	4600	
	Serviceability		4.0	3.8	3.1	2.3	2.0	1.3	
5052 H36 Aluminium 0.70mm	End Span		900		900	1100	1200	1400	1600
	Internal Span		1300		1400	1700	1800	2100	2400
	Serviceability		3.1		2.8	2.2	2.0	1.5	1.2
5052 H36 Aluminium 0.90mm	End Span		1300	1400	1600	1900	1900	2200	2800
	Internal Span		2000	2100	2400	2800	2900	3300	3700
	Serviceability		3.8	3.6	2.8	2.1	2.0	1.5	1.2
Duraclad® 1.7mm (Note 4)	End Span				600	800	900	1100	1400
	Internal Span				900	1200	1300	1700	2100
	Serviceability Ultimate	N/R	N/R		- 4.5	- 4.5	- 4.5	- 3.2	- 2.0

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 6 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.0 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Duraclad®
   – Serviceability Limit State loads are not applicable to the Duraclad® material, as it does not experience permanent deformation.
   – System must include Safety Mesh if intended for use as a Restricted-Access roof. Refer Section 2.2.1.8.
5. N/R = not recommended.
6. End span capacities given in this table are based on the end span being $^{2}/_{3}$ of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of Brownbuilt 900 is determined from the Brownbuilt 900 Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines. The capacities given do not apply for cyclonic wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.
9. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Brownbuilt 900 should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g or 14g screw will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Span Capacity Chart.

Purlin Type	Screw Fastener			
	Roofing Rib		Wall Cladding Pan Fix	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	75	T17 - 14 - 10 x 75	50	Roofzip M6 x 50 HG-Z4
Steel	65	Tek - 14 - 10 x 65 Tek - 12 - 14 x 68	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the purlins or for wall cladding fixed onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 6 screw fasteners/sheet/purlin without the use of load spreading washers (except for Duraclad® material, which must be fitted with profiled metal washers and 36mm EPDM seals.

Profiled metal washers are recommended for use:

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section 2.1.3.4 Thermal Movement.
3. Wherever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Use in serviceability categories (1) or (2) can allow the reduction of fasteners to 3 screw fasteners/sheet/purlin. If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.5.

Long spans may require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

Design Example

Restricted access roof, 0.55mm G550 steel Brownbuilt 900 has a maximum end span of 2400mm and a maximum internal span of 3400mm. The following distributed load capacities apply.

	6 fasteners/sheet	3 fasteners/sheet
End Span	2300mm	2300mm
Internal Span	3400mm	3400mm
Serviceability	2.0 kPa	1.0 kPa

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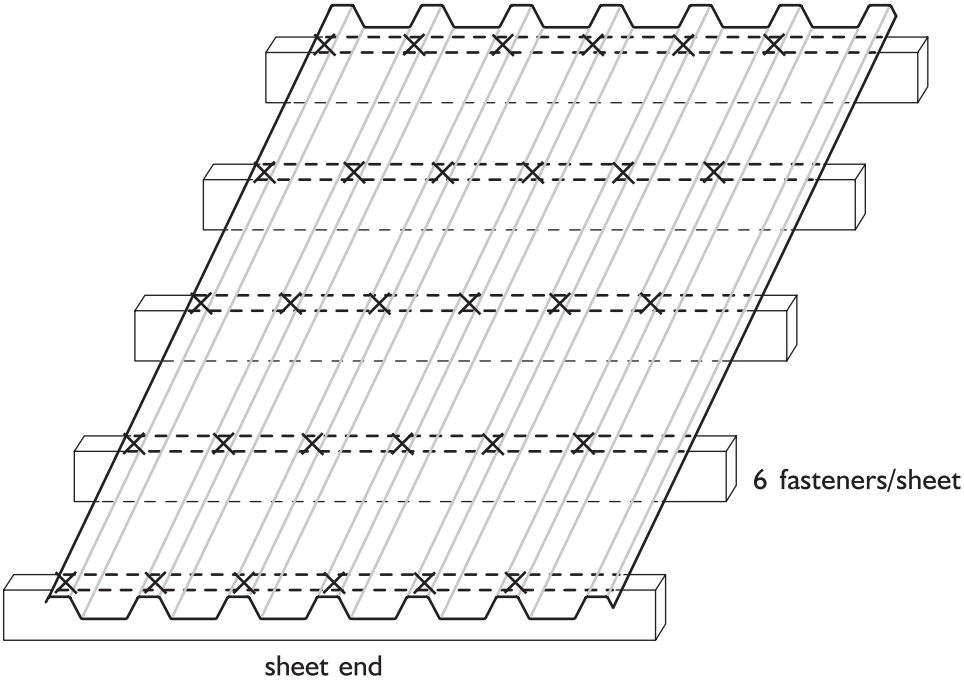
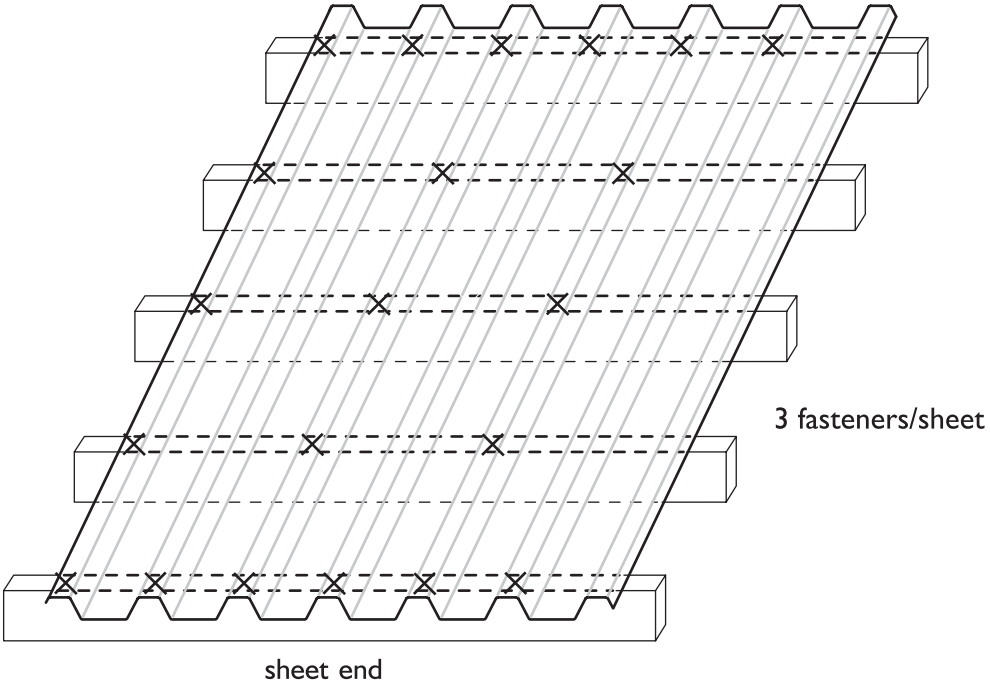
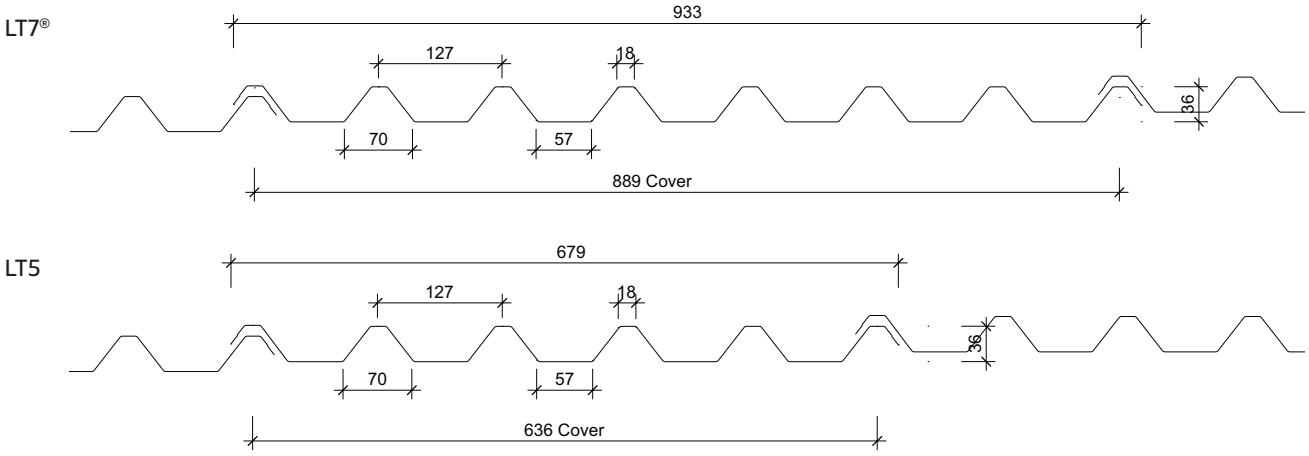
DIMOND BROWNBUILT 900
FASTENER LAYOUT OPTIONS





DIMOND LT7® & LT5 PROFILE INFORMATION



	LT7®	LT5
Cover (mm)	889	635
Sheet width (mm)	933 (Wellington) 942 (Invercargill)	725
Minimum Pitch	3° (approx. 1:20)	

All dimensions given are nominal

Sheet Tolerances

Sheet width: ‡5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel		Aluminium		Steel		Aluminium	
	LT5		LT5		LT7®		LT7®	
Thickness (BMT) mm	0.40	0.55	0.70	0.90	0.40	0.55	0.70	0.90
Nominal weight/lineal metre (kg/m)	3.17	4.27	1.78	2.28	4.12	5.55	2.31	2.96
Drape curved roof - min. radius (m)	80	50	80	50	80	50	80	50
Purlin spacing's for drape curved roof (m)(1)	1.4	2.2	1.4	2.2	1.4	2.2	1.4	2.2
**Machine curved - roof min. radius (mm)	n/a	n/a	n/a	n/a	900	400	n/a	400
Unsupported overhang (2)(mm)	250	350	200	300	250	350	200	300

(1) Recommended maximum purlin spacing's at minimum radius.
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a not available

Roll-forming facilities at: Wellington and Invercargill

** Crimp Curving facility at: Wellington

Sheet lengths: LT7® and LT5 are custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

LT7® - LT5 LIMIT STATE LOAD/SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof	Restricted-Access Roof			Non-Access Roof or Wall		
G550 Steel 0.40mm	End Span (mm)	800	900	1000	1200	1300	1500	1800
	Internal Span (mm)	1200	1300	1500	1800	1900	2300	2700
	Serviceability	2.5	2.2	2.1	1.7	1.6	1.1	0.8
G550 Steel 0.55mm	End Span (mm)	1300	1400	1700	1900	2000	2300	2500
	Internal Span (mm)	2000	2100	2500	2900	3000	3400	3800
	Serviceability	2.2	2.1	1.8	1.5	1.4	1.2	1.1
5052, H36 Aluminium 0.70mm	End Span (mm)				900	900	1100	1400
	Internal Span (mm)				1300	1400	1700	2100
	Serviceability				1.7	1.6	1.3	0.9
5052, H36 Aluminium 0.90mm	End Span (mm)	1100	1100	1300	1500	1600	1900	2100
	Internal Span (mm)	1600	1700	2000	2300	2400	2800	3200
	Serviceability	2.3	2.3	2.1	1.7	1.6	1.2	0.9
Duraclad® 1.7mm (Note 4)	End Span (mm)			600	800	900	1100	1400
	Internal Span (mm)			900	1200	1300	1700	2100
	Ultimate			4.5	4.5	4.5	2.7	1.7

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 4 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 3.5kPa. If design requirements exceed this limit, Contact Dimond® Roofing for specific advice.
4. Duraclad®
   - Serviceability Limit State Load are not applicable to Duraclad® material, as it does not experience permanent deformation
   - System must include Safety Mesh it intended for use as a Restricted-Access roof. Refer Section 2.2.1.8
5. N/R = not recommended
6. End span capacities given in this table are based on the end span being 2/3 of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No Deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fasteners withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of LT7®/5 is determined from the LT7®/5 Limit State Load/Capacity Chart using the section of the chart appropriate to grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines. The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expected regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pan. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access point.
1. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.

7. **Wind Pressure Guide**
   As a guide for no-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

LT7®/5 Design

LT7®/5 should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g or 14g screw will ensure failure by screw pull out will not occur under loads within the scope of the Limited State Load/Span Capacity Chart.

LT7®/5 Fastener Designation

Fixing Requirement				
Purlin or frame material	Roof		Wall (over vented cavity batten, 18 - 25mm thick)	
	Base material		Base material	
	Steel	Aluminium	Steel	Aluminium
Timber	Type 17 14g x 75mm Timbertite	14g x 73mm Alutite	Type 17 12g x 50mm Timbertite	14g x 55mm Alutite
Steel	Tek 12g x 68 or 14g x 65	Stainless Steel grade 304 14g x 75mm	M6 x 50mm roofzip	Stainless Steel grade 304 14g x 20mm

*If sarking or insulation is used over the purlins or for wall cladding fixing onto cavity a batten, into a stud, the screw length will need to be increased.

When using Stainless Steel screws, an 8mm diameter clearance hole must be drilled through the Aluminium LT7 sheet and an EPDM seal with an Aluminium washer must be used.

For screw size range and fastener/washer assembly refer to Section 2.2.3.1

The Limited State Load/Span Capacity Chart for LT7® is based on 4 screw fasteners/sheet/purlin without the use of load spreading washers. For LT5 Load /span capacity chart is based on 3 screw fasteners/sheet/purlin without the use of load spreading washers.

Profile metal washers are recommended for use:

1. On end spans, or large internal spans where Ultimate Limit State distribution load is limiting. Contact Dimond® Roofing for specific advice in these cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – See Section 2.1.3.4 Thermal Movement.
3. Whenever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing in the crest of the profile rib.

Use in serviceability categories (1) and (2) can allow the reduction of fasteners to 3 screw fasteners/sheet/purlin. If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.75.

Long spans may require specification and use of side lap stitching screws – Section 2.3.2 C Installation

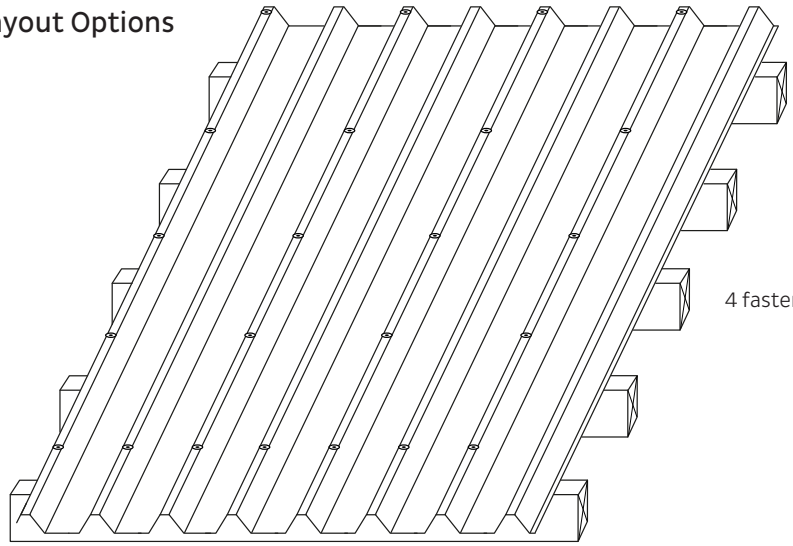
Information: Layout and Fastenings.

Design Examples

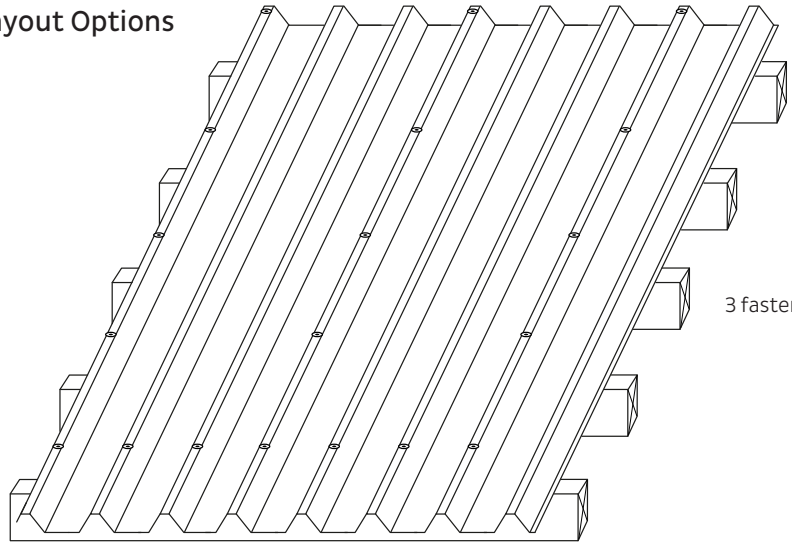
Restricted access roof, 0.55mm G550 steel LT7® has a maximum end span of 1900mm and a maximum internal span of 2900mm. The following distributed load capacities apply.

	4 fasteners/sheet	3 fasteners/sheet
End Span	1900mm	1900mm
Internal Span	2900mm	2900mm
Serviceability	1.5kPa	1.1kPa

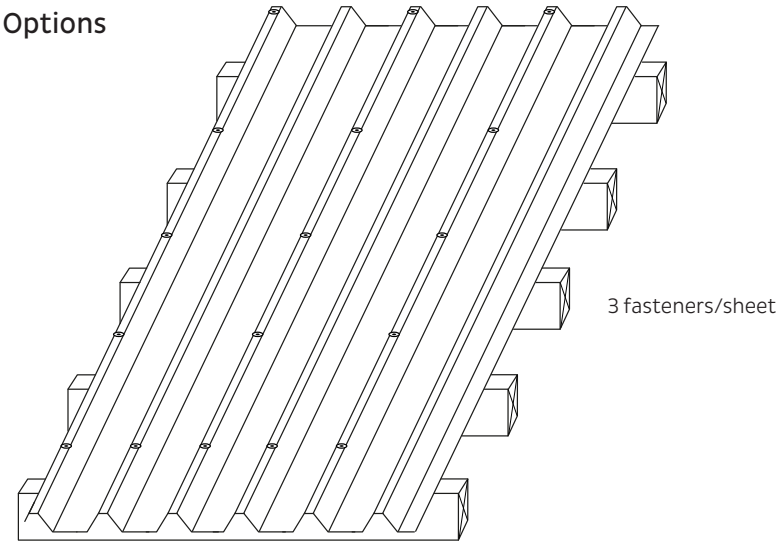
LT7® Fastener Layout Options



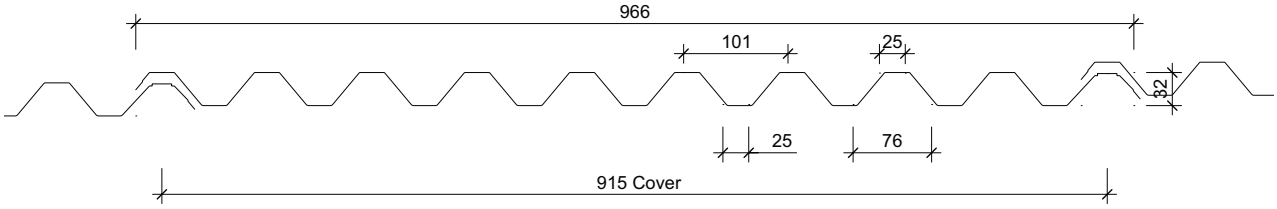
LT7® Fastener Layout Options



LT5 Fastener Layout Options



DIMOND V-RIB PROFILE PERFORMANCE



Cover (mm)	915
Sheet width (mm)	966
Minimum Pitch	4° (approx. 1:15)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet width for aluminium +0, -15. If sheet cover widths are critical, advise Dimond at time of order.

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options Profile	Steel		Aluminium		Duraclad®
Thickness (BMT) mm	0.4	0.55	0.7	0.9	1.7 (total thickness)
Nominal weight/lineal metre (kg/m)	4.12	5.55	2.31	2.96	2.70
Drape curved roof - min. radius (m)	20	16	20	16	20
Purlin spacings for drape curved roof (m)(1)	1.3	1.6	1.3	1.6	1.2
Machine crimp curved - roof min. radius (mm)	400	400	n/a	n/a	n/a
Unsupported overhang (2)(mm)	200	300	150	250	150

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a – not available

Roll-forming & crimp curving facility at:	Christchurch
Manufacturing location for Duraclad®:	Auckland
Sheet lengths:	V-Rib is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

Refer Section 2.1.3.4.

V-RIB LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof	Restricted-Access Roof				Non-Access Roof or Wall		
G550 Steel 0.40mm	End Span	800	800	900	1100	1200	1400	1700	1900
	Internal Span	1100	1200	1400	1700	1800	2100	2500	2900
	Serviceability	3.5	3.4	3.2	2.6	2.4	1.9	1.4	1.0
G550 Steel 0.55mm	End Span	1100	1100	1300	1600	1700	2000	2300	2700
	Internal Span	1600	1700	2000	2400	2500	3000	3500	4000
	Serviceability	3.2	3.1	2.7	2.2	2.0	1.4	1.0	0.8
5052 H36 Aluminium 0.70mm	End Span				800	900	1100	1400	1600
	Internal Span				1200	1300	1700	2100	2400
	Serviceability				2.5	2.4	1.4	1.3	1.0
5052 H36 Aluminium 0.90mm	End Span	900	1000	1100	1300	1400	1700	1900	2300
	Internal Span	1400	1500	1700	2000	2100	2500	2900	3400
	Serviceability	2.8	2.7	2.5	2.1	1.9	1.4	1.0	0.7
Duraclad® 1.7mm (Note 4)	End Span				700	800	1100	1200	
	Internal Span				1100	1200	1500	1800	
	Serviceability Ultimate				- 4.5	- 3.8	- 1.7	- 1.3	

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 5 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Duraclad®
   – Serviceability Limit State loads are not applicable to the Duraclad® material, as it does not experience permanent deformation.
   – System must include Safety Mesh if intended for use as a Restricted-Access roof. Refer Section 2.2.1.8.
5. N/R = not recommended.
6. End span capacities given in this table are based on the end span being 2/3 of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of V-Rib is determined from the V-Rib Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines.

   The capacities given do not apply for cyclonic wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.

9. **Wind Pressure Guide**
   As a guide for no-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

V-Rib should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g or 14g screw will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Span Capacity Chart.

Purlin Type	Screw Fastener			
	Roofing Rib		Wall Cladding Pan	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	65	T17 - 14 - 10 x 65 T17 - 12 - 11 x 65 Roofzip M6 x 50 HG-Z4	50	Roofzip M6 x 50 HG-Z4
Steel	55	Tek - 12 - 14 x 55	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the purlins or for wall cladding fixing onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 5 screw fasteners/sheet/purlin without the use of load spreading washers (except for Duraclad® material, which must be fitted with profiled metal washers and 36mm EPDM seals).

Profiled metal washers are recommended for use:

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section 2.1.3.4 Thermal Movement.
3. Wherever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Use in serviceability categories (1) or (2) can allow the reduction of fasteners to 3 screw fasteners/sheet/purlin.
If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.6.

Long spans may require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

Design Example

Restricted access roof, 0.55mm G550 steel V-Rib has a maximum end span of 1600mm and a maximum internal span of 2400mm. The following distributed load capacities apply.

	5 fasteners/sheet	3 fasteners/sheet
End Span	1600mm	1700mm
Internal Span	2400mm	2400mm
Serviceability	2.2 kPa	1.3 kPa

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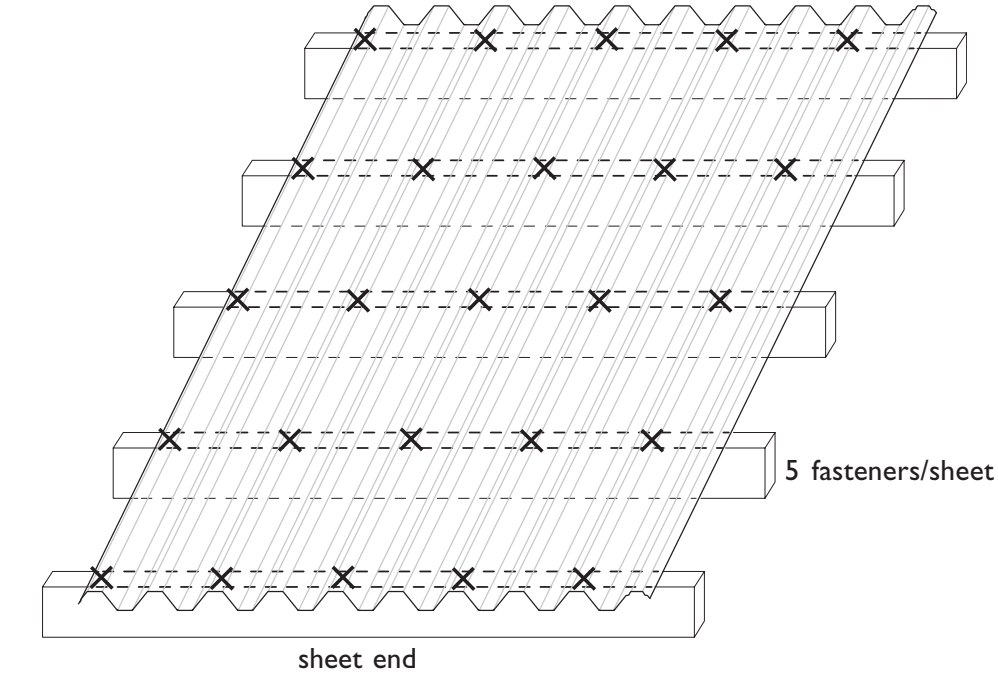
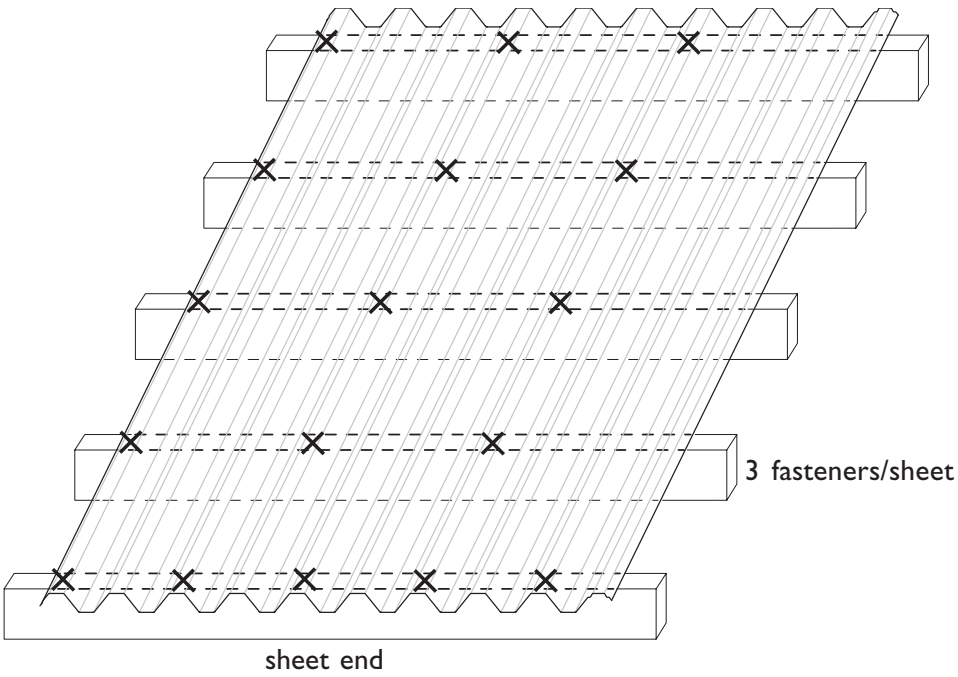
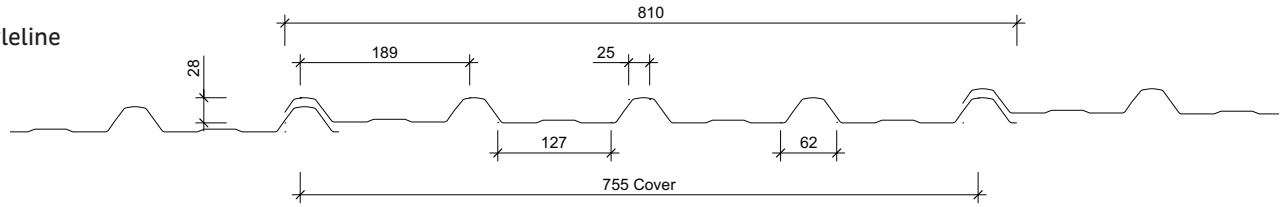
DIMOND V-RIB
FASTENER LAYOUT OPTIONS



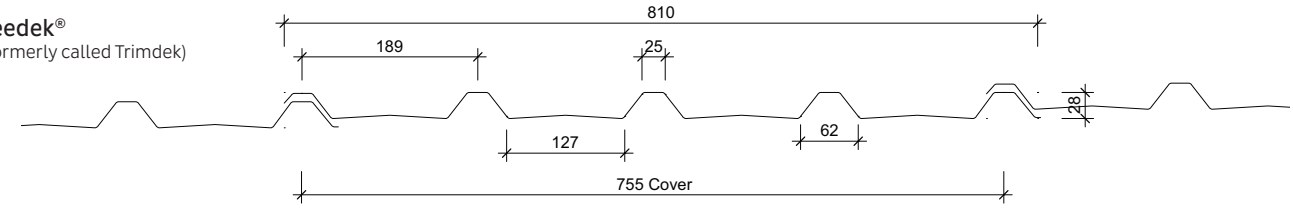


DIMOND STYLELINE, HI FIVE AND VEEDEK® PROFILE PERFORMANCE

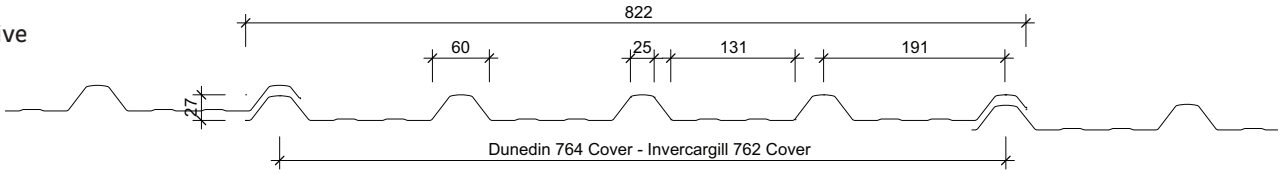
Styleline



Veedek®
(Formerly called Trimdek)



Hi Five



Cover (mm)	755
Sheet width (mm)	810
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet width for aluminium +0, -15. If sheet cover widths are critical, advise Dimond at time of order.

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options Profile	Steel		Aluminium		Duraclad®
Thickness (BMT) mm	0.4	0.55	0.7	0.9	1.7 (total thickness)
Nominal weight/lineal metre (kg/m)	3.17	4.27	1.78	2.28	2.2
Drape curved roof - min. radius (m)*	80	40	80	40	12
Purlin spacings for drape curved roof (m) (1)	1.2	1.4	1.2	1.4	1.1
Machine crimp curved - roof min. radius (mm)*	900**	400	n/a	400	n/a
Unsupported overhang (2)	200	250	100	200	100

*Please note only Styleline and Hi Five are suitable for drape curving or crimp curving. **450mm for Hi Five only.

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a – not available

Roll-forming facilities for Styleline at:	Whangarei, Auckland, Hamilton, Wellington, Christchurch
Roll-forming facilities for Veedek® at:	Auckland, Hamilton, Wellington, Christchurch
Roll-forming facilities for Hi Five at:	Dunedin, Invercargill (Curving for Hi Five at Invercargill)
Manufacturing location for Duraclad®:	Auckland
Sheet lengths:	Styleline, Veedek® and Hi Five are custom run to order

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

Dimond Roofing

STYLELINE, HI FIVE AND VEEDEK® LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof		Restricted-Access Roof			Non-Access Roof or Wall		
G550 Steel 0.40mm	End Span			600	800	1000	1100	1300	1600
	Internal Span			900	1200	1600	1700	2000	2400
	Serviceability			3.5	2.7	1.8	1.6	1.2	0.9
G550 Steel 0.55mm	End Span	800	1000	1100	1300	1500	1500	1700	2000
	Internal Span	1200	1500	1600	1900	2200	2300	2600	3000
	Serviceability	4.0	3.3	3.0	2.5	2.0	1.8	1.5	1.1
5052 H36 Aluminium 0.70mm	End Span				600	800	900	1100	1300
	Internal Span				900	1200	1300	1600	1900
	Serviceability				2.4	1.9	1.8	1.2	0.8
5052 H36 Aluminium 0.90mm	End Span		800	900	1000	1100	1200	1500	1700
	Internal Span		1200	1300	1500	1700	1800	2200	2600
	Serviceability		2.8	2.7	2.2	1.7	1.6	1.4	1.1
Duraclad® 1.7mm (Note 4)	End Span					700	800	1000	1200
	Internal Span					1100	1200	1500	1800
	Serviceability Ultimate	N/R	N/R			- 4.5	- 4.4	- 2.6	- 1.6

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 4 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Duraclad®
   – Serviceability Limit State loads are not applicable to the Duraclad® material, as it does not experience permanent deformation.
   – System must include Safety Mesh if intended for use as a Restricted-Access roof. Refer Section 2.2.1.8.
5. N/R = not recommended.
6. End span capacities given in this table are based on the end span being 2/3 of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of Styleline, Hi Five and Veedek® are determined from the Styleline, Hi Five and Veedek® Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines.

   The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.

9. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Styleline, Hi Five and Veedek® should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g screw will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Roofing Span Capacity Chart.

Purlin Type	Screw Fastener			
	Roofing Rib		Wall Cladding Pan	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber with steel based sheet	65	T17 - 12 - 10 x 65 Roofzip M6 x 65 HG-Z4	Non cavity 35	Roofzip M6 x 50 HG-Z4
			Cavity 50	
Timber with aluminium based sheet	73	14g x 73mm Alutite with 12mmØ clearance hole and an aluminium profiled washer and 36Ø EPDM seal	Non cavity 35	12g x 35mm or 14g x 55mm Alutite with 12mmØ clearance hole and an aluminium round washer and seal
			Cavity 55	
Steel	45	Tek - 12 - 14 x 45	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the purlins or for wall cladding fixing onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 4 screw fasteners/sheet/purlin without the use of load spreading washers (except for Duraclad® material, which must be fitted with profiled metal washers and 36mm EPDM seals).

Profiled metal washers are recommended for use:

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section 2.1.3.4 Thermal Movement.
3. Wherever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Use in serviceability categories (1) or (2) can allow the reduction of fasteners to an average of 2 screw fasteners/sheet/purlin. If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.5.

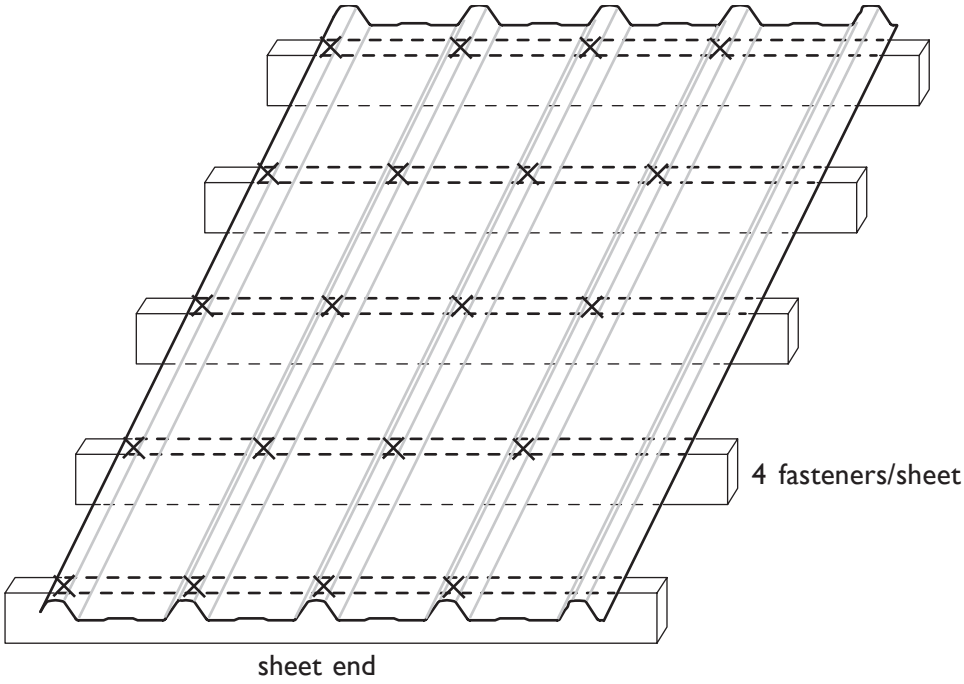
Long spans may require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

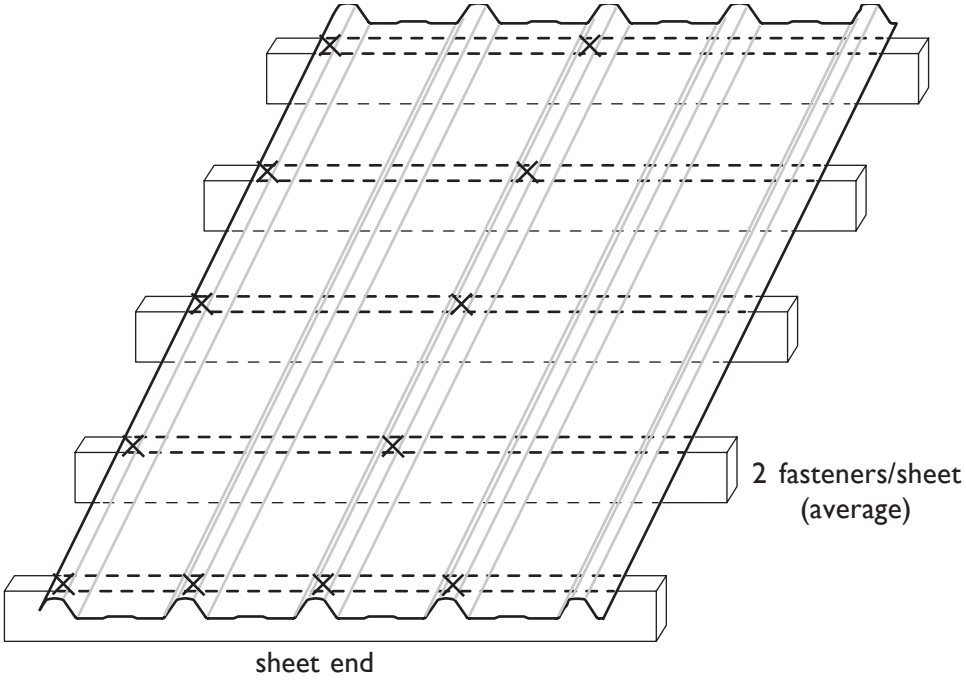
Design Example

Restricted access roof, 0.55mm G550 steel Styleline has a maximum end span of 1500mm and a maximum internal span of 2200mm. The following distributed load capacities apply.

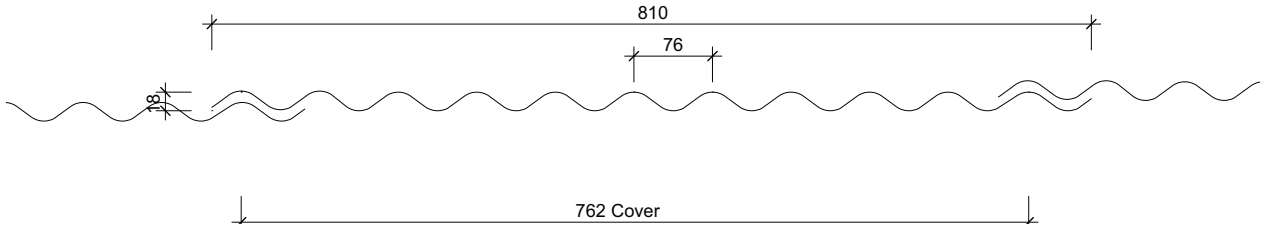
	4 fasteners/sheet	2 fasteners/sheet
End Span	1500mm	1500mm
Internal Span	2200mm	2200mm
Serviceability	2.0 kPa	1.0 kPa

DIMOND STYLELINE, HI FIVE AND VEEDEK®
FASTENER LAYOUT OPTIONS





DIMOND CORRUGATE PROFILE PERFORMANCE



Cover (mm)	762
Sheet width (mm)	810
Minimum Pitch	8° (approx. 1:7)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet width for aluminium +0, -15. If sheet cover widths are critical, advise Dimond at time of order.

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options Profile	Steel		Aluminium		Duraclad®
Thickness (BMT) mm	0.4	0.55	0.7	0.9	1.7 (total thickness)
Nominal weight/lineal metre (kg/m)	3.17	4.27	1.78	2.28	2.21
Drape curved roof - min. radius (m)	12	10	12	10	8
Purlin spacings for drape curved roof (m)(1)	800	1100	800	1100	900
Machine crimp curved - roof min. radius (mm)	450	450	450	450	n/a
Unsupported overhang (2)(mm)	100	150	75	150	100

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a – not available

Roll-forming facilities at:	Whangarei, Auckland, Hamilton, Wellington, Christchurch, Dunedin, Invercargill
Roll-curving facilities at:	Hamilton, Christchurch, Dunedin, Invercargill
Manufacturing location for Duraclad®:	Auckland
Sheet lengths:	Corrugate is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

CORRUGATE LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof		Restricted-Access Roof				Non-Access Roof or Wall		
G550 Steel 0.40mm	End Span			400	500	700	800	900	1000	
	Internal Span			600	800	1000	1200	1400	1500	
	Serviceability			4.0	3.2	2.5	2.0	1.6	1.4	
G550 Steel 0.55mm	End Span		600	600	700	900	1000	1100	1200	1300
	Internal Span		900	1000	1100	1300	1500	1600	1800	1900
	Serviceability		4.4	4.0	3.7	3.2	2.8	2.6	2.2	2.0
5052 H36 Aluminium 0.70mm	End Span						500	600	800	1000
	Internal Span						800	900	1200	1500
	Serviceability						1.4	1.3	1.1	0.8
5052 H36 Aluminium 0.90mm	End Span		500			600	800	900	1000	1200
	Internal Span		800			900	1200	1300	1500	1800
	Serviceability		3.5			3.2	2.2	2.0	1.7	1.3
Duraclad® 1.7mm (Note 4)	End Span						600	700	800	900
	Internal Span						900	1000	1200	1400
	Serviceability Ultimate	N/R	N/R				- 4.5	- 4.1	- 2.3	- 1.6

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 5 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Duraclad®
   – Serviceability Limit State loads are not applicable to the Duraclad® material, as it does not experience permanent deformation.
   – System must include Safety Mesh if intended for use as a Restricted-Access roof. Refer Section 2.2.1.8.
5. N/R = not recommended.
6. End span capacities given in this table are based on the end span being 2/3 of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of Corrugate is determined from the Corrugate Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines.

   The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.
9. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Corrugate should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g screw, or when fixing aluminium roof or wall cladding to timber, the use of a 12g or 14g Alutite, on both a non cavity and cavity system will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Span Capacity Chart.

Corrugate Fastener Designation

Purlin or frame material	Roof - rib fixed		Wall - pan fixed		
	Steel based sheet	Aluminium based sheet	Steel based sheet		Aluminium based sheet
Timber	T17 x 12 - 11 x 50 M6 x 50 HG-Z4 Roofzip	14g x 55mm Alutite with a 12mm dia. clearance hole, alum. profiled washer & 36mm dia EPDM seal	Non cavity	M6 x 50mm HG-Z4 Roofzip	12g x 35mm Alutite
			Cavity	M6 x 50mm HG-Z4 Roofzip	14g x 55mm Alutite
Steel up to 1.5mm thick	M6 x 50 HG-Z4 Roofzip or Tek 12g - 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm with a 12mm dia clearance hole, alum. profiled washer & 36mm dia EPDM seal	Non cavity	Tek 12g - 14 x 20 Class 4	Stainless steel grade 304 14g x 20mm with a 15mm dia bonded washer, through an 10mm dia. clearance hole
			Cavity	Tek 12g - 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm with a 15mm dia bonded washer, through an 10mm dia. clearance hole
Steel 1.5mm to 4.5mm thick	Tek 12g - 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm with a 12mm dia clearance hole, alum. profiled washer & 36mm dia EPDM seal	Non cavity	Tek 12g - 14 x 20 Class 4	Stainless steel grade 304 14g x 20mm with a 15mm dia bonded washer, through an 10mm dia. clearance hole
			Cavity	Tek 12g - 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm with a 15mm dia bonded washer, through an 10mm dia. clearance hole

*If sarking or insulation is used over the purlins or for wall cladding fixing onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 5 screw fasteners/sheet/purlin without the use of load spreading washers (except for Duraclad® material, which must be fitted with profiled metal washers and 36mm EPDM seals).

Profiled metal washers are recommended for use:

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section 2.1.3.4 Thermal Movement.
3. Wherever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Use in serviceability categories (1) or (2) can allow the reduction of fasteners to 3 screw fasteners/sheet/purlin.
If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.6.

Long spans may require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

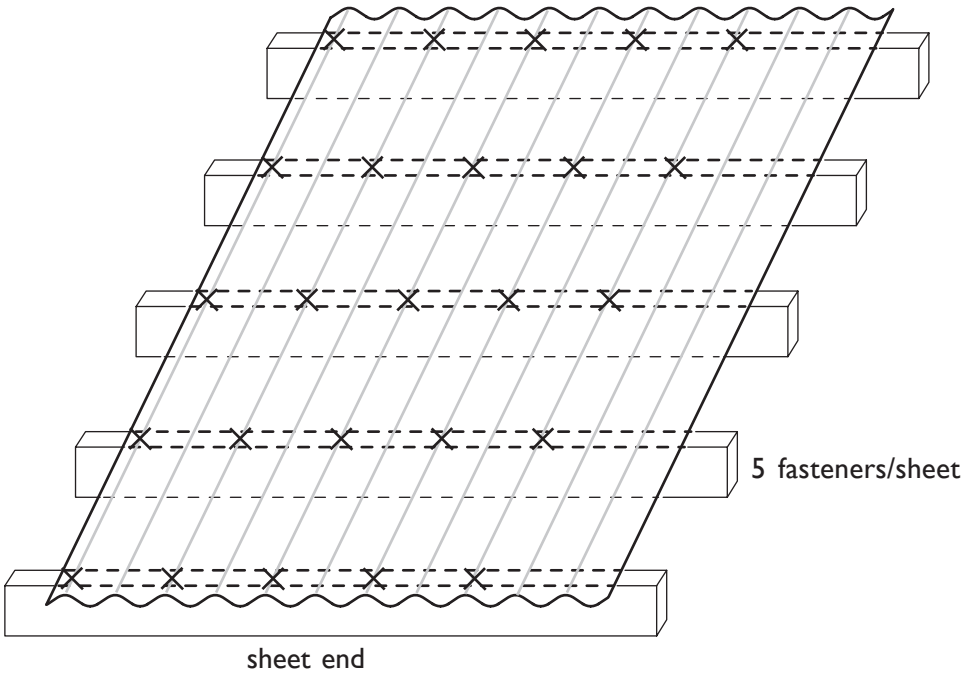
Design Example

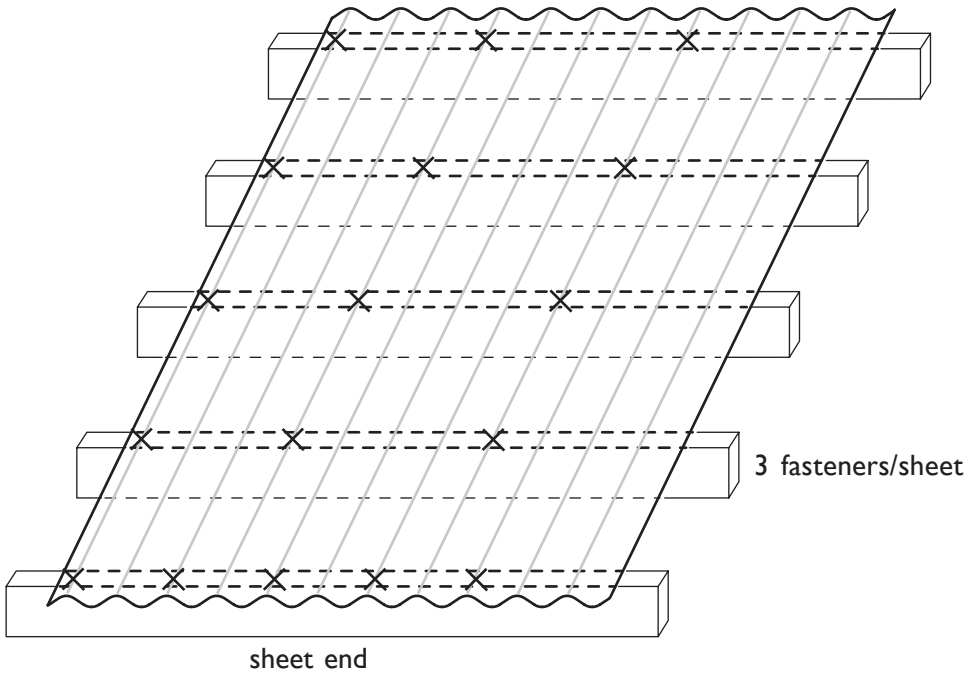
Restricted access roof, 0.55mm G550 steel Corrugate has a maximum end span of 1000mm and a maximum internal span of 1500mm. The following distributed load capacities apply.

	5 fasteners/sheet	3 fasteners/sheet
End Span	1000mm	1000mm
Internal Span	1500mm	1500mm
Serviceability	2.8 kPa	1.7 kPa

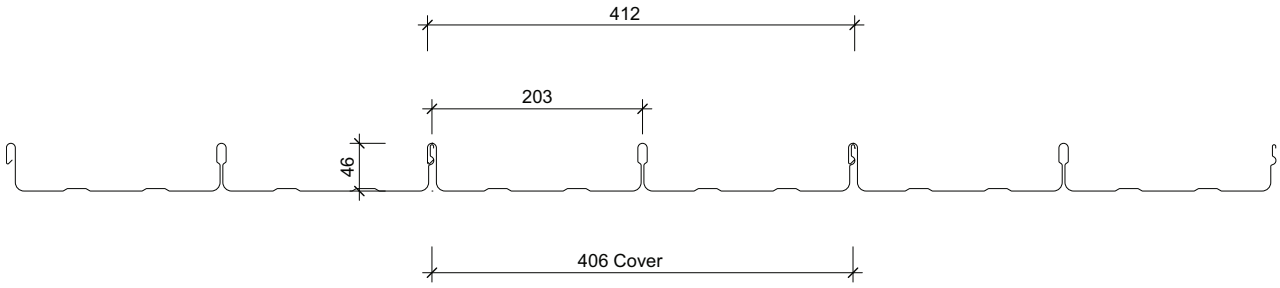
Continued on next page...

DIMOND CORRUGATE
FASTENER LAYOUT OPTIONS





DIMONDEK® 400 PROFILE PERFORMANCE



Cover (mm)	406
Sheet width (mm)	412
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options	Steel		Aluminium	Copper*
Thickness (BMT) mm	0.55	0.75	0.9	0.55
Nominal weight/lineal metre (kg/m)	2.77	3.73	1.48	2.99
Drape curved roof - min. radius (m)**	70	70	70	70
Purlin spacings for drape curved roof (m)(1)	1200	1500	900	1000
Machine crimp curved - roof min. radius (mm)	n/a	n/a	n/a	n/a
Unsupported overhang (2)(mm)	250	300	200	200

*Dimondek® 400 is available in Copper ex Auckland only, subject to coil availability.
**To achieve a high level of appearance on the completed roof, it is important that the purlin layout alignment is laid within the tolerances as stated in Section 2.4.2.3.1.

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a – not available

Roll-forming facilities for Dimondek® 400 at: Auckland, Hamilton, Wellington, Christchurch, and a mobile machine based in Hamilton which can be moved to site as required.

Sheet lengths: Dimondek® 400 is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion. Refer Section 2.1.3.4.
- Possibility of manufacturing sheets on site – sheet lengths up to 100m long are possible when rolled on site.

Call 0800 400 222 to discuss.

DIMONDEK® 400 LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed ultimate loads in kPa)

Serviceability Category

		Unrestricted-Access Roof		Restricted-Access Roof			Non-Access Roof or Wall	
G300 Steel 0.55mm	End Span	600	800		900	1100	1100	1400
	Internal Span	900	1200		1300	1600	1700	2100
	Ultimate[5]	2.0	1.7		1.6	1.4	1.3	1.0
G300 Steel 0.75mm	End Span	800	1000	1100	1300	1500	1500	
	Internal Span	1200	1500	1600	1900	2200	2300	
	Ultimate[5]	2.0	1.8	1.7	1.5	1.3	1.2	
5052 H36 Aluminium 0.90mm	End Span	400	600		700	900	900	1100
	Internal Span	600	900		1000	1300	1400	1700
	Ultimate[5]	2.7	2.1		1.9	1.6	1.5	1.0
½ hard Copper 0.55mm	End Span		700		700	900	1000	
	Internal Span		1000		1100	1400	1500	
	Ultimate[5]		1.9		1.8	1.5	1.4	

*Subject to availability

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on clip fastening every rib at every purlin.
3. If design requirements exceed the loads given above, the push on Dimond wind clamps can be installed to double the wind uplift load.
4. N/R = not recommended.
5. For the purposes of serviceability design, the serviceability limit, limited by permanent rib deformation, occurs essentially at the same load as ultimate failure which is the point of disengagement of the roof with the clip.
6. End span capacities given in this table are based on the end span being 2/3 of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of Dimondek® 400 is determined from the Dimondek® 400 Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. It is recommended that to obtain a dependable design strength capacity for the ultimate limit state, a reduction factor of Ø = 0.8 is applied.
   The capacities given do not apply for cyclonic wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and "Restricted Access" signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, "No Roof Access" signs used.

9. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Dimondek® 400 is clip-fastened to either timber or steel purlins. The use of the appropriate type and length of fastener for clip fixing will ensure failure by fastener pull out will not occur under loads within the scope of the Limit State Load / Span Capacity Chart.

Purlin Type	Clip Fastener
Timber	10g x 45mm timbertite wafer head screw or T17 M4x75mm pan head for fixing through Cavibats and 17.5mm thick ply
Steel	10g x 16mm wafer head screw

*If sarking or insulation is used over the purlins or for wall cladding fixing onto a cavity batten, into the stud, the screw length will need to be increased.

For screw size range refer Section 2.2.3.1.

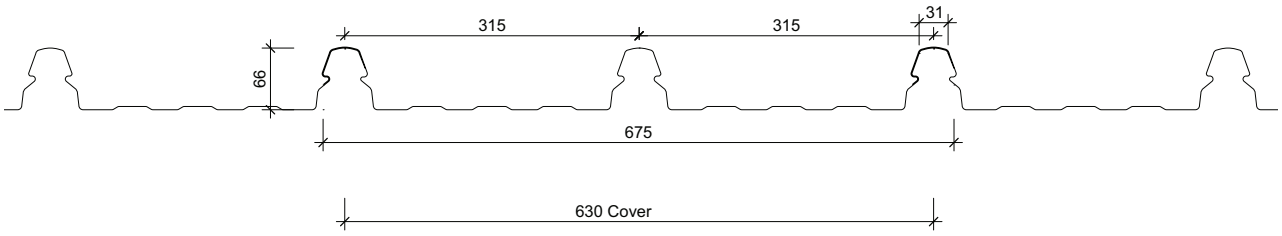
The Limit State Load / Span Capacity Chart is based on every rib being clip fastened to every purlin or girt.

Design Example

Restricted access roof, 0.55mm G300 steel Dimondek® 400 has a maximum end span of 1100mm and a maximum internal span of 1600mm. The following distributed load capacities apply.

End Span	1100mm
Internal Span	1600mm
Ultimate	1.4 kPa

DIMONDEK® 630 PROFILE PERFORMANCE



Cover (mm)	630
Sheet width (mm)	675
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, −0mm.

Material Options	Steel	
Thickness (BMT) mm	0.48	0.55
Nominal weight/lineal metre (kg/m)	3.85	4.22
Drape curved roof - min. radius (m)*	250	250
Purlin spacings for drape curved roof (m)(1)	2400	3300
Machine crimp curved - roof min. radius (mm)	n/a	n/a
Unsupported overhang (2)(mm)	150	250

*To achieve a high level of appearance on the completed roof, it is important that the purlin layout alignment is laid within the tolerances as stated in Section 2.4.2.3.1.

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a – not available

Roll-forming facilities at: Mobile machine based in Hamilton, and can be moved to site when required.

Sheet lengths: Dimondek® 630 is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion. Refer Section 2.1.3.4.
- Possibility of manufacturing sheets on site, sheets length up to 100m long are possible, when rolled on site.

Call 0800 DIMOND to discuss.

DIMONDEK® 630 LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed ultimate loads in kPa)

Serviceability Category

		Unrestricted-Access Roof				Restricted-Access Roof			Non-Access Roof or Wall
G550 Steel 0.48mm	End Span			1400	1600	1800	2000	2200	2400
	Internal Span			2100	2400	2700	3000	3300	3600
	Ultimate[5]			2.6	2.3	2.0	1.8	1.7	1.4
G550 Steel 0.55mm	End Span	1500	1700	2000	2200	2400	2600	2800	See Note 4
	Internal Span	2300	2600	3000	3300	3600	3900	4200	
	Ultimate[5]	2.6	2.3	1.9	1.8	1.6	1.4	1.2	

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on clip fastening every rib at every purlin.
3. Loads given are limited to a maximum of 2.6 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Spans beyond 3.6m are not recommended.
5. For the purposes of serviceability design, the serviceability limit, limited by permanent rib deformation, occurs essentially at the same load as ultimate failure which is the point of disengagement of the roof with the clip.
6. End span capacities given in this table are based on the end span being $^{2}/_{3}$ of the internal span.
7. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
8. **System Design**
   The span capacity of Dimondek® 630 is determined from the Dimondek® 630 Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability selected from the three categories below. It is recommended that to obtain a dependable design strength capacity for the ultimate limit state, a reduction factor of Ø = 0.8 is applied.
   The capacities given do not apply for cyclonic wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.
9. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Dimondek® 630 is clip-fastened to either timber or steel purlins. The use of the appropriate type and length of fastener for clip fixing will ensure failure by fastener pull out will not occur under loads within the scope of the Limit State Load / Span Capacity Chart.

Purlin Type	Clip Fastener
Timber	Roofzip M6 x 50 HG-Z4
Steel	12g x 30mm hex head tek screw

*If sarking or insulation is used over the purlins or for wall cladding fixing onto a cavity batten, into the stud, the screw length will need to be increased.

The Dimondek® 630 perimeter clip must always be used over the first rib and clip on the first laid sheet.

For screw size range refer Section 2.2.3.1.

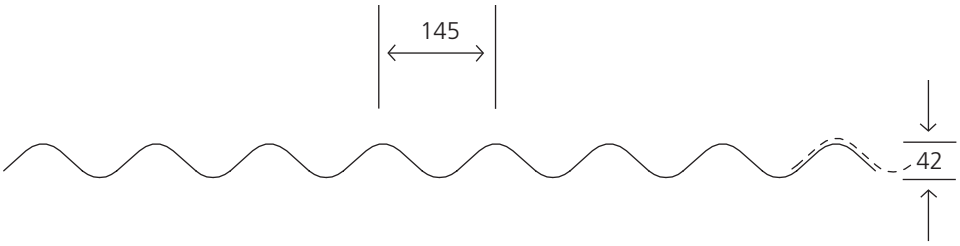
The Limit State Load / Span Capacity Chart is based on every rib being clip fastened to every purlin or girt.

Design Example

Restricted access roof, 0.55mm G550 steel Dimondek® 630 has a maximum end span of 2800mm and a maximum internal span of 4200mm. The following distributed load capacities apply.

End Span	2800mm
Internal Span	4200mm
Ultimate	1.2 kPa

DIMOND SUPER SIX PROFILE PERFORMANCE



Cover (mm)	1007
Sheet width (mm)	1097
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options	Duraclad®
Thickness (BMT) mm	1.7
Nominal weight/lineal metre (kg/m)	2.7
Drape curved roof - min. radius (m)	28
Purlin spacings for drape curved roof (m) (1)	1.2
Machine crimp curved - roof min. radius (mm)	n/a
Unsupported overhang (2)	250

(1) Recommended maximum purlin spacing at minimum radius
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a – not available

Manufacturing location for Duraclad®: Auckland

Sheet lengths: Super Six is custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

Refer Section 2.1.3.4.

SUPER SIX LIMIT STATE LOAD / SPAN CAPACITY CHART

(span in mm, distributed serviceability and ultimate loads in kPa)

Serviceability Category

		Unrestricted-Access Roof	Restricted-Access Roof		Non-Access Roof or Wall		
Duraclad® 1.7mm (Note 4)	End Span		800	1000	1100	1400	1700
	Serviceability & Ultimate	N/R	N/A 4.5	N/A 4.5	N/A 4.5	N/A 3.8	N/A 2.6
	Internal Span		900	1200	1300	1700	2100
	Serviceability & Ultimate	N/R	N/A 4.5	N/A 4.5	N/A 4.5	N/A 3.2	N/A 1.7

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 4 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
4. Duraclad®
   – Serviceability Limit State loads are not applicable to the Duraclad® material, as it does not experience permanent deformation.
   – System must include Safety Mesh if intended for use as a Restricted-Access roof. Refer Section 2.2.1.8.
5. N/R = not recommended.
6. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   Super Six is supplied only in Duraclad® material. Serviceability criteria of permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding do not apply.

   b) Ultimate Limit State
   No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift loads, or cracking at the purlin line due to inward wind loads.
7. **System Design**
   The span capacity of Super Six is determined from the Super Six Limit State Load/Span Capacity Chart using the section of the chart appropriate to the grade and type of material, and to the category of serviceability required for foot traffic application.
   It is recommended that to obtain a dependable design strength capacity for the ultimate limit state, a reduction factor of Ø = 0.75 is applied.
   The capacities given do not apply for cyclonic wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expect regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pans, or carefully across two profile ribs. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access points.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.
8. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Fastener Design

Super Six should be screw fixed to either timber or steel purlins. The use of the appropriate length of 12g or 14g screw will ensure failure by screw pull out will not occur under loads within the scope of the Limit State Load / Roofing Span Capacity Chart.

Purlin Type	Screw Fastener			
	Roofing Rib		Wall Cladding Pan	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	75	T17 - 14 - 10 x 75	50	Roofzip M6 x 50mm
Steel	65	Tek - 12 - 14 x 68 Tek - 14 - 10 x 65	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the purlins, the screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Limit State Load / Span Capacity Chart is based on 4 screw fasteners/sheet/purlin using load spreading washers that are either profiled metal washers and 36mm EPDM seals.

Long spans may require the specification and use of side lap stitching screws – see Section 2.3.2C Installation Information: Layout and Fastening.

Design Example

Restricted access roof, Duraclad® Super Six has a maximum end span of 1000mm and a maximum internal span of 1200mm. The following distributed load capacities apply.

	4 fasteners/sheet
End Span	1000mm
Internal Span	1200mm
Ultimate	4.5 kPa

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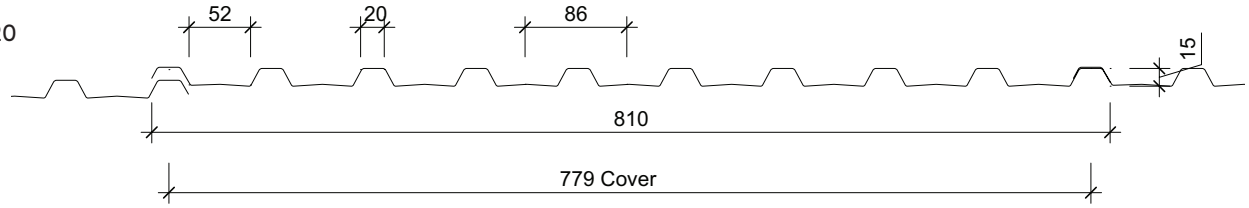
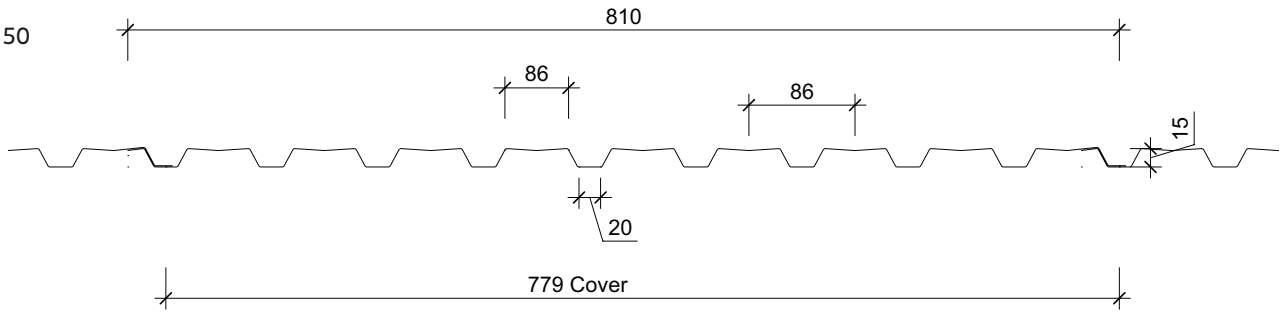
DIMONDCLAD RIB 20 & RIB 50 PROFILE PERFORMANCE

Rib 20



Rib 50



Cover (mm)	779
Sheet width (mm)	810
Minimum Pitch	Wall cladding only

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, −0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, −0mm.

Material Options	Steel	Aluminium	
Thickness (BMT) mm	0.4	0.7	0.9
Nominal weight/lineal metre (kg/m)	3.17	1.78	2.28
Unsupported overhang (1) (mm)	100	75	100

(1) Not intended to support point loads.

Roll-forming facility at: Hamilton

Sheet lengths: Dimondclad Rib 20 and Rib 50 are custom run to order.

Where long sheets are used consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion.

Refer Section 2.1.3.4.

DIMONDCLAD – DETAILED CLADDING DESIGN

Design Criteria for Limit State Capacities.

a) Serviceability Limit State

No deflection or permanent distortion that would cause unacceptable appearance or side lap leakage due to inward or outward wind loads.

b) Ultimate Limit State

No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.

System Design

The span capacity of Dimondclad Rib 20 and Dimondclad Rib 50 is determined by the serviceability requirement for acceptable appearance and should not exceed 1400mm.

The ultimate windload should not exceed 3 kPa.

The Dimondclad Rib 20 and Dimondclad Rib 50 profiles are not intended for use as roofing products, and must not be used in situations where foot traffic point loads can be applied.

Fastener Design

Dimondclad Rib 20 and Dimondclad Rib 50 should be screw fixed over cavity battens to either timber or steel framing where a high level of appearance is required. Nail fixing to timber may be used in an interior situation not exposed to the weather. The use of the appropriate length of 12g screw will ensure failure by fastener pull out will not occur under the load limitation given.

Framing	Fastener Length (mm)	
	Wall Cladding Pan Fixed - Over Vented Cavity Battens	
	Screw Length* (mm)	Designation
Timber	50	Roofzip M6 x 50mm
Steel	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the framing, screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Span Capability and Sheet Appearance is based on fasteners at 260mm maximum spacing across the sheet without the use of load spreading washers.

Spans greater than 800mm will require the specification and use of side lap stitching fasteners – see Section 2.3.2C Installation Information: Layout and Fastening, for fastener type.

As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

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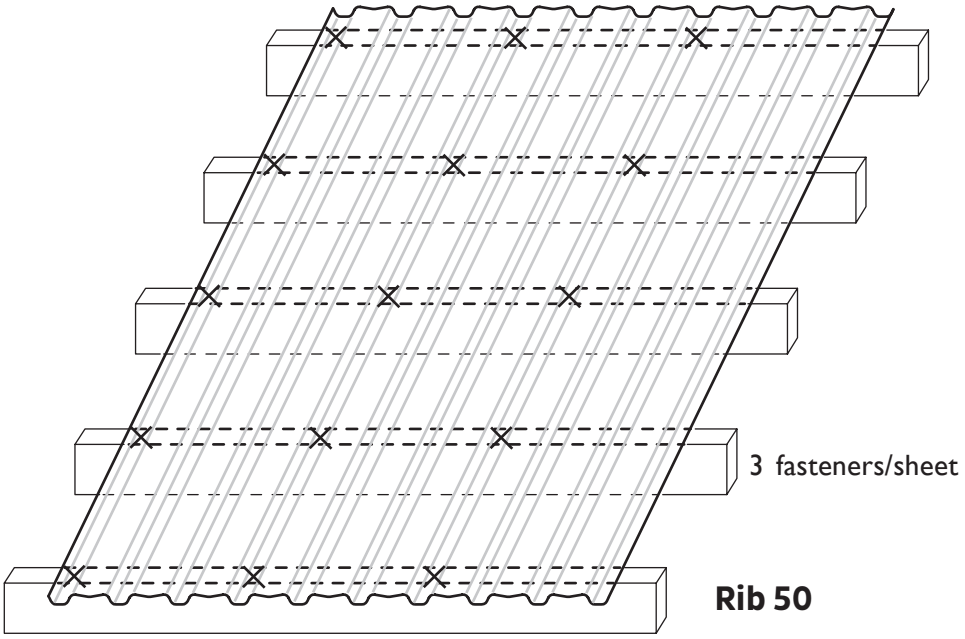
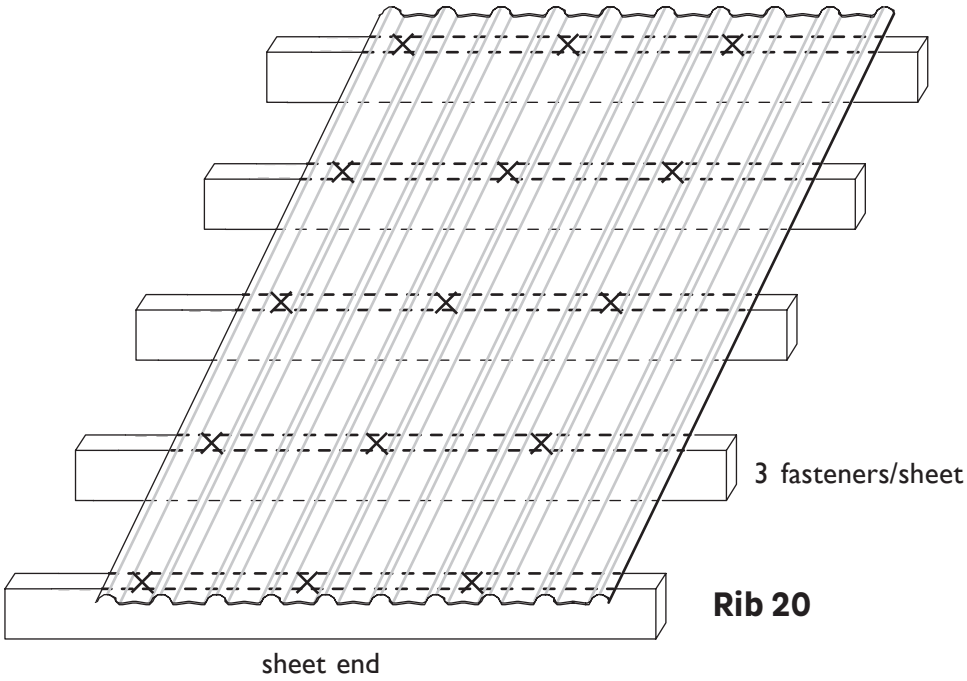
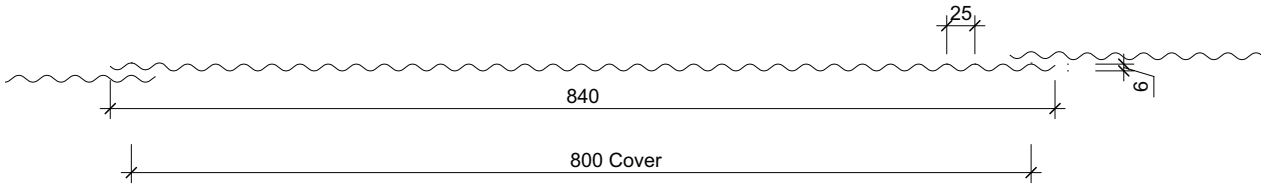
DIMONDCLAD
FASTENER LAYOUT OPTIONS





DIMOND BABY CORRUGATE PROFILE PERFORMANCE



	Northern Region	Central Region	Southern Region
Cover (mm)	815	840	*
Sheet width (mm)	835	890	
Minimum Pitch	Wall cladding only		

All dimensions given are nominal
*Check with Dimond South Island supplying branch

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, −0mm. Where notified at time of order its intended use will be for horizontal wall cladding, tighter tolerances can be achieved +3mm, −0mm.

Material Options	Steel	
Thickness (BMT) mm	0.4	0.55
Nominal weight/lineal metre (kg/m)	3.17	4.27
Unsupported overhang (1)	75	75

(1) Not intended to support point loads.

Baby Corrugate is available ex Auckland or Palmerston North. For South Island please check with your local branch.

Sheet lengths: Baby Corrugate is available in lengths up to 6m long.

BABY CORRUGATE – DETAILED CLADDING DESIGN

Design Criteria for Limit State Capacities

a) Serviceability Limit State

No deflection or permanent distortion that would cause unacceptable appearance or side lap leakage due to inward or outward wind loads.

b) Ultimate Limit State

No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.

System Design

The span capacity of Baby Corrugate is determined by the serviceability requirement for acceptable appearance and should not exceed 600mm.

The ultimate windload should not exceed 3 kPa.

The Baby Corrugate profiles are not intended for use as roofing products, and must not be used in situations where foot traffic point loads can be applied.

Fastener Design

Baby Corrugate should be screw fixed to either timber or steel framing.

For Timber

Buildex Ripple Zip M4.8 x 25 provides a tidy fixing detail with a unique head design that seals without a washer and screws to fit down into corrugations.

For Steel

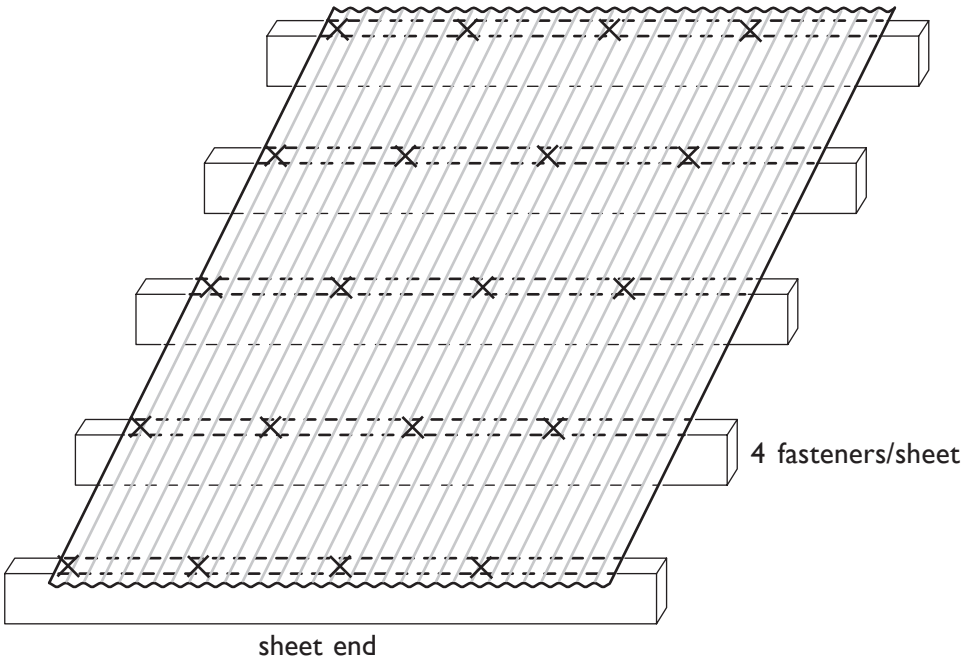
Buildex Ripple Zip M4.8 x 25 provides a unique head design that seals without a washer and does not deform the sheeting. If sarking or insulation is used over the framing Ripple Zips can't be used, as they are not long enough and a 12g screw of appropriate length will be required.

For screw size range and fastener / washer assembly refer section 2.2.3.1.

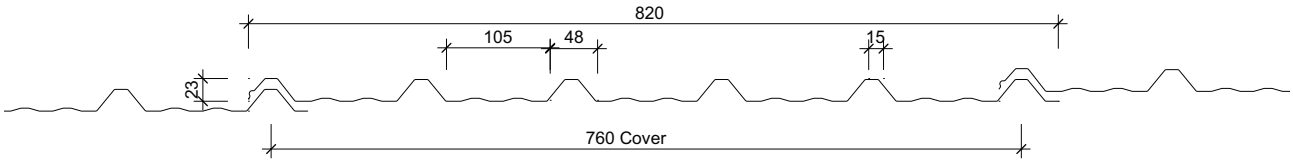
The Span Capability and Sheet Appearance is based on fasteners at 200mm maximum spacing across the sheet without the use of load spreading washers.

Spans greater than 800mm will require the specification and use of side lap stitching fasteners – see Section 2.3.2C Installation Information: Layout and Fastening, for fastener type.

DIMOND BABY CORRUGATE
FASTENER LAYOUT OPTIONS



DIMOND SIX RIB PROFILE INFORMATION



Cover (mm)	760
Sheet width (mm)	820
Minimum Pitch	4° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel	
Thickness (BMT) mm	0.40	0.55
Nominal weight/lineal metre (kg/m)	3.17	4.27
Drape curved roof - min. radius (m)	80	40
Purlin spacing's for drape curved roof (m)(1)	1.2	1.4
Machine curved - roof min. radius (mm)	n/a	n/a
Unsupported overhang (2)(mm)	250	250

(1) Recommended maximum purlin spacing's at minimum radius.
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a not available

Roll-forming facilities at: Invercargill

Sheet lengths: Six Rib is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

SIX-RIB LIMIT STATE LOAD/SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof	Restricted-Access Roof			Non-Access Roof or Wall
G550 Steel 0.40mm	End Span (mm)	600	700	800	1000	1200
	Internal Span (mm)	900	1000	1200	1500	1800
	Serviceability	4.5	3.9	3.1	2.3	2.0
G550 Steel 0.55mm	End Span (mm)	1000	1100	1250	1500	1600
	Internal Span (mm)	1500	1700	900	2200	2400
	Serviceability	3.0	2.5	2.0	1.5	1.3

Notes

1. In any category, spans above the maximum shown should not be used. Category 1 and 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 5 screw fasteners/sheet/purlin.
3. Loads given are limited to a maximum of 4.5kPa. If design requirements exceed this limit, Contact Dimond® Roofing for specific advice.
4. End span capacities given in this table are based on the end span being 2/3 of the internal span.
5. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No Deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fasteners withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
6. **System Design**
   The span capacity of Six Rib is determined from the Six Rib Limit State Load/Capacity Chart using the section of the chart appropriate to grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines. The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expected regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pan. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access point.
1. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.
7. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Six Rib Design

Fasteners that are used to secure Six Rib down as a roof cladding must penetrate into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the solid framing by 30mm for timber and 6mm for steel.

Fixing Requirements		
Purlin or frame material	Roof	Wall (over vented cavity batten, 18 - 25mm thick) Pan fixed
Timber	12g x 65mm Type 17 Timbertite with neo	12g x 50mm Type 17 Timbertite complete with neo
Steel	12g x 35mm Steeltite	12g x 50mm Steeltite complete with neo

For screw size range and fastener/washer assembly refer to Section 2.2.3.1

The Limited State Load/Span Capacity Chart is on 5 screw fasteners/sheet/purlin without the use of load spreading.

Profiled metal washers are recommended for use;

1. On end spans, or large internal spans where the Ultimate Limit State distributed load is limiting. Contact Dimond® Roofing for specific advice in these design cases.
2. When required to enable the fixing system to accommodate the thermal movement of long sheets – see Section2.1.3.4 Thermal Movement

3. Whenever the designer wishes to ensure the risk of fastener over-tightening will not cause dishing of the crest of the profile rib.

Use in serviceability categories (1) or (2) can allow the reduction of fasteners to an average of 3 screw fasteners/sheet/purlin. If this is done, the distributed load capacities given in the chart should be reduced using a multiplying factor of 0.6.

Long spans may require specification and use of side lap stitching screws – Section 2.3.2 C Installation

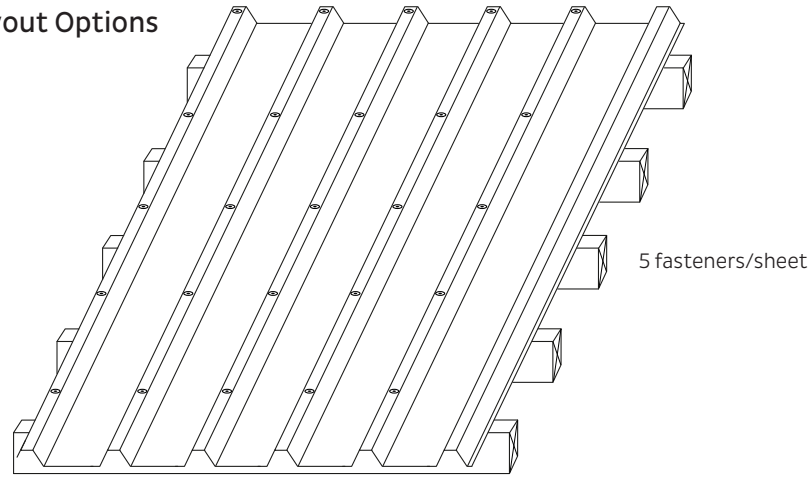
Information: Layout and Fastenings.

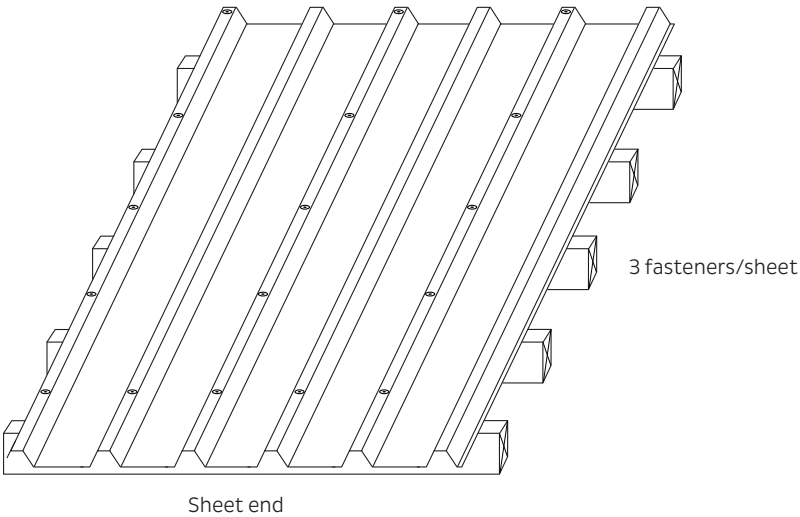
Design Examples

Restricted access roof, 0.55mm G550 steel Six Rib has a maximum end span of 1500mm and a maximum internal span of 2200mm. The following distributed load capacities apply.

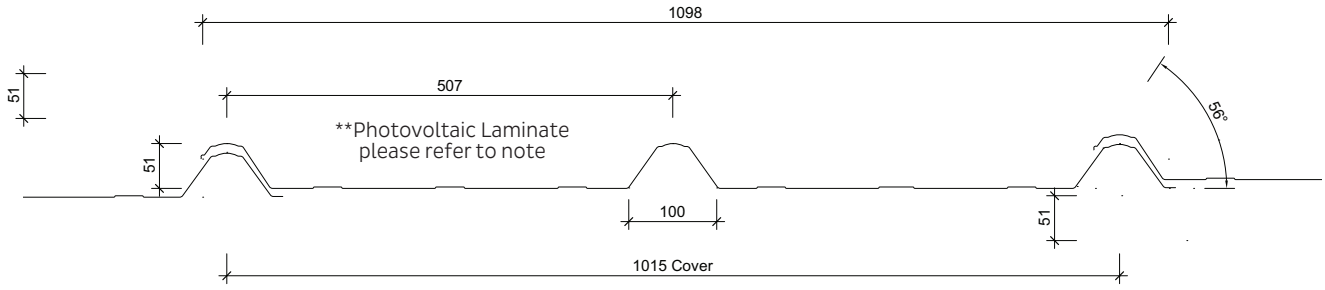
	5 fasteners/sheet	3 fasteners/sheet
End Span	1500mm	1500mm
Internal Span	2200mm	2200mm
Serviceability	1.5kPa	0.9kPa

Six Rib Fastener Layout Options





DIMOND SOLAR-RIB® PROFILE INFORMATION



Cover (mm)	1015
Sheet width (mm)	1098
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel	Aluminium
Thickness (BMT) mm	0.55	0.90
Nominal weight/lineal metre (kg/m)	5.55	2.96
Drape curved roof - min. radius (m)	90	90
Purlin spacing's for drape curved roof (m)(1)	1.500	1.500
Machine curved - roof min. radius (mm)	n/a	n/a
Unsupported overhang (2)(mm)	50	50

(1) Recommended maximum purlin spacing's at minimum radius.
(2) Based on 1.1kN point load support, but not intended for roof access.
n/a not available

Roll-forming facilities at: Auckland and Invercargill

Sheet lengths: Solar-Rib® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences for sheet lengths over 25m
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths or a Dimond Recommended Installer.

**NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trade have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5.910mm and 2.585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For Solar-Rib, oil canning can be reduced by the use of vented roof underlay (e.g. Tyvek Metal) and/or the use of backer rods under the tray. There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

Dimond Roofing

SOLAR-RIB® LIMIT STATE LOAD/SPAN CAPACITY CHART

(span in mm, distributed serviceability loads in kPa)

Serviceability Category

		Unrestricted-Access Roof	Restricted-Access Roof		Non-Access Roof or Wall	
G550 Steel 0.55mm	End Span (mm)	700	1000	1300	1500	1700
	Internal Span (mm)	1000	1500	1900(x)	2300(x)	2300(y)
	Serviceability	2.5	1.7	1.7	1.2	1.2
5052, H34 Aluminium 0.90mm	End Span (mm)		700	800	1000	1300
	Internal Span (mm)		1000	1200	1500	1900(x)
	Serviceability		2.3	1.7	1.5	1.0

Notes

1. In any category, spans above the maximum shown should not be used. Category 2 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.
2. Loads given are based on 2 screw fasteners/sheet/purlin (x) = one stitching screw between mid-span purlins, (y) = two stitching screws per mid-span purlin.
3. Loads given are limited to a maximum of 2.5kPa. If design requirements exceed this limit, Contact Dimond® Roofing for specific advice.
4. N/R = not recommended
5. End span capacities given in this table are based on the end span being 2/3 of the internal span.
6. **Design Criteria for Limit State Capacities**

   a) Serviceability Limit State
   No Deflection or permanent distortion that would cause unacceptable appearance, side lap leakage or water ponding, due to foot traffic point loads, inward or outward wind loads or snow loads.

   b) Ultimate Limit State
   No pull through of fixings or fasteners withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
7. **System Design**
   The span capacity of Solar-Rib® is determined from the Solar-Rib® Limit State Load/Capacity Chart using the section of the chart appropriate to grade and type of material, and to the category of serviceability selected from the three categories below. Serviceability loads have been derived by test to the NZMRM testing procedures. To obtain an ultimate limit state load we recommend factoring the serviceability load up by 1.4 in-line with NZMRM guidelines. The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expected regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
2. Restricted-access roof	Expect occasional foot traffic educated to walk only on the purlin lines, in the profile pan. Walkways installed where regular traffic is expected, and “Restricted Access” signs placed at access point.
3. Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, “No Roof Access” signs used.

8. **Wind Pressure Guide**
   As a guide for no-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Solar-Rib® Design

Fasteners that are used to secure Solar-Rib® down as a roof cladding must penetrate into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the solid framing by 30mm for timber and 6mm for steel.

Fixing Requirements				
Purlin or frame material	Roof		Wall (over vented cavity batten, 18 - 25mm thick) Pan fixed	
	Base material		Base material	
	Steel (1,2,3,4)	Aluminium (1,2,3,4)	Steel	Aluminium
Timber	14g x 100mm Type 17 Timbertite with 36mm EPDM washer and load spreading washer	Type 17 304 Grade stainless steel 14g x 90mm Timbertite with 36mm EPDM and load spreading washer	14g x 50mm Type 17 Timbertite complete with neo	14g x 55mm Alutite with a clearance hole an complete with bonded washer
Steel	14g x 90mm Steeltite with 36mm EPDM washer and load spreading washer	14g x 90mm Steeltite with 36mm EPDM washer and load spreading washer	14g x 50mm Steeltite complete with neo	Stainless steel grade 304 - 12g x 50mm Steeltite with hole and complete with bonded washer

1. A 30mm bonded (BRA) washer may be used in low and medium wind zones and when the sheet length is less than 7m. Periphery and valley lines must still have a load spreading washers used.
2. When using bonded washers remove the neo from the fastener prior to installing.
3. Were photo-voltaic laminates are to be used an extra row of purlins is required 600mm down from the ridge line and up from the bottom purlin.
4. When using Load Spreading Washers a 12mm (clearance) hole is to be drilled for the 36mm diameter EPDM seal.

For screw size range and fastener/washer assembly refer to Section 2.2.3.1

The Limited State Load/Span Capacity Chart is on 2 screw fasteners/sheet/purlin with the use of load spreading

Long spans may require specification and use of side lap stitching screws – Section 2.3.2 C Installation

Information: Layout and Fastenings.

Design Examples

Restricted access roof, 0.55mm G550 steel Solar-Rib® has a maximum end span of 1300mm and a maximum internal span of 1900mm. The following distributed load capacities apply.

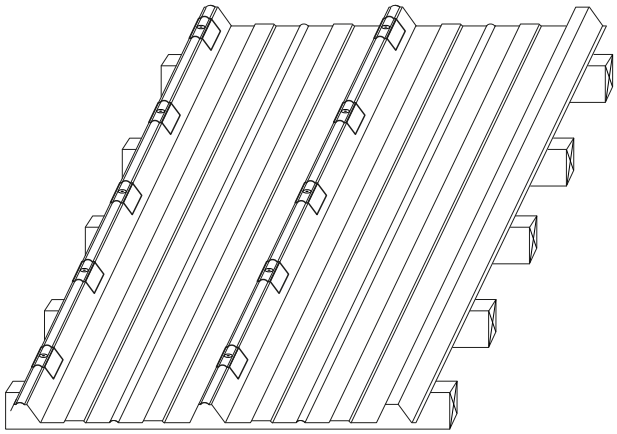
	2 fasteners/sheet
End Span	1300mm
Internal Span	1900mm
Serviceability	1.7kPa

Solar-Rib® Fastener Layout Options

2 fasteners per sheet with 36mm EPDMs and load spreading washers.

Drill 12mm holes to accommodate the EPDM.

High wind zones and above, and all wind zones for sheets longer than 7m.



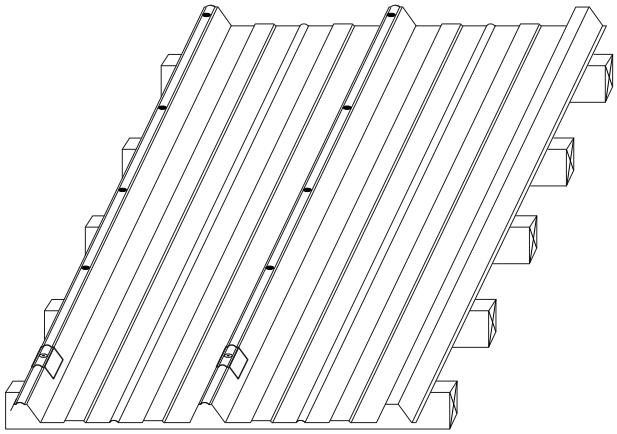
Sheet end

Solar-Rib® Fastener Layout Options

2 fasteners per sheet with 36mm EPDMs and load spreading washers at the sheet end and 30mm bonded (BRA) washer on the remaining.

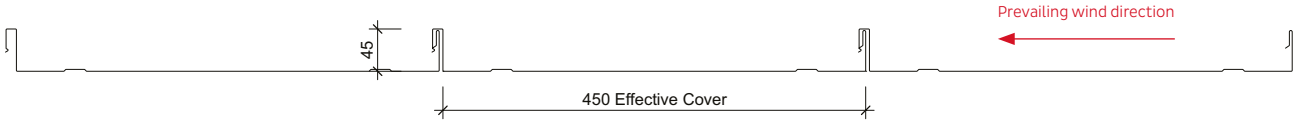
Drill 12mm holes to accommodate the EPDM.

Low and medium wind zones and when sheet length is less than 7m.



Sheet end

DIMOND HERITAGE TRAY® PROFILE PERFORMANCE



***Photovoltaic Laminate please refer to note

Cover (mm)	450
Sheet width (mm)	465
Minimum Pitch	3° (approx. 1:20)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel	Aluminium
Thickness (BMT) mm	0.55	0.90
Nominal weight/lineal metre (kg/m)	2.77	1.48
Drape curved roof - min. radius (m)	n/a	n/a
Machine curved - roof min. radius (mm)	No	No
Swages in profile pans required (all Wind Zones)	Yes	Yes
Vented underlay required* - Tyvek Metal (all Wind Zones)	Yes	Yes
Plywood substrate required	Extra High and SED Wind Zones only**	
Use with the Dimond Tricore® insulated roof system (all Wind Zones)	No	No
Drip edge flashing required (refer CAD detail - het 4130 - 4131)	Yes	Yes

***Vented underlay (Tyvek Metal or Dimond approved equivalent) laid full cover over purlins (or laid full cover over the face of cavity battens for walling) is required in all Wind Zones. In addition, Plywood substrate is required in Extra High and Specific Engineering Design (SED) Wind Zones.**

****Contact Dimond Roofing on 0800 ROOFSPEC for specific advice on product suitability for your location.**

Roll-forming facilities at: Auckland, Christchurch and Invercargill

Curving facilities: n/a

Sheet lengths: Heritage Tray® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences
- Should be run on-site
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths or a Dimond Recommended Installer.

***NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trade have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5910mm and 2585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

The Dimond Roofing Heritage Tray profile is only available in a fixed cover width, and cannot be manually folded. When the profile is used as wall cladding, careful attention is required to sheet set-out and sheet width tolerances to ensure the sheet modules align to wall openings.

SOUND REVERBERATION: Extreme wind events may cause sound reverberation of Heritage Tray pans. It does not cause detriment to product performance.

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For Heritage Tray, oil canning can be reduced by the vented roof underlay (e.g. Tyvek Metal). There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

HERITAGE TRAY® LIMIT STATE LOAD/SPAN CAPACITY CHART

(span in mm, distributed ultimate load in kPa)

Serviceability Category

		1. Unrestricted-Access Roof	3. Wall
		Fix clip to every purlin	Fix clip to every dwang/girt
G300 Steel 0.55mm	End Span (mm)	500	600
	Internal Span (mm)	500	600
	Ultimate (kPa)	4.7	3.5
5052, H34 Aluminium 0.90mm	End Span (mm)	500	600
	Internal Span (mm)	500	600
	Ultimate (kPa)	2.8	2.0

Notes

1. Category 1 maximum spans are based on static point load testing as a guide, and further limited by practical experience of roof performance under dynamic foot traffic loads. Category 3 maximum spans are limited as a guide to achieving satisfactory appearance for wall cladding.Loads given are based on 2 screw fasteners per clip.
2. Loads given are based on 1 clip/sheet/purlin. Refer Fastener Layout Options in 2.1.4.16 (c).
3. Loads given are limited to a maximum of 4.7kPa. If design requirements exceed this limit, Contact Dimond® Roofing for specific advice.
4. End span capacities given in this table are based on the end span being the same as the internal span.
5. **Design Criteria for Limit State Capacities**

   a) Ultimate Limit State
   No pull through of fixings or fasteners withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.
6. **System Design**
   The span capacity of Heritage Tray® is determined from the Heritage Tray® Limit State Load/Capacity Chart using the section of the chart appropriate to grade and type of material, and to the category of serviceability selected from the two categories below. It is recommended that to obtain a dependable design strength capacity for the ultimate limit state, a reduction factor of Ø = 0.8 is applied.

   The capacities given do not apply for cyclone wind conditions.

   Serviceability Requirements
   While these categories are given for design guidance to meet the serviceability limit state criteria, foot traffic point load damage may still occur if there is careless placement of these point loads.

Service Category	Description
1. Unrestricted-access roof	Expected regular foot traffic to access the roof for maintenance work and able to walk anywhere on the roof. No congregation of foot traffic expected.
7. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

Heritage Tray® Design

Fasteners that are used to secure Heritage Tray® clip down as a roof cladding must penetrate into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the clip fasteners must be long enough to pass through the substrate, cavity batten and into the main frame by 30mm for timber and 6mm for steel.

Galvanised Clip Fixing Requirement 2 fixings per clip			
Purlin or frame material	Roof		Wall (over vented cavity batten, 18 - 25mm thick)
	Steel or Aluminium sheeting		Steel or Aluminium sheeting
	No Substrate	Plywood Substrate	
Timber	Class 4 Type 17 10g x 45mm #2 SQ. drive Wafer Head	Class 4 Type 17 10g x 65mm #2 SQ. drive Wafer Head	Class 4 Type 17 10g x 65mm #2 SQ. drive Wafer Head
Steel	Class 4 10g x 16mm #2 SQ. drive Wafer Head	Class 4 10g x 40mm #2 SQ. drive Wafer Head	Class 4 10g x 40mm #2 SQ. drive Wafer Head

If cavity batten and/or insulation is used over the purlins the screw length will need to be increased by at least the cavity batten and/or insulation thickness.

Design

To be designed using the Dimond Heritage Tray CAD details.
These can be downloaded on-line at **www.dimond.co.nz/products/heritage-tray#tab-drawings**

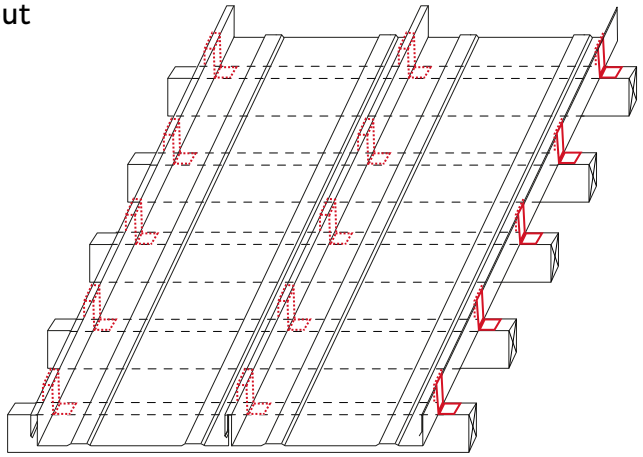
Dimond Heritage Tray® Fastener Layout

Low to Very High Wind Zones

Fix clips to all ribs of all purlin lines
Purlins at maximum 500mm centres

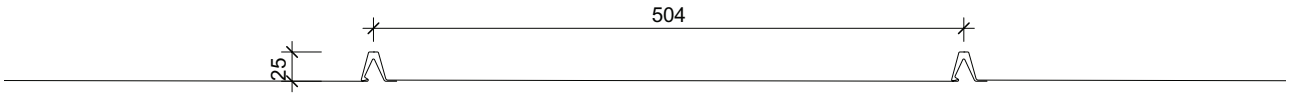
(For Extra High and SED Wind Zones contact Dimond Roofing on 0800 ROOFSPEC for specific advice on suitability for your location)

Wall Cladding
Fix clips to all ribs of all dwangs/girts.



Sheet end

DIMOND EUROTRAY® LITE PROFILE INFORMATION



**Photovoltaic Laminate please refer to note

Cover (mm)	504mm (FIXED)
Sheet width (mm)	528mm
Minimum Pitch	8° (approx. 1:7)

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel
Thickness (BMT) mm	0.55
Nominal weight/lineal metre (kg/m)	2.77
Drape curved roof - min. radius (m)	n/a
Substrate required	Yes
Vented Underlay Required (e.g. Tyvek Metal)	Yes
Machine curved - roof min. radius (mm)	n/a
Drip edge flashing recommended CAD detail R-002-02	Yes

Roll-forming facilities at: Christchurch

Curving facilities: n/a

Sheet lengths: Eurotray® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences
- Should be run on-site
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths.

**NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trades have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5.910mm and 2.585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

This profile is only available in a fixed cover width, and cannot be manually folded. When the profile is used as wall cladding, careful attention is required to sheet set-out and sheet width tolerances to ensure the sheet modules align to wall openings.

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For fully supported standing seam tray profiles, oil canning can be reduced by the vented roof underlay (e.g. Tyvek Metal), in addition backer rods under the tray can also be used. There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

Eurotray® Lite Design

Eurotray® Lite roof cladding must always be installed over a plywood (12mm minimum) substrate with a moisture content of less than 18% and made wind tight, with purlin supports underneath at 600mm centres in low to high wind zones and 400mm centres for very high and extra high wind zones. 8 gauge x 40mm countersunk stainless steel screws at 150mm centres around

the panel edged and 200mm centres on the intermediate supports. The fasteners should be no closer than 10mm to the edge.

A 3mm expansion gap be should be provided between the sheets. All joints should be staggered and taped over before placing underlay, Dimond® Roofing recommend the use of vented type underlay such as tyvek metal or Covertek 407 with drainage mat. This allows added air-flow between the underside of the tray and substrate, it also helps to reduce oil-canning in the tray.

Fasteners that are used to secure Eurotray® down as a roof cladding must penetrate through the substrate and into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the main frame by 30mm for timber and 6mm for steel.

Fixing Requirement		
Purlin or frame material	Roof (standard 12mm Substrate)	Wall Standard 12mm substrate over vented cavity batten (18-25mm thick)
	Base material	Base material
	Steel only	Steel only
Timber	Class 4 10g x 45mm wafer head	Class 4 10g x 45mm wafer head
Steel	Class 4 - 10g x 40mm #2sq/drive wingtec	Class 4 - 10g x 60mm #2sq/drive wingtec

Design

Fasteners must be fixed closer together on the periphery edges of all roofs in areas of High to Extra High Wind Zones.

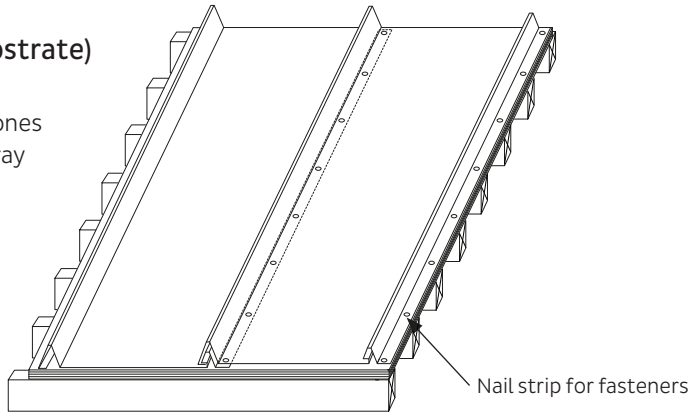
Unlike profiled metal cladding, the point load imposed on a fully supported cladding is supported by the substrate underneath.

Clip fixing table	
Wind Zone	Purlin Centre (mm)
Low to High	600
Very High to Extra High	400

Minimum pitch for Eurotray® Lite is 8 degrees.

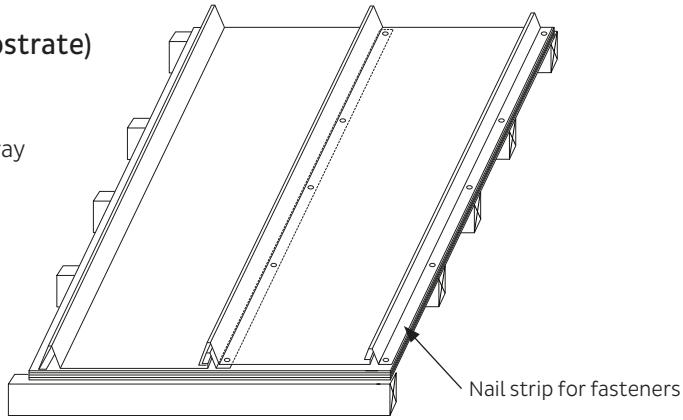
Eurotray® Lite (over substrate)

400mm purlin centres
Very high/Extra High Wind Zones
Nail strip formed as part of tray



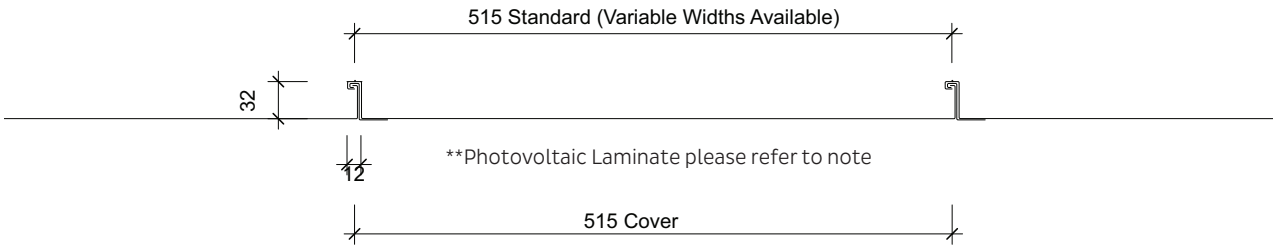
Eurotray® Lite (over substrate)

600mm purlin centres
Low - High Wind Zones
Nail strip formed as part of tray



Dimond Roofing

DIMOND EUROTRAY® ANGLE SEAM PROFILE INFORMATION



Roll-forming facility	AKL	CHC	INV
Cover (mm)	525	517	525
Sheet width (mm)	523	515	523
Minimum Pitch	5° (approx. 1:11)		

Note for Copper and Zinc reduce widths by 10mm

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel	Aluminium	*Copper	*Zinc
Thickness (BMT) mm	0.55	0.90	0.70	0.70
Nominal weight/lineal metre (kg/m)	2.77	1.48	3.84	3.06
Drape curved roof - min. radius (m)	40	70	40	40
Substrate required	Yes	Yes	Yes	Yes
Vented Underlay Required (e.g. Tyvek Metal)	Yes	Yes	Yes	Yes
Machine curved - roof min. radius (mm)	2500	600	600	600
Drip edge flashing required CAD detail R-004-02	Yes	Yes	Yes	Yes

*Please contact your Dimond® Roofing 0800 Dimond (0800 346 663) for availability.

Roll-forming facilities at: Auckland, Christchurch and Invercargill

Curving facilities: Machine is transportable
For curving restraints check with the local RoofingSmiths.

Sheet lengths: Eurotray® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences
- Should be run on-site
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths.

**NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trade have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5.910mm and 2.585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For fully supported standing seam tray profiles, oil canning can be reduced by the vented roof underlay (e.g. Tyvek Metal), in addition backer rods under the tray can also be used. There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

Eurotray® Angle Seam Design

Eurotray® Angle Seam roof cladding must always be installed over a plywood (12mm minimum) substrate with a moisture content of less than 18% and made wind tight, with purlin supports underneath at 600mm centres in low to high wind zones and 400mm centres for very high and extra high wind zones. 8g x 40mm countersunk stainless steel screws at 150mm centres around the panel edged and 200mm centres on the intermediate supports. The fasteners should be no closer than 10mm to the edge when using Zinc avoid contact with Bituminous paper underlays and use Covertek 403.

A 3mm expansion gap should be provided between the sheets. All joints should be staggered and taped over before placing underlay, Dimond® Roofing recommend the use of vented type underlay. This allows added air-flow between the underside of the tray and substrate, it also helps to reduce oil-canning in the tray.

Fasteners that are used to secure Eurotray® down as a roof cladding must penetrate through the substrate and into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the main frame by 30mm for timber and 6mm for steel.

Clip Fixing Requirement - 2 fixings per clip per purlin								
Purlin or frame material	Roof (standard 12mm Substrate)				Wall (over vented cavity batten, 18 - 25mm thick)			
	Base material				Base material			
	Steel	Aluminium	Copper	Zinc	Steel	Aluminium	Copper	Zinc
Timber	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk
Steel	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk

Design

Fasteners must be fixed closer together on the periphery edges of all roofs in areas of High to Extra High Wind Zones.

Unlike profiled metal cladding, the point load imposed on a fully supported cladding is supported by the substrate underneath.

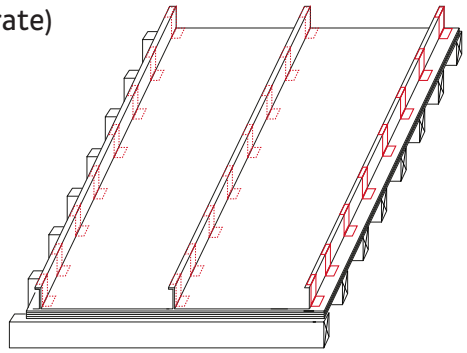
Clip fixing table	
Wind Zone	Purlin Centre (mm)
Low to High	600
Very High to Extra High	400

Minimum pitch for Eurotray® Angle Seam is 5 degrees.

NOTE
Flashing and jointing details when using Copper or Zinc materials are required to be solder, silicone sealants are not to be used on these materials avoid contact between zinc and Bituminous underlay. Recommend Covertek 403.

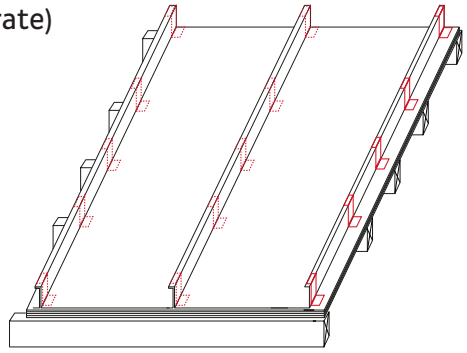
Eurotray® Angle Seam (over substrate)

400mm purlin centres
Very high/Extra High Wind Zones

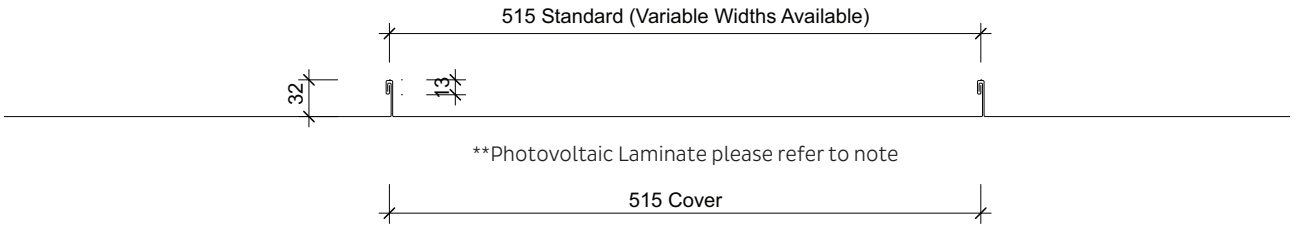


Eurotray® Angle Seam (over substrate)

600mm purlin centres
Low - High Wind Zones



DIMOND EUROTRAY® DOUBLE STANDING SEAM PROFILE INFORMATION



Roll-forming facility	AKL	CHC	INV
Cover (mm)	526	520	525
Sheet width (mm)	523	517	523
Minimum Pitch	3° (approx. 1:20)		

Note for Copper and Zinc reduce widths by 10mm

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel	*Copper	*Zinc
Thickness (BMT) mm	0.55	0.70	0.70
Nominal weight/lineal metre (kg/m)	2.77	3.84	3.06
Drape curved roof - min. radius (m)	40	40	40
Substrate required	Yes	Yes	Yes
Vented Underlay Required (e.g. Tyvek Metal)	Yes	Yes	Yes
Machine curved - roof min. radius (mm)	2500	600	600
Drip edge flashing required CAD detail R-003-02	Yes	Yes	Yes

*Please contact your Dimond® Roofing 0800 Dimond (0800 346 663) for availability.

Roll-forming facilities at: Auckland, Christchurch and Invercargill

Curving facilities: Machine is transportable
For curving restraints check with the local RoofingSmiths.

Sheet lengths: Eurotray® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences
- Should be run on-site
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths.

**NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trade have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5.910mm and 2.585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For fully supported standing seam tray profiles, oil canning can be reduced by the vented roof underlay (e.g. Tyvek Metal), in addition backer rods under the tray can also be used. There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

Eurotray® Double Standing Seam Design

Eurotray® Double Standing Seam roof cladding must always be installed over a plywood (12mm minimum) substrate with a moisture content of less than 18% and made wind tight, with purlin supports underneath at 600mm centres in low to high wind zones and 400mm centres for very high and extra high wind zones. 8g x 40mm countersunk stainless steel screws at 150mm centres around the panel edged and 200mm centres on the intermediate supports. The fasteners should be no closer than 10mm to the edge.

A 3mm expansion gap should be provided between the sheets. All joints should be staggered and taped over before placing underlay, Dimond® Roofing recommend the use of vented type underlay such as tyvek metal or Covertek 407. Avoid Bituminous underlays in contact with Zinc. This allows added air-flow between the underside of the tray and substrate, it also helps to reduce oil-canning in the tray.

Fasteners that are used to secure Eurotray® down as a roof cladding must penetrate through the substrate and into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the main frame by 30mm for timber and 6mm for steel.

Clip Fixing Requirement - 2 fixings per purlin								
Purlin or frame material	Roof (standard 12mm Substrate)				Wall (over vented cavity batten, 18 - 25mm thick)			
	Base material				Base material			
	Steel	Aluminium	Copper	Zinc	Steel	Aluminium	Copper	Zinc
Timber	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 50mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk	Stainless steel grade 304 - 8g x 65mm c/sunk
Steel	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 30mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk	Stainless steel grade 304 - 8g x 40mm c/sunk

Design

Fasteners must be fixed closer together on the periphery edges of all roofs in areas of High to Extra High Wind Zones.

Unlike profiled metal cladding, the point load imposed on a fully supported cladding is supported by the substrate underneath.

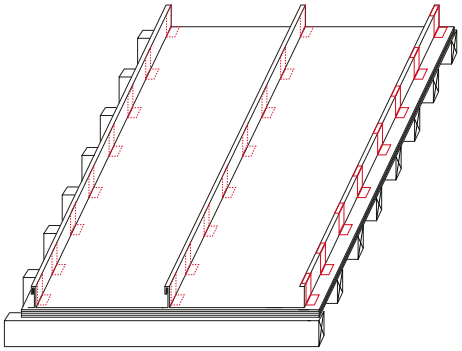
Clip fixing table	
Wind Zone	Purlin Centre (mm)
Low to High	600
Very High to Extra High	400

Minimum pitch for Eurotray® Double Standing Seam is 3 degrees.

NOTE
Flashing and jointing details when using Copper or Zinc materials are required to be solder, silicone sealants are not to be used on these materials.

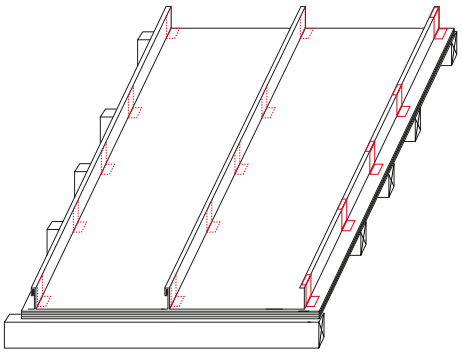
Eurotray® Double Standing Seam (over substrate)

400mm purlin centres
Very high/Extra High Wind Zones

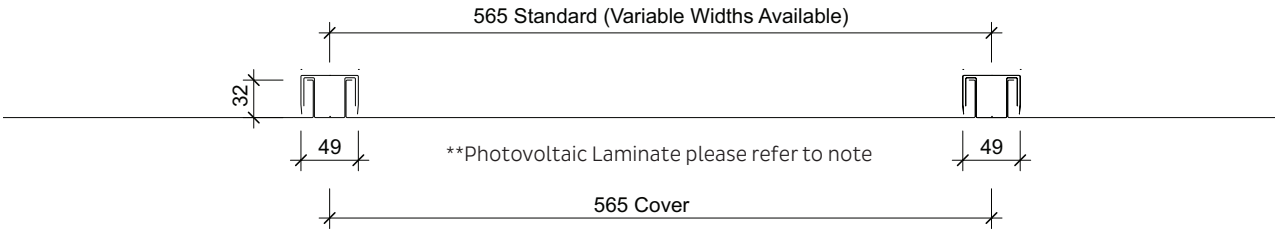


Eurotray® Double Standing Seam (over substrate)

600mm purlin centres
Low - High Wind Zones



DIMOND EUROTRAY® ROLL CAP PROFILE INFORMATION



Roll-forming facility	AKL	CHC	INV
Cover (mm)	575	565	579
Sheet width (mm)	540	530	544
Minimum Pitch	5° (approx. 1:11)		

Note for Copper and Zinc reduce widths by 10mm

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. Tighter tolerances can be achieved +3, -0.

Material Options	Steel	Aluminium
Thickness (BMT) mm	0.55	0.90
Nominal weight/lineal metre (kg/m)	2.77	1.48
Drape curved roof - min. radius (m)	n/a	n/a
Substrate required	Yes	Yes
Vented Underlay Required (e.g. Tyvek Metal)	Yes	Yes
Machine curved - roof min. radius (mm)	n/a	n/a
Drip edge flashing required see detail R-005-02	Yes	Yes

Roll-forming facilities at: Auckland, Christchurch and Invercargill

Curving facilities: Machine is transportable
For curving restraints check with the local RoofingSmiths.

Sheet lengths: Eurotray® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences
- Should be run on-site
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths.

**NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trade have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5.910mm and 2.585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

Can be installed as a vertical wall cladding only with a substrate over vented cavity battens.

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For fully supported standing seam tray profiles, oil canning can be reduced by the vented roof underlay (e.g. Tyvek Metal), in addition backer rods under the tray can also be used. There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

Dimond Roofing

Eurotray® Roll Cap Design

Eurotray® Roll Cap roof cladding must always be installed over a plywood (12mm minimum) substrate with a moisture content of less than 18% and made wind tight, with purlin supports underneath at 600mm centres in low to high wind zones and 400mm centres for very high and extra high wind zones. 8g x 40mm countersunk stainless steel screws at 150mm centres around the panel edged and 200mm centres on the intermediate supports. The fasteners should be no closer than 10mm to the edge.

A 3mm expansion gap should be provided between the sheets. All joints should be staggered and taped over before placing underlay, Dimond® Roofing recommend the use of vented type underlay such as Tyvek metal or Covertek 403 with drainage mat. This allows added air-flow between the underside of the tray and substrate, it also helps to reduce oil-canning in the tray.

Fasteners that are used to secure Eurotray® down as a roof cladding must penetrate through the substrate and into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the main frame by 30mm for timber and 6mm for steel.

Clip Fixing Requirement - 1 fixing per clip per purlin								
Purlin or frame material	Roof (standard 12mm Substrate)				Wall (over vented cavity batten, 18 - 25mm thick)			
	Base material				Base material			
	Steel	Aluminium	Copper	Zinc	Steel	Aluminium	Copper	Zinc
Timber	Type 17 class 4 12 x 50mm timbertite	Type 17 class 4 12 x 50mm timbertite	N/A	N/A	Type 17 class 4 12 x 65mm timbertite	Type 17 class 4 12 x 65mm timbertite	N/A	N/A
Steel	Class 4 12 x 45mm steeltite	Class 4 12 x 45mm steeltite	N/A	N/A	Class 4 12 x 45mm steeltite	Class 4 12 x 45mm steeltite	N/A	N/A

Design

Fasteners must be fixed closer together on the periphery edges of all roofs in areas of High to Extra High Wind Zones.

Unlike profiled metal cladding, the point load imposed on a fully supported cladding is supported by the substrate underneath.

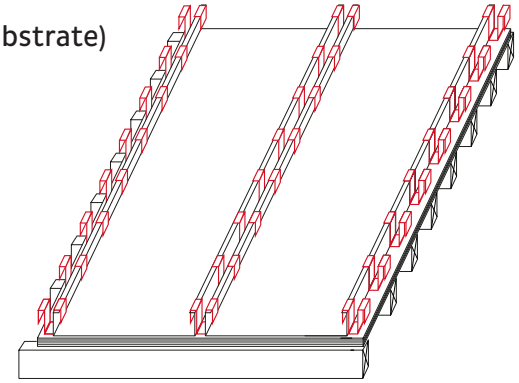
Clip fixing table	
Wind Zone	Purlin Centre (mm)
Low to High	600
Very High to Extra High	400

Minimum pitch for Eurotray® Roll Cap is 5 degrees.

NOTE
Flashing and jointing details when using Copper or Zinc materials are required to be solder, silicone sealants are not to be used on these materials.

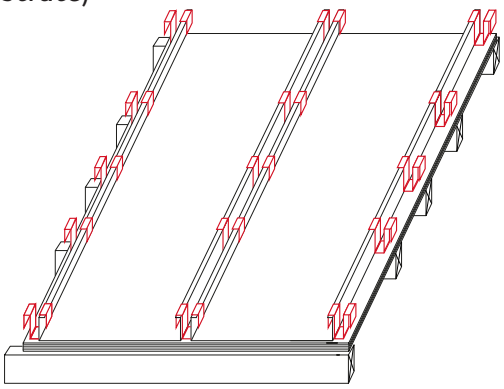
Eurotray® Roll Cap (over substrate)

400mm purlin centres
Very high/Extra High Wind Zones

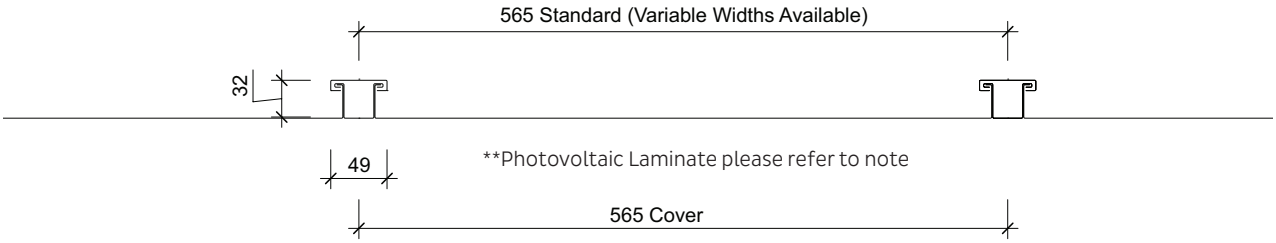


Eurotray® Roll Cap (over substrate)

600mm purlin centres
Low - High Wind Zones



DIMOND EUROTRAY® ROLL SEAM PROFILE INFORMATION



Roll-forming facility	AKL	CHC	INV
Cover (mm)	575	565	579
Sheet width (mm)	540	530	544
Minimum Pitch	5° (approx. 1:11)		

Note for Copper and Zinc reduce widths by 10mm

Sheet Tolerances

Sheet width: ±5mm
Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

Material Options	Steel	Aluminium	*Copper	*Zinc
Thickness (BMT) mm	0.55	0.90	0.70	0.70
Nominal weight/lineal metre (kg/m)	2.77	1.48	3.84	3.06
Drape curved roof - min. radius (m)	40	70	40	40
Substrate required	Yes	Yes	Yes	Yes
Vented Underlay Required (e.g. Tyvek Metal)	Yes	Yes	Yes	Yes
Machine curved - roof min. radius (mm)	2500	600	600	600
Drip edge flashing required see detail R-005-02	Yes	Yes	Yes	Yes

*Please contact your Dimond® Roofing 0800 Dimond (0800 346 663) for availability.

Roll-forming facilities at: Auckland, Christchurch and Invercargill

Curving facilities: Machine is transportable
For curving restraints check with the local RoofingSmiths.

Sheet lengths: Eurotray® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences
- Should be run on-site
- Site access for special lifting equipment
- Fixing techniques to accommodate thermal expansion

This roofing system is to be installed by RoofingSmiths.

**NOTE
Photovoltaic laminates (PVL's) can be installed on to this profile at an additional cost when the cladding is completed and other trade have finished or it can be installed at a later date.
Laminates are 348mm wide and available in 5.910mm and 2.585mm lengths. Lead time of 16 weeks
Laminates cannot be installed on raking sections of roofs
Consult with Dimond® Roofing 0800 Dimond (0800 346 663) for further information

Can be installed as a vertical wall cladding only with a substrate over vented cavity battens.

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For fully supported standing seam tray profiles, oil canning can be reduced by the vented roof underlay (e.g. Tyvek Metal), in addition backer rods under the tray can also be used. There are several options to reduce the oil canning effect in tray type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

Dimond Roofing

Eurotray® Roll Seam Design

Eurotray® Roll Seam roof cladding must always be installed over a plywood (12mm minimum) substrate with a moisture content of less than 18% and made wind tight, with purlin supports underneath at 600mm centres in low to high wind zones and 400mm centres for very high and extra high wind zones. 8g x 40mm countersunk stainless steel screws at 150mm centres around the panel edged and 200mm centres on the intermediate supports. The fasteners should be no closer than 10mm to the edge.

A 3mm expansion gap should be provided between the sheets. All joints should be staggered and taped over before placing underlay, Dimond® Roofing recommend the use of vented type underlay. This allows added air-flow between the underside of the tray and substrate, it also helps to reduce oil-canning in the tray.

Fasteners that are used to secure Eurotray® down as a roof cladding must penetrate through the substrate and into the purlin a minimum of 30mm for timber and 6mm for steel purlins. For wall cladding the fasteners must be long enough to pass through the substrate, cavity batten and into the main frame by 30mm for timber and 6mm for steel.

Clip Fixing Requirement - 2 fixings per clip per purlin								
Purlin or frame material	Roof (standard 12mm Substrate)				Wall (over vented cavity batten, 18 - 25mm thick)			
	Base material				Base material			
	Steel	Aluminium	Copper	Zinc	Steel	Aluminium	Copper	Zinc
Timber	Type 17 class 4 12 x 50mm timbertite	Type 17 class 4 12 x 50mm timbertite	Type 17 Stainless steel grade 304 12 x 50mm	Type 17 class 4 12 x 50mm timbertite	Type 17 class 4 12 x 65mm timbertite	Type 17 class 4 12 x 65mm timbertite	Stainless steel grade 304 class 4 12 x 65mm timbertite	Type 17 class 4 12 x 65mm timbertite
Steel	Class 4 12 x 25mm steeltite	Class 4 12 x 25mm steeltite	Class 4 12 x 25mm steeltite	Class 4 12 x 25mm steeltite	Class 4 12 x 45mm steeltite	Class 4 12 x 45mm steeltite	Stainless steel grade 304 class 4 12 x 45mm steeltite	Class 4 12 x 45mm steeltite

Design

Fasteners must be fixed closer together on the periphery edges of all roofs in areas of High to Extra High Wind Zones.

Unlike profiled metal cladding, the point load imposed on a fully supported cladding is supported by the substrate underneath.

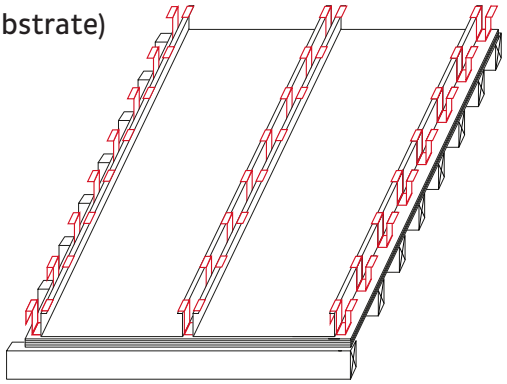
Clip fixing table	
Wind Zone	Purlin Centre (mm)
Low to High	600
Very High to Extra High	400

Minimum pitch for Eurotray® Double Standing Seam is 5 degrees.

NOTE
Flashing and jointing details when using Copper or Zinc materials are required to be solder, silicone sealants are not to be used on these materials.

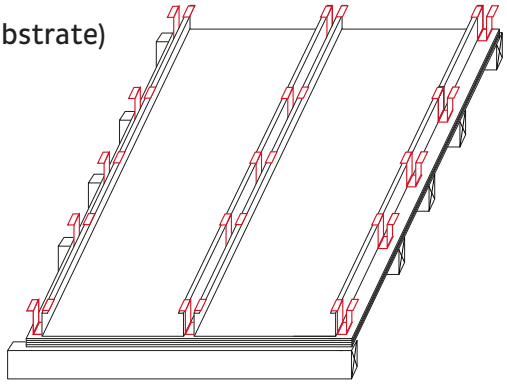
Eurotray® Roll Seam (over substrate)

400mm purlin centres
Very high/Extra High Wind Zones



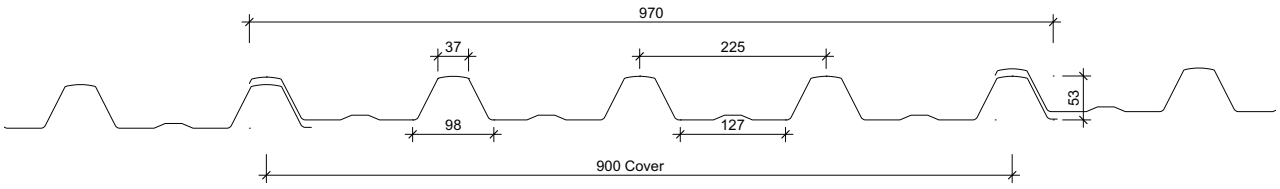
Eurotray® Roll Seam (over substrate)

600mm purlin centres
Low - High Wind Zones



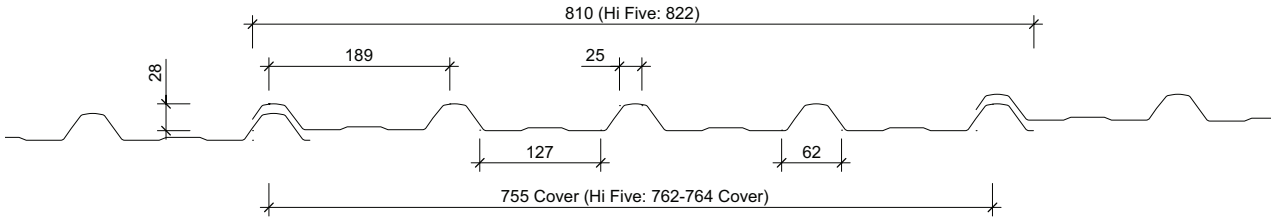
DIMOND AUDIOPERF® PROFILE INFORMATION

Steel Span & Top Span



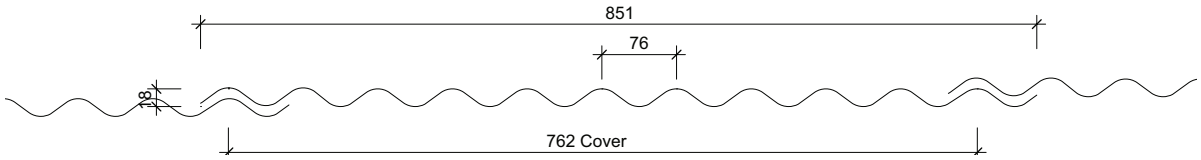
Cover (mm)	900
Sheet width (mm)	970

Hi Five, Styleline, Veedek®



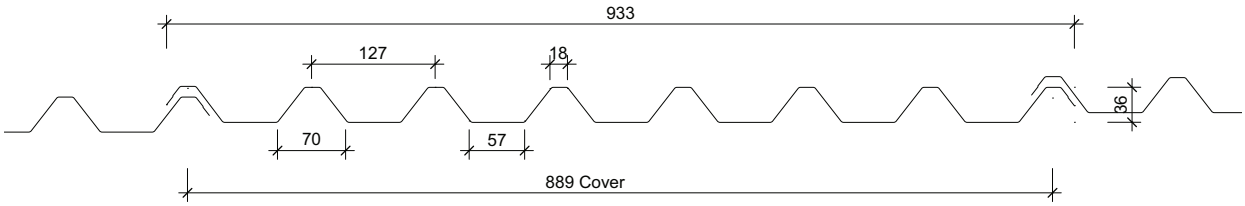
Cover (mm)	755
Sheet width (mm)	810

Image of Corrugate



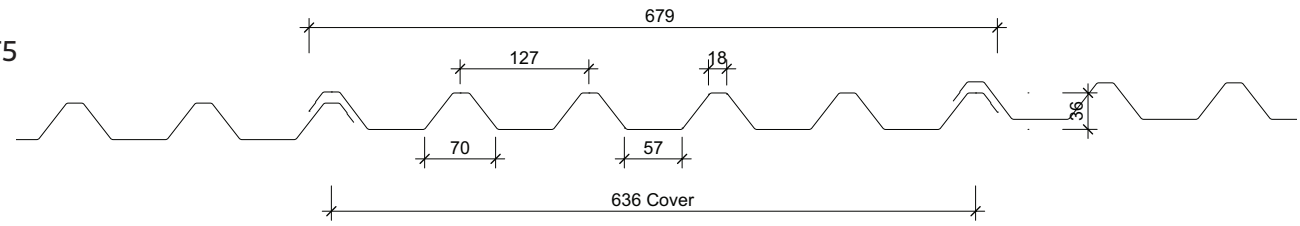
Cover (mm)	762
Sheet width (mm)	851

LT7®



Cover (mm)	762
Sheet width (mm)	851

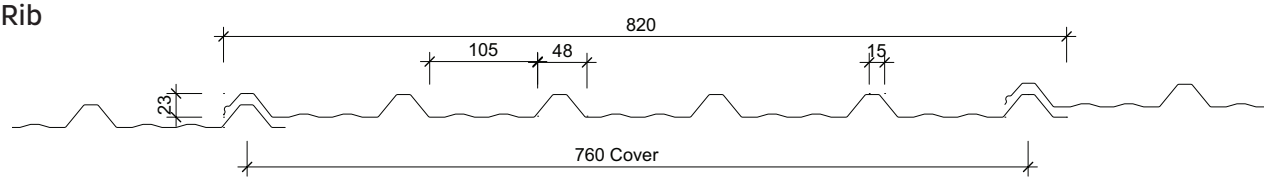
LT5



Cover (mm)	635
Sheet width (mm)	725

Dimond Roofing

Six Rib



Cover (mm)	760
Sheet width (mm)	851

Sheet Tolerances

Sheet width: ±5mm

Sheet width for aluminium +0, -15mm. If sheet cover widths are critical, advise Dimond® Roofing at time of order.
Sheet length: +10, - 0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3, -0.

	AudioPerf® Specifications Maximum allowable spans for direct fixed ceiling applications (mm)					
Material Options	Corrugate	6 Rib	Hi Five	V-Rib	LT7® & 5	Steel/Top Span
**0.55mm (G300)	1.3	1.35	1.5	1.6	1.6	1.7
0.70mm Aluminium	1.3	1.35	1.5	1.6	1.6	1.7
0.90mm Aluminium	1.5	1.65	1.7	1.8	1.8	2.0

**Indicates AZ150 Coated Steel, Pre-painted material and for internal (dry location) use.

Roll-forming facilities at: Auckland, Hamilton, Wellington, Christchurch and Invercargill (LT5 is Wellington and Invercargill)

Curving facility at: Contact Dimond® Roofing.

Sheet lengths: AudioPerf® is custom run to order. Where long sheets are used, consideration must be given to:

- Special transportation licences for sheet lengths over 16m
- Site access for special lifting equipment

AudioPerf®

AudioPerf® is a perforated ceiling system for commercial applications and is manufactured from perforated metal of aluminium and roll-formed into a wide range of profiles.

Developed for large and medium scale building applications, and particularly large span ceiling applications. AudioPerf® gives strong clean lines and bold symmetry with modern forms it is used to create dynamic shadows and can be integrated with bespoke flashings to create negative details and installation points for sprinklers, light units etc.

Profiles

AudioPerf® is available in the following profiles:

- Steel Span or Top Span
- LT7® & LT5
- V-Rib
- High Five
- Six Rib
- Corrugate

Material Thicknesses

- 0.55mm AZ150 Coated Steel
- 0.55mm MagnaFlow™
- 0.70mm AlumiGard™
- 0.90mm AlumiGard™

As the product is intended primarily as an internal ceiling material other uses should be considered carefully on an individual basis in consultation with Dimond® Roofing, typical examples are:

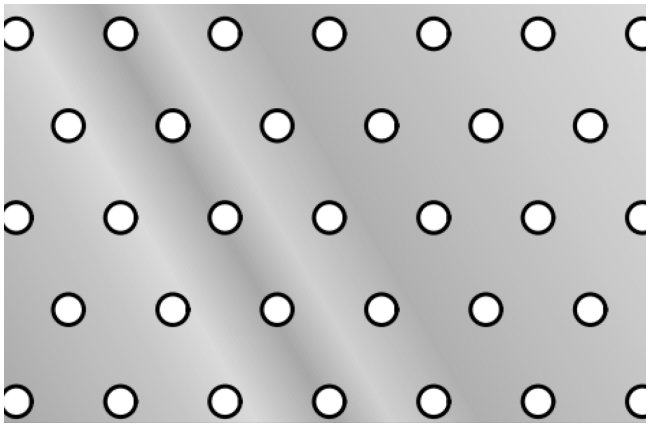
- External use such as veranda ceiling, decorative panels or back lit applications as wall cladding
- Curved or Bull-nose applications
- Internal wall cladding or areas exposed to physical contact or vandalism

Perforations

Perforations are available in three hole sizes and array pitches giving 7% to 33% open areas. Examples are shown below:

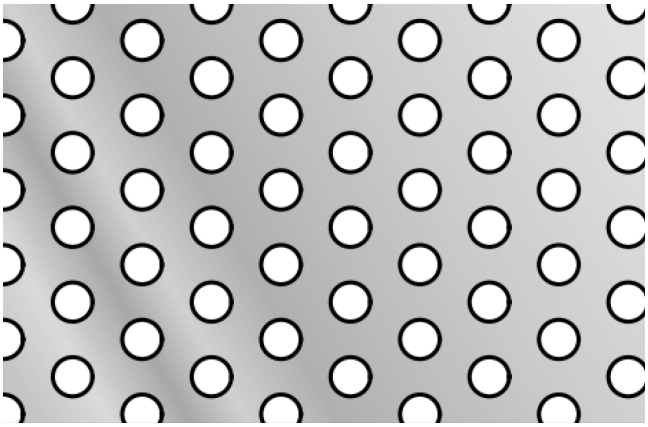
Note: For acoustic performance, P143C is recommended.

P119C



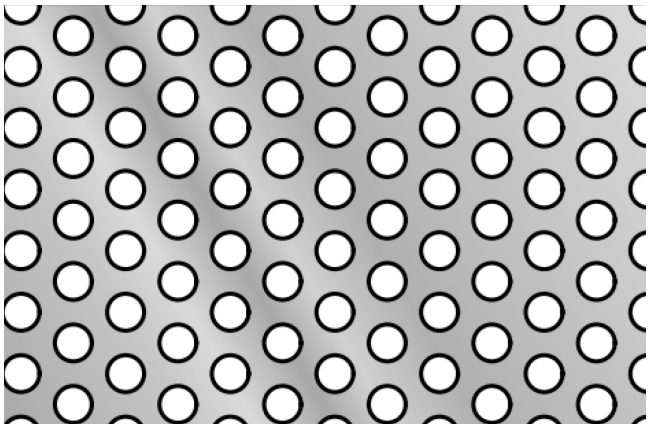
2.5mm perforation diameter at 8.62mm centres - 7.6% open area

P143C



3.2mm perforation diameter at 6.38mm centres - 22.8% open area

P129C



3.0mm perforation diameter at 5.0mm centres - 32.6% open area

Note: It is important to use the full code number when specifying the perforation.

Span Data

The table on the front page cover, the installation onto metal battens using the material thickness, condition and perforation pattern specified. Note the span data assumes self-weight only and penetrations, inserts of other items should have loads reacted directly against structural members rather than imposed via the AudioPerf®. For small items (less than 3kg) where no more than 2 items exist on the same sheet these should be located near to battens (to avoid sag) and battens spans should be reduced by 20%.

Curved Ceilings

Sheets may be rolled over their width or sprung curved/ machine curved over their length, for corrugated profile the following should be maintained:

Width Curved	1 metre radius
Sprung curved	10 metre radius
Machine curved	450mm radius

Acoustic Performance

Testing of the ceiling system is to ASTM C423 and ASTM E1414. Independent laboratory testing of insulation materials can give an NRC value of up to 1.0; Testing of a typical complete system has shown the following NRC values:

- P143C corrugate direct fixed with 25mm insulation = NRC 0.55
- P143C corrugate direct fixed with 50mm insulation = NRC 0.70
- P143C corrugate direct fixed with 75mm insulation = NRC 0.70
  (NRC = Noise Reduction Coefficient)

Fire Performance

The system when installed on metal purlins or battens complies with the New Zealand Building Code C/AS1 and has been specifically tested to AS1530.3 and meets the following:

Ignitability Index (Range 0-20)	0
Spread of Flame (Range 0-10)	0
Heat Evolved Index (Range 0-10)	0
Smoke Developed Index (Range 0-10)	3

Durability

All materials selected and supplied by Dimond® Roofing are warranted for internal use only, to exceed the requirements of clause B.2.3 (1) of the first schedule to the Building Regulations 1992 for 15 years durability, providing the materials selected are suited to the environment and designed, detailed, and fixed and maintained in compliance with Dimond® Roofing instructions, the Roofing Code of Practice and good trade practice.

Lengths

AudioPerf® is made to custom long run lengths. Where these exceed 16 metres, they may require special transport and handling facilities. For lengths over 24m, special Land Transport Safety Authority permission should be sought at design stage.

Flashings

Standard flashings are available for each profile. Attention is drawn to use of matching flashing material in contact with the AudioPerf®. In addition, curved flashings are available to suit curved or sprung ceilings.

Fixing

Fasteners for internal use shall be 12g x 20mm steel or 12g x 25mm timbertite and be pan fixed.

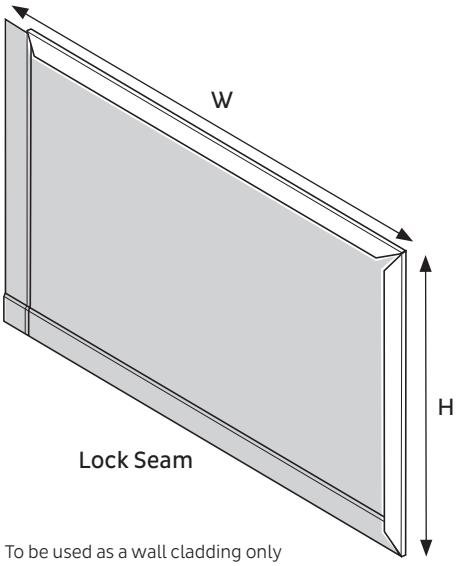
Maintenance

No specific maintenance is required for internal use than an annual removal of dust with a mild detergent.

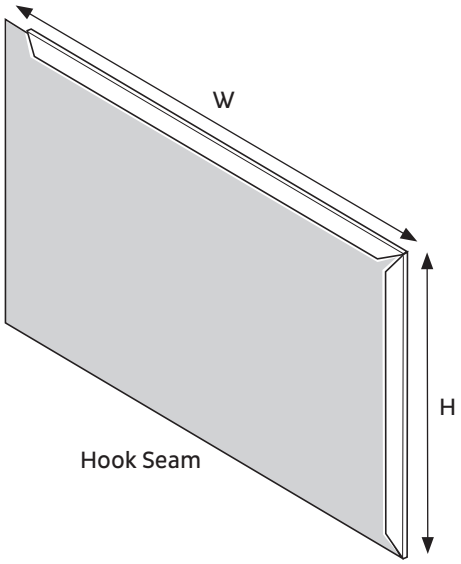
Avoid the product being prolonged contact with debris that could hold moisture
Regularly hose down and clean any areas showing accumulation of dirt salt other contaminants. Always use a non-abrasive brush. For moderate environments this should be carried out at least annually.
Avoid contact with, or discharge from dissimilar metals.

Failure to observe these guidelines may result in voiding the warranty and affect the durability of the product.

DIMOND EUROPANEL® PROFILE INFORMATION



To be used as a wall cladding only



Panel Tolerances

Cover (mm) H = 600 x W = 1125
Panel length ±5mm
Panel Height ±5mm

Dimensions given are nominal

Material Options	Copper	Zinc
Thickness (BMT) mm	0.7	0.7
Nominal weight/lineal metre (kg/m)	6.78	3.02
Substrate Required (in red column)	Yes	Yes
Vented Underlay Required (e.g. Tyvek Metal)	Yes	Yes

EuroPanel® Fastener Designation

Over cavity batten, with a 12mm plywood substrate (18-25mm thick)		
Framing material	Copper	Zinc
Timber	Type 17 Stainless steel grade 304 8g x 20mm c/sunk or 2.5mm x 25mm grade 304 stainless steel annular grooved nails	Type 17 Stainless steel grade 304 8g x 20mm c/sunk or 2.5mm x 25mm grade 304 stainless steel annular grooved nails
Fixing Clips	The maximum clip fixing centre is 500mm, with clip spacing's from the corners no greater than 65mm	
Lock Seam Width	Standard seam width is 30mm, but can be made to 40mm	

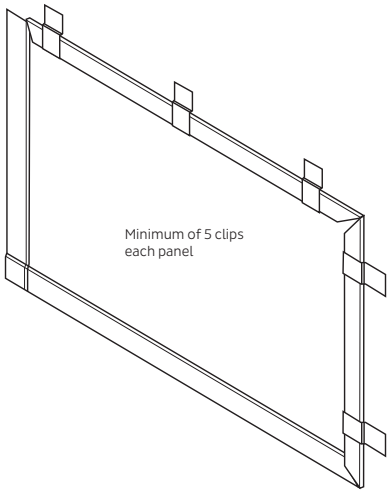
This wall cladding system is to be installed by RoofingSmiths.

OIL CANNING: Oil Canning is the visible waviness in the flat areas of metal roofing and walling. Oil canning produces an aesthetic effect inherent in standing seam tray profiles and profiles/flashings with wide flat elements. It does not cause detriment to product performance.

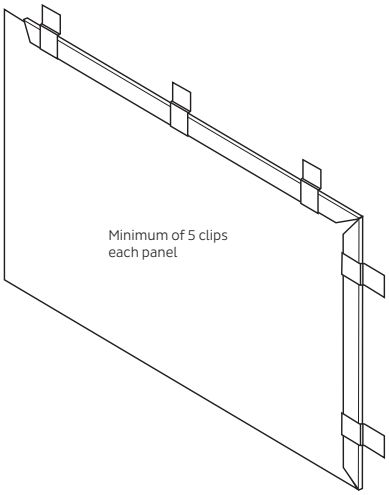
Oil canning can occur during the forming and installation processes and during thermal expansion of the roof sheeting during its life cycle. The effect can be more or less pronounced depending on **differing light and sun angle conditions and the coating gloss levels.**

For EuroPanel, oil canning can be reduced by the vented underlay (e.g. Tyvek Metal), in addition backer rods under the panel can also be used. There are several options to reduce the oil canning effect in panel type profiles and flashings, for example, a) increasing the thickness of the material, b) using stiffening swages in wide flat elements and c) limiting flat elements to less than 150mm width. For further information, please refer to the New Zealand Metal Roof and Wall Cladding Code of Practice, Section 12.3.

EuroPanel® Lock Seam (swages around two edges)



EuroPanel® Hook Seam



EUROPANEL® LIMIT STATE LOAD/SPAN CAPACITY CHART

(span in mm, distributed ultimate load in kPa)

Serviceability Category Wall

	Fixings per Panel	Fixings per Clip	Ultimate (kPa)
Zinc 0.70mm	5	2	2.65
Copper 0.70mm	5	2	4.15

NOTES

1. Loads given are limited to a maximum of 4.15kPa. If design requirements exceed this limit, Contact Dimond® Roofing for specific advice.
2. **Design Criteria for Limit State Capacities**
   a) **Ultimate Limited State**
   No pull through of fixings or fasteners withdrawal resulting in sheet detachment due to wind up-lift (outward) loads
3. **Wind Pressure Guide**
   As a guide for non-specific design the following S.L.S. design loads in accordance with the MRM Roofing Code of Practice can be used for buildings less than 10m high, otherwise AS/NZS 1170.2 should be used

   Low wind zone = 0.68kPa, Medium wind zone = 0.93kPa, High wind zone = 1.32kPa, Very high wind zone = 1.72kPa and Extra high wind zone = 2.09kPa.

EuroPanel® Design

EuroPanel® wall cladding must always be installed over a plywood (12mm minimum) substrate with a moisture content of less than 18% and made wind tight, with purlin supports underneath at 600mm centres in low to high wind zones and 400mm centres for very high and extra high wind zones. Avoid contact between Zinc and Bitumous papers. Use covertek 403.

8g x 40mm countersunk stainless steel screws at 150mm centres around the panel edged and 200mm centres on the intermediate supports. The fasteners should be no closer than 10mm to the edge.

A 3mm expansion gap should be provided between the sheets. All joints should be staggered and taped over before placing underlay.

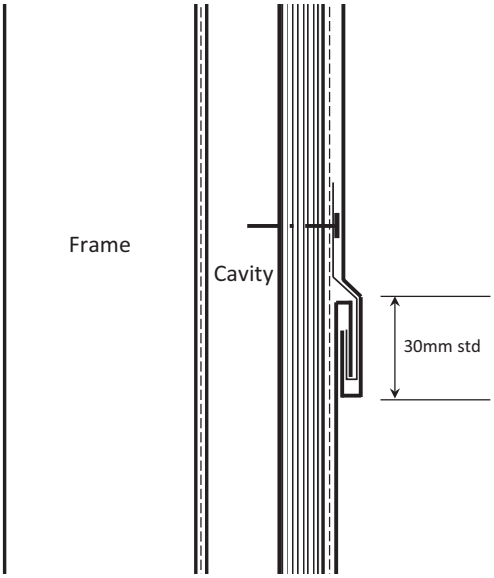
EuroPanel® can have varying length panels up to 1125mm for Lock seam but can be longer for Hook Seam panels please contact the local Dimond® Roofing branch for further information.

EuroPanel® can be laid in pattern or randomly depending on the required finish. Most often the panel will be installed in a brick-block pattern.

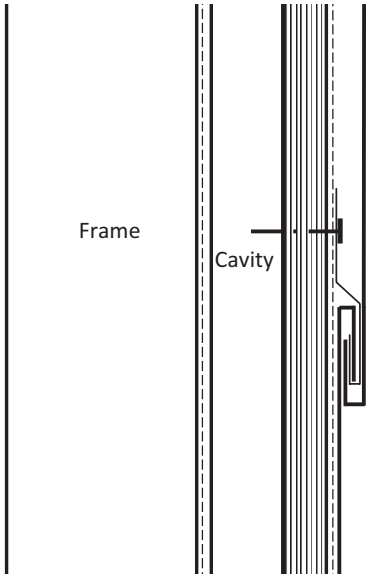
The height of the panel must remain the same for each row or course. Concealed 'stainless steel' or copper clips connect the EuroPanel® to the substrate, and the seam width of the Lock Seam panel can be adjusted if required.

Types of Panel

EuroPanel® Lock Seam



EuroPanel® Hook Seam

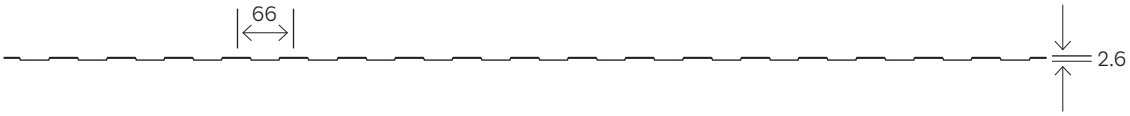


Production facility at: Invercargill

NOTES

Coated steel based materials are not recommended for these profiles, due to the high likelihood of scratching, which could lead to corrosive issues at a later date. Flashing and jointing details when using Copper or Zinc materials are required to be solder, silicone sealants are not to be used on these materials.

DIMOND FINELINE PROFILE PERFORMANCE



Cover (mm)	885	1147
Sheet width (mm)	940	1200
Minimum Pitch	Wall cladding only	

All dimensions given are nominal

Sheet Tolerances

Sheet width: ±5mm

Sheet length: +10mm, –0mm. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options	Steel	Aluminium
Thickness (BMT) mm	0.55	0.9
Nominal weight/lineal metre (kg/m)	4.27	2.28
Unsupported overhang (mm)	nil	nil

Roll-forming facility at: Auckland

Sheet lengths: Fineline is custom run to order in sheet lengths up to 6 metres long.

FINELINE – DETAILED CLADDING DESIGN

Design Criteria for Limit State Capacities.

a) Serviceability Limit State

No deflection or permanent distortion that would cause unacceptable appearance or side lap leakage due to inward or outward wind loads.

b) Ultimate Limit State

No pull through of fixings or fastener withdrawal resulting in sheet detachment due to wind up-lift (outward) loads.

System Design

The span capacity of Fineline is determined by the serviceability requirement for acceptable appearance and should not exceed 300mm.

The ultimate windload should not exceed 3 kPa.

The Fineline profiles are not intended for use as roofing products, and must not be used in situations where foot traffic point loads can be applied.

Fastener Design

Fineline should be screw fixed to either timber or steel framing, or may be nail fixed to timber if not used in an exterior situation exposed to the weather. The use of the appropriate length of 12g screw will ensure failure by fastener pull out will not occur under the load limitation given.

Framing	Fastener Length (mm)	
	Wall Cladding Pan	
	Screw Length* (mm)	Designation
Timber	50	Roofzip M6 x 50mm
Steel	20	Tek - 12 - 14 x 20

*If sarking or insulation is used over the framing, screw length will need to be increased.

For screw size range and fastener / washer assembly refer Section 2.2.3.1.

The Span Capability and Sheet Appearance is based on fasteners at 200mm maximum spacing across the sheet without the use of load spreading washers.

ColorCote® ZinaCore™ (formerly ZR8)

Conforms to AS/NZS 2728:2013 Product type 4 (Table 1.1).
Suitable for ISO 9223 Atmosphere Classifications C1-C3

Description

A high durability product with improved cut edge performance designed to give excellent colour retention and high formability at moderate cost.

Substrate

Hot dipped Aluminium/Zinc/alloy coated steel coil ZA150 coat weight. Manufactured to AS 1397:2011. Steel grade either G550 or G300.

Pretreatment

Corrosion resistant chromate conversion coating.

Primer

Flexible corrosion resistant chromated primer.

Finish Coat

Flexible exterior acrylic, polyester. Film thickness Nominal 18 microns.

Note: the finish coat can be applied to one or both sides of the sheet in the same or different colours. Colours outside the standard range may be available depending on colour and quantity.

Backing Coat

Shadow Grey (standard colour) wash coat 5 microns thickness.

Gloss

Typical gloss levels are 25%, measured in accordance with ASTM D523-89 (60 degrees). The Naturals colour range (G10) uses a lower gloss level of a nominal 10% which is available in the ZinaCore™ range.

Strippable Film

Products can be supplied with an optional strippable protective film at extra cost. This material has a relatively short life span under exterior exposure conditions. It should be removed as soon as possible within 48 hours of outdoor exposure.

Expected Performance

Outdoor Durability: ColorCote® ZinaCore™, under well washed conditions of exposure, is expected to show no cracking (other than that which may occur during forming), flaking or peeling of the paint film for 15 years from date of installation.

Colour change during service will depend on the colour chosen, aspect, design of the structure and the environment. Maximum colour change levels of ColorCote® ZinaCore™ colours in normal environments after 10 years service are given in warranty documentation. Colour change is measured using an instrumental colour spectrophotometer, according to ASTM D-2244-93, and determined on clean surfaces, free of all dirt, chalk, oxidised film, oil, grease and other foreign contaminants.

Some chalking may occur. A maximum rating of 2 is expected after 10 years exposure, when measured in accordance with AS/NZS 1580.481.1.11:1998. Scale is between 0 and 5 with a lower number indicating less chalking.

Handling and Roll-Forming

To avoid damaging the paint surface the material must be handled carefully during transport and roll-forming. Pacific Coilcoaters does not recommend the use of roll-forming lubricants on ColorCote® products, as they will affect performance of pre-painted steel and will lead to staining and uneven premature fading.

Typical Properties

- Mar Resistance: Good
- Scratch Resistance: Good
- Impact Resistance: (AS/NZS 2728 Appendix E) – Greater than 10 Joules
- Pencil Hardness: (AS/NZS 1580.405.1) – F minimum
- Bend Test: (AS/NZS 2728 Appendix F) – No loss of paint adhesion when bent around a diameter equal to five times the thickness of the sheet.
- Heat Resistance: Suitable for continuous service up to 100°C. Continuous service at higher temperatures may cause some colour change of the paint film.

Index	Rating	Range
Ignitability Index	0	0-20
Spread of Flame Index	0	0-10
Heat Evolved Index	0	0-10
Smoke Developed Index	0-2	0-10

Accelerated Corrosion Tests

(Tests are conducted on a flat panel.)

Salt Spray

Meets the requirements of AS/NZS 2728:2013 Sections 2.8 and 2.10

Humidity Resistance

Meets the requirements of AS/NZS 2728:2013 Sections 2.8 and table 2.9

QUV Resistance

Meets the requirements of AS/NZS 2728:2013 Sections 2.8 and table 2.4

Chemical Resistance

ZinaCore™ has good resistance to accidental spillage of solvents such as methylated spirits, mineral turpentine, toluene, trichloroethylene and dilute acids and alkalis. All spillages should be removed immediately by wiping or washing.

Recommended End Uses

Exterior uses where there is a high risk of accelerated corrosion. It has very good colour and gloss retention and is suitable for roofing, cladding, rainwater goods and garage doors. For information concerning product use in areas not covered by ColorCote® ZinaCore™ refer to the ColorCote® ZinaCore™ X and / or AlumiGard™ X technical brochures or contact Pacific Coilcoaters for details. ZinaCore™ is not suitable for use as watertanks or areas where a constantly wet environment is maintained or in constantly running water or in contact with soil.

Site Practice

If nestable profiles become wet while closely stacked, formation of wet storage stain or 'white rust' is inevitable. To minimise the possibility of inadvertent contamination:

a) Inspect deliveries on arrival. If moisture is present, individual sheets should be dried immediately with a clean rag and then stacked to allow air to circulate and complete the drying process.

b) Well ventilated storage is essential. Always store metal products under cover in clean, well-ventilated buildings.

c) Cross-stack or fillet sheets where outside storage is unavoidable and make provision for a fall to allow water to run off.

It is the responsibility of the roofing contractor to avoid damaging the roof sheeting during its installation and fixing. Never drag sheets from a pile. Remove by 'turning' off the stack. Lift sheets onto a roof, and do not drag over the eaves or purlins. Use clean footwear, remove swarf and other contaminants regularly. For further information refer to the MRM Code of Practice.

Touch Up Paint

ColorCote® is a baked on paint system which has different weathering characteristics to standard air drying paints. Do not use touch up paint on ColorCote® products. Minor scratches should be left alone.

Clean Up

Installation procedures involving self-drilling screws, drills and hacksaws etc. will leave deposits of swarf and metal particles. These particles including blind rivet shanks, nails and screws should be swept and washed from the roof at the end of each day.

Dissimilar Materials

When dissimilar metals come into contact with each other, the electric potential difference between the metals establishes a corrosion cell and accelerated corrosion can occur. To avoid this problem the following precautions should be observed:

- Avoid discharges of water from brass or copper pipes onto ColorCote® ZinaCore™.
- Do not use non-galvanised steel, copper, stainless steel or Monel metal in direct contact with ColorCote® ZinaCore™.
- Do not use lead flashings in contact with ColorCote® ZinaCore™ products. Soft edge aluminium, or notching of flashings, are the best solutions.
- Do not use tanalised timber in direct contact with ColorCote® ZinaCore™ products. Use PVC tape or similar barrier to isolate potential problem points of contact between materials.

ColorCote® ZinaCore™ products are not suitable for use in the following situations:

- Animal shelters, where excessive ammonia fumes can accumulate due to inadequate venting, or where direct contact with animal effluent can occur.
- Water tanks or areas where a constantly wet environment is maintained.
- In direct contact with concrete, or where lime deposits are evident.
- In contact with soil. (Allow 75mm run off below cladding sheets to ground level.)

Fastenings

Match corrosion resistance of the fastenings with the service life of the chosen ColorCote® ZinaCore™ product. Class 4 coated screws will give best service life with ColorCote® ZinaCore™.

Do not use stainless or Monel fasteners on ColorCote® ZinaCore™ products. Aluminium rivets should be used for best results. For further details refer to the MRM Code of Practice.

Sealing and Jointing

Where sealed joints are required, use only neutral cure silicon rubber sealant, together with mechanical fasteners, such as aluminium rivets. Do not solder or weld ColorCote® products.

Unwashed Areas

These are typically those areas that are not washed by natural rainfall, such as the underside of unsarked overhanging roofing and recessed doorways in commercial cladding, tops of garage doors etc. These areas are excluded from warranty. Pacific Coilcoaters recommends the exclusion of unwashed areas by design wherever possible. In cases where this is not possible, then a regular washing programme should be put in place. Airborne contaminants should be removed by water blasting or mechanical washing with water and a soft nylon brush for best results at least every 6 months, or more frequently in severe environments.

Roof Pitch

Do not use a pitch less than 3º to avoid ponding and premature degradation of the coating system.

ColorCote® ZinaCore™ X (formerly ZRX)

Suitable for ISO 9223 Atmosphere Classiciation C1-C4 as per AS/NZS 2728:2013.

Description

A high durability product with improved cut edge performance designed to give excellent colour retention and high formability at moderate cost.

Substrate

Hot dipped Aluminium / Zinc steel coil AZ150 coating weight. Manufactured to AS 1397:2011 steel grade either G550 or G300.

Pretreatment

Corrosion resistant chromate conversion coating.

Primer

Highly corrosion resistant high build primer both sides. Nominal film thickness 15µm ± 2µm on the topside and 10µm ± 2µm on the reverse.

Finish Coat

70% PVF_2 system. Nominal film thickness 20µm ± 2µm.

Note: the finish coat can be applied to one or both sides of the sheet in the same or different colours. Colours outside the standard range may be available depending on colour and quantity.

Backing Coat

Shadow Grey (standard colour) wash coat 5 microns thickness.

Gloss

Typical gloss levels are 25%, measured in accordance with ASTM D523-89 (60 degrees). Non standard gloss levels may be available on application.

Strippable Film

Products can be supplied with an optional strippable protective film at extra cost. This material has a relatively short life span under exterior exposure conditions. It should be removed as soon as possible within 48 hours of outdoor exposure.

Expected Performance

Outdoor Durability: ColorCote® ZinaCore™ X, under normal well washed conditions of exposure, is expected to show no cracking (other than that which may occur during forming), flaking or peeling of the paint film for 15 years from date of installation.

Colour change during service will depend on the colour chosen, aspect, design of the structure and the environment. Maximum expected colour change levels of ColorCote® ZinaCore™ X colours in moderate environments after 15 and 20 years of service are given in warranty documentation. Colour change is measured using an instrumental colour spectrophotometer, according to ASTM D-2244-93, and determined on clean surfaces, free of all dirt, chalk, oxidised film, oil, grease and other foreign contaminants.

Some chalking may occur. A maximum rating of 2 is expected after 20 years exposure, when measured in accordance with AS/NZS 1580.481.1.11:1998. Scale is between 0 and 5 with a lower number indicating less chalking.

Handling and Forming

To avoid damaging the paint surface the material must be handled carefully during transport and roll-forming. Pacific Coilcoaters does not recommend the use of roll-forming lubricants on ColorCote® products, as they will affect performance of pre-painted steel and will lead to staining and uneven premature fading.

Typical Properties

- Mar Resistance: Fair
- Scratch Resistance: Fair
- Impact Resistance: (AS/NZS 2728 Appendix E) – Greater than 10 Joules
- Pencil Hardness: (AS/NZS 1580.405.1) – F minimum
- Bend Test: (AS/NZS 2728 section 2.6 and Appendix F) – No loss of adhesion or paint cracking when bent around a diameter equal to five times the thickness of the sheet.
- Heat Resistance: Suitable for continuous service up to 100°C. Continuous service at higher temperatures may cause some colour change of the paint film.

Index	Rating	Range
Ignitability Index	0	0-20
Spread of Flame Index	0	0-10
Heat Evolved Index	0	0-10
Smoke Developed Index	0-2	0-10

Accelerated Corrosion Tests

(Tests are conducted on a flat panel.)

Salt Spray

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and 2.10

Humidity Resistance

Meets the requirements of AS/NZS 2728:2007 sections 2.8 and table 2.9

QUV Resistance

Meets the requirements of AS/NZS 2728:2007 sections 2.8 and table 2.4

Chemical Resistance

Good resistance to accidental spillage of solvents such as methylated spirits, white spirits, mineral turpentines, toluene, trichlorethylene and dilute acids and alkalis. All spillages should be immediately removed by wiping or washing.

Recommended End Uses

Exterior uses where high formability, such as crimp curving after roll forming, excellent colour and gloss retention is required. It is suited to environments such as severe marine, geothermal and industrial sites where there is a high risk of corrosion due to corrosive elements in the atmosphere.

For information concerning product use in areas not covered by ColorCote® ZinaCore™ X refer to the ColorCote® MagnaFlow™ X AlumiGard™ X technical information brochure or contact Pacific Coilcoaters for details.

Site Practice

If nestable profiles become wet while closely stacked, formation of wet storage stain or 'white rust' is inevitable.

To minimise the possibility of inadvertent contamination:

a) Inspect deliveries on arrival. If moisture is present, individual sheets should be dried immediately with a clean rag and then stacked to allow air to circulate and complete the drying process.

b) Well ventilated storage is essential. Always store metal products under cover in clean, well-ventilated buildings.

c) Cross-stack or fillet sheets where outside storage is unavoidable and make provision for a fall to allow water to run off.

It is the responsibility of the roofing contractor to avoid damaging the roof sheeting during its installation and fixing. For light gauges and large purlin spacings, never drag sheets from a pile. Remove by 'turning' off the stack. Lift sheets on to a roof, and do not drag over the eaves or purlins.

Touch Up Paint

ColorCote® is a baked on paint system which has different weathering characteristics to standard air drying paints. Do not use touch up paint on ColorCote® products. Minor scratches should be left alone.

Clean Up

Installation procedures involving self-drilling screws, drills and hacksaws etc. will leave deposits of swarf and metal particles. These particles including blind rivet shanks, nails and screws should be swept and washed from the roof at the end of each day.

Dissimilar Materials

When dissimilar metals come into contact with each other, accelerated corrosion can occur. To avoid this problem the following precautions should be observed:

- Avoid discharges of water from brass or copper pipes onto ColorCote® ZinaCore™ X.
- Do not use non-galvanised steel, copper, stainless steel or Monel metal in direct contact with ColorCote® ZinaCore™ X.
- Do not use lead flashings in contact with ColorCote® ZinaCore™ X products. Soft edge aluminium, or notching of flashings, are the best solutions.
- Do not use tanalised timber in direct contact with ColorCote® ZinaCore™ X products. Use PVC tape or similar barrier to isolate potential problem points of contact between materials.

ColorCote® ZinaCore™ X products are not suitable for use in the following situations:

- Animal shelters, where excessive ammonia fumes can accumulate due to inadequate venting, or where direct contact with animal effluent can occur.
- Water tanks or areas where a constantly wet environment is maintained.
- In direct contact with concrete, or where lime deposits are evident.
- In contact with soil. (Allow a 75mm run off below cladding sheets to ground level.)

Fastenings

Match corrosion resistance of the fastenings with the service life of the chosen ColorCote® product. Galvanised nails should not be used on ZinaCore™ X. Class 4 coated screws are the minimum for ZinaCore™ X roofing and cladding in severe environments.

Do not use stainless or Monel fasteners on ColorCote® ZinaCore™ X products. Aluminium rivets should be used for best results. For further details consult your fastening suppliers.

Sealing and Jointing

Where sealed joints are required, use only neutral cure silicon rubber sealant, together with mechanical fasteners, such as aluminium rivets. Do not solder or weld ColorCote® products.

Unwashed Areas

These are typically those areas that are not washed by natural rainfall, such as the underside of unsarked overhanging roofing and recessed doorways in commercial cladding, tops of garage doors etc. These areas are excluded from warranty. Pacific Coilcoaters recommends the exclusion of unwashed areas by design wherever possible.

In cases where this is not possible, then a regular washing programme should be put in place. Airborne contaminants should be removed by water blasting or mechanical washing with water and a soft nylon brush for best results at least every 6 months, or more frequently in severe environments.

Roof Pitch

Do not use a pitch less than 3°, to avoid ponding and premature degradation of the coating system.

ColorCote® AlumiGard™ X AND AlumiGard™ (formerly ARX and AR8)

A highly durable and corrosion resistant product, with high formability, designed for roofing and cladding in very severe marine applications. Suitable for ISO 9223 Atmospheric Classification 1-5. Conforms to AS/NZS 2728: 2013 Product 6 (Table 2.1).

Substrate

Aluminium alloy type 5052 Marine Grade for excellent corrosion resistance and very good formability (in soft temper). Alternatively, by specification, Aluminium Alloy type 5005, with lower tensile properties for customer projects requiring greater formability. Available typically in thickness 0.7 and 0.9mm. Common widths are 610mm, 940mm, 1220mm.

Alloy	Temper	Hardness	Ultimate Tensile Strength (MPa)		Yield (MPa)	Elongation % in 50mm	Ultimate Shear (MPa)	Bend Radii (mm)	
Mod/Elasticity 69000MPa			Minimum	Maximum	Minimum	Minimum		Internal	Typical Use
5005	H32	Quarter	115	160	85	5	97	1t	Lockseam
5005	H34	Half	135	180	105	4	97	1t	Folding
Mod/Elasticity 69000MPa									
5052	H32	Quarter	215	265	160	5	138	1t	Lockseam
5052	H34	Half	235	285	180	4	145	2t	Folding and Crimping
5052	H36	Three Quarter	255	305	200	3	159	2t	Rollforming
5052	H38	Fully Hard	270		220	3	165	3t	Rollforming

Note: typical stocking of 5052 alloy H36, allows both roll forming of trapezoidal and corrugates, and can also be used in the manufacture of flashings.

Composition of Alloys

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Other	AL
5005	0.30%	0.70%	0.20%	0.20%	0.5-1.1%	0.10%	0.25%	0.15%	Remainder
5052	0.25%	0.40%	0.10%	0.10%	2.2-2.8%	0.15-0.35%	0.10%	0.15%	Remainder

Note: higher chrome and magnesium levels increase tensile strength and corrosion resistance.

Bend Radii

Minimum recommended substrate bend radii for 90 degree cold bends at right angle to rolling direction, without substrate cracking, however T bends should be at least double this to avoid over stressing the paint coating.
Bend Test: No loss of adhesion of paint cracking when bent around a diameter equal to 5 times the thickness of the sheet.

ColorCote® AlumiGard™ X and AlumiGard™ Paint Coating Specifications

Nominal film thickness 25 microns.

Pretreatment

Corrosion resistant chromate conversion coating.

Primer

Highly corrosion resistant polyester primer on both sides.

Finish Coat

AlumiGard™ X: PVF_2 system. AlumiGard™: Acrylic or polyester system.

Backing Coat

Shadow Grey (standard colour) or Foam Grey on request for use with adhesives for laminating.

Finish Coat

- AlumiGard™ X: Nominal film thickness of 20 microns PVF_2 providing good resistance to chemical attack, and excellent colour retention.
- AlumiGard™: Nominal film thickness of 20 microns.
- AlumiGard™ is available in an extensive range of colours beyond the AlumiGard™ X colour range.

The finish coat can be applied to one or both sides of the sheet in the same or different colours. Colours outside the standard range may be available depending on colour and quantity.

Expected Performance

ColorCote® AlumiGard™ X and AlumiGard™ Aluminium is an excellent solution for roofing and cladding in Very Severe environments. It is ideal for open-ended soffits and canopies.

Should the paint deteriorate in a particular spot due to attack or mechanical damage, the surrounding product will not delaminate as a result of the film being broken as the paint film is a breathing membrane which can be overpainted later in the life of the building.

ColorCote® AlumiGard™ X and AlumiGard™ Aluminium is recyclable, should sheets be damaged or perforated at a later stage in the life of the building.

Outdoor Durability

ColorCote® AlumiGard™ X and AlumiGard™, under normal well washed conditions of exposure, can be expected to show no cracking (other than that which may occur during forming), flaking or peeling of the paint film in 15 years.

Handling and Roll-Forming

To avoid damaging the paint surface the material must be handled carefully during transport and roll-forming. Pacific Coilcoaters does not recommend the use of roll-forming lubricants on ColorCote® products.

Strippable Film

Products can be supplied with an optional strippable protective film at extra cost. Light colours must use strippable film to prevent marking during roll-forming. Strippable film should be removed just before or just after product installation or within 12 months of delivery from Pacific Coilcoaters.

Typical Properties

- Mar Resistance: Fair
- Scratch Resistance: Fair
- Impact Resistance: (AS/NZS 2728 Appendix E) – Greater than 10 Joules
- Pencil Hardness: (AS/NZS 1580.405.1) – F minimum
- Bend Test: (AS/NZS 2728 Appendix F) – No loss of adhesion or paint cracking when bent around a diameter equal to five times the thickness of the sheet.
- Heat Resistance: Suitable for continuous service up to 100°C. Continuous service at higher temperatures may cause some colour change of the paint film.

Index	Rating	Range
Ignitability Index	0	0-20
Spread of Flame Index	0	0-10
Heat Evolved Index	0	0-10
Smoke Developed Index	0-2	0-10

For exact specification consult your rollformer.

ColorCote® AlumiGard™ X generally performs well in

- Salt-laden environments
- Timber processing areas
- Milk treatment facilities
- Fish processing plants

Rainwater Collection

Rainwater collected from roofs clad with products made from ColorCote® AlumiGard™ X and AlumiGard™ prepainted aluminium will comply with the provisions of NZBC G12.3.1, provided the water is not contaminated from other sources. The first 25mm of rainfall from a newly installed roof must be discarded before drinking water collection starts.

Corrosion Resistance

In very aggressive environments, ColorCote® AlumiGard™ X and AlumiGard™ will give increased protection from atmospheric attack, as the paint surface then acts as further protection between the aluminium and the atmosphere. Care should be taken to avoid galvanic attack when pre-painted aluminium is used in conjunction with certain other materials. Flashings should be aluminium, and fastenings should be aluminium or austenitic stainless steel.

Steel:

- Where pre-painted aluminium is laid on steel purlins, the two surfaces must be isolated by an inert membrane.

Wood:

- Unseasoned wood and certain treated timbers may contain acids or chemicals which can cause galvanic corrosion. In mild atmospheres it is enough to seal the timber surface with an inert membrane at the points of contact with the pre-painted aluminium. In aggressive conditions, the two surfaces should be isolated by a gasket of rubber, neoprene or bituminous roofing felt.

Concrete & Plaster:

- The structural properties are not significantly affected by contact with these materials. However, there may be some discolouration especially in wet conditions. The pre-painted aluminium sheet should therefore be protected by an inert membrane at the points of contact.

Cement:

- Wet cement may have a corrosive effect on AlumiGard™ X and AlumiGard™, and care should be taken to avoid cement splashes falling on the sheet. Where this occurs, it should be cleaned off as soon as possible.

Copper:

- In no circumstances should pre-painted aluminium be used in contact with copper or copper alloys, as the pre-painted aluminium will corrode very quickly.

Where water runs off copper on to pre-painted aluminium there will also be rapid corrosion, so care must be taken to avoid this.

For information related to the general specification, application and maintenance of ColorCote® products refer to the ColorCote® General Information Guide.

Site Practice

If nestable profiles become wet while closely stacked, formation of wet storage stain or ‘white rust’ is inevitable.

To minimise the possibility of inadvertent contamination:

a) Inspect deliveries on arrival. If moisture is present, individual sheets should be dried immediately with a clean rag and then stacked to allow air to circulate and complete the drying process.

b) Well ventilated storage is essential. Always store metal products under cover in clean, well-ventilated buildings.

c) Cross-stack or fillet sheets where outside storage is unavoidable and make provision for a fall to allow water to run off.

It is the responsibility of the roofing contractor to avoid damaging the roof sheeting during its installation and fixing. For light gauges and large purlin spacings, never drag sheets from a pile. Remove by ‘turning’ off the stack. Lift sheets on to a roof, and do not drag over the eaves or purlins.

Touch Up Paint

ColorCote® is a baked on paint system which has different weathering characteristics to standard air drying paints. Do not use touch up paint on ColorCote® products. Minor scratches should be left alone.

Clean Up

Installation procedures involving self-drilling screws, drills and hacksaws etc. will leave deposits of swarf and metal particles. These particles including blind rivet shanks, nails and screws should be swept and washed from the roof at the end of each day.

ZINCALUME®

The Zincalume® coated steel coating has been formulated to give a significantly longer service life than a galvanised coating. This is of particular value in New Zealand where the prevailing winds carry corrosive salt laden air many kilometres inland.

Zincalume® coated steel is produced by a continuous hot dip process similar to that used to manufacture galvanised steel. While both Zincalume® steel and galvanised steel products have a steel base, galvanised steel has a coating of 100% zinc, whereas Zincalume® steel has an alloy coating of 43.5% zinc, 55% aluminium and 1.5% silicon.

The Zincalume® alloy coating weight is 150g/m^2 (AZ150) covering both sheet surfaces and the steel substrate grade is either G550 or G300.

The Zincalume® steel product has an attractive finely spangled silvery matt appearance. Zincalume® steel is recommended for the manufacture of:

- Roofing and flashings
- Wall cladding
- Gutters and downpipes
- Fences
- Steel house frames
- Garage doors
- Garden sheds
- Flues

It is formable, weldable and readily accepts paint finishes.

Corrosion Resistance

Zincalume® steel has superior long-term corrosion resistance in most atmospheric conditions. This is achieved through the combination of the sacrificial protection of the zinc and the barrier protection of the aluminium.

Test sites from around the world over a period of twenty-five years have provided a wealth of information about comparative performance of galvanised and Zincalume® steel products. Test sites are placed in many different environments, ranging from typical rural, to severe marine. Corrosion rates are determined by exposing samples of Zincalume® steel and galvanised steel on standard test racks and regularly monitoring the coating performance over a number of years.

Though corrosion rates vary according to the severity of conditions, Zincalume® steel coatings out-perform galvanised coatings in almost all environments. This is particularly true in marine environments where Zincalume® steel will provide a significantly longer service life than galvanised steel.

Painting Zincalume® Steel

Zincalume® steel is readily paintable using good quality primers and water-based acrylic topcoats. Paint manufacturers' instructions should be followed. Dirt, grease and any loose materials must be cleaned off so the surface is clean and dry prior to the first coat being applied.

Unwashed Areas

Compared to galvanised steel, Zincalume® steel performs exceptionally well in areas not regularly washed by rainwater. However, as with any steel-based product, regular washing of areas not naturally rain-washed is essential to ensure that a satisfactory life is realised from the product.

Rainwater Collection

Rainwater collected from roofs clad with products made from Galvsteel™, Zincalume® steel and COLOURSTEEL® prepainted steel, will comply with the provisions of NZBC G12.3.1, provided the water is not contaminated from other sources. The first 25mm of rainfall from a newly installed roof must be discarded before drinking water collection starts. Where a paint or paint system is applied to the roof, its suitability for the collection of drinking water must be established.

Protection at Cut Edges

At the cut edge, Zincalume® steel provides similar protection to galvanised coatings. The zinc/aluminium alloy coating of Zincalume® steel provides galvanic protection to bare steel exposed at cut edges and by deep scratches.

Passivation

Surface passivation enhances the protection of the galvanised and Zincalume® steel product during storage, forming, handling and fixing. A completely new passivation system has been developed for Zincalume® steel which offers a technical advance over the Zincalume® steel product manufactured in Australia prior to October 1993. It largely eliminates the need for roll-forming oils, offers improved wet stack corrosion resistance and generally makes the product more mark resistant during handling and fixing.

Handling and Storage

The normal storage care, site cleanliness and installation procedures used for Galvsteel™ products apply to Zincalume® steel products.

Although passivation provides improved protection during storage, care should still be taken. If Zincalume® steel becomes wet during storage, the product should be immediately separated, wiped with a clean cloth and placed in a position where it can completely air dry.

Forming

As with Galvsteel™, Zincalume® steel is suitable for all but the most severe forming operations.

With Zincalume® steel, the new passivation system acts as a dry lubricant and in most cases will eliminate the need for additional lubrication in most forming operations. Solvent-based lubricants must not be used.

Welding

Zincalume® steel can be satisfactorily welded using the following techniques:

- GMA (Gas Metal-Arc, often called MIG)
- Resistance welding (spot or seam)
- MMA (Manual Metal-Arc)

When welding Zincalume® steel, excessive weld currents must be avoided. With correct welding procedures, sufficient coating is normally left on the Zincalume® steel sheet to protect the substrate from corrosion. Weld repair should be carried out by coating with a zinc-rich paint.

Adequate ventilation must be provided even though the welding of Zincalume® steel gives off fewer fumes than galvanised steel.

Joining and Sealing

Zincalume® cannot be soldered. Join Zincalume® steel in the same ways as recommended for COLOURSTEEL® prepainted steel products. Use a neutral cure silicone rubber sealant in conjunction with mechanical fasteners such as blind rivets. Care should be exercised in the choice of rivets. Aluminium rivets are recommended. Monel, stainless steel and carbon steel rivets must not be used.

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Fasteners

Most fasteners complying with the corrosion requirements of Australian Standard AS3566 “Screws – Self-drilling for the building and construction industry”, are suitable for use with Zincalume® steel.

- Stainless steel fasteners should not be used with Zincalume® steel or COLOURSTEEL® ENDURA® or MAXX® products in any environment.
- Lead headed nails must not be used.
- Use only low carbon (<15%) non-conductive sealing washers.

Flashings and Accessories

Flashings and ridge capping should be manufactured from the same coating system as used for the main roof area to ensure equal durability. For COLOURSTEEL® ENDURA® or MAXX® and Zincalume® steel products, extended ridge caps, soft zinc, or practices such as cutting and notching are recommended.

Where penetration flashings are required, neoprene or silicone rubber, EPDM aluminium or soft zinc all give excellent performance.

Marking Zincalume® Steel

Black lead pencils must never be used for marking Galvsteel™, Zincalume® steel or COLOURSTEEL® prepainted steel products. The carbon in the pencil promotes corrosion which will etch the surface, leaving a permanent mark. Use a pencil of any colour other than black.

Information To Help You Avoid Problems

In almost all applications, Zincalume® steel will out-perform galvanised steel. There are, however, a small number of applications for which galvanised steel is more suitable.

Zincalume® steel must not be used for:

- Formwork in contact with wet concrete.
- Products to be embedded in concrete. However, where very small volumes of concrete are involved (e.g. splashes) which are able to cure quickly, there is little corrosive effect.
- Animal shelters where ammonia levels are constantly high.
- Fertiliser storage sheds and containers.
- Culverts, or where Zincalume® steel material is buried in the ground.
- Water tanks.
- Highly alkaline environments (e.g. cement manufacture).
- Coolroom products.

Maintenance

All roofing and cladding products are subject to the cumulative effect of weather, dust and other deposits. Normal rain washing will remove most accumulated atmospheric contaminants from roofs. For wall cladding, manual washing every 3 to 12 months, depending on the paint system, is recommended in moderate to very severe environments to prevent accumulation of dirt, debris or other material not removed by rain washing. For areas that do not receive any or adequate rain washing (called unwashed areas) such as soffits, wall cladding under eaves, underside of gutters, fascias, sheltered areas of garage doors and unwashed roof areas, more extensive manual washing is required. Similarly other high risk areas, around flues, under television aerials or overhanging trees and sites prone to mould, lichen, bird droppings or debris, need to have extensive manual washing.

Regular washing of COLOURSTEEL® prepainted steel products increases the durability by reducing attack from airborne salts and pollutants. Galvsteel™ products and Zincalume® steel products will also benefit from routine washing.

Surfaces should be manually washed with water and a sponge or a soft nylon bristled brush. For large areas it may be more appropriate to use water blasting at pressures up to 20Mpa.

If New Zealand Steel Limited products are maintained according to the following recommendations, the requirements of the New Zealand Building Code B2 for 15-year durability for roofs and exterior walls will be met or exceeded.

Maintenance Recommendations for Zincalume® Used for Roofing and Wall Cladding

	Environment		
	Moderate	Severe	Very Severe
Roof	Rain washing	Not recommended	Not recommended
Wall Cladding	Rain washing plus manual washing every 6 months	Not recommended	Not recommended
Unwashed and High Risk Areas	Manual washing every 3 months	Not recommended	Not recommended

Note

1. The New Zealand Building Code durability requirement does not include aesthetic appearance
2. The New Zealand Building Code requires a durability of 15 years minimum (with maintenance) for roofing, including valleys, and wall cladding products. This means no moisture penetration due to product failure.
3. The New Zealand Building Code requires a durability of 5 years minimum (with maintenance) for rainwater products, gutters and downpipes. This means no perforation due to product failure.
4. New Zealand Steel Limited products are designed to exceed the New Zealand Building Code B2: durability requirements. Continued maintenance and overpainting will greatly extend the ultimate life of all products.
5. Where a 50 year durability is required or where a product is to be used in aggressive internal environments, New Zealand Steel Limited should be consulted.
6. In Industrial Environments, the type of pollution generated may alter the above recommendation. If in doubt, consult New Zealand Steel Limited.

New Zealand Steel Limited will not accept responsibility for propriety roofing and cladding products which do not conform to our recommendations for manufacturing, environmental use or maintenance.

COLOURSTEEL® ENDURA®

Product Description

New Zealand Steel manufactures a range of factory coated COLOURSTEEL® prepainted steel products to suit defined environmental conditions. The COLOURSTEEL® ENDURA® paint system consists of a Zincalume® steel substrate to which a prepainted finish system is applied. The system is designed to provide protection against corrosion in areas where moderate to severe environmental conditions are experienced. The Zincalume® steel substrates give improved corrosion resistance in most environments (particularly coastal), when compared to the performance of galvanised steel.

The steel substrate grade is either G550 or G300.

COLOURSTEEL® ENDURA® product is suitable for a wide range of rollformed roof and wall claddings, rainwater accessories and general building products.

The COLOURSTEEL® ENDURA® paint system will exceed the service life of most traditional post-painted systems.

Durability

When rollformed, installed and maintained in accordance with New Zealand Steel's recommendations, COLOURSTEEL® ENDURA® prepainted steel is warranted by New Zealand Steel to meet the performance requirements of NZBC B2.3 (c) for a 15-year durability when used for the manufacture of roof and wall claddings.

COLOURSTEEL® ENDURA® products are expected to fade uniformly over the surface, the extent being no more than 8 Hunterlab units on the Delta E scale, and have a chalk rating of ≤4 (AS 1580 481.1.11, 1998) after 10 years exposure.

Limitations of Use

COLOURSTEEL® ENDURA® products are not recommended for use in very severe environments, ie. within approximately 100m of breaking surf or corrosive industrial emissions. (Very severe marine environments are characterised by heavy salt deposits and the almost constant smell of salt spray in the air). Refer to New Zealand Steel's Environmental Categories Guide for further information on the definition of corrosive environments. (For very severe environments, COLOURSTEEL® MAXX® may be suitable.)

Before using COLOURSTEEL® ENDURA® products near sources of industrial pollution or in geothermal areas, consult the Technical Market Manager, New Zealand Steel.

COLOURSTEEL® ENDURA® products should not be used in the following applications:

- Embedded in concrete
- In contact with permanently wet materials
- Water tanks
- In contact with soil, bark or similar
- As concrete formwork
- In intensive animal shelters

Copper or brass pipes must not be allowed to discharge onto COLOURSTEEL® prepainted steel products or be allowed to come into contact with them. The use of other materials in proximity to COLOURSTEEL® prepainted steel products must be in accordance with New Zealand Steel Specifiers' and Builders Guide booklet. Mixing of brands of pre-painted material on the same building is not recommended by New Zealand Steel Limited.

The reaction between Zincalume® steel and lead flashings will degrade the Zincalume® steel material. Soft zinc or aluminium flashings should be used. Marking with lead pencils is not advised, and sealing washers should be low carbon - nonconducting. Refer to New Zealand Steel's Installers' Information booklet, "Marking Cutting and Drilling" section.

Maintenance

Areas of COLOURSTEEL® ENDURA® not regularly washed with rainwater, such as wall claddings, unwashed areas and areas of high risk must be routinely washed to remove surface deposits to ensure satisfactory life is obtained from the product. Specific maintenance recommendations are given in the following table.

Maintenance Recommendations for COLOURSTEEL® ENDURA® Used for Roofing and Wall Cladding

	Environment		
	ISO Category 3	ISO Category 4	ISO Category 5
Roof	Rain washing	Rain washing	Not recommended
Wall Cladding	Rain washing plus manual washing every year	Rain washing plus manual washing every 6 months	Not recommended
Unwashed and High Risk Areas	Manual washing every 6 months	Manual washing every 3 months	Not recommended

Composition

The COLOURSTEEL® ENDURA® substrate is steel strip, commonly 0.40mm or 0.55mm thick and coated with a 45% zinc, 55% aluminium alloy to a nominal coating mass of 150g/m^2 manufactured in accordance to AS1397 2001. A range of thicknesses, widths and strengths are available.

Following pre-treatment, a corrosion inhibitive primer, and topcoat is applied to the outer surface and a backer to the reverse side. These coatings are oven cured to provide colour and corrosion performance.

Appearance

COLOURSTEEL® ENDURA® products are available in a range of colours. The backer coat is a light grey.

Identification

COLOURSTEEL® ENDURA® product is identified by a brand applied to the reverse surface, indicating product type and date of manufacture.

Installation

Full installation details for COLOURSTEEL® ENDURA® product is contained in the New Zealand Steel Installers' Guide.

Fixings

- Aluminium and factory painted fixings are acceptable.
- Stainless steel, Monel or other copper alloy fixings must not be used.
- Lead-head nails must not be used.
- Fixings that comply with AS3556 class 3 or 4 are acceptable.

Sealing and Joining

- Use only neutral-cure silicone rubber sealants.
- Do not use abrasive cutting wheels.
- Do not weld, braze or solder COLOURSTEEL® prepainted steel products.

Touch-up paints should not be used, as air-drying paints have different weathering characteristics to the COLOURSTEEL® prepainted steel coating.

Clean up – all debris (particularly from roofing installation) must be removed from COLOURSTEEL® ENDURA® product surfaces at the end of each day's work. Take care not to damage the coating when removing sharp fixing debris.

External Moisture

COLOURSTEEL® ENDURA® roof cladding must be installed at a minimum of 3° or over the minimum pitch given for the profile by the manufacturer, whichever is greater. Factors likely to affect the resistance of COLOURSTEEL® ENDURA® prepainted steel to external moisture include the quality of the installation, the severity of the climate, roof configuration, material profile and the design and execution of junctions between similar materials and other elements.

Rainwater Collection

Rainwater collected from roofs clad with products made from Galvsteel™, Zincalume® steel and COLOURSTEEL® prepainted steel, will comply with the provisions of NZBC G12.3.1, provided the water is not contaminated from other sources. The first 25mm of rainfall from a newly installed roof must be discarded before drinking water collection starts. Where a paint or paint system is applied to the roof, its suitability for the collection of drinking water must be established.

Spread of Fire

COLOURSTEEL® ENDURA® prepainted steel comprises a combustible surface adhered to a non-combustiblesubstrate. Used on roofs, it meets the requirements of NZBC C3/AS1 in all-purpose groups. Refer to C3/AS1 Section 4.0 External Walls and Roofs which covers vertical and horizontal spread of fire.

Hazardous Building Materials

The use of roofing and wall claddings manufactured from COLOURSTEEL® ENDURA® prepainted steel in accordance with New Zealand Steel's instructions will meet the non-hazardous performance requirements of NZBC F2.3.1.

Handling and Storage

If COLOURSTEEL® prepainted steel products are to be stored for any time prior to forming or installation, they must be stored in dry, well-ventilated conditions. Storage which allows water, (including condensation) to be trapped between the sheets may damage the coating beyond repair. COLOURSTEEL® ENDURA® products must be handled carefully during transport, fabrication and fixing to avoid damaging the surface.

Availability

COLOURSTEEL® ENDURA® prepainted steel is available ex stock from most roofing distributors in a range of colours. Where a colour is not available, delivery is normally within 1-4 weeks, depending on the location of the distributor.

Serviceable Life

The COLOURSTEEL® ENDURA® coating can be repainted to extend its serviceable life. Contact New Zealand Steel for recommendations on overpainting weathered COLOURSTEEL® products.

Accreditation

The New Zealand Steel paintline is accredited to ISO9001.

COLOURSTEEL® MAXX®

Product Description

New Zealand Steel manufactures a range of factory coated COLOURSTEEL® prepainted steel products to suit defined environmental conditions. The COLOURSTEEL® MAXX® paint system consists of an AZ200 (200g/m^2) Zincalume® steel substrate to which a super polyester prepainted finish system is applied. The system is designed to provide protection against corrosion in areas where moderate to severe environmental conditions are experienced.

The steel substrate grade is either G550 or G300.

COLOURSTEEL® MAXX® product is suitable for a wide range of rollformed roof and wall claddings, rainwater accessories and general building products.

The COLOURSTEEL® MAXX® paint system will exceed the service life of most traditional post-painted systems.

Durability

When rollformed, installed and maintained in accordance with New Zealand Steel's recommendations, COLOURSTEEL® MAXX® prepainted steel is warranted by New Zealand Steel to meet the performance requirements of NZBC B2.3(c) for a 15-year durability when used for the manufacture of roof and wall claddings.

COLOURSTEEL® MAXX® products are expected to fade uniformly over the surface, the extent being no more than 8 Hunterlab units on the Delta E scale, and have a chalk rating of ≤4 (AS 1580 481.1.11, 1998) after 10 years exposure.

Limitations of Use

COLOURSTEEL® MAXX® products are designed for use in very severe environments, greater than 50m on the East Coast or greater than 100m on the West Coast.

Before using COLOURSTEEL® MAXX® products near sources of industrial pollution or in geothermal areas, consult the Technical Market Manager, New Zealand Steel.

COLOURSTEEL® MAXX® products should not be used in the following applications:

- Embedded in concrete
- In contact with permanently wet materials
- Water tanks
- In contact with soil, bark or similar
- As concrete formwork
- In intensive animal shelters

Copper or brass pipes must not be allowed to discharge onto COLOURSTEEL® prepainted steel products or be allowed to come into contact with them. The use of other materials in proximity to COLOURSTEEL® prepainted steel products must be in accordance with New Zealand Steel Specifiers' and Builders Guide. Mixing of brands of pre-painted material on the same building is not recommended by New Zealand Steel Limited.

The reaction between Zincalume® steel and lead flashings will degrade the Zincalume® steel material. Soft zinc or aluminium flashings should be used. Marking with lead pencils is not advised, and sealing washers should be low carbon - nonconducting. Refer to New Zealand Steel's Installers' Information booklet, "Marking Cutting and Drilling" section.

Maintenance

Areas of COLOURSTEEL® MAXX® not regularly washed with rainwater, such as wall claddings, unwashed areas and areas of high risk must be routinely washed to remove surface deposits to ensure satisfactory life is obtained from the product. Specific maintenance recommendations are given in the following table.

Maintenance Recommendations for COLOURSTEEL® MAXX® Used for Roofing and Wall Cladding

	Environment		
	ISO Category 3	ISO Category 4	ISO Category 5
Roof	Rain Washing	Rain Washing	Rain Washing
Wall Cladding	Rain washing plus manual washing every year	Rain washing plus manual washing every 6 months	Rain washing plus manual washing every 6 months
Unwashed and High Risk Areas	Manual washing every 6 months	Manual washing every 3 months	Manual washing every 3 months

Composition

The COLOURSTEEL® MAXX® substrate is steel strip, commonly 0.40mm or 0.55mm thick and coated with a 45% zinc, 55% aluminium alloy to a nominal coating mass of 200g/m^2 manufactured in accordance to AS1397 : 2013. A range of thicknesses, widths and strengths are available.

Following pre-treatment, a corrosion inhibitive primer, and topcoat is applied to the outer surface and a backer to the reverse side. These coatings are oven cured to provide colour and corrosion performance.

Appearance

COLOURSTEEL® MAXX® products are available in a range of colours. The backer coat is a Bass Grey.

Identification

COLOURSTEEL® MAXX® product is identified by a brand applied to the reverse surface, indicating product type and date of manufacture.

Installation

Full installation details for COLOURSTEEL® MAXX® product is contained in the New Zealand Steel Installers' Guide.

Fixings

- Aluminium and factory painted fixings are acceptable.
- Stainless steel, Monel or other copper alloy fixings must not be used.
- Lead-head nails must not be used.
- Fixings that comply with AS3556 class 3 or 4 are acceptable.

Sealing and Joining

- Use only neutral-cure silicone rubber sealants.
- Do not use abrasive cutting wheels.
- Do not weld, braze or solder COLOURSTEEL® prepainted steel products.

Touch-up paints should not be used, as air-drying paints have different weathering characteristics to the COLOURSTEEL® prepainted steel coating.

Clean up – all debris (particularly from roofing installation) must be removed from COLOURSTEEL® MAXX® product surfaces at the end of each day's work. Take care not to damage the coating when removing sharp fixing debris.

External Moisture

COLOURSTEEL® MAXX® roof cladding must be installed at a minimum of 3° or over the minimum pitch given for the profile by the manufacturer, whichever is greater. Factors likely to affect the resistance of COLOURSTEEL® MAXX® prepainted steel to external moisture include the quality of the installation, the severity of the climate, roof configuration, material profile and the design and execution of junctions between similar materials and other elements.

Rainwater Collection

Rainwater collected from roofs clad with products made from Galvsteel™, Zincalume® steel and COLOURSTEEL® prepainted steel, will comply with the provisions of NZBC G12.3.1, provided the water is not contaminated from other sources. The first 25mm of rainfall from a newly installed roof must be discarded before drinking water collection starts. Where a paint or paint system is applied to the roof, its suitability for the collection of drinking water must be established.

Spread of Fire

COLOURSTEEL® MAXX® prepainted steel comprises a combustible surface adhered to a non-combustible substrate. Used on roofs, it meets the requirements of NZBC C3/AS1 in all-purpose groups. Refer to C3/AS1 Section 4.0 External Walls and Roofs which covers vertical and horizontal spread of fire.

Hazardous Building Materials

The use of roofing and wall claddings manufactured from COLOURSTEEL® MAXX® prepainted steel in accordance with New Zealand Steel's instructions will meet the non-hazardous performance requirements of NZBC F2.3.1.

Handling and Storage

If COLOURSTEEL® prepainted steel products are to be stored for any time prior to forming or installation, they must be stored in dry, well-ventilated conditions. Storage which allows water, (including condensation) to be trapped between the sheets may damage the coating beyond repair. COLOURSTEEL® MAXX® products must be handled carefully during transport, fabrication and fixing to avoid damaging the surface

Availability

COLOURSTEEL® MAXX® prepainted steel is available ex stock from most roofing distributors in a range of colours. Where a colour is not available, delivery is normally within 1-4 weeks, depending on the location of the distributor.

Serviceable Life

The COLOURSTEEL® MAXX® coating can be repainted to extend its serviceable life. Contact New Zealand Steel for recommendations on overpainting weathered COLOURSTEEL® products.

Accreditation

The New Zealand Steel paintline is accredited to ISO9001.

ALUMINIUM

a) General Characteristics

A wide variety of mechanical characteristics, or tempers, are available through various combinations of cold working and heat treatment.

A good resistance to corrosion on surfaces exposed to the atmosphere is achieved due to the formation of a thin transparent oxide film that protects the substrate from further oxidisation.

Attractive appearance, low maintenance, and light weight together with reflectivity are additional features of aluminium roofing materials.

Finishes available are plain mill finish, and stucco embossed finish which reduces glare.

b) Alloy and Temper

The four-digit system used for designating the alloys is an international one which has been adopted by all major aluminium producers. The first digit indicates the alloy group. The second digit indicates modifications of the original alloy or impurity limits. The last two digits identify the specific alloy and aluminium purity.

Alloys recommended for roofing and wall cladding products are 5052, 5005 and 5251. In particular, the magnesium and chromium content of 5052 makes this alloy appropriate for recommended use in marine environments, and this alloy is in common use in New Zealand for roofing and wall cladding products.

The temper designation describes the combination of cold working and heat treatment performed to give the material appropriate forming and end use mechanical properties. The tempers used for roofing and wall cladding products are H34 for crimp curving and folding, and H36 for rollforming.

These tempers involve strain-hardening and then low temperature heating to slightly lower the material strength and increase ductility.

c) Material Thickness

Common thicknesses for use as roofing and wall cladding are 0.70mm, 0.90mm and 1.2mm. The 0.70mm material is easily damaged in use and should be specified with caution.

d) Working and Finishing

All aluminium alloys work harden and gain strength during forming operations. Thus the appropriate alloy and temper must be selected to allow the appropriate degree of formability, without excessive hardening and consequent splitting.

Mechanical fasteners, whether rivets or screws, are available in aluminium. Where the use of aluminium fasteners is plainly unsuitable, e.g. self-drilling screws, stainless steel is normally regarded as the best alternative.

With correct pretreatment procedures, aluminium is an excellent substrate for applied coatings. The pretreatment uses phosphate or chromate conversion coatings to chemically remove the aluminium oxide layer.

e) Durability

Aluminium alloys have excellent durability and corrosion resistance, but their behaviour can be influenced by the way in which they are used.

Aluminium's natural affinity with oxygen results in the formation of a transparent oxide film when aluminium is exposed to air. This film is extremely hard, chemically stable, corrosion resistant, and adheres strongly to the parent metal surface. Once formed it prevents further oxidation, and, if damaged in any way, will reform if sufficient oxygen is available.

If the surface is pitted by air-borne pollutants found in industrial or marine atmospheres (e.g. sulphuric acid, sodium chloride) the resulting chemical reaction produces a larger volume of powdered corrosion product than the volume of original pit. This seals the surface and inhibits further corrosion.

Ongoing protection against corrosion in this way requires oxygen to be available at the surface.

Therefore aluminium alloys can suffer corrosion when used in ways that prevent this, e.g. continuously wet environments like sheet end laps or under accumulated debris.

f) Contact with Other Materials

In general, direct chemical attack of aluminium only occurs when the pH is below 5 or above 8.

Contact with other metals can result in corrosion due to galvanic reactions. Copper, steel, stainless steel and lead will all cause attack of the aluminium alloy. Contact with zinc will cause the zinc to be attacked.

Entrapment of moisture between adjacent aluminium surfaces will cause water stains. The stain is a superficial condition, and the mechanical properties of the aluminium alloy are not affected. The degree of staining may be judged by the relative roughness of the stained area. If the surface is reasonably smooth the stain appearance may be able to be improved by abrading with steel wool and oil.

g) Maintenance

Regular cleaning is required to maintain an unaffected surface for good aesthetic quality in industrial and marine environments.

This can be achieved naturally by rain washing but surfaces not adequately washed by rain must be cleaned by water washing and scrubbing with a soft brush at sufficient frequency to prevent build up of salt or dirt deposits. In severe marine locations the washing frequency may be every 4-6 months for surfaces not washed by rain.

DURACLAD®

Product Description

Dimond Duraclad® is a heavy weight premium grade glass fibre reinforced polyester sheet profiled for use as roofing and wall cladding. It is available with a choice of surface finishes and resin types to provide maximum durability in specific environments.

Environment Type	Topside	Underside
Up to and including Very Severe Marine and Industrial (marine salt, acid*, alkali* or solvent*) from both outside and in	Gel coat	Polyester surface film

*The specific chemical nature of the environment must be discussed with Dimond to ensure the correct resin type is chosen. Duraclad is available in a range of colours. Please contact 0800 DIMOND.

Standard material thickness is 1.7mm (nominal). Duraclad® is available in thicker sheets if required.

Features and Benefits

- Non corrosive substrate and surface protection provides excellent durability in harsh environments.
- Available in continuous lengths limited only by transport, handling and installation considerations.
- Proven durability in buildings with uses like wool scouring, fertiliser storage, exposure to severe marine or geothermal activity, galvanising and battery acid plants, swimming pool covers.
- Suitable for service temperatures of –10ºC to 50ºC.
- Available in the following Dimond range of roofing and wall cladding profiles: Corrugate, Veedek® / Styleline, V-Rib, LT7,® BB900, SS900, Super Six.

Limitations of Use

Duraclad® will support combustion and require fire engineering input if intended for use where fire ratings are required.

Not intended to support foot traffic other than carefully placed foot point loads on purlin lines during installation.

Fastener corrosion may require fastener replacement before Duraclad® requires replacing.

Will require the installation of Safety Mesh under the sheeting when used as roofing on spans that exceed the scope of the load span data given in section 2.1.4 for each profile. Safety mesh should be used whenever foot traffic is expected. Whenever mesh is used under Duraclad,® a separation layer such as Dimond purlin protection strip, must be placed between the mesh and the Duraclad® to protect the sheet underside.

Maintenance

Keep surfaces clean by regular washing.

Inspect fasteners, and replace before corrosion becomes advanced.

Aesthetic value can be restored by over painting the surface with a suitable coating system once the original surface has:

- become well weathered
- lost the top surface.

Do not use abrasive cleaners on Duraclad.®

Handling and Storage

Care must be taken not to damage the surface films. Material should be stored so it will remain dry and not suffer damage.

Fasteners

The correct fastener size for the sheet profile should be used (refer section 2.1.4).

The Duraclad® sheet must be pre-drilled with an oversize hole 2mm larger than the diameter of the fixing. When thermal expansion must be allowed for a larger pre-drilled hole diameter will be required. Refer Section 2.1.3.4.

The choice of fastener material must take into account the durability expected in the particular environment.

Severe internal environments may require that the screw shank is protected from contact with corrosive materials.

ColorCote® MagnaFlow™ (formerly ZM8)

Conforms to AS/NZS 2728:2013 Product type 6 (Table 1.1). Suitable for ISO 9223 Atmosphere Classification C1-C5 as per AS/NZS 2728:2013.

Description

A high durability product with improved cut edge performance designed to give excellent colour retention and high formability at moderate cost.

Substrate

Hot dipped Aluminium / Zinc / Magnesium alloy coated steel coil with a minimum coating weight of 240 gms/m^2 coating weight (240 gms per m^2).

Manufactured to AS 1397 : 2011. Steel grade either G550 or G300.

Pretreatment

Corrosion resistant chromate conversion coating.

Primer

Flexible corrosion resistant high build primer both sides. Nominal film thickness 5 microns on the topside and on the reverse. ±1 Micron.

Finish Coat

Flexible exterior acrylic, polyester or modified polyester coating system. Nominal film thickness 18µm ± 1µm.

Note: the finish coat can be applied to one or both sides of the sheet in the same or different colours. Colours outside the standard range may be available depending on colour and quantities.

Backing Coat

Shadow Grey (standard colour) wash coat 5 microns thickness ±1µm.

Gloss

Typical gloss levels are 25%, measured in accordance with ASTM D523-89 (60°). Non standard gloss levels may be available on application.

Strippable Film

Products can be supplied with an optional strippable protective film at extra cost. This material has a relatively short life span under exterior exposure conditions. It should be removed either as soon as possible within 48 hours of outdoor exposure.

Expected Performance

Outdoor Durability: ColorCote® MagnaFlow™, under normal well washed conditions of exposure, is expected to show no cracking (other than that which may occur during forming), flaking or peeling of paint film for 15 years from date of installation.

Colour change during service will depend on the colour chosen, aspect, design of the structure and the environment. Maximum colour change levels of ColorCote® MagnaFlow™ colours in moderate (C2) environments after 10 years of service are given in warranty documentation. Colour change is measured using an instrumental colour spectrophotometer, according to ASTM D-2244-93, and determined on clean surfaces, free of all dirt, chalk, oxidised film, oil, grease and other foreign contaminants.

Some chalking may occur. A maximum rating of 2 is expected after 20 years exposure, when measured in accordance with AS/NZS 1580.481.1.11:1998. Scale is between 0 and 5 with a lower number indicating less chalking.

Handling and Storage

To avoid damaging the paint surface the material must be handled carefully during transport and rollforming. Pacific Coilcoaters does not recommend the use of rollforming lubricants on ColorCote® products, as they will affect performance of prepainted steel and will lead to staining and uneven premature fading.

Typical Properties

- Mar Resistance: Good
- Scratch Resistance: Good
- Impact Resistance: (AS/NZS 2728 Appendix E) – Greater than 10 Joules
- Pencil Hardness: (AS/NZS 1580.405.1) – F minimum
- Bend Test: (AS/NZS 2728 Appendix F) – No loss of paint adhesion when bent around a diameter equal to five times the thickness of the sheet.
- Heat Resistance: Suitable for continuous service up to 100°C. Continuous service at higher temperatures may cause some colour change of the paint film.

Index	Rating	Range
Ignitability Index	0	0-20
Spread of Flame Index	0	0-10
Heat Evolved Index	0	0-10
Smoke Developed Index	0-2	0-10

Accelerated Corrosion Tests

(Tests are conductede on a flat panel).

Salt Spray

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and 2.10

Humidity Resistance

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and table 2.9

QUV Resistance

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and table 2.4

Chemical Resistance

ZinaCore™ has good resistance to accidental spillage of solvents such as methylated spirits, mineral turpentine, toluene, Trichloroethylene and dilute acids and alkalis. All spillages should be removed immediately by wiping or washing.

Recommended End Uses

Exterior uses where there is a high risk of accelerated corrosion. It has very good colour and gloss retention and is suitable for roofing, cladding, rainwater goods. For information concerning product use in areas not covered by ColorCote® MagnaFlow™ refer to the ColorCote® ZinaCore™ X and / or AlumiGard X™ technical brochures or contact Pacific Coilcoaters for details. MagnaFlow™ is not suitable for use as watertanks or areas where a constantlly wet environment is maintained or in constantly running water or in contact with soil.

Site Practice

If nestable profiles become wet while closely stacked, formation of wet storage stain or ‘white rust’ is inevitable.
To minimise the possibility of inadvertent contamination:

a) Inspect deliveries on arrival. If moisture is present, individual sheets should be dried immediately with a clean rag and then stacked to allow air to circulate and complete the drying process.

b) Well ventilated storage is essential. Always store metal products under cover in clean, well-ventilated buildings.

c) Cross-stack or fillet sheets where outside storage is unavoidable and make provision for a fall to allow water to run off.

It is the responsibility of the roofing contractor to avoid damaging the roof sheeting during its installation and fixing. Never drag sheets from a pile. Remove by 'turning' off the stack. Lift sheets onto a roof, and do not drag over the eaves or purlins. Use clean footwear, remove swarf and other contaminants regularly. For further information refer to the MRM Code of Practice.

Touch Up Paint

ColorCote® is a baked on paint system which has different weathering characteristics to standard air drying paints. Do not use touch up paint on ColorCote® products. Minor scratches should be left alone.

Clean Up

Installation procedures involving self-drilling screws, drills and hacksaws etc. will leave deposits of swarf and metal particles. These particles including blind rivet shanks, nails and screws should be swept and washed from the roof at the end of each day.

Dissimilar Materials

When dissimilar metals come into contact with each other, the electric potential difference between the metals establishes a corrosion cell and accelerated corrosion can occur. To avoid this problem the following precautions should be observed:

- Avoid discharges of water from brass or copper pipes onto ColorCote® MagnaFlow™.
- Do not use non-galvanised steel, copper, stainless steel or Monel metal in direct contact with ColorCote® MagnaFlow™.
- Do not use lead flashings in contact with ColorCote® MagnaFlow™ products. Soft edge aluminium, or notching of flashings, are the best solutions.
- Do not use tanalised timber in direct contact with ColorCote® MagnaFlow™ products. Use PVC tape or similar barrier to isolate potential problem points of contact between materials.

ColorCote® MagnaFlow™ products are not suitable for use in the following situations:

- Animal shelters, where excessive ammonia fumes can accumulate due to inadequate venting, or where direct contact with animal effluent can occur.
- Water tanks or areas where a constantly wet environment is maintained.
- In direct contact with concrete, or where lime deposits are evident.
- In contact with soil. (Allow 75mm run off below cladding sheets to ground level.)

Fastenings

Match corrosion resistance of the fastenings with the service life of the chosen ColorCote® MagnaFlow™ product. Class 4 coated screws will give best service life with ColorCote® MagnaFlow™.

Do not use stainless or Monel fasteners on ColorCote® MagnaFlow™ products. Aluminium rivets should be used for best results. For further details refer to the MRM Code of Practice.

Sealing and Jointing

Where sealed joints are required, use only neutral cure silicon rubber sealant, together with mechanical fasteners, such as aluminium rivets. Do not solder or weld ColorCote® products.

Unwashed Areas

These are typically those areas that are not washed by natural rainfall, such as the underside of eaves, sheltgered roofs or wall cladding etc. These areas are excluded from warranty. Pacific Coilcoaters recommends the exclusion of unwashed areas by design wherever possible. In cases where this is not possible, then a regular washing programme should be put in place. Contaminants should be removed by water blasting or mechanical washing with water and a soft nylon brush for best results at least every 6 months, or more frequently if contaminant build-up keeps occuring.

Roof Pitch

Do not use a pitch less than 3º to avoid ponding and premature degradation of the coating system.

ColorCote® MagnaFlow™ X (formerly ZMX)

Conforms to AS/NZS 2728:2013 Product type 4 (Table 1.1). Suitable for ISO 9223 Atmosphere Classification C1-C5 as per AS/NZS 2728:2013.

Substrate

Hot dipped Aluminium / Zinc / Magnesium alloy coated steel coil with a minimum coating weight of 240 gms/m^2 (240 gms per m^2). Manufactured to AS 1397 : 2011. Steel grade either G550 or G300.

Pretreatment

Corrosion resistant chromate conversion coating.

Primer

High build flexible corrosion chromated primer both sides. Nominal film thickness 16µm ± 1µm on the topside and 10µm ± 2µm on the reverse.

Finish Coat

70% PVF_2. The exterior coat of ColorCote® MagnaFlow™ X is a PVF2 (polyvinyl/difluoride) paint system containing at least 7% PVF_2 Resin in the dry paint film. Nominal film thickness 20µm ± 2µm.

Note: the finish coat can be applied to one or both sides of the sheet in the same or different colours. Colours outside the standard range may be available depending on colour and quantities.

Backing Coat

Shadow Grey (standard colour) wash coat 5 microns thickness ±1µm.

Gloss

Typical gloss levels are 25%, measured in accordance with ASTM D523-89 (60°). Non standard gloss levels may be available on application.

Strippable Film

Products can be supplied with an optional strippable protective film at extra cost. This material has a relatively short life span under exterior exposure conditions. It should be removed either just before or just after product installation. If stored indoors strippable film should be removed within 12 months of delivery from Pacific Coilcoaters. Light colours must use strippable film to prevent marking during rollforming.

Expected Performance

Outdoor Durability: ColorCote® MagnaFlow™ X, under normal well washed conditions of exposure, is expected to show no cracking (other than that which may occur during forming), flaking or peeling of paint film for 15 years from date of installation.

Colour change during service will depend on the colour chosen, aspect, design of the structure and the environment. Maximum colour change levels of ColorCote® MagnaFlow™ X colours in moderate environments after 15 and 20 years of service are given in warranty documentation. Colour change is measured using an instrumental colour spectrophotometer, according to ASTM D-2244-93, and determined on clean surfaces, free of all dirt, chalk, oxidised film, oil, grease and other foreign contaminants.

Some chalking may occur. A maximum rating of 2 is expected after 20 years exposure, when measured in accordance with AS/NZS 1580.481.1.11:1998. Scale is between 0 and 5 with a lower number indicating less chalking.

Handling and Storage

To aovid damaging the paint surface the material must be handled carefully during transport and rollforming. Pacific Coilcoaters does not recommend the use of rollforming lubricants on ColorCote® products, as they will affect performance of prepainted steel and will lead to staining and uneven premature fading.

Typical Properties

- Mar Resistance: Good
- Scratch Resistance: Good
- Impact Resistance: (AS/NZS 2728 table 2.2 and Appendix E) – Greater than 10 Joules
- Pencil Hardness: (AS/NZS 1580.405.1) – F minimum
- Bend Test: (AS/NZS 2728 section 2.6 and Appendix F) – No loss of paint adhesion when bent around a diameter equal to five times the thickness of the sheet.
- Heat Resistance: Suitable for continuous service up to 100°C. Continuous service at higher temperatures may cause some colour change of the paint film.

Index	Rating	Range
Ignitability Index	0	0-20
Spread of Flame Index	0	0-10
Heat Evolved Index	0	0-10
Smoke Developed Index	0-2	0-10

Accelerated Corrosion Tests

(Tests are conductede on a flat panel).

Salt Spray

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and 2.10

Humidity Resistance

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and table 2.9

QUV Resistance

Meets the requirements of AS/NZS 2728:2007 Sections 2.8 and table 2.4

Chemical Resistance

Good resistance to accidental spillage of solvents such as methylated spirits, mineral turpentine, toluene, Trichloroethylene and dilute acids and alkalis. All spillages should be removed immediately by wiping or washing.

Recommended End Uses

Exterior uses where high formability, such as crimp curving after rollforming, excellent colour and gloss retention is required. It is suited to environments such as severe marine, and industrial sites wher ethere is a high risk of corrosion due to corrosive elements in the atmosphere.

For information concerning product use in areas not covered by ColorCote® MagnaFlow™ X refer to the ColorCote® AlumiGard™ X technical brochure or contact Pacific Coilcoaters for details.

Site Practice

If nestable profiles become wet while closely stacked, formation of wet storage stain or 'white rust' is inevitable.
To minimise the possibility of inadvertent contamination:

a) Inspect deliveries on arrival. If moisture is present, individual sheets should be dried immediately with a clean rag and then stacked to allow air to circulate and complete the drying process.

b) Well ventilated storage is essential. Always store metal products under cover in clean, well-ventilated buildings.

c) Cross-stack or fillet sheets where outside storage is unavoidable and make provision for a fall to allow water to run off.

It is the responsibility of the roofing contractor to avoid damaging the roof sheeting during its installation and fixing. Never drag sheets from a pile. Remove by 'turning' off the stack. Lift sheets onto a roof, and do not drag over the eaves or purlins. Use clean footwear, remove swarf and other contaminants regularly. For further information refer to the MRM Code of Practice.

Touch Up Paint

ColorCote® is a baked on paint system which has different weathering characteristics to standard air drying paints. Do not use touch up paint on ColorCote® products. Minor scratches should be left alone.

Clean Up

Installation procedures involving self-drilling screws, drills and hacksaws etc. will leave deposits of swarf and metal particles. These particles including blind rivet shanks, nails and screws should be swept and washed from the roof at the end of each day.

Dissimilar Materials

When dissimilar metals come into contact with each other, the electric potential difference between the metals establishes a corrosion cell and accelerated corrosion can occur. To avoid this problem the following precautions should be observed:

- Avoid discharges of water from brass or copper pipes onto ColorCote® MagnaFlow™ X.
- Do not use non-galvanised steel, copper, stainless steel or Monel metal in direct contact with ColorCote® MagnaFlow™ X.
- Do not use lead flashings in contact with ColorCote® MagnaFlow™ X products. Soft edge aluminium, or notching of flashings, are the best solutions.
- Do not use tanalised timber in direct contact with ColorCote® MagnaFlow™ X products. Use PVC tape or similar barrier to isolate potential problem points of contact between materials.

ColorCote® MagnaFlow™ X products are not suitable for use in the following situations:

- Water tanks or areas where a constantly wet environment is maintained.
- In direct contact with concrete, or where lime deposits are evident.
- In contact with soil. (Allow 75mm run off below cladding sheets to ground level.)

Fastenings

Match corrosion resistance of the fastenings with the service life of the chosen ColorCote® MagnaFlow™ X product. Galvanised nails should not be used on ColorCote® MagnaFlow™ X. Class 4 coated screws are the minimum for ColorCote® MagnaFlow™ for roofing and cladding in severe environments.

Do not use stainless or Monel fasteners on ColorCote® MagnaFlow™ X products. Aluminium rivets should be used for best results. For further details refer to the MRM Code of Practice.

Sealing and Jointing

Where sealed joints are required, use only neutral cure silicon rubber sealant, together with mechanical fasteners, such as aluminium rivets. Do not solder or weld ColorCote® products.

Unwashed Areas

These are typically those areas that are not washed by natural rainfall, such as the underside of unsarked overhanging roofing and recessed doorways in commercial cladding, tops of garage doors etc. These areas are excluded from warranty. Pacific Coilcoaters recommends the exclusion of unwashed areas by design wherever possible. In cases where this is not possible, then a regular washing programme should be put in place. Contaminants should be removed by water blasting or mechanical washing with water and a soft nylon brush for best results at least every 6 months, or more frequently if contaminant build-up keeps occuring.

Roof Pitch

Do not use a pitch less than 3° to avoid ponding and premature degradation of the coating system.

ZINC

General Characteristics

Zinc is composed of very high quality zinc Z1 (99,995% zinc), as defined by the EN 1179 standard, to which titanium and copper are added:

- Copper raises the mechanical resistance of the alloy making it harder and stronger. It also controls the colour of the natural protective patina that is created as the zinc weathers
- Titanium increases the creep resistance, permitting far greater thermal expansion and contraction of the material without causing metal fatigue
- Titanium: 0.06% minimum – 0.2% maximum
- Copper: 0.08% minimum – 1.0% maximum
- Aluminium: 0.015% minimum.

The Material & Finish's

Zinc is an imported material, and generally is available and not carried as a stock item. In its original natural form it has colour closely resembling that of plain aluminium. Over a period of time the zinc will start to patina, and change colour to a light grey. This type of natural zinc is not commonly used in New Zealand.

Quartz-Zinc: is the mainly used material in New Zealand which is the natural product that has been through a surface treatment process that speeds up the patina effect, that generally would take's years to achieve.

Anthra-Zinc: is the same base material but has under gone a coating process to give a charcoal black finish. The finish may slowly and gradually lighten over time to a dark grey.

Pigmento: is available in four colours, organic red, green, blue and brown. The colour is created by adding mineral pigments to the durably protective coating.

Zinc in compliance with BS EN 988: 1987 Zinc and Zinc alloys. Specification for roll flat products for buildings.

Material Thickness

Available in 0.70mm.

Material Width

Natural Zinc and Quartz-Zinc	600mm
Anthra-Zinc and Pigmento	600mm

Durability

The patina forms a layer which is compact, adherent, insoluble in rainwater, and which will hinder any further exchanges between oxygen and zinc, thereby controlling the corrosion rate and maintaining it at a low level. Nevertheless, the durability of zinc can be reduced by some acid pollutants, which increase the corrosion rate. The main pollutant is sulphur dioxide (SO_2). Sulphur dioxide reacts with the patina to form a sulphate ($ZnSO_3$ + $ZnSO_4$), which is soluble in water and is washed away by rain.

Ongoing protection against corrosion requires oxygen to be available at the surface. Zinc can also suffer from corrosion when used in ways that prevent this, e.g. under ventilated skillion roof construction, continuously wet environments like end laps or under accumulated debris.

Maintenance

Regular washing with water and a soft brush is required every 4 – 6 months to maintain an unaffected surface for good aesthetic quality in industrial and marine environments. Particular attention is required in server marine locations and sheltered areas to prevent the build-up of salt or dirt deposits.

Recyclability

Fully 100%.

COPPER

General Characteristics

The copper mainly used in the roofing industry is DHP 122 ½ hard it is 99.9% pure and is widely used on architectural builds. When new the copper is bright reddish orange and over time will develop a patina on the surface. This patina will vary in colour depending on the atmosphere the material is in. Some of the patina colours are green, blue/green and nut brown.

Compliance to AS1566:1997 COPPER AND COPPER ALLOYS - Re-rolled flat products and alloys.

Material Thickness

General material thickness used in New Zealand is 0.55 to 0.70mm.

Material Width

The most common sheet size is 2400 x 1000 used for flashings and rainwater goods. For roll-formed goods like Eurotray® a 600mm wide coil is used.

Durability

Copper offers excellent resistance to corrosion in a wide variety of environments. It is resistant to non-oxidizing acids and salts, seawater and fresh water, hot or cold atmospheric corrosion and a wide variety of organic materials. Copper is not resistant to oxidising acids, oxidising heavy metal salts, ammonia, and cyanides, complex ions and high velocity aerated waters.

Maintenance

Just an occasional wash down with fresh water and that's it.

Recyclability

Fully 100%.

BITUMEN COATED BUILDING PAPER

Black bitumen saturated building paper is a breather type kraft building paper intended for use within the roofs and wall cladding of a building where the following are required:

- Moisture permeability
- Reduced air flow
- Absorbency
- Non fire retardant

Features and Benefits

Black building paper reduces wind entry into the cavity, thereby assisting the performance of insulating materials and provides a temporary protection against wind, dust, rain, and other weathering elements until the external cladding is applied. Black building paper is not designed for use in extreme weathering conditions. Black building paper is permeable to water vapour thereby allowing any excess water vapour, which might otherwise condense in the structure, to escape. Black building paper is not considered to be hazardous under the New Zealand Health Safety and Employment Act 1992.

Applications

Dimond Black Building Paper is available in three grades for different applications –

Grade	Application
Bitumac 720	As an extra light duty wall wrap, fixed onto framing at 450mm centres. Framing at centres greater than 450mm require 720 to be installed with polypropylene tape at 300mm centres horizontally over the framing once the wrap has been installed. Recommended in medium wind zones.
Thermakraft 213	As a heavy weight building paper used as a wall wrap or roofing underlay supported on netting. Recommended in very high wind areas.
Bitumac 750	As a heavy duty roofing underlay, self supported up to a purlin spacing of 1200mm, otherwise supported on mesh or strapping at 300mm centres. Recommended in very high wind areas.

Duty grade of underlay in accordance with NZS4200.1.

10m maximum run lengths are recommended to minimise shrinkage.

SYNTHETIC FIRE RETARDANT UNDERLAYS

Synthetic Fire Retardant self supporting underlays are designed for use under roofing and cladding.

The synthetic product consists of a micro –porous water resistant film laminated between two layers of non woven spun bonded polyolefin where the following is required:

- Fire retardant
- Moisture permeability
- Air barrier
- Water barrier

Features and Benefits

The fire retardant properties of these underlays do not support combustion from Fire both during and after construction. Being synthetic they may be exposed to rainfall during installation without affecting future durability or performance.

Being Vapour permeable the underlay allows moisture to pass through minimising the build up of condensation within the roof space and allows it to escape to the outside.

Self supporting on spans up to 1200mm, its tough to tear, so offers best resistance when exposed in all wind zones including up to extra high. Can be left exposed to weather for 7 days.

Shrinkage is minimal so there is no restriction on maximum run length.

It's not considered to be hazardous under the New Zealand Health Safety and Employment Act 1992.

Applications

Product	Application
Sisalation Surewrap Roof And Thermakraft Covertek 407 and 405	All Roof applications down to 3 degrees roof pitch, on purlin spacing's up to 1200mm. Otherwise support on netting or strapping at 300mm centres. Can be laid vertically or horizontally on roof pitches equal to and above 8 degrees without support provided the purlins spacing's are less than or equal to 1200 mm centres. Can be laid horizontally without support on Roof pitches less than 8 degrees, but provided purlins must be at 1200 centres or less and edges are fully restrained by the roof fixings. Otherwise it must be supported. Vertical lay on roof pitches less than 8 degrees must be supported. Can be used as direct fixed in contact with the roof.
Sisalation Surewrap wall And Thermakraft Covertek 403	Suitable for all wall applications on timber or steel framing, either direct fixed to framing or used over a vented cavity system. Can be in direct contact with metal cladding. Suitable as an air barrier to walls that are not lined.

Meets the NZBC requirements

B2.3.1 Durability (a) 50 years (b) 15 years

C3 Fire affecting area beyond the fire source C3.4(C)

E2/AS1 for use as a roof underlay

F2.3.1 No health hazard present to people

GALVANISED WIRE MESH

Galvanised Wire Mesh or Netting is used to support roofing underlay. Mesh is recommended in an appropriate grade to qualify for use as Safety Mesh.

MESH

Refer Section 2.4.5 Safety for information on Aus mesh.

BAYONET GALVANISED WIRE NETTING

Description

Bayonet Galvanised Wire Netting consists of a range of hexagonal netting made from imported standard galvanised mild steel wire which conforms to NZS/AS 1650:1989. The wire tensile strength is between 380 and 550 MPa and its galvanising weight is between 24 and 31 g/m^2.

The product range consists of two sizes of wire netting for use as building paper support.

Mesh Size (mm)	Wire Diameter (mm)	Roll Width (mm)	Roll Length (m)	Roll Area (m^2)
75 50	1.0 1.0	2000 2000 900	50 50 50	100 100 45

Handling and Storage

Bayonet Galvanised Wire Netting must be handled with care to prevent damage to the netting.

The rolls must be stored on end, under cover and protected from moisture. They must not be double stacked or used to support other materials. Bayonet Galvanised Wire Netting rolls should not be stored on concrete floors for long periods, particularly where moisture is present, as this can result in an accelerated corrosion of the galvanising.

Mesh Size Selection

Bayonet Galvanised 50mm and 75mm Wire Netting is suitable for supporting building paper or roofing underlay when the wire netting is supported by timber or steel roof or wall framing. 50mm mesh size must be used where the Wind Zone is very high, or where heavy weight underlay is to be used, e.g. in all non residential roofing systems.

The 50mm mesh size must be used for buildings not covered by NZS 3604, and is recommended when:

- The paper is to be exposed for more than two days and up to one week
- There is a high risk that ongoing construction work may cause damage
- The building is in a high rainfall region (>1400mm/year)

Netting used on spans greater than 2m, or in windspeeds greater than 50 m/s, is outside the limitations published in BRANZ Appraisal No 318A (1997).

Serviceable Life

Bayonet Galvanised Wire Netting, when used to support building paper or roof underlay in roof spaces or wall cavities, will have a serviceable life in excess of 50 years when:

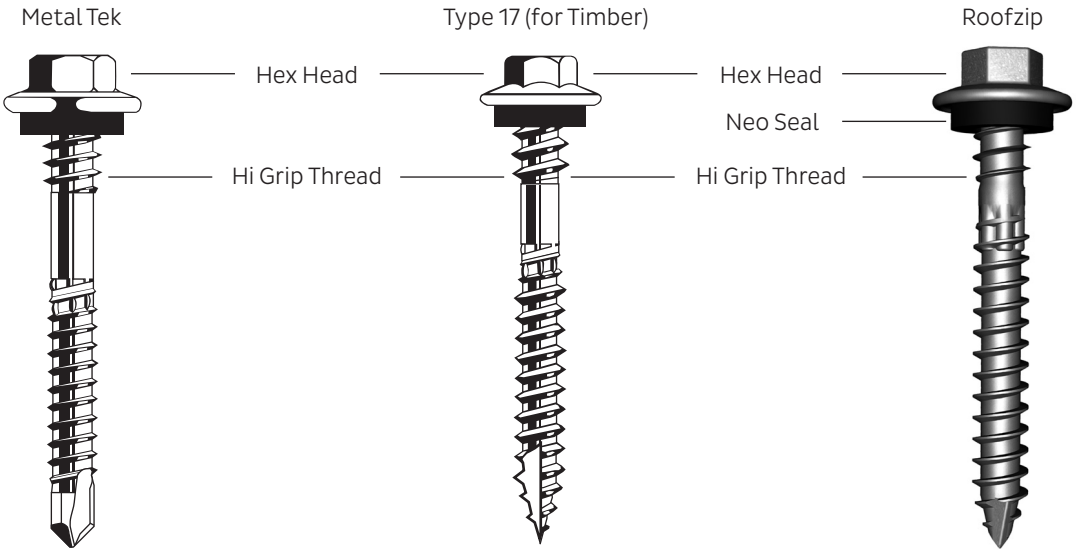
- Enclosed with the roof space or wall cavity
- Subject to a dry interior environment with relative humidity not greater than 90%
- Not exposed to a corrosive environment
- Not exposed to the atmosphere for more than one week before cladding is installed
- Air extraction or dehumidifying devices are not vented into the roof space or wall cavity

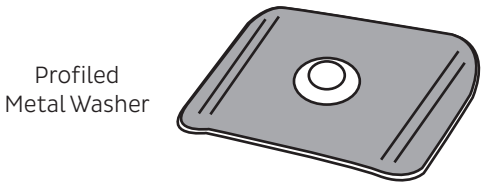
Installation

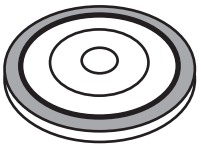
Refer Section 2.3.

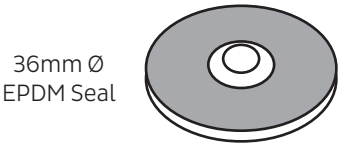
BUILDEX® SCREW FASTENERS

FASTENER ASSEMBLY AND DESIGNATION









Designation

Designation example 14 – 10 x 20 HG means 14 gauge, 10 threads per inch and 20 mm in length measured from the underside of the head to the point of the screw. Screws to have Higrip thread.

Note: Screws can be specified with or without the Higrip thread option.

BUILDEX® METAL TEKS®
FIXING ROOFING AND WALL CLADDING TO METAL

TEKS® self-drilling screws have a hardened drill point that will drill and thread in structural steel and mild steel. To choose the correct fastener it is necessary to select one where the length of the drill point is equal to or greater than the total thickness of the material to be drilled, and the table below gives the thickness limitations for each screw. The length should allow three threads to protrude beyond the metal being fastened to.

Taptites® require pre-drilled holes into which the fastener will thread.

Selection Guide

Use	Dimensions	Coating / Material Available			
		Climaseal 4®	304 Stainless Steel	Thickness Limitation (mm)	Hi Grip Available
Hex Head fixing to steel purlins and girts	12-14x20	Yes	-	4.5	-
	12-14x35	Yes	-	4.5	Yes
	12-14x45	Yes	-	4.5	Yes
	12-14x55	Yes	-	4.5	Yes
	12-14x68	Yes	-	4.5	Yes
	12-14x75	Yes	-	4.5	-
	14-20x22	Yes	-	6.4	-
	14-10x25	Yes	-	3.0	-
	14-10x42	Yes	-	3.0	-
	14-20x45	Yes	-	6.4	-
	14-10x50	Yes	-	3.0	-
	14-10x65	Yes	-	3.0	-
	14-10x75	Yes	-	3.0	-
	14-10x95	Yes	-	3.0	-
Wafer Head fixing decking clips to steel purlins	10-16x16	Class 3 only	-	3.5	-
	10-16x25	Class 3 only	-	3.5	-
Hex Head stitching sheet metal	10-16x16	Yes	-	0.8	-
	10-16x25	Yes	-	0.8	-
	12-11x20	-	Yes	0.8	-
Hex Head Taptites Pre-drilled holes into heavy gauge steel	14-24x25	-	Yes	-	-
	14-24x50	-	Yes	-	-
	14-24x65	-	Yes	-	-
	14-24x75	-	Yes	-	-
Phillips head Ripple hitek for Baby Corrugate	10-16x20	Class 3 only	-	3.0	-

BUILDEX® TYPE 17
FIXING ROOFING AND WALL CLADDING TO TIMBER, OR STITCHING SHEETMETAL

Type 17's are self-drilling screws for fixing into timber and thin metal thicknesses up to 0.6mm. To use the correct fastener, the screw length should be chosen to achieve the minimum amount of embedment given in the table below.

Selection Guide

Use	Dimensions	Coating / Material Available			
		Climaseal 4®	304 Stainless Steel	Embedment Depth (mm)	Hi Grip Available
Hex Head fixing to timber purlins or girts	12-11x25	Yes	-	23	-
	12-11x65	Yes	-	30	Yes
	14-10x25	Yes	Yes	23	-
	14-10x50	Yes	Yes	35	-
	14-10x65	Yes	Yes	35	-
	14-10x75	Yes	Yes	35	-
	14-10x90	Yes	Yes	35	-
	14-10x100	Yes	-	35	-
Hex Head stitching sheet metal max 0.6mm thickness	10-12x20	Class 3 only	-	-	-
	10-12x30	Class 3 only	-	-	-
	10-12x30	Class 3 only		-	-
Phillips head Ripple hitek for Baby Corrugate	10-16x30	Class 3 only	-	30	-

BUILDEX ROOFZIPS®

Roofzips® are a revolutionary self drilling roof fastener that can be used into all types of timber, and steel purlins up to 1.5mm thick. Its improved drill tip starts quicker into the metal, overcomes skidding and scratching of the screw, as well as reduces washer damage. Incorporates HiGrip, to stop the roof moving down the screw shank, and Shankguard to protect the fastener shank from scratching during fixing. Only available in the superior Climaseal 4® coating for use in moist areas up to Severe Marine.

		Climaseal 4®	Embedment Depth (mm)	Hi Grip Available
Hex head Fixing to timber purlins or girts or steel purlins up to 1.5mm thick	M6 x 50mm HG - Z4	Yes	30	Yes
	M6 x 65mm HG - Z4	Yes	30	Yes

MATERIAL GRADES

Buildex® fasteners are available in a finish that complies with AS3566, and are made to a high standard of quality backed by strict inspection and testing procedures endorsed to ISO 9002.

Climaseal 4®

Climaseal 4® fasteners meet and exceed the AS3566 Class 4 specifications. Climaseal 4® is a unique coating system comprising of an alloy combination which gives exceptional galvanic protection. The coating thickness exceeds 50µm, which is twice the thickness of a lesser Class 3 product.

1. A mechanically deposited zinc alloy coating giving excellent galvanic protection.
2. A chromate conversion coating to passivate the zinc alloy, further inhibiting coating loss.
3. An aluminium filled polyester coating with good all-round corrosion and long-term weathering resistance.

Climaseal 4® should be used in all areas including coastal areas where salt, wind, UV and moisture are prevalent, in tropical zones, in industrial zones subject to acid rain fall-out, where agricultural spraying is carried out, or anywhere high performance cladding material is specified.

Effective sealing of roofing sheets/cladding and reduced corrosion with an improved black non-conductive EPDM seal. The black seal remains elastic in temperature extremes, and will not breakdown and allow water entry.

It is particularly recommended for use in moderate and severe marine environments.

CATEGORY 5 SCREWS

Extra coating applied to the screw offering superior corrosion performance with increased durability allowing for use in a category class 5 severe marine in accordance with ISO9223: 2012.

Available only on a few of the screw range and sizes.

Buildex® Stainless Steel

Buildex® has a comprehensive range of stainless steel fasteners available in the following grades:

Grade 304

This is the basic composition of Austenitic Stainless Steel. Overall corrosion resistance is rated Excellent. Has the ability to withstand ordinary rusting, resists nitric acid well, sulphur acids moderately and halogen acids poorly. The Buildex® range consists of:

- **Type 17's**
  Developed to self-drill through long-life corrosion resistant panels into timber where a highly corrosive environment exists. The drilling point is designed to drill its own hole through various aluminium and steel roofing and cladding sheets and secure into timber in one simple operation. Available in a Hexagon Head or a Countersunk Head where a flush finish is required.
- **Taptites**
  Thread rolled fasteners for fixing long-life roofing and cladding sheets to steel or aluminium. Ideal for jobs where thickness of material prevents the use of self-drilling fasteners. Taptites produce their own mating threads to ensure greater contact and a tighter fit.
- **Stitch Screw**
  Ideal for joining light gauge metal such as gable trim and parapet flashing.

Grade 316

An Austenitic Stainless Steel, commonly known as marine grade, is required where submergence in salt water, or direct contact in severe environments will occur.

Buildex® Type 17's and Taptites are available in Grade 316 – but only made to order (minimum quantities may apply).

Alutite Aluminium Type 17 Hex Head Screws

Designed for fixing aluminium roofing and cladding into timber in severe marine environments. Supplied with neo seals only or a 14mm diameter aluminium and a EPDM bonded washer, which is compatible with aluminium roofing and cladding. Material: AA 2024 Aluminium (SS 4338).

HIGRIP

HiGrip from Buildex® is a revolutionary design in roof fasteners that overcomes the traditional problems with crest fixing metal roofing to steel or timber.

When roofing screws are placed on the top of the roofing profile prior to installation, an indent area sometimes forms around the screw due to the operator forcing down heavily before drilling commencement. When the profile is fixed down with a non-HiGrip fastener this indentation remains around the fastener, causing water entry.

HiGrip is a secondary thread located at the top of the shank under the washer face. During installation the thread of the HiGrip is carrying the roof profile in an upward motion while the washer face is carrying the fastener in the downward motion. The upward pressure at the HiGrip tends to straighten or reverse the indent made by the initial penetration, therefore preventing the possibility of water entry.

STRENGTH PROPERTIES

Ultimate Average Pullout Loads

Buildex® TEKS® Screws & Roofzips Fixing to Grade G450						
Gauge/TPI	1.0mm	1.2mm	1.6mm	1.9mm	2.4mm	3.2mm
10-16	2819N	3519N	4563N	-	7823N	-
12-14	2826N	3174N	4428N	5525N	7620N	11140N
12-24	-	-	3945N	-	7375N	10420N
14-10	3010N	3441N	4594N	6260N	8650N	-
Buildex® Roofzips						
M6-11 TP 1		3200N	4800N			

Buildex® Type 17 Screws & Roofzips Fixing to F5 (F5/JD4 Timber - Radiata Pine)					
	Embedment Depth				
Screw Type	20mm	25mm	30mm	35mm	50mm
12g	-	-	12-11x45mm Hex 5400N	12-11x50mm Hex 6300N	-
14g	-	-	14-10x50mm Hex 6500N	14-10x50mm Hex 6900N	14-10x75mm Hex 9700N
M6 Roofzip			5400N	6300N	

Fixing to F17 J3 (Timber - Seasoned Hardwood)					
	Embedment Depth				
Screw Type	20mm	25mm	30mm	35mm	50mm
12g	-	-	12-11x45mm Hex 6400N	12-11x50mm Hex 7900N	-
14g	-	-	14-10x50mm Hex 7100N	14-10x50mm Hex 9100N	14-10x75mm Hex 13500N
M6 Roofzip			6300N	7200N	

Mechanical Properties			
Screw Type	Single Shear Strength	Axial Shear Strength	Torsional Strength
Buildex® TEKS® Screws			
10g	6.8kN	11.9kN	8.4Nm
12g	8.8kN	15.3kN	13.2Nm
14g	10.9kN	19.7kN	18.5Nm
Buildex® Type 17 Screws			
12g	8.4kN	13.9kN	13.4Nm
14g	10.2kN	17.9kN	18.5Nm
14g Stainless Steel	10.2kN	12.6kN	12.7Nm
Buildex® Roofzips			
M6	8.5kN	15.4kN	14.0Nm

Note: All values are ultimate averages obtained under laboratory conditions (N.A.T.A approved). Appropriate safety factors should be applied for design purposes. These figures apply to Buildex® (BX Head marked) products only.

WASHERS

Profiled washers match the rib shape and fit over the ribs of the roofing profile. They are used for two purposes.

1. To provide an acceptable area of seal around the oversize holes drilled in the sheet material to allow for thermal expansion of the sheet (refer Section 2.1.3.4).
2. To provide load-spreading capability at the fastener point when sheet material is used under high load or long span conditions that cause the load per fastener point to exceed guidelines given in Section 2.1.4.

To fulfil either or both of these functions the recommended washer components are:

- Dimond profiled metal washer – pressed from 0.95mm Zincalume® or 1.2mm aluminium and painted for colour match and corrosion resistance if required. Each sheet profile has a specific profiled washer.
- EPDM (ethylene propylene diene monomer) seal washer – round seal used to fit all sheet profiles. Available in 19mm, 25mm and 36mm diameters for use under profiled washers. Manufactured from EPDM type rubber. It is important for the long term durability of the Zincalume® substrate that the carbon black fillers in the sealing washers and neo seals contain less than 15% by volume or 25% by weight of carbon. All washers and neo seals supplied by Dimond meet this requirement.

Use of other washer components may be satisfactory, but their suitability for use must be checked against the two criteria above.

Round Washers

Dekfast round embossed washers (with the seal incorporated with the washer) are primarily used on wall cladding to provide:

1. An acceptable area of seal around the fixing screw to allow for thermal expansion of the sheet where fixed in the cladding pin.
2. Load spreading capability at the fastener point of the cladding material when fixed in the pan under high load.
3. Available in 19mm and 25mm diameter.

DECKING CLIPS – DOUBLE

Used to secure decking profiles such as Dimondek® 400 by pushing the profile down onto it until it clicks into place. The clip is fixed onto the roof structure with either 2 wafer head screws or 2 nails. Refer Section 2.1.4.7 (b).

The double clip is designed to fix over the previously laid male under rib and centre rib of the sheet to be laid.

Clip Material

Usually manufactured from either

1. As standard unpainted 1.15mm thick coil with galvanised coating to 275 g/m^2.

or

2. Coated for increased durability. Nylon coated over galvanised. Colour may vary between Bright blue or light grey depending on supply. During a salt fog test after 2000 hours this coat showed no sign of degradation. Must be used with Aluminum roofing.

or

3. Other material, such as brass clips to suit a copper roof, can be manufactured to customer order. The brass is 1.2mm thick and is $^1/_2$ hard brass.

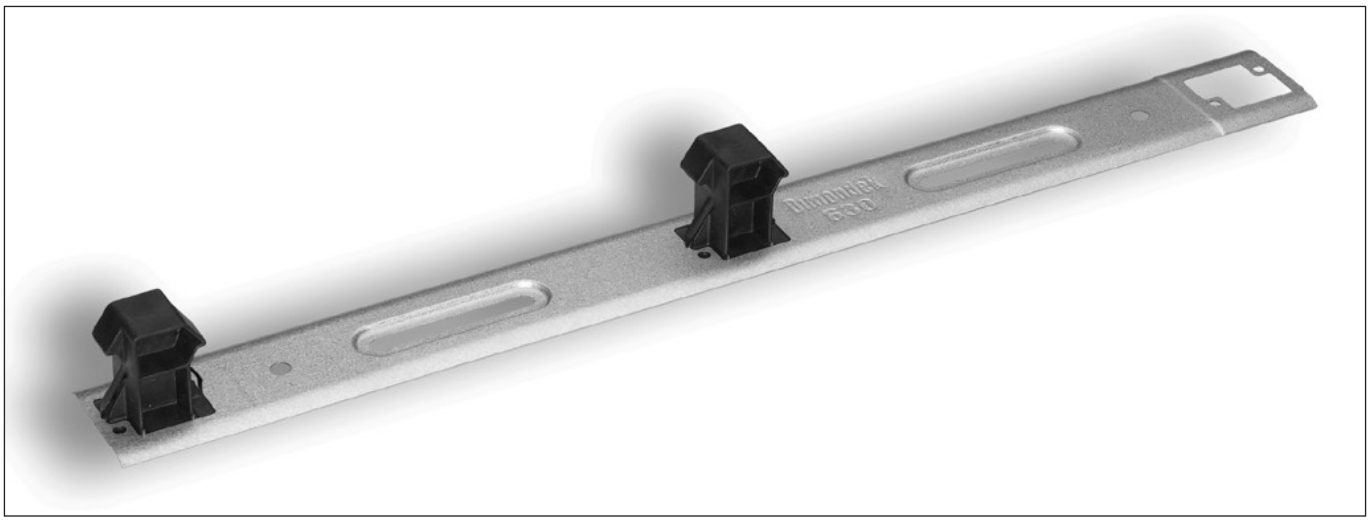
CONTINUOUS CLIPS

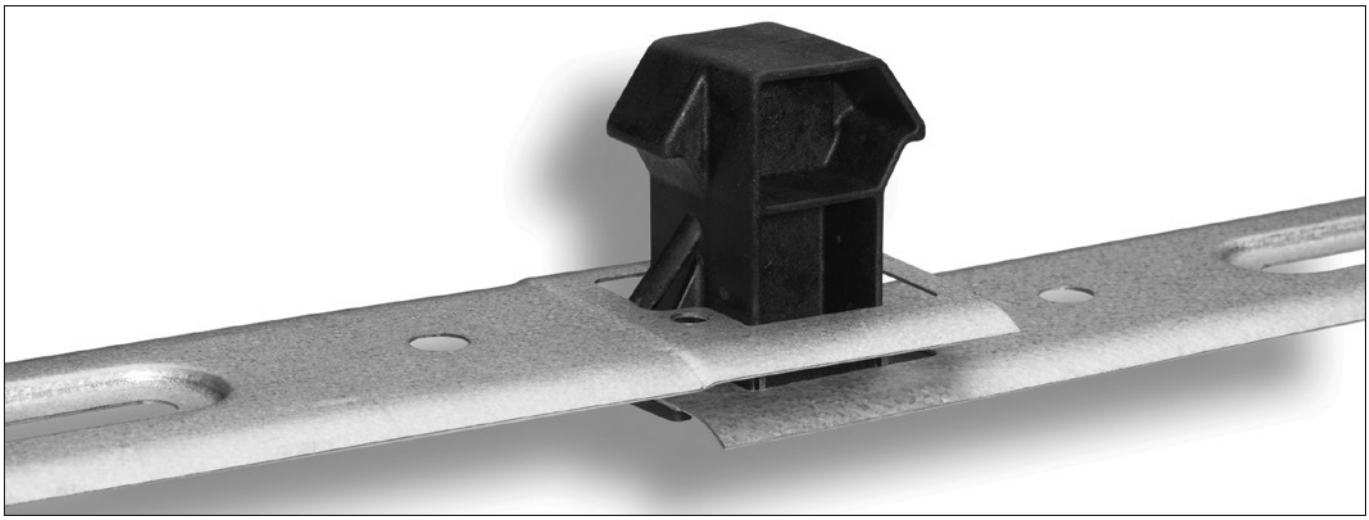
The innovative continuous metal strip with plastic clip is 1 sheet wide and holds 3 ribs of Dimondek® 630 down.
It is interlocked with the previously laid clip, thereby controlling the sheet creep and avoiding an increase in profile cover width.

The Dimondek® 630 perimeter clip must always be used over the last rib and clip on the last laid sheet, or on any part of the roof where wind loads exceed 1.6 kPa.

Used only with the Dimondek® 630 profile, the clip is screw fixed onto the roof structure after laying and interlocking with the previous clip. This also allows the building paper to be secured, prior to the laying of the roof. The roof profile is then fully pushed down and locked on to the clip and previously laid sheet.

Available as standard: unpainted AZ150g/m^2 Zincalume® coated steel base with black glass reinforced nylon plastic clip.





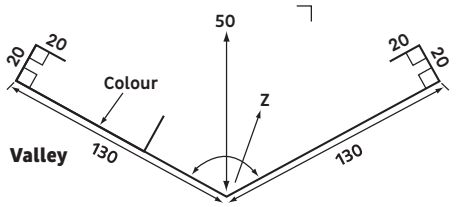
NZ Patent Appln No. 539212/539694

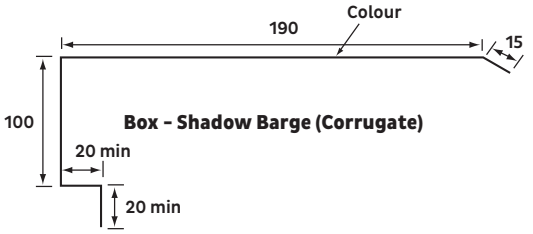
METAL FLASHINGS

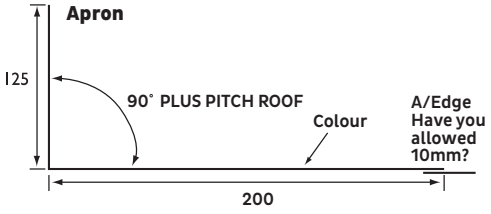
The following range of flashings have proven to be universally popular and suitable for most applications. Minor local variations may exist from that shown. Dimensions are nominal and may vary with changes in material.

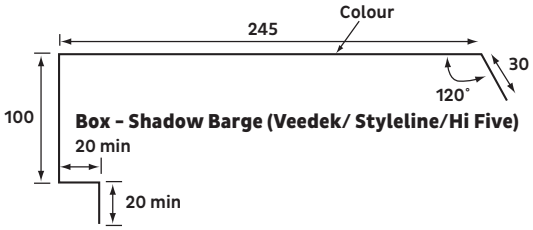
For guidance on detailing specific flashings, please refer to General Systems Design – Flashings, Section 2.1.3.6 and Table 2.1.O.

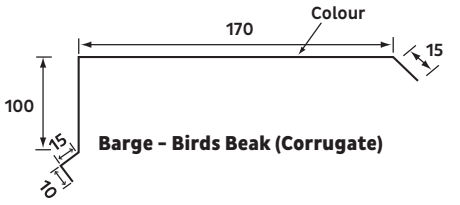
For guidance on Installation, refer Section 2.3.3.



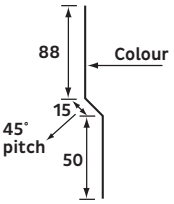




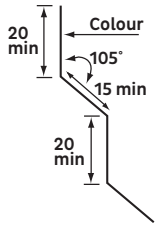


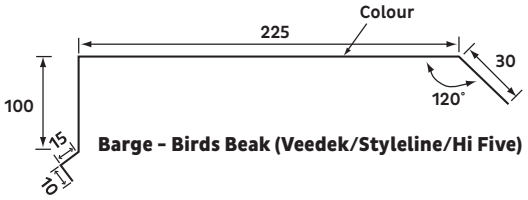


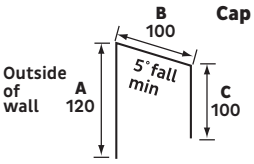
Z Flashing



Window Flashing



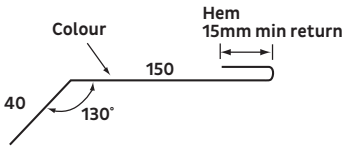




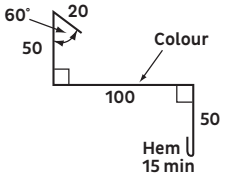
Cap Flashings

Whatever the B measurement is, one side cannot be greater than this measurement (it can be equal).

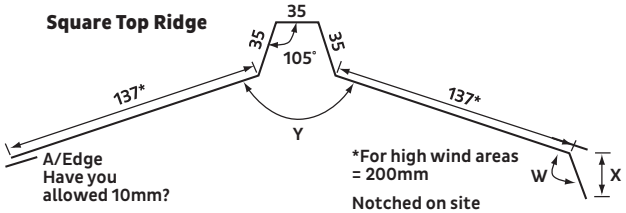
Gutter Eave Flashing



Example of Hem & Angles Required



Square Top Ridge



PROFILED FOAM STRIP – ECOFOAM

Product Description

Ecofoam is a polyethylene closed cell foam produced by Tetral® Industries Ltd (Christchurch) for use in providing long life seals against water, draughts and pests, and is commonly used between the underside of flashings and roof or wall sheet profiles.

Features

- High tensile and tear strength.
- Resistant to most chemicals and biologically and physically inert.
- Resists embrittlement due to UV exposure.
- Profiled to fit under all the Dimond® Roofing profiles.
- 20mm wide with dovetailed interlocking ends.

Compatibility

Ecofoam is suitable for use with any metal roofing or cladding materials and with translucent sheeting.

The carbon black contained in Ecofoam is less than 0.065% by weight and it is therefore suitable for use with Zincalume®, COLOURSTEEL® and ColorCote® products.

Block foam – 30 x 30mm polyethylene closed cell foam. Usually ordered in for specific jobs. Allow a 14 working day lead time, for date of order to supply.

DEKTITE® FLASHINGS

Product Description

Dektite® Flashings are a range of EPDM or silicone polymer flashings distributed in NZ by DLM, and manufactured by Deks Industries Pty Ltd (Australia). The range delivers a wide choice of specifically designed innovative products to prevent the ingress of water and dust at service pipes, flues and ducts that penetrate roofs or walls.

Dektite® EPDM and silicone is compatible with Zincalume,® galvanised steel, aluminium, copper, lead, asbestos cement, and even timber. Self seals at the top of the cone.

Dektite® sizes are available to accommodate pipe/flue diameters from 1.0mm to 610mm.
Dektite® has a wide range of configurations and sizes to suit virtually any penetration or flashing requirement.
Dektite® Standard Pipe Flashing, suits flue diameters up to 450mm on Corrugate 20º roof pitch
Dektite® Retrofit Flashing, suits flues up to 250mm diameter for 15º roof pitch
Dektite® Soaker Flashing, suits flues up to 610mm diameter for 25º roof pitch
Dektite® Retrofit Soaker Flashing, suits flues 250 to 410mm diameter
Mini Dektite® Flashing, suits smaller diameter from wiring to hot water overflow pipes
Dektite® Tile Flashing, suits pipe sizes up to 320mm diameter
Dektite® Strip & Bullnose Flashing, 225mm wide flat strip.

Features

- Quick installation using only mechanical fasteners and sealant.
- Flexible base adapts easily to roofing shape.
- Flexible seal to pipe/flue accommodates vibration and isolates noise.
- Durable polymer material withstands UV exposure and heat.
- EPDM withstands temperatures from -30ºC to 115ºC constant and up to 150ºC intermittently.
- Silicone withstands temperatures from -60ºC to 200ºC constant and up to 250ºC intermittently.

Maintenance

No maintenance is required. In an environment that contains either chemical fumes or salt water, periodic wash down and soapy water is good practice.

Warranty

Deks Industries warrants that all Dektite® flashings will perform in accordance with their published specifications, and will be free from defects in material and workmanship for a maximum period of 20 years, commencing from the date of delivery to the end user.

HANDLING AND STORAGE

Correct handling of profiled metal roofing and cladding products is critical to ensure damage does not occur during transportation and storage of the material. The following comments are made as guidelines to be used when inspecting Dimond® Roofing and wall cladding systems during the installation process.

Visual inspection of materials when they are delivered to the site should be carried out to ensure they are dry and free from damage. All components stored on site must be kept dry.

Site storage of sheet material requires dunnage evenly spaced to provide a surface for the materials to be placed on that is in plane.

Covers must be placed over the material to ensure it does not become wet during any storage period, and must remain clear of the material surface so air can circulate freely around the bundle. Product with strippable film applied must not be exposed to direct sunlight during storage.

The need to keep the sheets dry applies to all metal types. If aluminium is stored wet it will suffer black staining that detracts from appearance. If pre-painted Zincalume® products are stored wet, the paint finish will blister due to moisture absorption and eventual under-film corrosion. If unpainted Zincalume® products are stored wet, the surface will stain and can suffer loss of protection that will show up in time as premature corrosion. If the sheets have remained in this wet condition for more than 3 days, they should not be used.

If sheets do become wet and remained wet for less than 3 days, they must first be removed from the stack, immediately dried thoroughly and re-stacked with timber fillets being placed evenly between the sheets to ensure air can circulate freely over the sheet surfaces.

Sheets must always be lifted clear of the stack, never dragged.

Adequate support must be given along the length of sheets when lifting, whether it be single sheets by hand or bundles of sheets by crane or other lifting device. When lifting by mechanical means, spreader bars must be used to ensure the fabric strops do not damage the edge of the sheets as they are lifted.

LAYOUT AND FASTENING

The following comments are made as guidelines to be used when inspecting Dimond® Roofing and wall cladding systems during and after installation.

a. Netting

Netting should be run across purlins and be tensioned to remove unnecessary sag. Fastening to timber should be with either galvanised staples or 25mm clouts avoiding contact with the roofing, and to steel with flat head screws.

Fixings should be at 150mm centres on end purlins in such a way that the netting cannot pull past the fixing. Edges of the netting should be tied together or twitched at 300mm centres and fixed to each purlin. Safety mesh should be installed to manufacturers recommendations.

b. Roofing Underlay

Horizontal Application: underlay is unrolled across the roof parallel with purlins and secured as necessary. Joins should be lapped by a minimum of 75mm and supported on netting if roof pitch is below 8 degrees for self supporting and have the side edges supported on purlins.

Vertical Application: underlay is unrolled vertically down the slope of the roof from ridge to gutter and secured to the purlins as necessary before laying the roof sheet and fixing down. Joins should be lapped by a minimum of 150mm. Support such as netting or safety mesh must be used on pitches below 8 degrees, or when using self supporting underlays on purlin spacings greater than 1200 mm.

When used under roofing, all underlays must be supported on wire netting or strapping at 300mm maximum spacings. Self support underlays can be used on purlins spacing up to 1200mm without support.

Underlay should overlay into the gutter at least 20mm and not more than 50mm, and avoid lapping into the water flow.

Maximum single underlay sheet lengths shall be 10m for bituminous and fire retarded kraft papers. Longer runs are to be end lapped 150mm. Synthetic underlays have no limit on their run length.

In general it is recommended that prolonged exposure of the underlay to the weather is avoided by fixing the roofing over the same day. Always follow underlay manufacturers recommendations.

c. Roofing and Cladding Sheets

Supporting Structure

- Roofing and wall cladding sheets should not be installed until the roofing contractor is satisfied that the support structure is complete, sound, and correctly aligned. This includes support around penetrations and openings.
- Purlin and girt spans both end and internal spacings must be in accordance with Dimond recommendations for profile, metal type and thickness, as well as the expected level of foot traffic. If in doubt, check.
- Curved roofs (whether draped/rolled or crimped) require purlin alignment within ±5mm to minimise the risk of unacceptable finished appearance.
- Spacers must be fixed to steel purlins to allow insulation to fit between and to create a 25mm air gap between underlay and insulation. Do compress the insulation.

Where the building is under the scope of E2/ASI there is a requirement to install horizontal wall cladding onto a cavity batten system to achieve a 20mm air space between the back of the cladding and wall framing on all walls in accordance with NZBC E2/ASI. Dimond profiles that come within the scope of E2/ASI are: Corrugate, Styleline, Veedek®, , DD400 and V-Rib.

Vertical run cladding does require a cavity batten system on all insulated walls and where the cladding is installed over RAB board or sheet panel products to allow ventilation to the back side of the profile.

Sheet Layout

- Firstly, the sheet should show no signs or evidence of transport damage or storage damage including wet storage effects. If the sheets are damaged they must not be fixed down, and the Dimond supplying branch should be informed as soon as possible.
- Care should be taken to ensure sheets are laid parallel to the lines of building ends, and perpendicular to ridges and gutters. If possible, the direction of laying should be such that the sheet side laps face away from the prevailing wind direction, or, in the case of wall cladding, away from the most common line of sight.
- Side laps must be properly engaged such that the overlap rib fits correctly over the underlay without obvious gaps or insufficient cover.
- Roofing sheets should run continuously from ridge to gutter, avoiding end laps. Long lengths separated for thermal expansion or handling reasons should join at a step in the roof. Where end lapping of straight and curved sheets cannot be avoided, a correctly formed 150mm minimum sealed lap is required, with a bead of neutral curing silicone sealant each end of the lapped sheets.
- Sheet ends should form an even line (within a workable tolerance) and roof sheeting should overhang into gutters by at least 50mm and must allow clearance to enable ease of gutter cleaning.

Sheet Ends

- All roofing and wall cladding sheet ends that terminate under flashings (regardless of pitch) should be formed with a full vertical dog-eared stop end to the full height of the profile rib. Where a full height dog-eared stop end cannot be achieved, a pull up stop end a minimum 28mm high on all profiles excluding Corrugate must be provided in conjunction with foam profile closures.
- For roofs below 8 degrees pitch the drip edge sheet end should be formed with a down turned lip.

Sheet Fastening

- Sheet must be fastened to every purlin (or girt) to transfer outward loads evenly to every structural member.
- The screw and washer system used should meet specification requirements and have a durability to at least match that of the sheeting, and be in accordance with Dimond literature for that profile.
- Fasteners must be perpendicular to the sheeting and tightened sufficiently to effect a durable seal without over tightening that results in seal washer distortion or profile crest dishing and depressing. Fixings must be to a line.
- Concealed clips used to fasten Dimondek® 400, Dimondek® 630 and Eurotray® profiles must not exhibit screw or nail head protrusion such that damage to the roof sheet and coating may result.
- Whenever oversize holes are required to accommodate expansion, profiled washers and seals must be used.
- Profiled washers and seals should be used whenever specified to provide extra wind uplift capacity.
- Note should be made to ensure there are sufficient fasteners, evenly distributed. In particular the perimeter zones of roofs, where maximum wind uplift occurs, must have sufficient fasteners.
- No areas on the roof should hold water that will cause ponding long term. The structure may require realignment and if the profile is damaged, this should be replaced.

Wall Cladding Underlay

- Can be laid either horizontally on steel girts or vertically on timber studs.
- When run horizontally lap upper sheet over lower sheet a minimum of 75mm. Adequately secure to framing at 300mm centres. When installed in high wind areas fix through a reinforced tape such as Danband branded polypropylene tape.
- Run lengths to be no greater than 10m.
- End laps to be no less than 150mm over studs of vertical joints.
- The underlay should be pulled taut as possible.
- Best practice is to clad on the same day as installation provided the product is kept dry and undamaged.
- Maximum period that the underlays are exposed to the weather is contained in the underlay manufacturers literature.

Side Lap Fastening

All metal profiles must have side laps fastened (either by primary fasteners through to the purlins, or by stitching the top sheet to the underlay sheet) to comply with the following maximum spacings.

Material	Thickness (mm)	Maximum Side Lap Fastener Spacing (mm)
Steel	0.40	1500
	0.55	2000
	0.75	2400
Aluminium	0.70	1500
	0.90	2000
Duraclad® (GRP) Rib height 30mm or less	1.7	750
Duraclad® (GRP) Rib height greater than 30mm	1.7	1000

Wall Cladding Side Lap

Side lap stitching on pan fixed wall cladding is recommended to improve the lap weather tightness, when the distance between fixings is greater than 1.5m. Side lap fixings should not exceed 750mm centre to centre.

The recommended side-lap fasteners for stitching sheets together are:

Metal Sheeting		
10-16x16mm	Hex head	Tek® screws
10-12x20mm	Hex head	Type 17 screws

Duraclad®

Bulb - Tite Rivet

or Bolt and compressible rubber sleeve

d. Duraclad®

The above comments for roofing and cladding sheets generally apply. Additional attention should be given to:

- Stop ends should be correctly formed by attaching a metal (usually aluminium) folded angle to the sheet end, and sealing it in place.
- The supporting structure must be free of abrasive surfaces or irregularities. If used over netting or safety mesh, a barrier strip must be installed to prevent abrasive damage to the sheet surface.
- Fastening of Duraclad® requires pre-drilling of the sheet with a hole size that is at least 2mm greater than the fastener diameter. Additional hole size may be required to accommodate thermal expansion of the sheeting.
- Provision should be made during installation to enable foot traffic movement across the roof without applying point loads to the Duraclad® sheeting. Planks or temporary walkways are recommended.
- Safety Mesh must be installed underneath Duraclad® if the sheet thickness is less than 1.7mm. (If general foot traffic is expected, consult Dimond for the use of products specifically designed for the purpose.)

e. Natural Lighting Products

Refer to Section 2.4.1.3 for installation of these products.

FLASHINGS / PENETRATIONS

The following comments are made as guidelines to be used when inspecting Dimond® Roofing and wall cladding systems during and after installation.

Material

Must be the same material and coating as the roof or wall cladding to give a similar durability and compatibility to the roof/wall system.

Fabrication

Flashings should be fabricated to achieve sufficient cover width and to maintain falls to avoid water ponding.

They must be without noticeable micro-cracking and be fixed without damage such as dings or crushing, and should be free of scratches and swarf the same as for roofing.

Flashing joins must be sealed at both ends of the lap, and the fasteners must pass through the sealant at the leading edge. Spacing of fasteners should be no greater than 50mm apart. Laps to be 150mm min.

Fastening

Wherever possible, flashings should be screw fixed through to the supporting structure, with sufficient slope or fall to ensure ponding does not occur. Stitch screws should be the preferred means of attaching flashings to sheeting ribs. If aluminium rivets are used, the minimum size should be 4.8mm diameter.

All fasteners should be of sufficient size and frequency to withstand the loads that may be applied through wind uplift or thermal expansion, throughout the life of the roofing material. As a guide, where flashings cover the roof, use the same fastener that has been used to fasten the roof.

As a guide, the fastener frequency for fixing flashings should be:

Wind Zone*	Fasteners Per Metre
Low (32 m/s)	1
Medium (37 m/s)	2
High (44 m/s)	3
Severe (50 m/s)	4

*in accordance with NZS 3604

Sensible allowance should be made to allow relative thermal expansion between flashings and sheeting if sheet lengths exceed 12m.

Expansion joints in the flashings should be considered for steel flashings greater than 18m and aluminium flashings greater than 12m in length.

Flashing lapping over roofing should be in accordance with Table 2.1.O of Section 2.1.3.6 in this manual. Where barges meet the gutter, this must be closed off to ensure wind driven moisture and birds cannot enter the building.

Profiled Foam

Profiled foam sealing strips should be installed when specified at the top end of the sheet, adjacent to the stop end. To help keep the strips in place it is good practice to position them on a bead of silicone sealant.

Notching

Best practice to notch flashing downturns around sheet profiles is to mark in-situ and use a rib-shaped template. Clearance gaps around the rib should be just sufficient to prevent cut edge contact with the sheet surface. Gaps between 1mm and 3mm are generally considered satisfactory.

Soft edging can be used on corrugate and low rib profiles with rib heights up to 30mm and should be neatly pushed down and formed in to the profile pans to achieve a neat-tight fit.

Property boot pipe flashing

Property boot pipe flashings must not be positioned in such a way that a dam is formed across a water channel. It is preferred that Property boot pipe flashings are positioned on the 'bias' rather than square across the sheet. If the pipe and Property boot pipe flashing dam up the pan or restrict more than 50% of the water flow around the pipe and flashing, an additional cover over flashing to the ridge and sealing of the Property boot pipe flashing to this flashing should be considered. Excess silicone sealant should be avoided, as it will add to the risk of water ponding.

Penetrations

Penetration holes with their major dimension or diameter greater than 150mm must have support framing placed around the perimeter of the penetration holes.

Water diversion around the penetration must not cause an overload of the receiving channel such as the pans that the water has been diverted into, which may cause flooding. Penetration flashing shall not rely solely on the silicone sealant to achieve weather tightness of the flashing.

GENERAL WORKMANSHIP

The following comments are made as guidelines to be used when inspecting Dimond® Roofing and wall cladding systems during and after installation.

Roof Access

The means of access must be safe and secure, and should provide protection to the sheeting at the access point. Provision for cleaning or changing footwear to prevent the transfer of dirt onto the roof surface is recommended to minimise the risk of surface scratching damage.

Walking on Roofs

Soft, clean (free from dirt and clay) light coloured soled footwear must be worn. Foot placement should be close to purlin lines, and point loads should not be applied to profile ribs through careless weight distribution while walking. Avoid foot placement on the underlay edge of roof sheets.

Translucent or Natural Lighting sheet must not be walked on.

Subsequent Trades

The work habits of trades accessing the roof must be controlled to avoid unnecessary damage from foot traffic, swarf, and storage of materials. Installed roofing that will be subject to further use (or abuse) during building construction should be protected by covers or temporary walkways. Care must be taken to protect and avoid scratching of the paint finish. The placement of scaffolding legs onto a roof should be avoided unless there is adequate support and protection to the roof finish to avoid damage. Penetration flashing should be placed as close to the ridge as possible to avoid large catchment areas upstream of the penetration. All penetration flashings should be done in accordance with the MRM Code of Practice.

Dissimilar Materials

Care should be taken to ensure that incompatible materials have not been used, particularly through the installation of walkways and air conditioning equipment. Copper pipe must not discharge or allow water run-off onto the metal roof. Where necessary, water run-off from dissimilar metals should be contained and discharged separately from the roofing material.

Wall cladding lapping onto concrete tilt slab or block walls must not contact the concrete. A small gap, such as 5mm, between or isolation strip is recommended.

Drilling and Cutting

When metal sheets require cutting, only shears, powered nibblers or hand snips should be used to leave a cleanly cut sheared edge. Any form of disc cut will nullify the material warranty.

Cutting of Duraclad® sheets can be with an abrasive disc or a fine tooth saw. Breathing protection should be worn to prevent inhalation of dust.

Cutting and drilling should be carried out clear of other sheeting material, and the drilling swarf immediately removed from the surrounding sheet surface.

Coil on cut edge protection lacquer may be required to be painted on all cut edges in severe marine areas to meet warranty requirements. Check with Dimond.

Swarf

The particles of metal that result from cutting, drilling or self-drilling screw placement can adhere to the sheet surface and rapidly corrode, causing staining problems. The sheet durability is not affected provided the swarf particles have not penetrated the coating. Loose swarf must be removed without damage to the metal surface at least at the end of each day's work including swarf driven by wind up under barge or apron flashings.

Remaining adhered swarf may be best left alone, provided no particles have broken the coating surface and the visual effect is acceptable. Roofs with heavy deposits of swarf or where the coating has been broken may require the affected sheets to be replaced.

It is best trade practice to clean up after each day's work to avoid swarf damage.

General Appearance

Screw fasteners should be installed to a straight line (staggered for lapped purlins). Extra care on wall cladding is required to achieve this. Flashings should run parallel with profile ribs or the building line.

Sheet side laps should not exhibit excessive gaps, which can be controlled by careful sheet layout and side lap stitching if necessary.

Water Ponding

The installed roof and flashings must not exhibit water ponding. Buckling of profile pans caused by poorly formed lip downturns at gutter lines is a particular area of potential ponding that should be checked.

Sealants

Only neutral cure silicone sealants should be used. All sealed joints must be mechanically fastened, and excess sealant removed to prevent unnecessary dirt build-up.

Joints in flashings or roof plane intersections should not be constructed in a way that relies entirely on sealant to remain weather secure. Sealant should only be used to seal between two metal surfaces, not fill holes or gaps.

Cleaning on Completion

All forms of debris must be removed daily from the roof surface to prevent scratching damage and moisture or dirt retention. On completion the roof should be thoroughly washed down and then inspected for any damage and any necessary remedial work carried out.

Strippable Film

Protective films must be removed within 1 day of product installation. Prolonged UV exposure will make removal difficult. The film must be removed from laps and under flashings during installation.

Scratches and Touch-up

Scratches that have not penetrated to the base metal (on coated materials) and minor surface abrasions should be left alone, as touch up painting will become obvious in time.

Sheets with heavy scratch damage (e.g. scratches readily visible from a 3 metre distance that expose the base metal) should be replaced.

Buckled Ribs

Minor buckles that have occurred in profile ribs and will not retain water can be left alone. More severe buckles that will retain water or weaken the sheet should be pushed out from underneath, or be capped over with a rib section extending a minimum 50mm beyond the damaged section, fully sealed with silicone sealant and held onto the roofing rib with 4mm diameter blind aluminium rivets each side.

Major buckles that affect more than 1/4 of the ribs in line across any sheet will cause a severe loss of strength, and in such cases the sheet must be replaced, e.g. if more than 2 adjacent ribs are buckled on the same purlin line, the sheet's ability to hold load is reduced and it must be replaced.

PERFORMANCE

NATURAL LIGHTING SYSTEM PERFORMANCE STATEMENT

Description

Dimond Natural Lighting Systems comprise:

- Durolite®, Durolite® HeatGuard 4, Durolite® HeatGuard 8, Durolite® FireGuard 2 (FG2), Durolite® Webglass™ and Durolite® translucent fibreglass sheeting products.
- Fasteners, washers and seals
- Flashings
- Underlays and safety netting
- Additional mid span support members

Material Properties

Durolite® including Durolite® Webglass™ Durolite® HeatGuard 4 & Durolite® HeatGuard 8 Durolite® FireGuard 2		
Tensile Strength	80 MPa	111 MPa
Impact Strength	8 Joules	10 Joules
Shear Strength	90 MPa	90 MPa
Modulus of Elasticity	5500 MPa	5500 MPa
Compressive Strength	135 MPa	151 MPa
Flexural Strength	150 MPa	181 MPa
Specific Gravity	1.45	1.6
Water Absorption	2% in 24 hrs @ 26°C	2% in 24 hrs @ 26°C
Temperature Stability	suitability for an in-service temperature range of 20°C to 95°C	

Scope of Use

Dimond Natural Lighting translucent sheeting products are manufactured to the requirements of AS/NZS 4256.3.1994 in a range of profiles, sheet thicknesses and sheet compositions to meet the light transmission, wind load and durability requirements for their intended use as Natural Lighting in roofs, walls and fences of AS/NZS 4257. Specific grades of product can be manufactured to support concentrated foot traffic loads, but the standard product range is not intended to support foot traffic.

Requirements

In addition to the relevant content of the general Roofing and Wall Cladding System Performance Statement (Section 2.1.1.1) the Dimond Natural Lighting System design must cover the following aspects of systems performance.

- Durability 2.4.1.1.2
- Light transmission 2.4.1.1.3
- Solar heat gain 2.4.1.1.4
- Load/span capability 2.4.1.1.5
- Fastener suitability 2.4.1.1.5
- Condensation control 2.4.1.1.6
- Fire resistance 2.4.1.1.7
- Safety 2.4.1.1.8
- Maintenance requirements 2.4.1.1.2d
- Installation information 2.4.1.3
- Thermal expansion 2.1.3.4

New Zealand Building Code Compliance

Past history of Durolite® use in New Zealand indicates that provided the Dimond Natural Lighting Systems are designed, handled, stored, used and maintained in accordance with the guidelines given in this manual they will meet the relevant performance criteria in Clauses B1, B2, E2 and G7. In addition, fire compliance with Clause C criteria is achieved with Durolite® products, tested to verification Method C. Durolite® achieves a Group Number 3 and Durolite® FG2 achieves a Group Number 2.

Use Outside Stated Guidelines: If the need arises to use Dimond Natural Lighting outside the limitations and procedures given in this or other referenced literature, or if any doubt exists on product handling or use, written approval for use must be obtained from Dimond before the project commences.

DURABILITY

(a) Sheet Characteristics

The useful life of Natural Lighting products is determined by their ongoing ability to allow sufficient light into the building. Table 2.4A gives a guide for the recommended use of each of the product types and the expected useful life based on light transmission.

The long-term performance of Durolite® products is enhanced by the use of a 100-micron integral gel coat surface rather than a laminated polyester film.

Table 2.4A Durability Guide

	Durolite®	Durolite® HeatGuard 4 (HG4)	Durolite® HeatGuard 8 (HG8)	Durolite® FireGuard 2 (FG2)	Durolite® Webglass™	Durolite® Webglass™ Plus
Performance Requirement	Best for long term light transmission in industrial/commercial buildings. Achieves a Group Number 3 under NZBC C/VM2.	Same as Durolite.® Reduces heat transmitted through sheet without large loss of light. 20% less heat without light loss compared to Durolite® Clear.	Same as Durolite.® Reduces a large amount of heat transmitted through sheet with some reduction of light. 20% less heat without light loss when compared to Durolite® Opal tinted sheet.	Same as Durolite.® Achieves a Group Number 2 under NZBC C/VM2.	Same as Durolite® but extra heavy woven glass matt allows the product to be used without safety mesh.	Same as Durolite® but extra heavy woven glass matt allows the product to be used without safety mesh. Resin uses a vinyl esta with excellent chemical resistance.
Product Type and Surface Film	GRP sheet with 100 micron nominal thickness, clear integral surface coating	GRP sheet with 100 micron nominal thickness, clear integral surface coating	GRP sheet with 100 micron nominal thickness, clear integral surface coating	GRP sheet with 100 micron nominal thickness, clear integral surface coating		
Visible Light Transmission of New Clear Sheet	63%	64%	49%	63%	-	-
Total Solar Transmission	63%	50%	36%	63%	-	-
Expected Useful Life as Skylighting	25 years	25 years	25 years	25 years	20 years	20 years
Sheet Characteristics at End of Useful Life						
Loss of Original Light Transmission	Up to 25%	Up to 25%	Up to 25%	Up to 25%	Up to 25%	-
Surface Coating Condition	Minimal surface degradation, gloss retained	Minimal surface degradation, glass retained	Minimal surface degradation, glass retained	Minimal surface degradation, gloss retained	Minimal surface degradation, gloss retained	Minimal surface degradation, gloss retained
Glass Fibre Appearance	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent
Sheet Yellowing	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal
Ongoing Properties	The products will remain an effective barrier to the weather for periods well in excess of their useful light transmission					
Hail Resistance	Sheet thickness 1.4mm or more will not fracture from 20mm ø hail impact 100km/h					
Chemical Resistance	Surface resistant to some hydrocarbons (e.g. toluene, petrol, mineral oils) & salt solutions.	Surface resistant to some hydrocarbons (e.g. toluene, petrol, mineral oils) & salt solutions.	Surface resistant to some hydrocarbons (e.g. toluene, petrol, mineral oils) & salt solutions.	Surface resistant to some hydrocarbons (e.g. toluene, petrol, mineral oils) & salt solutions.	Surface resistant to some hydrocarbons (e.g. toluene, petrol, mineral oils) & salt solutions.	Best surface & sheet resistance to some hydrocarbons (e.g. toluene, petrol, mineral oils) and salt solutions.

(b) Life Cycle Costing

A comparison of installed Natural Lighting costs that includes the effect of the product durability and need for replacement is given in Chart 2.4B.

The $/m² cost is based on market prices for the installed system discounted at 8% to compare as present value. The steps in $/m² for each product represent the cost of removing and replacing the Natural Lighting product at the end of its useful light transmission life.

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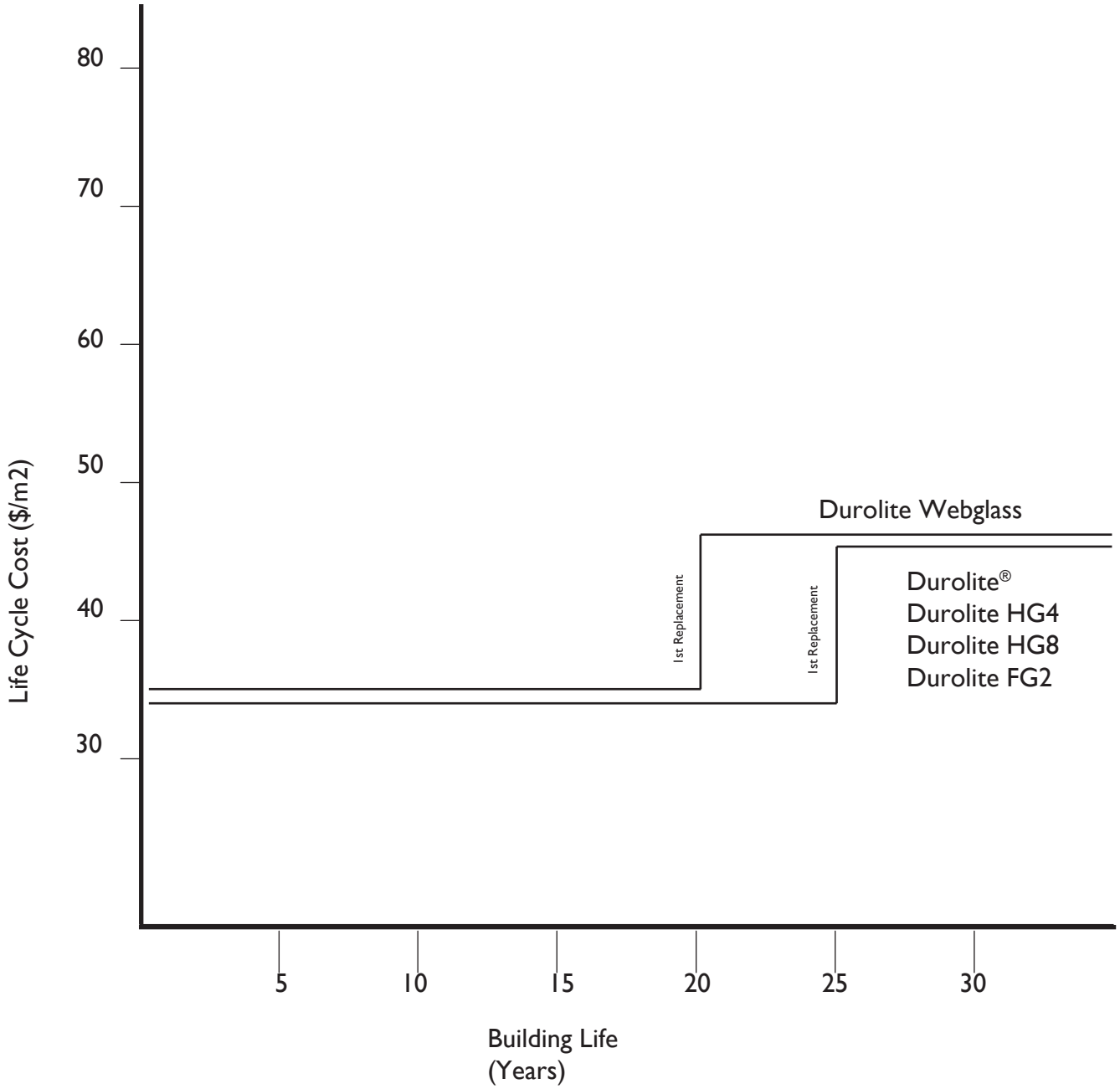
Chart 2.4B Life Cycle Cost



(c) Warranty

Product performance is covered by the following warranties:

Durolite,® Durolite® HeatGuard 4 & Durolite® HeatGuard 8

- Will not suffer excessive yellowing and degradation to cause a light transmission loss of more than 25% from the original value when installed, for a period of 25 years from installation.
- Will not delaminate, surface erode away, allow protrusion of the reinforcing fibres through the surface, or fracture due to impact from hailstones up to 20mm diameter accompanied by winds of up to 100km/hr, for a period of 20 years from installation.
- Will not permit water to penetrate right through the sheet for a period of 25 years from date of installation.
- Durolite® will achieve a Group Number 3 in accordance with the NZBC verification method C/VM2 Appendix A.

Durolite® FireGuard 2

- Will not suffer excessive yellowing and degradation to cause a light transmission loss of more than 25% from the original value when installed, for a period of 25 years from installation.
- Will not delaminate, surface erode away, allow protrusion of the reinforcing fibres through the surface, or fracture due to impact from hailstones up to 20mm diameter accompanied by winds of up to 100km/hr, for a period of 20 years from installation.
- Will not permit water to penetrate right through the sheet for a period of 25 years from date of installation.
- Durolite® FG2 will achieve a Group Number 2 in accordance with the NZBC verification method C/VM2 Appendix A.

Durolite® Webglass

- Will not suffer excessive yellowing and degradation to cause a light transmission loss of more than 25% from the original value when installed, for a period of 20 years from installation.
- Will not delaminate, surface erode away, allow protrusion of the reinforcing fibres through the surface, or fracture due to impact from hailstones up to 20mm diameter accompanied by winds of up to 100km/hr, for a period of 20 years from installation.
- Will not permit water to penetrate right through the sheet for a period of 20 years from date of installation.
- Will remain as a trafficable sheet, resistant to foot traffic loads, for a period of 20 years from date of installation.
- Durolite® Webglass will achieve a Group Number 3 in accordance with the NZBC verification method C/VM2 Appendix A.

These guarantees are subject to conditions relating to correct storage, handling and installation, exposure to unsuitable temperatures, debris or chemicals, and to terms regarding Dimond liability.

(d) Maintenance Requirements

Dimond Natural Lighting Systems require at least the following maintenance as a minimum to ensure the guaranteed performance is achieved. Additional regular maintenance can extend the useful life of the products.

1. Keep surfaces clean and free from continuous contact with moisture and debris. Wash at least annually using a soft bristle brush to remove dirt build-up.
2. Inspect and replace any fasteners and washers that have deteriorated sufficiently to cause leakage risk or noticeable staining.

LIGHT TRANSMISSION DESIGN

The Durolite® range provides a source of soft, shade free natural light to building interiors. This results from the refraction by the glass fibre reinforcement in the sheet material, in contrast to the more direct and intense light and heat transmission of clear glass or clear plastic. The light transmitted excludes 99% of UVB radiation, thus minimising burning. Photosynthetically active radiation is transmitted through Durolite® allowing plant growth in greenhouse buildings.

Durolite® is available in a range of tints to reduce the level of light transmission if required.
Refer Table 2.4D for Relative Light Transmission.

Opal and Woolstore tints may not be available ex stock, but can be manufactured in minimum run quantities. Discuss with your Dimond representative well in advance of your required delivery date to ensure the product required to meet your light transmission needs will be available.

Design Method For Light Transmission

To calculate the level of light transmission through Natural Lighting installed in a building the following procedure can be used.

1. Select The Value Of External Illumination For The Location Of The Building Located From Table 2.4C.

Table 2.4C

Location	Latitude (Degrees South)	External Illumination (Lux)
Auckland	37	7700
Wellington	41	6450
Christchurch	43	5920
Dunedin	46	5380

EXTERNAL ILLUMINATION FOR OTHER LOCATIONS MAY BE INTERPOLATED BY LATITUDE

2. Select The Recommended Minimum Level Of Internal Illumination In Lux, Refer AS/NZS 1680.2.4

3. Calculate The Daylight Factor (A) From:

$$A = \frac{\text{Internal Illumination} \times 100}{\text{External Illumination}}$$

4. Determine The Transmission Factor (B) For The Grade Of Natural Lighting Selected From The Range In Table 2.4D.

Table 2.4D Relative Light Transmission

Colour Type	Effective visible light transmission of new sheet %	Transmission factor (B)
HeatGuard 4	64	1.5
Clear	63	1.5
HeatGuard 8	49	2.0
Opal	40	2.4
Double Skin Clear or when using sky film	55 (estimated)	1.8
Woolstore	14	7.0

5. Determine Dirt Allowance Factor (C) From Table 2.4E.

Table 2.4E Dirt Allowance Factor

Locality	Class of Activity	Dirt Allowance Factor (C)
Country or outer suburban area	Clean	1.2
	Dirty	1.8
Built up residential area	Clean	1.4
	Dirty	2.5
Built up industrial area	Clean	1.8
	Dirty	4.0

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6. Determine Reflection Allowance Factor (D) From The Table 2.4F For The Surfaces Involved Within The Building Space Using The Following Guidelines:

	Range	Typical Industrial
Ceiling	0-30%	10
Glazing	0-20%	10
Wall	0-50%	25
Floors	0-30%	15

Typical Industrial Application Average Reflection $= \frac{10+10+25+15}{4} = 15\%$

Table 2.4F

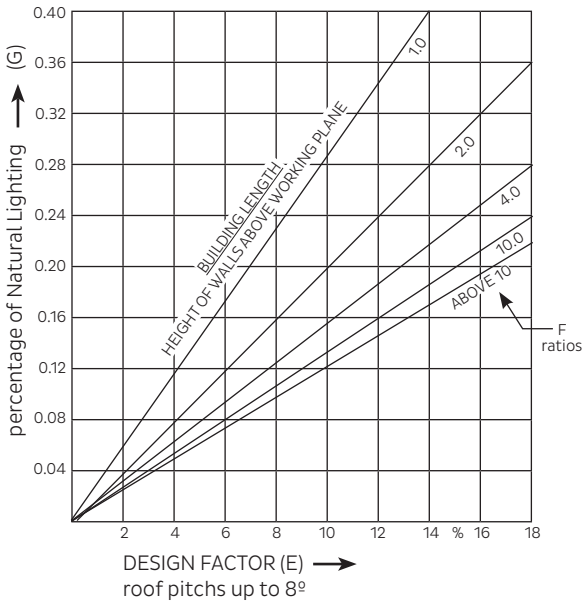
Average Reflection	Reflection Allowance Factor (D)
15%	1.05
25%	0.96
30%	0.93
35%	0.88
40%	0.84

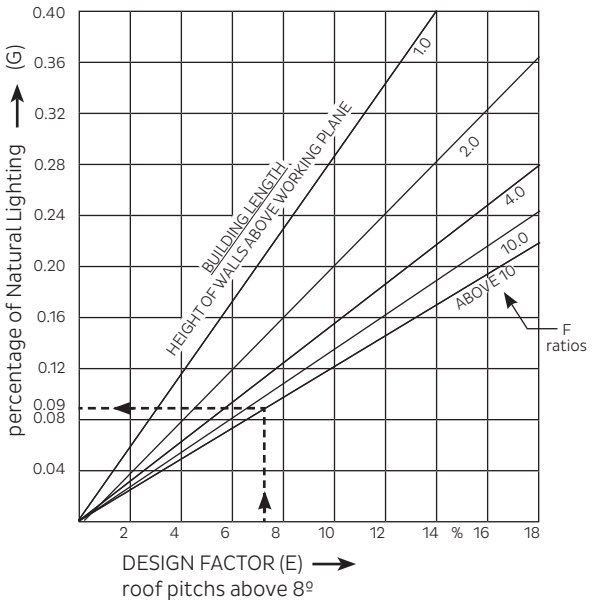
7. Calculate Design Factor (E) from the other factors.
   E = A x B x C x D

8. Determine The Building Dimensions Factor (F)
   $F = \frac{\text{Building Length}}{\text{Wall Height – Working Plane Height}}$

9. Using **E & F** from above, on Chart 2.4G read off the percentage of Natural Lighting sheet required (G), for the relevant roof pitch.

Chart 2.4G





10. Calculate The Area Of Natural Lighting Required
    Durolite® area = $\frac{G \times \text{Floor Area}}{100}$

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Design Example

Calculate the amount of clear Durolite® required to give 110 lux of natural light in a building 60m x 18m x 6m walls with a 15° roof pitch in a built up industrial area of Auckland. The workbench is 1m above the floor, and the roof has a foil underlay.

From Table 2.4C External Illumination = 7700 Lux

Internal Illumination requirement of 110 lux

1. $A = \frac{110 \times 100}{7700} = 1.4$
2. Table 2.4D Clear Durolite® transmission factor, B = 1.5
3. Table 2.4E Dirt allowance factor, C = 4.0
4. Average reflection calculated as: $\frac{20+10+25+15}{4} = 17.5$ Table 2.4F, D = 1.05
5. E = 1.4 x 1.5 x 4.0 x 1.05 = 8.82
6. $F = \frac{60}{6-1} = 12$

From Chart 2.4G, G = 11%

7. $\frac{11 \times 18 \times 60}{100} = 118.8m^2$ of Durolite® required.

Sheet Layout

As a guide to Natural Lighting sheet layout, the designer should check that the following relationship holds,

$$\frac{\text{Distance between Natural Lighting rows}}{\text{Height of roof above working area}} < 2$$

The achievement of even dispersed light can be enhanced by using half sheet widths.

SOLAR HEAT GAIN

There are four ways of reducing solar heat gain using the Dimond Natural Lighting range.

1. Durolite® is available in a range of clear and colour tints in Dimond profiles to reduce the level of solar heat gain as required. Refer to Table 2.4I for relative solar heat gain.
2. Use Durolite® HeatGuard 4 (HG4) in any of the Dimond profiles to reduce the total solar transmission by 13% without any noticeable loss of visible light transmission when compared to Durolite® clear (which allows 64% of visible light through the sheet).
3. Use Durolite® HeatGuard 8 (HG8) in any of the Dimond profiles to further reduce the total solar transmission. When compared to tinted Durolite® opal sheet, Durolite® HG8 has similar solar heat gain characteristics, while still allowing 49% of visible light through the sheet.

For the System in point 1 above, the heat gain resulting from the use of Durolite® can be estimated in a simple way using the following calculations: (This does not take into account heat transmissions through other materials making up the building envelope.)

Design Method for Solar Heat Gain

Total instantaneous heat gain = Qi + Qc (watts)

Where Qi = instantaneous solar gain
Qc = conduction heat gain/loss through Natural Lighting sheeting

To calculate instantaneous solar gain (Qi) use:

Qi = A x SHGC x E

A = Area of Natural Lighting sheeting (m^2)
SHGC = Solar heat gain coefficient. Refer Table 2.4I
E = Solar Irradiance (W/m^2) Refer Table 2.4H

Table 2.4H

Zone	Solar Irradiance E (Average) (W/m^2)
Auckland	752
Wellington	733
Christchurch	695
Dunedin	592

Table 2.4I Relative Solar Heat Gain

Colour/Type	SHGC	Total Solar Transmission
Clear	0.73	63%
Opal	0.42	36%
Woolstore	0.19	16%
HeatGuard 4	0.58	50%
HeatGuard 8	0.41	36%

To calculate conduction heat gain/heat loss (Qc) use:

Qc = A x U x Td

A = Area of Natural Lighting sheeting (m^2)
U = Thermal transmittance W/m^2 °C from Table 2.4J
E = Solar Irradiance (W/m^2) Refer Table 2.4H

Table 2.4J Thermal Transmittance U (W/m^2 °C)

	Single Skin	Double Skin AIr Gap		
		100mm	50mm	DSR 5
Heat flow down (Heat Gain)	2.2	0.9	1.0	1.1
Heat flow up (Heat Loss)	-4.8	-1.9	-2.0	-2.2

This table includes internal and external boundary layer effects.

For example: To calculate the total heat gain of an Auckland building with 43.2m^2 of Clear Durolite® single skin roofing with a temperature difference of 8°C (warmer inside than outside).

Solar Heat Gain Qi = A x SHGC x E
= 43.2 x 0.73 x 752
= 23.7kW

Conductive Heat Gain Qc = A x U x Td
= 43.2 x (-4.8) x 8
= -1.66kW

Total Instantaneous Heat Gain Q = Qi + Qc
= 23.7 - 1.66
= 22.04kW

LOAD SPAN DESIGN

Table 2.4K provides the maximum spans for each Durolite® product type in all the grades such as clear, HG and FG for each profile and sheet thickness limited by the ultimate limit state capacities given. The load span data is based on the number of fasteners/sheet/purlin given. The load capacities apply to both inward and outward uniformly distributed loads. Table 2.4K does not cover Natural Lighting Systems intended to support concentrated loads (e.g. foot traffic). Consult Dimond for alternative systems if design consideration is to be given to concentrated load support.

Fastener Design

Dimond Natural Lighting sheets must be fixed with screw fasteners of the same type and length for the matching metal sheeting. The fastener frequency should be specified according to Table 2.4K.

Weatherlok roofing washers may be used to achieve a seal and to spread wind uplift reaction loads. For roofs with design wind loads close to the maximum values below or above 2.0 kPa, use the matching metal profiled washer and 36Ø EPDM seal. Side lap stitching and pre-drilled oversize holes may be required (refer Section 2.4.1.3.2).

Table 2.4K Natural Lighting Systems – Load / Span / Fastener Design

			Maximum Internal Span (mm) End Span = 0.7 x Internal Span			Fasteners per sheet per purlin	
Profile	Gauge (mm)	Nominal Sheet Weight/m² Kg/m²	U.L.S[5] 1.0 kPa	U.L.S[5] 1.5 kPa	U.L.S[5] 2.0 kPa	End Span	Internal Span
Corrugate Min pitch 8°	1.1	1.8	1200	1000	900	5	3
	1.4	2.4	1400	1200	1000	5	3
	1.7	3.0	1500	1300	1200	5	3
Veedek®/Styleline/ Hi Five Min pitch 3°	1.1	1.8	1400	1200	1000	4	4
	1.4	2.4	1700	1500	1200	4	4
	1.7	3.0	1900	1700	1400	4	4
V-Rib Min pitch 4°	1.1	1.8	1400	1200	1000	5	3
	1.4	2.4	1700	1500	1200	5	3
	1.7	3.0	1900	1700	1400	5	3
LT7® Min pitch 3°	1.1	1.8	1600	1400	1300	7	4
	1.4	2.4	1900	1700	1500	7	4
	1.7	3.0	2100	1800	1700	7	4
BB900 Min pitch 3°	1.1	1.8	1700	1400	1300	6	3
	1.4	2.4	2000	1700	1500	6	3
	1.7	3.0	2300	1900	1700	6	3
DP955® Min pitch 3°	1.1	1.8	1400	1000	750	3	3
	1.4	2.4	1900	1300	900	3	3
	1.7	3.0	2500	1600	1200	3	3
SS900/Topspan® Min pitch 3°	1.1	1.8	1800	1600	1400	4	4
	1.4	2.4	2000	1800	1400	4	4
	1.7	3.0	2300	2000	1700	4	4
Super Six Min pitch 3°	1.1	1.8	1800	1400	1200	4	4
	1.4	2.4	2000	1600	1400	4	4
	1.7	3.0	2300	1800	1600	4	4
Dimondek® 400 Min pitch 3°	0.75	1.9	1400	1200	1000	1 Clip	1 Clip
	0.9	2.3	1600	1400	1200	1 Clip	1 Clip
Dimondek® 630 Min pitch 3°	1.4	2.4	2200	1500	1100	3	3
	1.7	3.0	2800	1900	1400	3	3
	2.2	3.6	3500	2500	1900	3	3
Six Rib Min pitch 4°	1.1	1.8	1200	1000	900	6	6
	1.4	2.4	1400	1200	1000	6	6
	1.7	3.0	1500	1300	1200	6	6

Note:
1. The spans given are for internal purlin spacings.
2. The tabulated data does not apply to single spans. Single spans must be reduced to 0.5 x internal span.
3. These spans apply where the Natural Lighting sheets are installed with both side edges supported by an adjacent metal roof.
4. For continuous coverage of two or more Natural Lighting sheets we recommend reducing the spans 0.9 x Internal spans.
5. U.L.S. = Ultimate Limit State Capacity.

Mid Span Support

Whenever the span capability of the Dimond Natural Lighting product does not match the purlin spacing used for the adjoining metal sheets, a mid span support must be used. The sheets must be fastened to the mid span support in the same manner as they are fastened to the purlins. Mid span supports are required to reduce sheet flutter due to wind loads and are not intended to support concentrated loads.

½ Sheet Widths Spans

The use of profiled 1⁄2 sheet widths, lapping over the side of the steel sheets, allow the spans of the selected profile Natural Lighting sheet to be increased by up to 40%, while still achieving the same ultimate limit state capacity, before needing mid supports. Half width sheets must have side lap stitching as shown in Table 2.4M, Section 2.4.1.3.2.

CONDENSATION CONTROL & INSULATION

Condensation can occur on the underside of Natural Lighting sheet when the building is not sufficiently ventilated or moisture is generated within the building space.

The following three methods are recommended options to help reduce the effect of condensation that may form on Natural Lighting.

1. Install a system that incorporates Dimond Skylight film as a translucent underlay. Refer 2.4.1.1.10 Detailed Drawings Fig. 1. This is a low performance system which in the extreme cases of low exterior temperatures, condensation may still form on the underside of the skylight film. Otherwise the skylight film is intended to carry condensation moisture dripping from the underside of the Natural Lighting sheet to the outside of the building, similar to building paper.
2. Install a system that incorporates a double skin of Natural Lighting sheeting with an air gap between. In colder climates the air gap provides additional insulation and reduces the likelihood of condensation forming on the underside of the inner surface.

For additional design considerations relating to condensation control by ventilation, refer to Section 2.4.4.

FIRE RESISTANCE

The fire resistance properties of the Natural Lighting products have been evaluated by recognised Fire Safety Consultants, resulting in the opinion that Durolite® can be used within the New Zealand Building Code requirements for fire safety given the following guidelines.

Durolite® and Durolite® FireGuard 2 (FG2) are manufactured with fire retardant polyester resin and have been tested by BRANZ.

Durolite® achieves a Group Number 3 classification to the NZBC verification method C/VM2 Appendix A. Durolite® uses a bromine free formulation.

Durolite® FG2 achieves a Group Number 2 classification to the NZBC verification method C/VM2 appendix A.

BRANZ Test Reports for Durolite® Group Number classifications are available upon request. Contact Dimond on 0800 ROOFSPEC (0800 766 377).

Durolite® and Durolite® FG2 is available in all profiles and standard colour tint options, e.g. HG4.

SAFETY

Impact tests carried out to AS/NZS 4040-4:1996 on Dimond Natural Lighting sheets supported by metal roofing sheets on either side, have shown that sufficient impact resistance to meet safety requirements without the installation of safety mesh can be achieved if the Natural Lighting sheet thickness is at least 1.7 mm.

The maximum span for each profile to pass the safety impact test is given in Table 2.4L.

Table 2.4L

Profile	Sheet Thickness (MM)	Maximum Span (mm) to meet Impact Safety
Corrugate	1.7	1500
Styleline / Veedek®/Hi Five	1.7	1800
V-Rib	1.7	1800
LT7®	1.7	2000
BB900 & DP955®	1.7	2200
SS900 / Topspan®	1.7	2400
Super Six	1.7	1800
Six Rib	1.7	1800

The Dimond Natural Lighting sheets with safety mesh laid under are not intended to carry foot traffic and Dimond recommend using Dimond Webglass if trafficable sheets are required.

When accidental fall safety is an issue, usage outside the scope of this table (e.g. different profiles, thinner sheet or greater spans) may require the installation of an approved safety mesh – see Section 2.4.5.

Alternatively Dimond Webglass may be used, which is manufactured to a thicker sheet weight of 2.1 mm and reinforced with a heavy woven glass mat which provides continuous reinforcement both across and up the profiled sheet. This reinforcement gives the sheet enough strength under an impact load such that safety mesh is not required under the webglass sheet.

DETAIL DRAWINGS

Fig 1 Dimond Skylight Film Detail

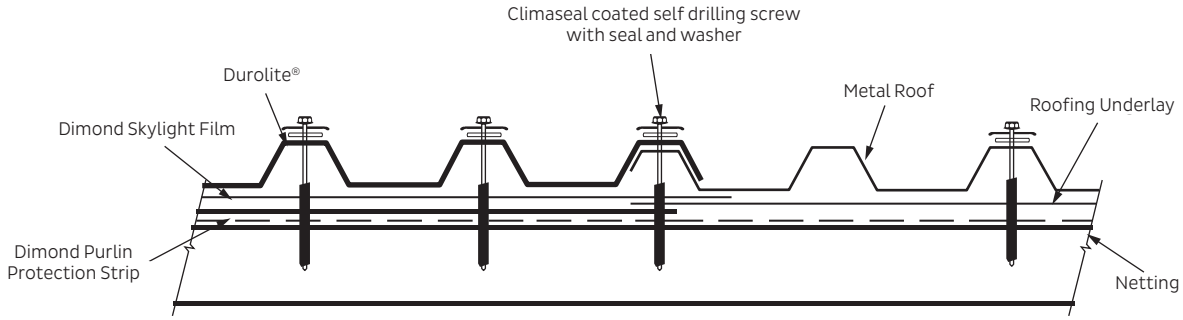

FIG 2 has been deleted

Fig 3 Detail At Ridge

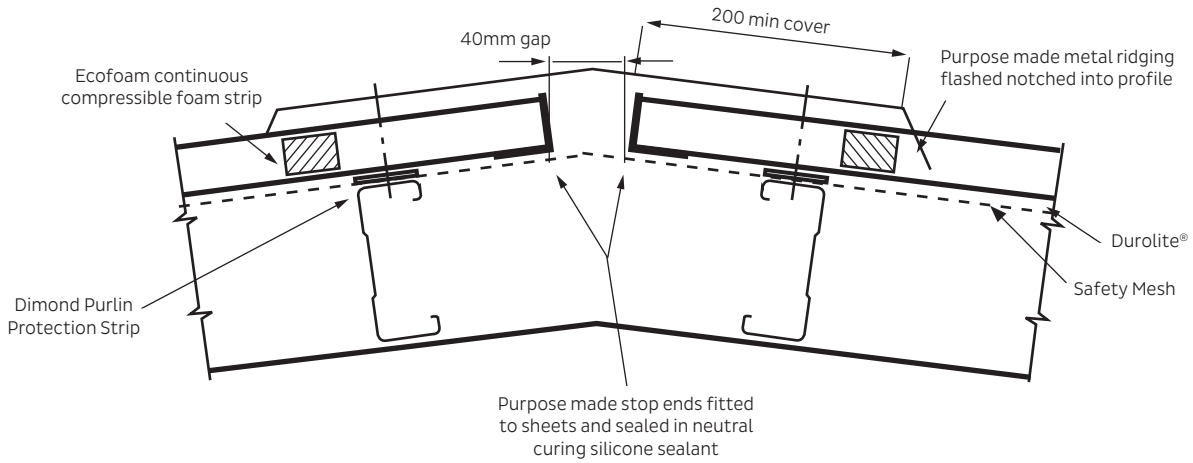

Fig 4 End Lap Durolite® to Durolite® & Durolite® to Steel

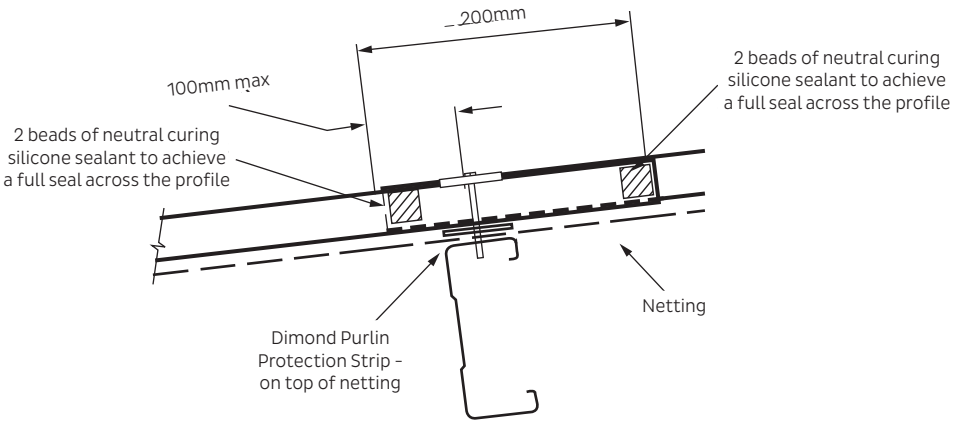

Fig 5 Stop End Detail

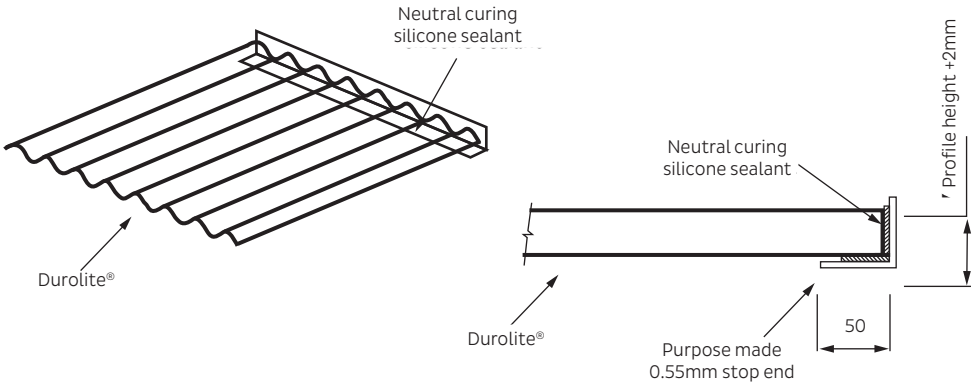

Fig 6 Side Lap Detail of Durolite® With Metal Roofing (Over/Over Process)

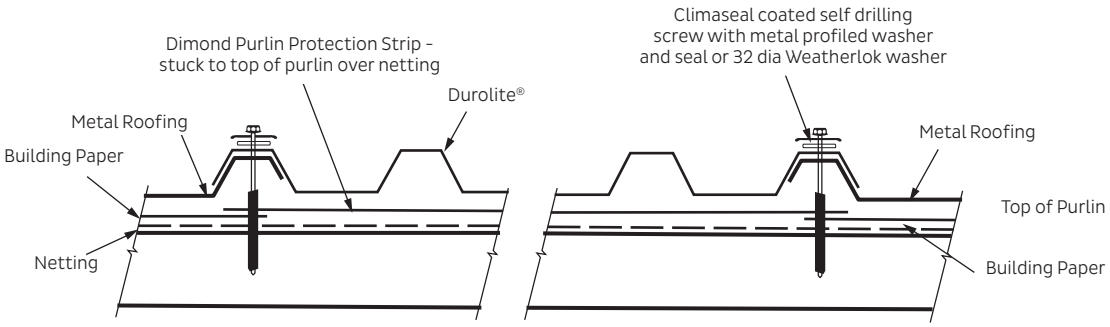

Fig 8 Detail For Single Durolite® Sheet With Dimondek® 400

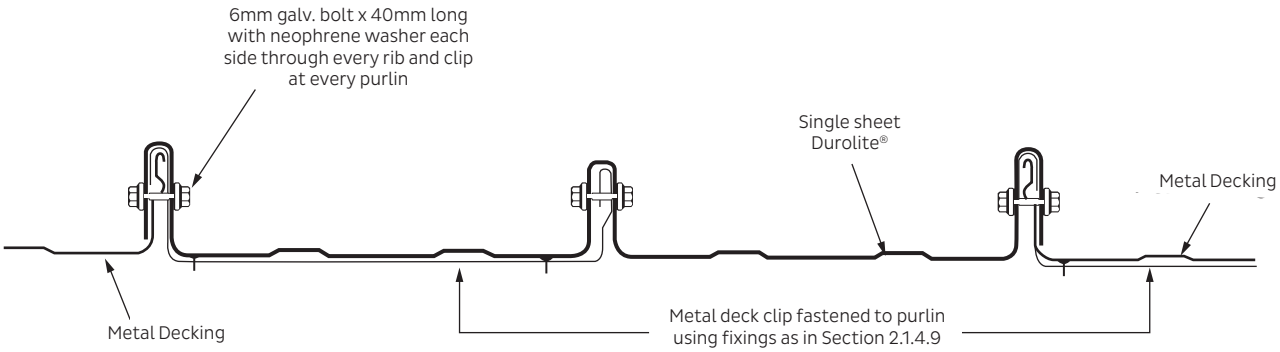

Fig 9 Multiple Durolite® Sheet Detail With Dimondek® 400

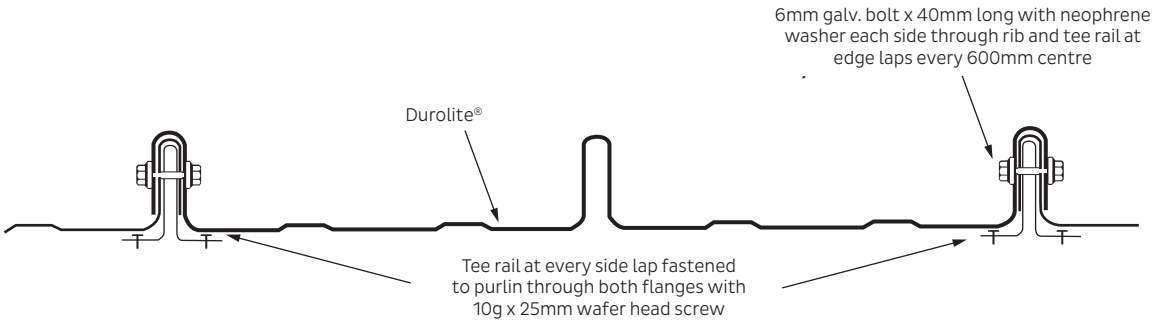

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Fig 10 Durolite® Dimondek® 630 Side Lap Detail With Metal Roofing (Over/Over Process)

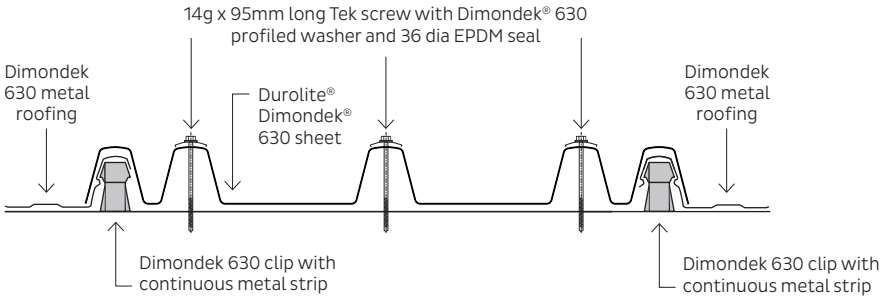


Fig 11 DSR5 Skylight Detail

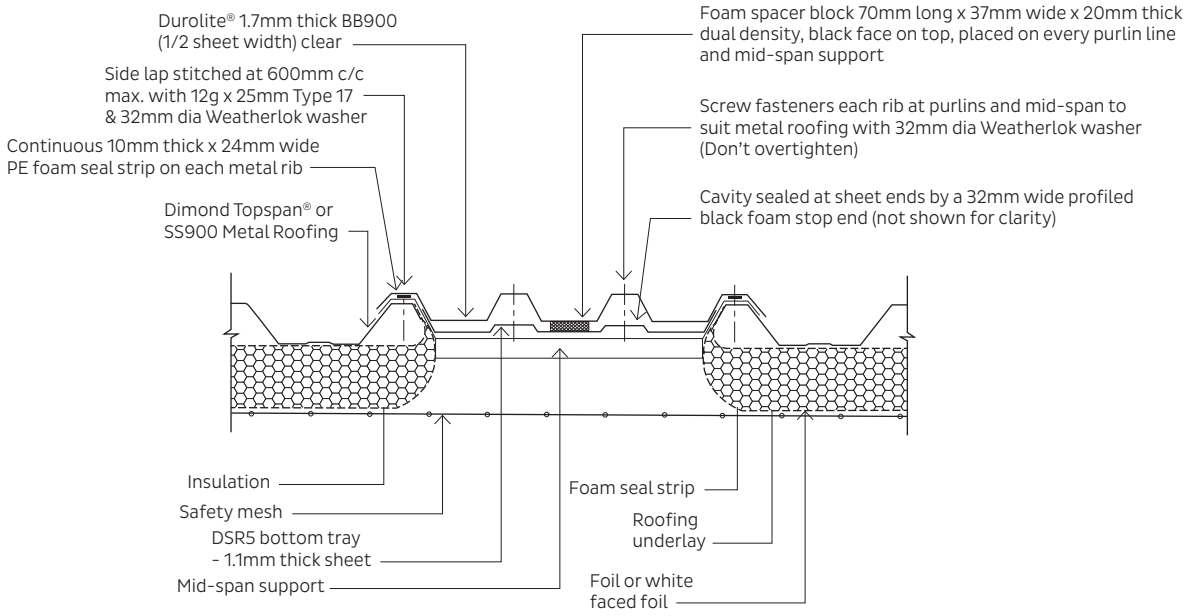
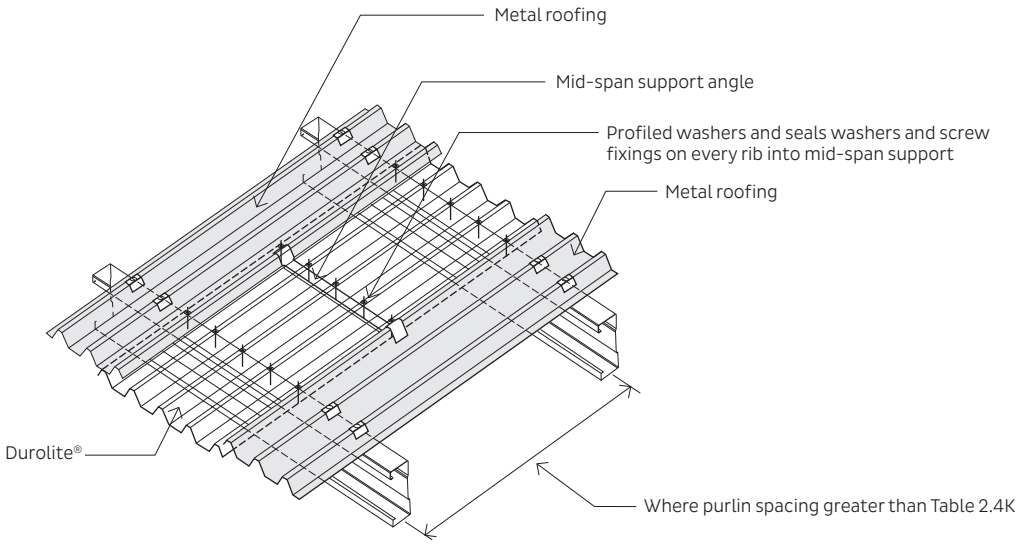
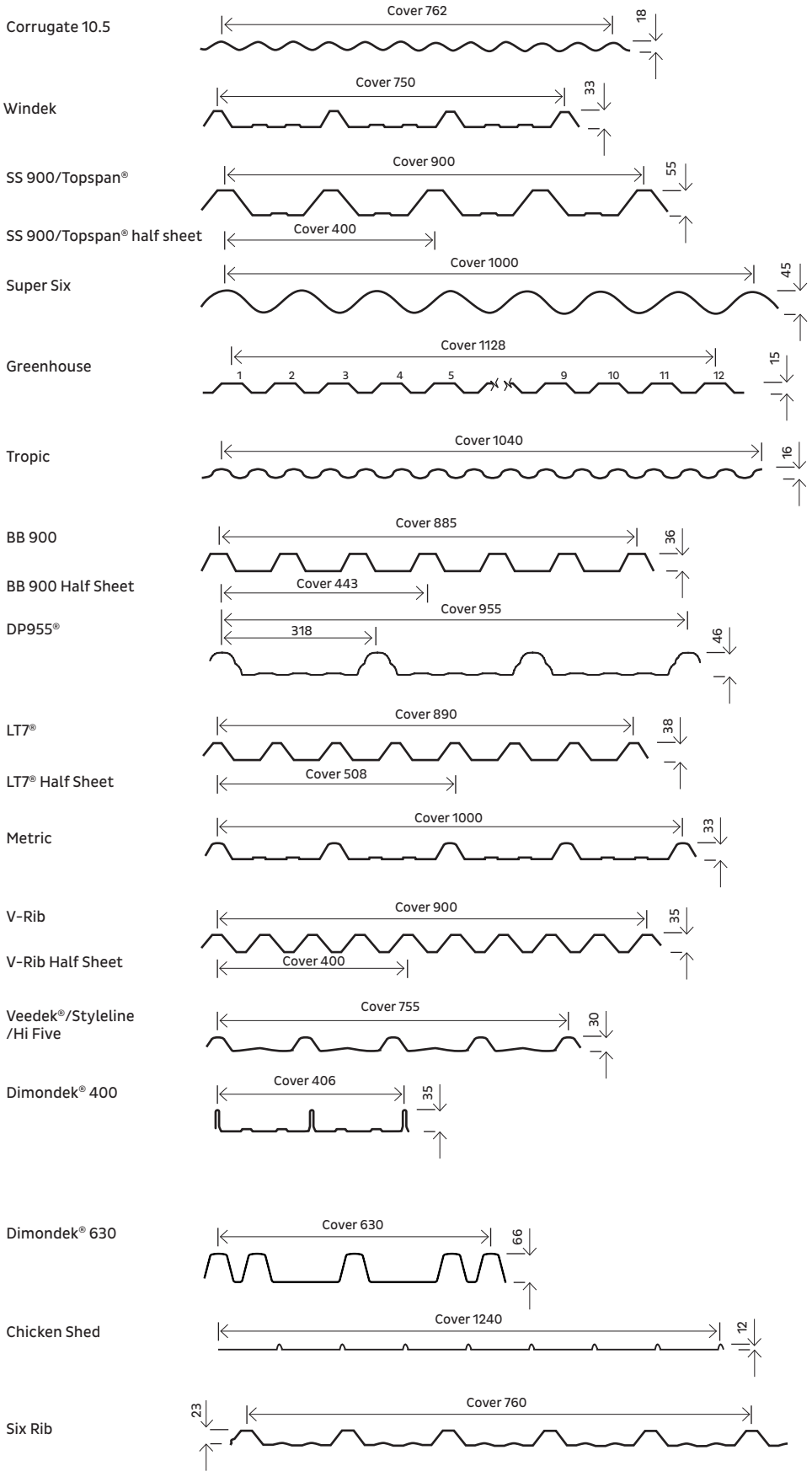


Fig 12 Mid-Span Support Detail (All Profiles Except Decking)



COMPONENTS - PROFILE RANGE

The following profiles are available in all Dimond Natural Lighting products. In addition, profiles matching most other metal roofing products may be available.



Dimond Roofing

2.4.1.2.2

DIMOND PURLIN PROTECTION STRIP

The recommended strip to use as a barrier between the purlin/mesh and Natural Lighting sheets is Purlin Protection Strip (PPS). These flat sheet strips of GPP are provided with double sided tape on one side for attachment onto the purlin over the netting or safety mesh before the Natural Lighting sheets are fixed down. They are supplied in either 70mm or 90mm wide strips to best suit the purlin flange width.

2.4.1.2.3

FASTENERS

1. Primary Natural Lighting sheet fasteners should be the correct length gauge and grade of screw fastener for the profile and will therefore be specified as the same fastener as for the adjoining metal sheeting. Clearfix 12g x 65mm long hex head self-drilling screws, drill both an oversized clearance hole in the Natural Lighting sheet and self drill into timber or steel purlins. Suitable for Corrugate, Styleline/Veedek®/Hi Five/Six Rib, Dimondclad into timber or steel purlins and DP955®, BB900, LT7® and V-Rib profiles into steel purlins only.
2. Washers, metal profiled shaped washers used with a 36Ø EPDM seal.
3. Lap stitching fasteners
   Stitching to metal – 2.2.3.1
   Stitching to fibreglass sheet – gutter bolt with compressible rubber sleeve

2.4.1.2.4

DIMOND SKYLIGHT FILM

Manufactured by Agpack Plastics Limited specially for use as a low cost condensation carrier/barrier beneath Dimond Natural Lighting products. The film is manufactured from a mix of virgin polymers to give a high tear resistance, and has additives for protection against rapid UV degradation. The film carries a durability period of 10 years. Genuine Dimond Skylight Film is branded on the film and has a thickness of 125 microns. Available in widths of 1000mm or 1300mm and roll sizes of 50 Lm or 100 Lm.

2.4.1.2.5

FLASHINGS

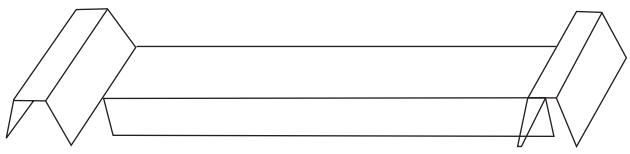
Metal flashings – see Section 2.1.3.6.

Natural Lighting Stop End – purpose made angle to suit profile rib height and to extend at least 50mm under the sheet to allow fixing and silicone sealant.

2.4.1.2.6

MID SPAN SUPPORT

Purpose made angle with folded end profiles to fit over adjoining metal sheeting ribs. For Dimondek® 630 the end profiles fit under and snap into the rib. Manufactured from 0.95mm G250 Z450 galvanised steel unless otherwise specified. The mid span support is not intended to support point loads from foot traffic.



2.4.1.2.7

SAFETY MESH

Ausmesh – see Section 2.4.5.

2.4.1.2.8

PROFILE STRIP

Closed cell foam strip to match sheet profile see Section 2.2.4.2.

INSTALLATION INFORMATION

HANDLING AND STORAGE

Dimond Natural Lighting sheets are delivered to the site in bundles which should remain strapped together and stored where damage will not occur. Ensure the product remains clean and dry. Edges of bundles must be protected during cranage. Sheets must be lifted into place, not dragged.

Durolite® has a 100 micron integral gel coat top surface which is less likely to suffer damage during handling that will affect long term performance. The underside however does have a thin plastic film laminate and care must be taken to avoid damaging it.

SHEET LAYOUT AND FASTENERS

(a) Supporting Structure

Before installation is commenced, the supporting structure must be free of sharp protrusions, or abrasive surfaces that may come into contact with the sheets. Ensure the purlin spacing is not greater than the span limitations for the selected profile as detailed in Section 2.4.1.5. A pliable, non-abrasive separation layer must be placed between the sheet underside and the wire netting/purlin surface. Refer to Section 2.4.1.2.2.

(b) Mid Span Support

In instances where single Dimond Natural Lighting sheets are to be used as skylights and placed between adjacent metal sheets, they may be installed on purlin spacings that exceeds the maximum span limitation for the sheet thickness chosen provided a mid span support member is incorporated to enable extra fastening to reduce sheet flutter in high winds. See Fig 12 for typically installed view. Where two or more Dimond Natural Lighting sheets are laid side by side purlin spacings must be reduced to suit the maximum span of the Natural Lighting material. (For decking profile refer to paragraph (e) below.)

(c) Layout

Sidelaps are designed for both edges of the Natural Lighting sheets to overlap the adjoining metal sheets. All sidelaps must lap over the profile rib of the sheet. It is preferred that the sheets are run from ridges to eaves without end laps. Where end laps are necessary, they should be a minimum of 200mm and fully sealed at both edges of the lap with a neutral cure silicone sealant. Laps must be positioned on a purlin in such a manner that the overlapping sheet edge is firmly fastened against the underlapping sheet.

(d) Fastening

Dimond Natural Lighting sheets will undergo movement at the fastener position. To correctly allow for this, the sheets should be pre-drilled through the crest of the rib or corrugation with a hole diameter at least 2mm greater than the screw. Larger pre-drilled holes will be required if the sheet length is greater than 6m and allowance for thermal expansion is required – see Section 2.1.3.4.

Ensure the correct fixings and washers are used in accordance with Section 2.4.1.1.5.

Screw fasteners must be tightened sufficiently to prevent the sheet lifting from the framing but not overtight so as to cause rib deformation. To control sheet flutter in high winds side lap stitching through the rib top is required similar to the primary fasteners and should be completed at spacings that achieve the side lap fastening required in Table 2.4M. Use profiled washers with 36Ø EPDM seals into 12mmØ oversized holes in the natural lighting sheets.

Table 2.4M

Profile Rib Height	Max. Side Lap Fixing Centres (mm)
30mm or less	450
Greater than 30mm	600
Dimondek® 630	900

Continued on next page...

(e) DD400 Decking Profile

Where one sheet of Natural Lighting DD400 or decking profile is used in conjunction with the metal decking, the sheets are laid using the under/over method. The sheets are held in position by galvanised bolts, which are located through each rib. The bolts must also pass through the rib of the metal decking and the deck clip to ensure correct hold down is achieved. If purlin spacings are greater than 1200mm centres or in high wind areas additional bolts must be placed through the sheet edge laps at 600mm centres. Where two or more Natural Lighting sheets are laid side by side, deck clips are replaced by Dimond Tee Rails manufactured from .55mm G550 Z450 Galvanised Steel or AZ150 Zincalume.® These are located at every side lap. Fixings are placed through ribs and Tee Rails at 600mm centres ensuring that a fastener is immediately adjacent to the purlin. The Tee Rail must be fixed to the purlin through both flanges.

(f) Dimondek® 630 Profile

It is intended to fix one natural lighting sheet between adjacent steel Dimondek® 630 sheets for sheet support.

Multiple natural lighting sheets can not be side lapped and fixed down as adacent sheets as the profile rib shape does not allow this. We recommend laying a steel sheet then natural lighting sheet, then another steel sheet and so on, if this effect is required.

Span breakers are used to reduce the purlin spacing of the natural lighting sheets only and are installed from the top side of the roof. They can only be installed one way around with the larger rib on the span breaker clipping and snapping up into the underside of the steel overlap rib.

The middle rib clip fixing post must be removed before the Durolite sheet is placed in position.

The outer side ribs of the natural lighting must not be fixed down. They fit over the steel sheet ribs allowing differential movement between Durolite and steel Dimondek® 630 sheets.

Self drilling fixings are used on the inner three ribs only. A 10mm diameter clearance hole must be drilled through each of the inner three 3 ribs and 14g x 95mm Teks with a Dimondek® 630 profiled washer and 36mm diameter EPDM seal are then screwed into each clearance hole on every purlin and/or span breaker.

Where end lapping of sheets to form runs of over 25m is required, we recommend overlapping 200mm, applying 4 beads of neutral curing silicone sealant approx. 10mm diameter in size. Allow these to tack off for 20 minutes before screwing down. This will allow the beads of silicone to roll and not shear under thermal expansion, and continue to provide a seal.

Refer 2.4.1.1.10, Fig. 10 for further detail.

FLASHINGS AND STOP ENDS

In addition to normal requirements (refer Sections 2.2.4 and 2.3.3) stop ends must be provided on all roof pitches, at the top end of all Natural Lighting sheet installations to provide a watertight seal under all over flashings, including immediately below any roof penetration. Sheet stop ends can be achieved by using either:

a. Compressible Closed-Cell Foam Strip to match the profiles. Use if roof pitch is greater than 15 degrees.

b. Metal angle folded to the height of the profile rib and fastened to the end of the sheet with rivets. Neutral curing sealant is then applied to the intersection of the sheet and metal angle. Refer Section 2.4.1.1.10, Fig. 5.

GENERAL WORKMANSHIP

In addition to normal requirements (refer Section 2.3.4) note the following:

1. **Sheeting Cutting**
   Natural Lighting sheets can be supplied cut to custom lengths. Where onsite cutting is necessary a fine tooth handsaw or an electric saw fitted with a fibre disc must be used. Breathing protection must be worn to prevent inhalation of glass fibres and resin dust. To resist cracking, the sheets must be firmly supported during cutting operations.

2. **Water Run-Off**
   Dimond Natural Lighting sheets, as with any other plastic or prepainted metal roofing materials, act as inert catchment areas for rainwater, and run-off from these areas onto unpainted galvanised surfaces may cause accelerated corrosion of the galvanised steel.

PERFORMANCE

CURVED ROOFING PERFORMANCE STATEMENT

The performance of Dimond Curved Roofing Systems is covered by the statement for straight roofs together with the additional criteria set out below.

Curved roofing systems are available in three basic forms:

1. Crimp Curved	Reference
Available in a restricted range of metal profiles and to a minimum machine crimped radius limitation.	2.4.2.1.2
Single curves, or combinations of straight, convex and concave are available, but with some restrictions that must be discussed with Dimond at the design stage of each project.	2.4.2.1.2
Attention at the design and installation stages must be given to correct sheet layout, end laps, and water catchment for low pitch areas.	2.4.2.1.2
Extra maintenance washing of crimp curved sheets may be required to remove dirt build-up at the crimps or in areas not naturally washed by rainfall.	
Transport and handling will limit sheet lengths and shapes and must be discussed with Dimond at the design stage of each project.	
2. Drape Curved	
Recommended for a restricted range of profiles in metal, Duraclad® and Natural Lighting materials.	2.4.2.1.3
Minimum curve radius is limited by the appearance of the roof sheet.	2.4.2.1.3
Roof purlin design must take into account the purlin deflection and reaction that will result from the load to hold drape curved sheet in place. As a guide this load can reach 2.5 kN/m or more on the purlin depending on radius and material.	
Water catchment for low pitch areas must be considered in relation to the sheet side laps, and may limit the maximum curve radius.	2.4.2.1.3
3. Roll Curved	
Available in a restricted range of metal profiles and to a minimum machine rolled radius for each profile and material.	2.4.2.1.2
Single curves, or a combination of straight, convex and concave are available but with some restrictions that must be discussed with Dimond at the design stage of each project.	2.4.2.1.2
Attention at the design and installation stages must be given to correct sheet layout, end laps, and water catchment for low pitch areas.	2.4.2.1.2
Transport and handling may limit sheet lengths and shapes, and must be discussed with Dimond at the design stage of each project.	

In all three curved roof systems penetrations, sheet termination (e.g. abutting walls, apex) and end lapping must be avoided in areas of the roof where the pitch is less than the minimum required for the profile.

CRIMP CURVED AND ROLL CURVED ROOFING SYSTEM DESIGN

Combinations of curves and straight sections must be laid out on the roof to fit purlin locations where fastening and sheet end laps occur. Basic rules that govern the design are:

1. Straight tails on curves must span across at least two purlins.
2. Maximum length from curve to tail end is normally limited by transport and handling to 6m.
3. Laps must be in areas of roof pitch that meet the minimum pitch requirement for the profile.
4. A roof shape transition from convex to concave curves must have a straight section of at least 300mm located over a purlin to allow fixing.

Table 2.4M

Profiles and material available for crimp curved systems are

Profile	Material and BMT (mm)		Minimum Radius (mm)
LT7®*	Steel G550 Steel G300 Aluminium H34	0.40 0.55 0.90	400 400 400
V-Rib	Steel G550 Steel G300	0.40 0.55	400 400
Styleline*/Hi Five	Steel G550 Steel G300 Aluminium H34	0.40 0.55 0.90	400 400 400

Profiles and materials available for roll curved systems are

Profile	Material and BMT (mm)		Minimum Radius (mm)
Corrugate	Steel G300 Steel G300 Aluminium H36 Aluminium H36	0.40 0.55 0.70 0.90	450 450 1200 450

*Note that 0.40mm LT7® and Styleline are not recommended for crimp curing to a radius greater than 900mm (refer Section 2.4.2.2.1)

DRAPE CURVED ROOFING SYSTEM DESIGN

Recommended Curve Radius

Minimum Radius

The minimum curve radius for each profile is restricted by the appearance of the roof sheet. As the radius is reduced the "pan" of the profile will begin to exhibit compression ripples that will detract from a clean appearance, and eventually reach a level that is generally regarded as unacceptable.

The minimum radius given below for each profile, together with the purlin spacing recommended for use at the minimum radius, will ensure the clean appearance of the drape curved roof with minimal ripple effect.

Specific aesthetic requirements for drape curved roofing must be discussed with Dimond at the design stage.

Maximum Radius

The maximum curve radius for each profile is restricted by the need to have the selected profile roof-sheeting reach its minimum recommended pitch at the gutter line for the profile used.

This restriction ensures large radius "flat" roofs are not used.

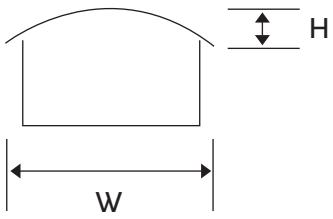
In addition, the maximum radius limitation and profiles given below for Corrugate profile ensures that water catchment on the low pitch area of the curve will not overfill the profile valleys due to inadequate run-off.

Table 2.4N Drape Curved System – Recommended Profiles and Radius Limitations

Recommended Profile	Recommended Radius							
	Minimum (m)							Maximum (m)
	G550 Steel		H36 5052 Aluminium		Natural Lighting		Duraclad®	
	0.40mm	0.55mm	0.70mm	0.90mm	1.1mm	1.4mm	1.7mm	
Corrugate	12	10	12	10	4	5	8	Note 1
V-Rib	20	16	20	16	12	14	20	Note 2
Styleline/Hi Five	80	40	80	40	8	9	12	Note 2
LT7®	80	50	80	50	12	14	24	Note 2
Dimondek® 400	N/A	70	N/A	70	16	18	N/R	Note 2
BB900	N/R	90	N/R	90	12	14	24	Note 2
DP955®	N/R	70	N/A	N/A	70	70	70	Note 2
Steelspan 900	N/A	120	N/R	120	16	18	30	Note 2
Topspan®	N/R	120	N/R	120	16	18	30	Note 2
Baby Corrugate	2	2	2	2	N/A	N/A	N/A	Note 4
Dimondek® 630	N/A	250 (Note 5)	(Note 6)	(Note 6)	250 (Note 7)	250 (Note 7)	N/A	Note 2
Super Six	N/A	N/A	N/A	N/A	16	18	30	Note 2
Six Rib	30	22	22	N/A	5	6	6	Note 2
Solar-Rib®	N/A	90	N/A	90	N/A	N/A	N/A	N/R
Heritage Tray®	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/R
Eurotray® Lite	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/R
Eurotray® Double Standing Seam	N/A	**2.5	0.6	N/A	N/A	N/A	N/A	N/R
Eurotray® Angle Seam	N/A	**2.5	0.6	N/A	N/A	N/A	N/A	N/R
Eurotray® Roll Cap	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/R
Eurotray® Roll Seam	N/A	**2.5	0.6	N/A	N/A	N/A	N/A	N/R

**G300 Steel Only
Note 1: Maximum radius for Corrugate is determined by the maximum run of roof that is below the minimum pitch, measured from the apex, shall not exceed 5m. Maximum radius may be further restricted by the criteria in Note 2.
Note 2: Maximum radius determined by the need for the roof pitch to reach the minimum requirement for the profile at the gutter line. Maximum radius will therefore depend on the building width.
Note 3: For the recommended maximum purlin spacing, the unrestricted access roof purlin spacing should be used to achieve a smooth curve (ref section 2.1.4 for the selected profile).
Note 4: The Baby Corrugate profile is not recommended for use as a roof product. It is only intended as cladding.
Note 5: DD630 is also available in 0.48mm thick steel and will achieve the same radius as 0.55mm steel.
Note 6: For the radius on aluminium, please call Dimond to discuss.
Note 7: DD630 Natural lighting sheets are not intended for use by themselves and must have support on the side lap from the steel sheet.
Note 8: Check suitability using section 2.1.3.1 - Table 2.1
N/R = Not recommended; N/A = Not available

$$\text{Curve Radius} = \frac{W^2 + 4(H)^2}{8H}$$



COMPONENTS

For sheet materials, underlay, netting and fasteners refer to Section 2.2.

CRIMP CURVED SHEETS

- Machine crimped across the profile pans. Each crimp deforms the sheet to a fixed angle and the radius required for the curve is achieved by altering the crimp spacing.
- G300 steel is generally used for 0.55mm thickness, although V-Rib and LT7® can be crimp curved in G550 steel.
- G550 steel is used for 0.40mm thickness in the Styleline, Hi Five, V-Rib and LT7® profiles to a maximum radius of 900mm. Larger radius curves have a risk of splitting the 0.40mm material due to fatigue at the crimps resulting from sheet deflection.
- H34 aluminium (5052 or 5251 alloys) in 0.90mm thickness is available for the Styleline, Hi Five and LT7® profiles.

DRAPE CURVED SHEETS

Refer Section 2.2 for straight sheets.

ROLL CURVED SHEETS

- G300 steel or H36 aluminium (5052 to 5251 alloys) in Corrugate profile is available to a minimum radius of 450mm and a maximum radius of 12m.
- Roll curved sheets are limited to a 4.5m tail length for ease of handling and transportation.

CURVED FLASHINGS

Two-piece lock-seamed flashings are recommended to finish curved edges in a smooth line. Crimped flashings are not recommended for aesthetic reasons.

INSTALLATION DETAILS

Installation recommendations for straight sheets apply together with the following additional requirements for all curved roofing systems.

FRAMING AND FASTENERS

It is critical to the fitting and the final appearance of curved roofing that the purlin and/or girt framing is located true to line. The installer should not fit the sheeting to out-of-line members. A recommended tolerance from the true purlin alignment is ±5mm. The tighter the tolerance, the better the final appearance will be.

Dimond recommend fitting a trial crimped or roll curved sheet to the purlins before the order is run, to check the curve fits the framing. An allowance of an extra 2 weeks should be built into the lead time to allow for this.

For the Drape Curved Roof Systems the framing member stiffness and attachment to the primary structure and the sheet fasteners must be adequate to resist the loads induced by the force required to hold the sheets in place. All drape curved sheets should therefore be screw fixed. Fasteners for crimp curved as for straight sheets.

There shall not be any part of the curved roof section or any part of the roof that does not have fall, that could allow ponding to occur. This is critical at the top of curved sheets where the roof pitch is level. If necessary purlins may need to be closed up in this region to give support to the roof and avoid ponding.

On areas of curved roof below the profile minimum pitch, an additional 3mm thick (min) side lap seal tape or bead of silicone sealant should be applied continuously on the top of the underlap rib, before the next sheet is laid over the underlap rib.

Flashing must be fabricated and fitted to follow an even curve of the profile, without obvious humps.

SHEET TERMINATION

Ends of sheets that are under head flashings and stop-ended must not terminate at zero or negative pitch. To ensure this does not occur it is recommended that the design is based on sheet termination at a roof pitch at least to the minimum pitch for the profile used.

THERMAL INSULATION SYSTEMS

PERFORMANCE

(a) Thermal Insulation Performance Statement

The performance of Dimond thermal insulation systems for roofing and wall cladding is covered by the statement for uninsulated systems together with the additional criteria set out below.

The use of Dimond metal roof or wall cladding in conjunction with foil underlay, Tasman Insulation NZ Building Insulation Blanket (BIB), or Foil Faced Building Insulation Blanket (FFBIB), can achieve thermal insulation with a reasonable expectation of performance to meet NZ Building Code requirements of:

- B2 – 50 years durability
- H1 – Energy efficiency

Design considerations must include:	Reference
Appropriate combination of foil underlay BIB and foil, or FFBIB to achieve the appropriate R value and light reflection.	2.4.3.1.1 (b), (c)
Allowance for thermal bridging – via purlins or girts – via skylights	
Use of the full thickness of insulation when laid between battens fixed onto purlins, rather than squeezing down onto purlin.	
Maintenance (and replacement if necessary) of the roof sheeting or wall cladding and fastener components.	

The performance is greatly affected by the quality of the installation which requires careful attention to detail to ensure gaps and holes through the insulation are eliminated as much as practicable.

When foil underlay is used as a vapour barrier all laps must be lapped 150mm and fully taped using 3M 425 foil tape 48mm wide.

BIB and FFBIB are designed for use at ambient temperatures and should not be used in conditions where the temperature exceeds 120ºC (e.g. within 150mm of hot flues). The glass wool content of BIB and FFBIB will not burn.

Aluminium foil surfaces must not be exposed to continuous moisture contact, salt laden air, alkalines or contact with dissimilar metals, that will corrode the surface and reduce the insulation and light reflectance performance.

(b) Foil Selection

Reflective foils can be used to increase thermal insulation, reduce daytime heat gain, disperse light within the building, and provide a vapour barrier.

NZS 4200.1 Category								
Product Name	Duty	Reflective Surfaces		Vapour Barrier	Fire Retardant	Abrasion Resistant Surfaces		Self Supporting
		1	2			1	2	
Sisalation 450	Heavy	✓	✓	✓	✓	✓	✓	✓
Sisalation 430	Medium	✓	✓	✓	✓	✓	✓	
Sisalation 420 White Faced	Medium	✓	W	✓	✓	✓	✓	
Sisalation 420	Light	✓	✓	✓	✓	✓		
Sisalation 420 White Ink	Light	✓	W	✓	✓	✓		
Sisalation 120	Light	✓	✓	✓		✓		
Sisalation 120	Extra Light	✓	✓	✓		✓		

COMPONENTS

TASMAN INSULATION NZ BUILDING INSULATION BLANKET (BIB) AND FOIL FACED BIB (FFBIB)

Product Description

Glass Wool Building Insulation Blanket (BIB) and Foil Building Insulation Blanket (FFBIB) consist of long, fine glass wool fibres bonded together with a thermosetting resin to form a lightweight, flexible, blanket insulation. FFBIB is faced on one side with double-sided foil which is lightly adhered to the glass wool. BIB and FFBIB are available in stock sizes, but may be manufactured to special requirements.

Features and Benefits

- Saves energy by reducing ongoing running costs of the building
- Non combustible, offering a safer environment
- Foil facings save installation time
- Absorbs sound so reduces rain noise and other unwanted environment noise

Product	R Value	Thickness	Size (m)	Pieces	Area (m^2)	Foil Facing
Pink Batts BIB R1.2	1.2	50	12 x 1.2	2	28.8	-
BIB R1.8	1.8	75	8 x 1.2	2	19.2	-
BIB R2.2	2.2	95	8 x 1.2	2	19.2	-
BIB R2.4	2.4	100	8 x 1.2	2	19.2	-
BIB R2.6	2.6	110	6 x 1.2	2	14.4	-
BIB R2.8	2.8	130	8 x 1.2	1	9.6	-
BIB R3.2	3.2	135	8 x 1.2	1	9.6	-
BIB R3.6	3.6	140	8 x 1.2	1	9.6	-
Flamestop FFBIB R1.2	1.2	50	12 x 1.2	1	14.4	Fire Retardant
FFBIB R1.8	1.8	75	12 x 1.2	1	14.4	Fire Retardant

For further information contact the manufacturer.

NON FIRE RETARDANT FOIL

Sisalation Building Foils are a light duty, single sided reflective foil laminate recommended for use in commercial and industrial wall applications where the following are required:

- Low cost reflective inner facing
- Vapour barrier facing for building insulation blanket
- Non fire retardant

Features and Benefits

Building foils provide a cost effective highly reflective surface to enhance interior light conditions, while providing low emissivity to limit heat loss and provide an effective barrier against water vapour entering the insulation and roof space when the laps are fully taped. Two way reinforced offering strength and with Albar on the reverse face offering a resistance to scuffing and abrasion.

Applications

Product	Application
Sisalation 110	Extra light duty for economical wall applications, offering low strength resistance where abrasion is not critical
Sisalation 120	Light duty for wall applications, offering better strength and resistance to scuffing

FIRE RETARDANT FOIL

Sisalation Fire Retardant Foils are a single side reflective foil laminate. Available in a light, medium and heavy duty laminate weight offering better resistance to exposure to wind as the duty increases.

Recommended for use in commercial and industrial wall and roof applications where the following are required:

- Effective reflective interior facing
- Vapour barrier facing for building insulation blanket
- Fire retardant non combustible material

Features and Benefits

Fire retardant foils provide a highly reflective surface to enhance interior lighting conditions, while offering, in a fire situation, a non-combustible surface which will limit the spread of flame. The foil offers a low emissivity surface to limit heat loss and provide an effective barrier against water vapour entering the insulation and roof space when all the laps are full taped.

Two way reinforced for greater strength and edge tear. Albar surface on the reverse faces offers a better resistance to scuffing.

Applications

Product	Application
Sisalation 420	A light duty fire retardant foil for economical wall applications when not exposed to high wind.
Sisalation 430	A medium duty fire retardant foil for wall applications and under roofs where better resistance to wind is required.
Sisalation 450	A heavy duty fire retardant foil for roof applications offering high strength in high wind conditions and best abrasion resistance. Suitable for high humidity applications such as indoor pools. Can be installed on spans up to 1200mm without netting or mesh support.

For further information contact the manufacturer.

WHITE FACED FOIL

Sisalation White Faced Flame Retardant Foil laminates have a white face one side and an aluminium foil face the other. Available in a light duty white ink face or a medium duty white polybar film face.

Recommended for use as an attractive interior exposed lining where a light white fresh face is required under roofing and wall cladding, and where the following are required:

- Effective reflective interior facing
- Vapour barrier facing for building insulation blanket
- Fire retardant non-combustible material

Features and Benefits

Provides a glossy white surface one side to diffuse and enhance lighting conditions, while offering in a fire situation a non-combustible surface which will limit the spread of flame. Both surface faces offer good scuff resistance and are two way reinforced which, combined with high tear resistance of the edges, limits damage during construction.

Applications

Product	Application
Sisalation 420 WI	A light duty fire retardant foil with a white ink coating on one side. Recommended on walls where damage will be minimal during construction.
Sisalation 430 WF	A medium duty fire retardant foil with a white polybar film on one side. Recommended on roofs of warehouses and factories, but must be fully supported.

For further information contact the manufacturer.

INSTALLATION INFORMATION

a) Building Insulation Blanket (BIB) and Foil Faced BIB (FFBIB)

Roofing – Building Insulation Blanket (BIB) and Foil Faced BIB (FFBIB) are designed for use under any roof system which requires control of temperature loss or gain. FFBIB is a true vapour barrier which may be necessary for conditioned spaces. In these cases the lap may be sealed during installation. This may be accomplished using contact adhesive or a tape. A more practical solution for FFBIB is suggested using sealant/mastic. Wherever visible the foil reflects light creating a brighter environment below. Roofing underlay should always be placed on top of BIB, to avoid condensation from the roof underside wetting the BIB.

Where insulation is required to achieve its full R value it must not be laid over the purlins. Insulation must be laid between packers fixed onto the top of steel purlins with a 25mm air gap between roof and insulation. If this is not followed and the insulation is fixed over the top of the purlins and squashed down, the R value will be reduced. There is also a risk the roof will appear bumpy between fixings and the side laps will not fully fit together.

Wall – FFBIB is installed next to the external cladding (building paper should be placed between the cladding and the insulation) with the foil facing inward, the foil facing will reflect the light where it is visible.

Install the insulation system in a DRY state.

Butt adjacent edges of insulation tightly together and fill all gaps with offcuts to avoid heat leakage.

Fit insulation tightly around all roof penetrations and vent pipes except hot flues where a 150mm gap is required.

Where cutting is necessary use a sharp knife and a straight edge.

Where practical it is considered good practice to incorporate an air gap, for ventilation, between the insulation and the metal deck.

b) Sisalisation Foil, Fire Retardant Foil and White Faced Foil

Roofing – Lay foil horizontally on netting. White faced foil is laid with the white surface facing down. Start at the gutter line and lap successive layers by 150mm minimum. For an effective vapour barrier seal all openings and laps with an appropriate 48mm adhesive foil tape, such as 3M 425 foil tape 48mm wide.

For vertical application lay the foil in the ridge to gutter direction with all laps a minimum of 150mm and sealed with an appropriate 48mm adhesive foil tape, such as 3M 425 foil tape 48mm wide.

Walls – Ensure foil is fixed to the supporting framing with a fastener system that is durable for at least 15 years. Lay and tape the laps as for roofing.

For further information visit www.pinkbatts.co.nz

RAIN NOISE INSULATION SYSTEMS

PERFORMANCE STATEMENT

The use of Tasman Insulation NZ Building Insulation Blanket (BIB) overlaid with a breather roofing underlay and in close contact with the underside of Dimond metal roofing can effectively reduce the surface impact noise from rainfall.

The noise reduction achieved has not been measured, but history of use suggests a noticeable reduction can be achieved. For the best results use either 75mm or 100mm BIB.

The effectiveness relies on correct installation whereby the supporting netting is stretched across the purlins to give a sag equivalent to one half of the blanket thickness. The BIB is consequently compressed by the roof sheeting over the total area.

Limitations of this system relate to the need for close contact between BIB and the roof underside and the consequences of a higher risk of corrosion from condensation or leakage moisture retained on the roof underside surface. Compression of the blanket will reduce thermal performance.

Other designed systems by acoustic engineers can be used such as:

- Building up a layer of 17.5mm plywood and insulation blanket laid over the purlins

or

- Using imported specialist products to deaden the noise when laid under the roof, such as Wavebar Soundbaffle. It does add extra dead weight into the roof system, i.e. 8kg/m^2, and is required to be fully sealed like a vapour barrier. For further information visit www.soundguard.com.au.

Specification

Refer Thermal Insulation Section 2.4.3.1.

COMPONENTS

Refer Thermal Insulation Section 2.4.3.1.2.

2.4.3.2.3 INSTALLATION

Refer Thermal Insulation Section 2.4.3.1.3.

PERFORMANCE OF NATURAL VENTILATION

Natural ventilation of industrial and commercial buildings, or of the above ceiling roof space in air conditioned buildings, is a cost effective means of exhausting hot air or achieving a sufficient degree of air change in the building.

Natural ventilation should also be considered as a means of venting smoke in a fire situation, and as a means of helping to control condensation by removal of warm moist air from the building space.

The roof system can be designed to incorporate either a Dimond Fixed Ridge Ventilator or a series of Ampelair Turbo Ventilators. Design information is given in this section to enable estimation of exhaust airflow rate and hence a reasonable basis on which to design for the air changes required.

DIMOND FIXED RIDGE VENTILATORS

Exhaust Capacities

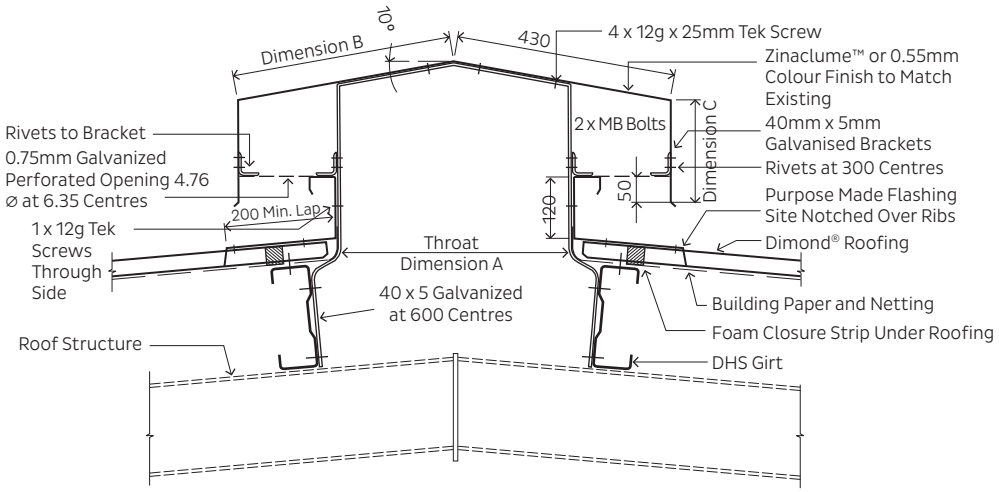
The table gives approximate exhaust flow capacities for a range of stack heights (ridge height above ground), wind speeds at the ridge and internal temperature between ground level and ridge.

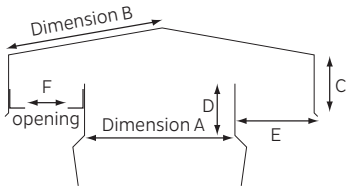
Clear Throat Opening (mm)	Temperature Difference (°C)	Exhaust Flow litres/second/lineal metre					
		Stack Height (m)					
		5		10		15	
		Wind Speed (m/s)		Wind Speed (m/s)		Wind Speed (m/s)	
		1	5	1	5	1	5
150	5	60	190	80	195	90	200
	10	80	195	105	210	125	220
	15	90	200	125	220	150	235
300	5	120	380	160	390	180	400
	10	160	390	210	420	250	440
	15	180	400	250	440	300	470
450	5	180	570	240	585	270	600
	10	240	585	315	630	375	660
	15	270	600	375	660	450	705
600	5	240	760	320	780	360	600
	10	320	780	420	840	500	880
	15	360	800	500	880	600	940

Achievement of these flows requires sufficient openings to provide free airflow into the building.

Dimond Fixed Ridge Ventilators are available in Zincalume,® COLOURSTEEL™, ColorCote® and Aluminium material to match the roofing material chosen.

Reference to Section 2.1.3.3 should be made if dissimilar materials are used.





Dimensions

A	B	C	D	E	F
150	160	60	80	85	55
300	310	100	100	150	100
450	430	160	120	200	150
500	488	240	150	225	175
600	558	250	180	250	200

*Hot dipped galvanised brackets (refer bracket selection table below for bracket size and sizing).

Sizes up to and including the 300 throat can be fixed directly onto the roof without bracketing using hex head self-drilling screws, the same as the roof profile on every rib. Sizes above this require a bracketing system.

U.L.S. Wind Load	Mild Steel Bracket Size (mm)	Maximum Bracket Spacing (mm)
1.0 kPa	40 x 5	600
2.0 kPa	40 x 8	600
3.0 kPa	40 x 8	400

U.L.S = Ultimate Limit Slate load

AMPELAIR WIND DRIVEN VENTILATORS

- Locked-on rotor mechanisms prevents loss or damage in high winds.
- Corrugated vanes provide more strength and stability.
- Square to round base on all models.
- Sealed dual bearing system excludes dust, grit and other foreign matter and retains lubricant.
- Paint finish available to match roof selection.

Model		Throat Diameter (mm)
ZINACLUME™	Aluminium	
AS150	-	150
AS200	-	200
AS300	-	300
-	AA360	360
AS450	-	457
-	AA460	460
AS600	AA600	600

Design Calculations for Ventilator Sizing

1. Determine the volume of the building
   Volume of section A = 0/5 x W x Ha x L
   Volume of section B = L x W x Hb
   Total building volume = volume of section B

Note: For factories, the combined volume A + B should be used.

Where Volume B is air-conditioned, only Volume A is used to calculate the number of ventilators required. No air should be drawn from the air-conditioned space. Using ventilators in ceiling space of air-conditioned buildings reduces the load on the air conditioning plant and helps reduce power consumption.

2. Calculate the ventilator exhaust capacity required using:

$$EX = \frac{V \times AC}{3600N}$$

Where:

V = volume of building or roof space, m^3
AC = air changes per hour
EX = exhaust capacity of ventilator, m^3/s
N = number of ventilators

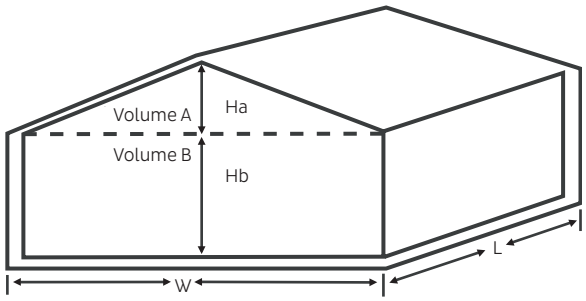


Fig. 1

Select the ventilator size required from Table 2.4 (overleaf) given consideration of height above ground (stack height), wind speed, and temperature difference from floor level to ridge inside the building.

Consideration should be given to the space occupied by stored goods or machinery. The adjustment to volume can reduce the number of vents required up to 50%.

Continued on next page...

Table 2.4 Exhaust Capacity, m^3/s

Stack Height Metres	Wind Speed m/s	Temp Diff °C	Throat Diameter in Millimetres					
			150	200	300	360	460	600
3	1.5	6	0.038	0.068	0.152	0.214	0.350	0.609
		12	0.039	0.070	0.158	0.221	0.362	0.630
		18	0.042	0.074	0.166	0.233	0.382	0.664
	5	6	0.084	0.150	0.336	0.472	0.772	1.343
		12	0.086	0.153	0.344	0.483	0.791	1.377
		18	0.088	0.157	0.352	0.494	0.808	1.408
5	1.5	6	0.039	0.070	0.158	0.221	0.362	0.630
		12	0.046	0.082	0.183	0.258	0.420	0.732
		18	0.047	0.084	0.189	0.264	0.431	0.751
	5	6	0.086	0.158	0.344	0.483	0.791	1.377
		12	0.089	.0158	0.354	0.497	0.813	1.414
		18	0.092	0.164	0.367	0.515	0.844	1.467
9	1.5	6	0.042	0.074	0.166	0.233	0.381	0.664
		12	0.047	0.084	0.180	0.264	0.431	0.751
		18	0.052	0.093	0.210	0.295	0.483	0.839
	5	6	0.088	0.157	0.352	0.494	0.808	1.408
		12	0.092	0.164	0.367	0.515	0.843	1.467
		18	0.093	0.166	0.371	0.522	0.855	1.486

Specification

The Wind Driven Ventilators shall be Ampelair Model **(insert Model No.)** as supplied by Dimond and shall match the roof colour (or shall be in Standard Grey finish or shall be in Mill Finish – insert as appropriate). Installation shall be in accordance with the manufacturer's instructions and be done in a workmanlike manner.

SAFETY SYSTEM PERFORMANCE

The provision of a permanent safe working environment throughout the roof installation (and for future maintenance work) can be achieved by using the Safety Mesh system over the entire roof plane.

Safety Mesh consists of 2mm galvanised wire with a tensile strength exceeding 450 MPa. The longitudinal wires are spaced at 150mm centres with crosswires spaced at 300mm centres. The rolls are 2100mm wide and are supplied in standard 50m rolls.

Safety Mesh complies with the "Safety Mesh requirements in the Approved Code of Practice for Safety in Working at Heights", as published by the Occupational Safety and Health Service of the Labour Department.
Safety Mesh, securely fastened over the entire roof plane, eliminates the need to use harnesses, static lines, inertia reels or other safety equipment, except when working closer than 2m to the edge of the roof.

Safety Mesh has passed dynamic and static tests as required by AS/NZS 4389-1996.

The dynamic test has a 1500mm x 350mm, 165kg sand bag dropped from a height of 1400mm onto the mesh. The static test has a 350mm diameter probe pressed into the mesh with a force of 50 Newtons. To comply the sand bag or probe must not penetrate the mesh.

Limitations On Use

- Do not use Safety Mesh for access or as a working platform.
- Workers should avoid walking or standing on Safety Mesh.
- It is not practicable to allow Safety Mesh to "sag" between purlins to accommodate insulation.
- For corrosive environments specifiers should consider PVC coated Safety Mesh.

COMPONENTS

Safety Mesh complies with the following standards for mesh:

AS/NZS 4389-1996, Safety Mesh.

Architects or design engineers should specify Safety Mesh at the initial stage of any commercial or industrial project. For corrosive environments PVC coated Safety Mesh can be specified, refer Dimond for details.

INSTALLATION OF SAFETY MESH

The fixing procedure is incorporated in a pamphlet included in every roll of Safety Mesh. Other pertinent installation details follow:

1. Take a continuous rope across the ridge; for this first pass workers MUST use appropriate fall protection equipment.
2. Position the rolls of mesh on mobile scaffolds either side of the roof and use the continuous rope to pull the mesh across the ridge.
3. Wires parallel to the direction of the corrugation of the sheeting (longitudinal wires) should be in contact with the tops of the purlins. Wires at right angles to the direction of the corrugations (transverse wires) shall be on top of the longitudinal wires.
4. Tie off to an anchor point the longitudinal wires of each “run” of mesh in accordance with one of the approved methods described in the pamphlet included in the roll. NB: The mesh is not safe until it is tied-off at each end. Anchor points can be 3mm diameter holes drilled into the steel purlin or 40mm long x 3.5mm diameter staples for timber purlins.
5. Side laps of the mesh MUST be lapped by one mesh spacing (150mm). If the purlin spacing is greater than 1700mm the side lap is to be twitched between purlins.
6. All wire joints MUST be twisted four times.
7. End joins should be avoided, but can be used provided the procedure in the Safety Mesh pamphlet is carefully followed.

RAINWATER DISPOSAL SYSTEM PERFORMANCE STATEMENT

(a) Description

Dimond rainwater disposal systems are available in a variety of materials together with the appropriate brackets and downpipes. Table 3.1A below summarises the gutter material options available.

Table 3.1A

Material	Grade	Thickness mm	Metal Coating	Prepaint Finish Available	Relevant Standard
Steel	G 250/300	0.55 BMT	Zinc/Aluminium/ Magnesium	Yes	AS 1397
Aluminium (plain)	5052 5251	0.9 BMT	N/A	Yes	AS 1734
Stainless Steel	445M2/304	0.55	N/A	No	AS1449
Copper	122A	0.55	N/A	No	AS2738

(b) Scope of Use

Dimond Rainwater Disposal Systems are intended to collect and channel water that runs off a roof. It is intended that the metal gutters be placed at the perimeter of the building, and not in an internal situation. Use of the products is subject to the limitations listed below.

(c) Requirements

Attention to the following details is required to ensure the expected system performance is achieved.

- The selection of the type and grade of gutter and bracket material and fasteners must be based on the life expectancy required and the severity of the external and internal environments. Refer Sections 2.1.1.2, 2.1.1.3, 2.1.1.4, 2.2.3.
- Site storage that keeps the product dry and protected from damage.
- Product handling that prevents surface damage.
- Correct installation of the brackets and gutter and snow straps.
- Allowance for thermal expansion and contraction.
- Sufficient fall to permit complete surface water drainage, allowing the gutter to completely dry out and not hold water.
- Control of allowable contact with dissimilar materials. Refer Section 2.1.3.3.
- Awareness and implementation of maintenance requirements, particularly for surfaces not washed by natural rainfall. Refer Section 2.1.1.3.

(d) NZBC Compliance

Test information available from Pacific Coilcoaters and BHP NZ Steel, and past history of rainwater products, indicate that provided the product use and maintenance is in line with the guidelines contained in the current literature referenced, Dimond Rainwater Disposal Systems can be expected to meet the performance criteria in Clause E2 of the New Zealand Building Code, for a period of not less than 5 years.

(e) Use Outside the Stated Guidelines

If the need arises to use Dimond Rainwater Disposal Systems outside the limitations and procedures given in this or other referenced literature, or, if any doubt exists on product handling or use, written approval for use must be obtained from Dimond, before the project commences.

DURABILITY, WARRANTY, MAINTENANCE

DURABILITY

Reference should be made to Section 2.1.1.2 Environments, to ensure the correct material for the environment is chosen. Coated brackets should be considered for use in severe and very severe marine environments. In snowfall areas refere to section 3.1.4.7.

WARRANTY

Warranties for commercial applications are issued on a job by job basis. It is imperative that care is taken during the planning process to choose the Dimond rainwater disposal system that will provide the life expectancy in the environment in which it will be installed, as incorrect selection could result in no warranty being available.

To assist you in determining the system that will best meet your warranty expectations Dimond have in place a Warranty Inquiry Service. Your design decisions on product type, paint coating type and colour, along with site details including address, distance from sea and degree of exposure will be required to enable us to provide a meaningful warranty. To access the service, please contact your Dimond Key Account person or phone 0800 DIMOND.

All warranties will carry a required maintenance clause, which must be complied with to ensure the warranty remains valid. Often aspects of design such as roof shape and roof pitch can influence the maintenance requirements. Due consideration of these factors during the design process is wise.

As a general guide, provided the materials are correctly selected from Section 2.1.1.2, Table 2.1B, and provided the building design does not impact on durability, it is reasonable to expect the following warranty terms will be available to your rainwater disposal system.

Steel and aluminium based materials

10 years to perforation of substrate.

5 years resistance to flaking, peeling and excessive fade.

MAINTENANCE

Dimond rainwater disposal systems require at least the following maintenance as a minimum to ensure the guaranteed performance is achieved. Additional regular maintenance can extend the useful life of the products. We define “regular” as often as is needed to avoid dirt build up on the gutter surface.

1. Keep surfaces clean and free from continuous contact with moisture and debris. The use of a proprietary leaf build-up protection system does not remove the need for regular gutter cleaning to remove any accumulated dirt and debris build-up on the roof or gutter.
2. Ensure that areas that are not washed by rainfall are cleaned regularly with water spray and/or if necessary by scrubbing with a soft nylon brush. This includes the foot of the internal brackets.
3. At the first sign of corrosion, the affected areas should be cleaned down, spot primed and then repainted to an appropriate paint manufacturer’s recommendations.
4. Some fading of the surface coating will occur over time, making repainting necessary to retain aesthetic value.

INSTALLER PROGRAMME

Dimond rainwater disposal systems must be correctly selected, specified and installed if they are to meet their designed performance.

Correct system selection and specification will be achieved by following the design guidelines in this manual.

Correct system installation (including components used and workmanship) will be achieved by specifying the use of a Dimond recommended installer.

Correct system performance will be endorsed by requesting a Dimond inspection and written report on completed work that has been carried out by a Dimond recommended installer.

AREAS TO CHECK ON SITE

Gutters

- Materials compatible with environment and roofing material used
- Laps sealed and correctly fastened
- Sufficient fall provided to avoid ponding
- Thermal expansion accommodated where necessary
- Secondary means of water discharge to eliminate water overflow from gutter entering the building

Brackets

- Correct type and size to suit the gutter chosen
- Snow straps installed if in Snowfall Region

Fasteners

- Correct type and size to suit bracket and environment
- Fixings to resist wind uplift of gutter

Droppers and Downpipes

- Droppers to be positioned at lowest point of gutter run
- Correct downpipe size and placement to handle flow load of roof and gutter chosen

RAINWATER DISPOSAL SYSTEMS DESIGN

(a) Thermal Movement

For guidance on expansion rate of the various materials please refer to Section 2.1.3.4.

Where long runs of gutter unbroken by change of direction are planned, it is recommended that steel gutters should not exceed 18 metres and aluminium and copper gutters 12 metres, without the provision of thermal expansion joints to prevent distortion.

The most practical way to accommodate movement is through the use of rainheads which will allow the gutter to move freely at the discharge end. If downpipes are fitted directly to the sole of the gutter, saddle flashings will be required at the high points to accommodate separation of the gutter runs.

(b) Flow Capacity

A quick reference for catchment area per downpipe is available for the standard Dimond gutters – refer Section 3.1.4.1 to 3.1.4.7.

To confirm the suitability of a non-standard gutter to handle the expected rainfall it is necessary to determine the flow load likely from the roof, and the flow capacity of the anticipated gutter shape.

To determine flow load from roof:

Design flow load (litres/minute)	Q	$= 1.67 \times A_C \times \frac{I}{100}$
Where	A_C	= catchment area (m^2) (this includes $^1/_2$ the area of any vertical surface or the total area of any other roof that drains on to the catchment area)
	I	= Expected rainfall intensity for the geographical location (see Table 3.1B) (mm/hr)

To determine flow capacity of the gutter chosen:

Flow capacity (litres/minute)	Q_C	$= .0016 \times A_e^{1.25}$
Where	A_e	= Effective cross sectional area of the gutter (mm^2)

These formulae are incorporated in Table 3.1C for use in the following design process.

The above formulae and Table 3.1C are for design of external gutters based on falls of at least 1:500 or greater. These formulae can be used for internal box gutters provided Q is factored down by

0.4 for no fall

0.5 for 1:500 fall

0.6 for 1:200 fall

This method then aligns itself with AS/NZS 3500 Part 3.

Design Process for Eaves Gutters

Where eaves gutters other than the standard Dimond range shown in Section 3.1.4.1 to 3.1.4.6 are preferred, you will need to confirm the performance of the gutter shape in relation to the location it will be used in, e.g. the area of roof the gutter shape can drain per downpipe. The following is a step by step guide to confirming the suitability of the gutter chosen.

1. Place downpipes at the preferred locations around the structure. No run of gutter from high point to outlet should exceed 18m. Downpipes should be placed with 2m of valley's discharging into the gutter. It is good practice to position the downpipe within 2m of internal or external corners.
2. Calculate the roof catchment area A_C (m^2) for each downpipe. Divide the roof into sections, each section served with a length of gutter sloping from a high point to the outlet. Each section or gutter length is multiplied by the rafter length. If any vertical surface can drain onto the catchment area, add half the vertical surface area to the roof area you are calculating. Also add the total area of any upper roof discharging on to a lower roof.
3. Establish the rainfall intensity for the geographical location of the structure. The New Zealand Building Code Approved Document E1 Surface Water has determined two levels of rainfall intensity. Where an overflowing gutter can result in water entering a building, the rainfall intensity shall be based on a storm with a 2% probability of occurring annually (a 1 in 50 year storm). Otherwise the intensity shall be based on a storm with a 10% probability of occurring annually (a 1 in 10 year storm).

Table 3.1B shows the average intensity for some of the metropolitan centres in New Zealand. For a more precise value contact should be made with the Plumbing and Drainage section of the relevant Territorial Authority.

Table 3.1B

Rainfall Intensity I (mm/hr)		
	10 year period	50 year period
Kaitaia	110	150
Keri Keri	115	155
Whangarei	140	180
Auckland	110	150
Hamilton	105	160
Tauranga	140	200
Rotorua	145	190
New Plymouth	110	175
Napier/ Hastings	75	125
Palmerston North	80	125
Wellington	70	100
Nelson	95	145
Blenheim	55	75
Christchurch	60	90
Timaru	55	90
Tekapo	50	75
Dunedin	70	100
Greymouth	105	145
Gore	65	110
Invercargil	60	100

The intensity is based on a 10 minute duration extrapolated to determine the theoretical amount over 1 hour.

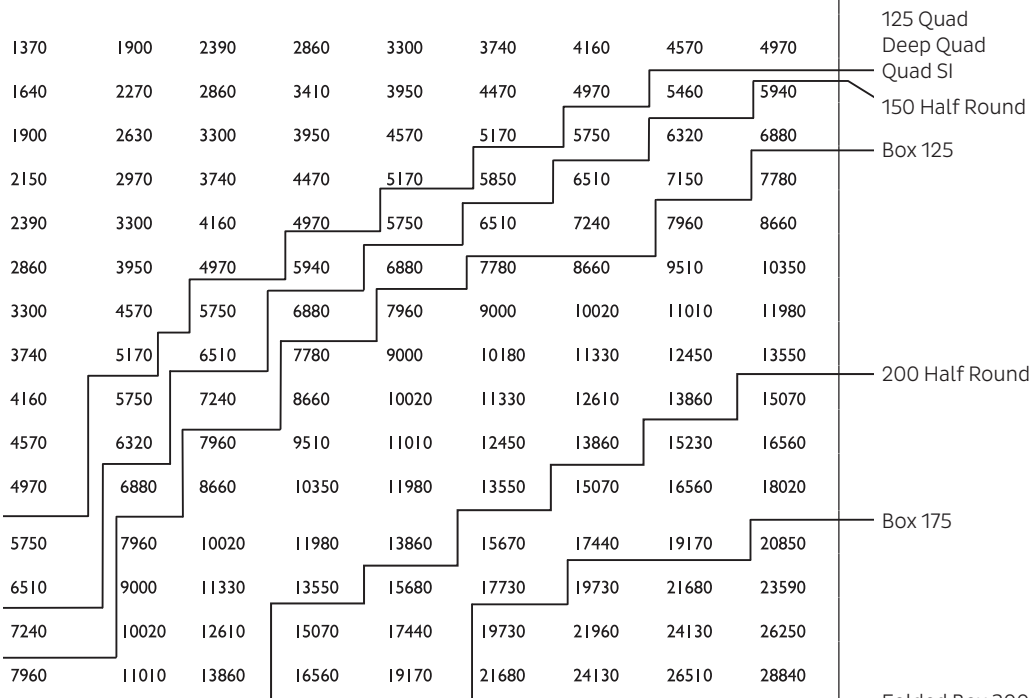
Figures derived from statistical data supplied by NIWA 2018.

4. Enter Table 3.1C on the catchment area line and extend across to the rain intensity column. This will provide the effective cross sectional area your proposed gutter will need to have. Interpolate between columns if necessary.

5. The flow capacity limit for each of the standard Dimond gutters is indicated in Table 3.1C by a stepped line. Select the appropriate Dimond gutter and refer to Sections 3.1.4.1 to 3.1.4.9 from the detailed design information.

Table 3.1C Effective Cross Section of Gutter A_e (mm²)

Catchment Area Per Downpipe A_c (m²)	Rainfall Intensity I (mm/hr)								
	40	60	80	100	120	140	160	180	200
20	1370	1900	2390	2860	3300	3740	4160	4570	4970
25	1640	2270	2860	3410	3950	4470	4970	5460	5940
30	1900	2630	3300	3950	4570	5170	5750	6320	6880
35	2150	2970	3740	4470	5170	5850	6510	7150	7780
40	2390	3300	4160	4970	5750	6510	7240	7960	8660
50	2860	3950	4970	5940	6880	7780	8660	9510	10350
60	3300	4570	5750	6880	7960	9000	10020	11010	11980
70	3740	5170	6510	7780	9000	10180	11330	12450	13550
80	4160	5750	7240	8660	10020	11330	12610	13860	15070
90	4570	6320	7960	9510	11010	12450	13860	15230	16560
100	4970	6880	8660	10350	11980	13550	15070	16560	18020
120	5750	7960	10020	11980	13860	15670	17440	19170	20850
140	6510	9000	11330	13550	15680	17730	19730	21680	23590
160	7240	10020	12610	15070	17440	19730	21960	24130	26250
180	7960	11010	13860	16560	19170	21680	24130	26510	28840
200	8660	11980	15070	18020	20850	23590	26250	28840	31380
250	10350	14320	18020	21540	24930	28200	31380	34480	37510
300	11980	16560	20850	24930	28840	32630	36300	39890	43400
350	13550	18740	23590	28200	32630	36910	41070	45130	49100
400	15070	20850	26250	31380	36300	41070	45700	50210	54630
500	18020	24930	31380	37510	43400	49100	54630	60030	
600	20850	28840	36300	43400	50210	56800	63210		
700	23590	32630	41070	49100	56800	64260			



6. If a custom made shape is required, choose your shape and set the dimensions to achieve the effective cross sectional area (A_e) of the gutter required by Table 3.1C using the following formula:

Effective cross sectional area (A_e)		= 0.9 x W x D
Where	W	= the average width measured at half the depth (mm)
	D	= depth (mm)

Once D is established to achieve A_e, it is recommended a free board allowance of at least 10mm is added.
Be sure to determine that it is possible to manufacture the gutter shape that you choose.
Phone 0800 DIMOND (0800 346 663).

7. Determine downpipe size. As a general rule for eaves gutters the downpipe sizes can be calculated as follows.

For circular downpipes:
The cross-sectional area should be one half the cross-sectional area of the gutter.

For rectangular downpipes:
The cross-sectional area should be one half the cross-sectional area of the gutter plus 10%.

Note: No downpipe shall be smaller than:

Circular downpipe	63mm (nominal available size is 80mm dia)
Rectangular downpipe	have a cross-sectional area of not less than 3250mm^2, and where the smallest dimension is at least 50mm.

Ensure that the downpipe size can be accommodated within the sole of the gutter.

Where rainheads and sumps are used both internal or external more accurate sizing of downpipes are achieved using AS/NZS 3500 Part 3.2.

(c) Overflow

Gutter and downpipe systems must be designed to accommodate any overflows that may result in water entering the structure, regardless of where the blockage occurs.

One option for eaves gutters is to ensure the top of the fascia board or cladding finishes above the top edge of the back of the gutter, including at the high point. A gap should be created between the fascia/cladding and the back of the gutter. This provides a continuous emergency overflow regardless of where the blockage occurs.

For rainheads and sumps care must be taken to ensure the capacity of the overflow is equal to or greater than the designed flow capacity of the downpipe. In many situations the head of water above the downpipe effectively increases its performance, whereas an overflow of equal dimension to the downpipe has a slower flow capacity.

(d) Design Guidelines for Box Gutters

Below is a simple outline of the main points to consider when designing an internal box gutter.

Box gutters should be of sufficient structural strength to accommodate foot traffic and have a width that provides safe passageway (300mm plus allowance for overhang of roofing material).

The recommended minimum slope for any box gutter is 1:200.

Where steel is being considered to form the lining of box gutters, care must be taken to ensure easy inspection, maintenance and replacement is available. In most instances it is prudent to consider other materials such as rubberised membrane, copper or zinc as the relatively maintenance-free long term performance of these materials provide a more cost effective option over the life of the structure.

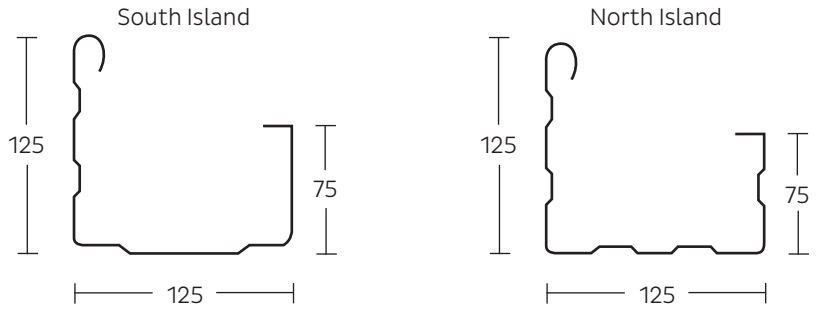
It is recommended that all box gutters discharge into a rainhead or sump, the depth of which can be chosen so as to permit the use of a downpipe of convenient size (the deeper the head of water above the outlet, the smaller the downpipe will need to be). The width of the rainhead or sump must be equal to or larger than the sole of the gutter.

All rainheads or sumps must have overflow systems designed to accommodate the water flow that is likely from the catchment area in the most intense rainfall for the geographical location.

An effective way to create an overflow in a rainhead is to set the front 25mm below the sole of the gutter. This will allow the water to weir over the front should the downpipe become blocked.

Where the gutter discharges into a sump positioned within a building, sufficient attention must be paid to the design of the overflow to ensure that the water flow from the catchment area is accommodated at all times. The depth of the rainhead or sump will determine the size of the downpipe required. This is due to the pressure that can be formed by the head of water above the outlet. However, the overflow system will most likely not have the head of water above it therefore it may need to be bigger than the main downpipe. The overflow drainage system must be capable of carrying all the water to the outside of the building as the overflow system will be activated only when the normal outlet is blocked.

BOX 125



All dimensions given are nominal.

Effective cross sectional area (with 15mm free board)	7500mm^2	
Flow capacity	112 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular Rectangular	70mm min. cross sectional area of 4125mm^2, smallest dimension at least 50mm.

Catchment area per downpipe based on the above flow capacity is given in Table 3.1G. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1G

Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	168	134	111	96	84	75	67	56	48	42	37	33

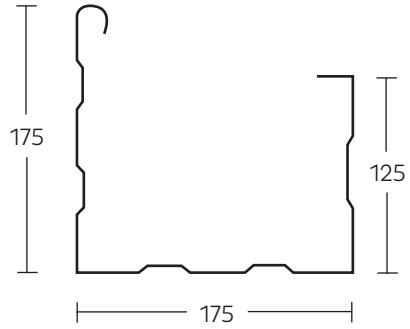
Material options including thickness and grade	Steel Aluminium Copper Stainless steel	0.55mm G300 0.90mm H34 0.55mm 1/2 hard refer Dimond
Roll-forming facility	Auckland, Christchurch (Note: all Dimond branches can fold gutter shapes with swages patterns to be confirmed at time of order) (1)	

Gutter bracket material and thickness	Internal External	Galvanised Hot dipped galvanised Aluminium Brass Stainless steel	1.15mm 3mm x 32mm 5mm x 30mm 3mm x 30mm 3mm x 30mm

Recommended maximum spacings	900mm spacing (refer section 3.1.4.7 for recommended spacings where snow fall is possible).
Bracket Centres	Aluminium 450mm Internal - 600mm External
Recommended fixings	Screw fastenings to suit substrate.

(1) Internal brackets are not recommended with folded gutter without a 4mm diameter aluminium rivet fixing through the gutter and bracket.

BOX 175



All dimensions given are nominal.

Effective cross sectional area (with 15mm free board)	19,250mm^2	
Flow capacity	363 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular Rectangular	115mm min. cross sectional area of 10,600mm^2

Catchment area per downpipe based on the above flow capacity is given in Table 3.1H. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1H

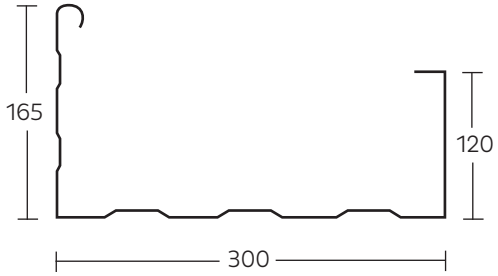
Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	545	435	360	310	270	240	220	180	155	135	120	110

Material options including thickness and grade	Steel Aluminium Stainless steel	0.55mm G300 0.90mm H34 offered in folded shape only refer Dimond
Roll-forming facility	Hamilton (Note: all Dimond branches can fold gutter shapes with swages patterns to be confirmed at time of order) (2)	
Gutter bracket material and thickness	Internal (1) External	Galvsteel Hot dipped galvanised Aluminium Stainless steel
		1.55mm 5mm x 30mm 7mm x 30mm 5mm x 30mm
Recommended maximum spacings	900mm (refer section 3.1.4.7 for recommended spacings where snow fall is possible). Aluminium: 600mm	
Recommended fixings	Bolts or screw fastenings to be compatible with substrate and bracket material	

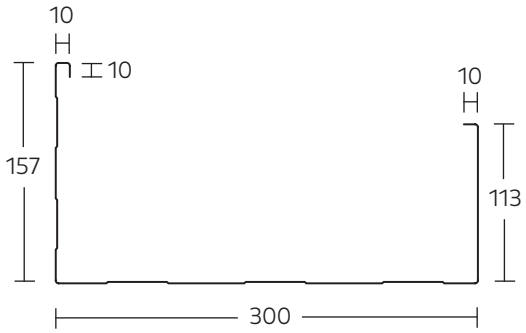
(1) Internal brackets are not recommended for use in areas that are subject to snow fall and/or wind above medium velocity (as determined by NZS 3604).

(2) Internal brackets are not recommended with folded gutter without a 4mm diameter aluminium rivet fixing through the gutter and bracket, it is better to use external brackets.

BOX 300



Roll formed shape



Folded shape (based on strip girth (g) of 600mm)

All dimensions given are nominal.

Effective cross sectional area (with 15mm free board)	33,550mm² or 29,400mm² (g = 600mm)	
Flow capacity	727 litres/min or 616 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular Rectangular	150mm min. cross sectional area of 18,500mm²

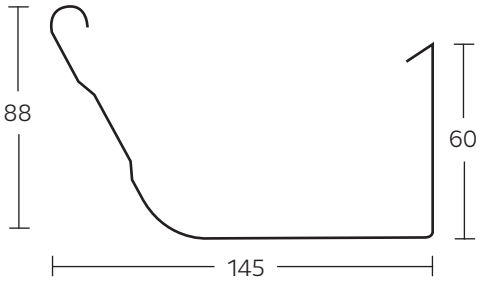
Catchment area per downpipe based on the above flow capacity is given in Table 3.1 I. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1 I

Roll formed shape												
Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m²)	1090	870	725	620	545	485	435	360	310	270	240	215
Folded shape (based on strip girth of 600mm)												
Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m²)	922	738	615	527	461	410	369	307	264	231	205	184

Material options including thickness and grade	Steel	0.55mm G300
	Aluminium	0.90mm H34
	Copper	0.55mm 1/2 hard
	Stainless steel	refer Dimond
Roll-forming facility	Hamilton (Note: all Dimond branches can fold gutter shapes) Dimensions may vary slightly from above. Check with your local Dimond branch.	
Gutter bracket material and thickness	External	Hot dipped galvanised 5mm x 50mm Aluminium 6mm x 38mm Stainless steel 5mm x 40mm
Recommended maximum spacings	600mm (refer section 3.1.4.7 for recommended spacings where snow fall is possible).	
Recommended fixings	Bolts or screw fastenings to be compatible with substrate and bracket material.	

DEEP QUAD



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	5435mm^2	
Flow capacity	75 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular Rectangular	60mm min. cross sectional area of 2717mm^2, smallest dimension at least 50mm.

Catchment area per downpipe based on the above flow capacity is given in Table 3.1J. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

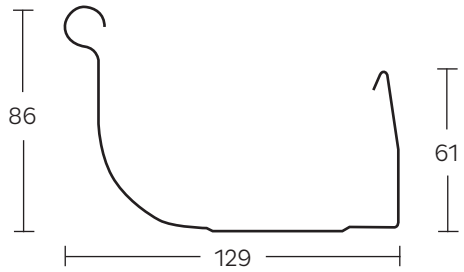
Table 3.1J

Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	112	90	75	64	56	50	45	37	32	28	25	22

Material options including thickness and grade	Steel	0.55mm G300	
Roll-forming facility	Rotorua		
Gutter bracket material and thickness	Internal	Aluminium	2.0mm
Recommended maximum spacings	900mm spacing (refer section 3.1.4.7 for recommended spacings where snow fall is possible).		
Recommended fixings	Screw fastenings to be compatible substrate and bracket material.		
Stop ends	Zinc cast stop ends are available powder coated to match fascia colour.		

*When using aluminium internal brackets the roofing may need to be 10mm longer into the gutter to accommodate correct roof overhang into gutter.

QUAD SI



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	5485mm^2	
Flow capacity	75 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular Rectangular	60mm min. cross sectional area of 2742mm^2, smallest dimension at least 50mm.

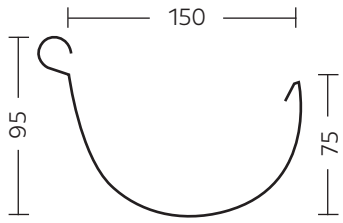
Catchment area per downpipe based on the above flow capacity is given in Table 3.1L. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1L

Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	112	90	75	64	56	50	45	37	32	28	25	22

Material options including thickness and grade	Steel	0.55mm G300	
Roll-forming facility	Christchurch		
Gutter bracket material and thickness	Internal	Galvanised	1.15mm
Recommended maximum spacings	900mm spacing (refer section 3.1.4.7 for recommended spacings where snow fall is possible).		
Recommended fixings	Screw fastenings to be compatible with substrate and bracket material.		
Stop ends	Zinc cast stop ends are available powder coated to match fascia colour.		

150 HALF ROUND



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	6600mm^2	
Flow capacity	95 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular	80mm

Catchment area per downpipe based on the above flow capacity is given in Table 3.1M. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1M

Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	142	114	95	81	71	63	57	47	40	36	32	28

Material options including thickness and grade	Steel	0.55mm G300	
Roll-forming facility	Christchurch & Invercargill **Note:** only available in the South Island		
Gutter bracket material and thickness	External	Aluminium	4mm x 30mm
Recommended maximum spacings	900mm spacing (refer section 3.1.4.7 for recommended spacings where snow fall is possible). Snow straps available.		
Recommended fixings	Screw fastenings to be compatible with substrate and bracket material avoiding dissimilar metal contact.		

GUTTER BRACKETS IN SNOWFALL AREAS

When installing gutters in areas subjected to snow fall in New Zealand, the gutter bracket spacings must be reduced and snow straps installed to take the increased snow weight that may be experienced during periods of snow fall to avoid damage to the gutter system.

This is a guide to the snow fall regions. Please refer to the standard AS/NZS 1170.3 for full details, available for purchase from www.standards.co.nz

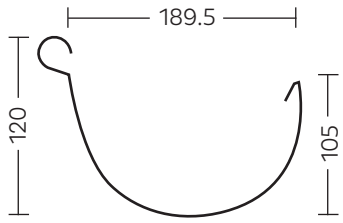
	Sub Alpine Snow Region	Height above sea level (m)	Region description
North Island	N1	400 to 1200	South of a line from Opotiki to Turangi and across to New Plymouth
South Island	N2	200 to 900	West of Southern Alps from Nelson to Milford Sound
	N3	150 to 900	Nelson East to Cheviot
	N4	0 to 900	East of Southern Alps Cheviot to Moeraki into Omarama
	N5	0 to 900	South of Moeraki around to Milford Sound

Note: Regions with a height above sea level great than shown above require specific design and are outside Dimond recommendations.

Dimond Gutter shape Type	Gutter Bracket	Maximum gutter bracket and snow strap spacing (mm) by Snow Region									
		N1		N2		N3		N4		N5	
		Gutter brackets	Snow straps	Gutter brackets	Snow straps	Gutter brackets	Snow straps	Gutter brackets	Snow straps	Gutter brackets	Snow straps
125 Quad	Internal	600	900	600	600	600	600	600	500	600	600
Deep Quad	Internal	600	900	600	600	600	600	600	500	600	600
Quad SI	Internal	600	900	600	600	600	600	600	500	600	600
Box 125	Internal	600	900	600	600	600	600	450	500	450	600
Box 125	External	900	900	600	600	600	600	450	500	600	600
Box 175	External	900	900	600	600	600	600	450	500	600	600
Box 300	External	600	900	600	600	600	600	450	500	600	600
150 Half Round	External	900	900	600	600	600	600	450	500	600	600
200 Half Round	External	900	900	600	600	600	600	450	500	600	600

Notes:
1. Based on an 8m maximum single roof run.
2. Situations where upper roofs allow snow to fall onto lower roofs are excluded and require specific design
3. Each Snow strap is fixed to roof and into purlins using 2x 12 gauge self drilling screws or M6 Roofzips
4. Each Snow strap is fixed to the gutter using 2x 4.8mm dia alum rivets minimum
5. Snow strap min sizing to be 0.55mm x 25mm
6. Formed snow straps are available for 125 Quad, 150 Half Round & 200 Half Round

200 HALF ROUND



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	14,200mm^2	
Flow capacity	248 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular	80mm
Maximum downpipe	Circular	150mm

Catchment area per downpipe based on the above flow capacity is given in Table 3.1M. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

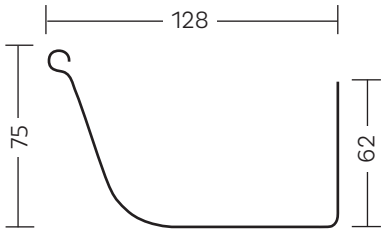
Table 3.1M

Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	371	297	247	212	185	165	148	124	106	93	83	74

Material options including thickness and grade	Steel	0.55mm G300	
	Copper	0.6mm Half hard	
Manufacturing facility	Christchurch & Invercargill **Note:** only available in the South Island		
Maximum length	4.2m		
Gutter bracket material and thickness	External	*Stainless steel	3mm x 30mm
	Powder coated in matching colour.		
	External	Brass (for use with copper gutter)	2.5mm or 3.0mm x 50mm wide
Recommended maximum spacings	900mm spacing (refer section 3.1.4.7 for recommended spacings where snow fall is possible). Snow straps available.		
Recommended fixings	Screw fastenings to be compatible with substrate and bracket material avoiding dissimilar metal contact.		

***Note:** A PVC barrier tape must be placed between the inside of the bracket and the spouting.

125 QUAD



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	5670mm^2	
Flow capacity	79 litres/min	
Minimum recommended fall	1:500	= 2mm in 1m
Minimum downpipe	Circular Rectangular	80mm min. cross sectional area of 2835mm^2, smallest dimension at least 50mm.

Catchment area per downpipe based on the above flow capacity is given in Table 3.1J. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1J

Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	118	95	79	68	59	53	47	39	34	30	26	24

Material options including thickness and grade	Steel Aluminium	0.55mm G300 0.70mm H34		
Manufacturing facility	Invercargill			
Gutter bracket material and thickness	Internal External	Zincalume® Galvanised steel	1.95mm 2.0mm	Q2 Q4
Recommended maximum spacings	900mm spacing (refer section 3.1.4.7 for recommended spacings where snow fall is possible). Snow strap available.			
Recommended fixings	Screw fastenings to be compatible substrate and bracket material.			

MATERIAL FINISH

For indepth information on the materials and finishes that rainwater disposal goods are available in, please refer to Section 3.1.1 of this manual.

BRACKETS AND FASTENERS

Eave gutters are secured to the edge of the structure by internal or external brackets that are shaped to fit the gutter.

Internal brackets are available for Quad SI, Deep Quad, 125 Quad, Box 125 and Box 175 gutter, but the Box 175 brackets should only be used in areas that are not subjected to snow fall and/or wind above medium velocity (as described by NZS 3604). Refer Sections 3.1.4.1 to 3.1.4.5 and 3.1.4.9.

External brackets are available for 150 Half Round, 200 Half Round, Box 125, Box 175 and Box 300 gutter. The brackets for the Box 125, Box 175 and Box 300 gutters can be custom run to accommodate the depth of the profile where metal cladding is fixed vertically. Refer Sections 3.1.4.1, 3.1.4.2, 3.1.4.3, 3.1.4.6 and 3.1.4.8.

300mm wide extruded external aluminium brackets are used on 150 Half Round gutters.

Please refer to the individual section for each profile (Section 3.1.4.1-3.1.4.9) for guidance on bracket spacings and the recommended fasteners. For bracket spacings in snowfall areas refere Section 3.1.4.7.

It is recommended that snow clips are attached to the gutter in areas where snow fall is expected and it is considered prudent to do so in the areas where snow fall may occur. Typically the bracket is 0.55mm thick and 40mm wide, fixed using the last roof fixing, through the bracket, and is nominally at 600mm centres. The gutter is fixed with 2 x 4.8mm diameter aluminium rivets. Refer Section 3.1.4.7 or snow straps welded to gutter if stainless steel is used.

Brackets for custom run gutters are made to suit the gutter shape chosen. Recommended bracket material dimensions for custom folded brackets are:

Cross Sectional Area A_e (mm^2)	Steel & Stainless Steel (mm)	Aluminium (mm)	Maximum Bracket Spacing* (mm)
4,00-6,000	20 x 2	20 x 4	900
6,100-10,000	32 x 3	30 x 5	900
10,100-20,000	30 x 5	30 x 6	900
20,100-40,000	40 x 5	40 x 6	600
40,100 - 65,000	50 x 5	fabricated with stiffening rib	600

*In areas not subject to snowfall.

DOWNPIPES

Downpipe options are many and varied.

Steel As a standard round in 80mm diameter or custom made in a rectangular shape such as 100mm x 50mm, in prepainted coil steel of ColorCote® MagnaFlow™ (formerly ZM8) and Zincalume.® Standard lengths are 3.2m long. Other lengths are subject to confirmation. Call 0800 DIMOND.

Spiral welded pipe can be used on large commercial jobs especially where the downpipe passes through the building, resulting in a "pressurised" downpipe system.

Dimond do not recommend using a fabricated lock-seamed downpipe such as is used on the rectangular shape in enclosed ceiling spaces and wall cavities.

115º round zinc elbow bends are available in standard colours for connecting the standard 80mm diameter downpipes together. The joint with the downpipe must be sealed and held with a minimum two 3mm aluminium rivets to each joint. Rectangular shapes are available in lengths up to 6m long. These require fabricating, riveting and sealing together with a neutral curing silicone sealant.

Copper A similar range of sizes are available. Call 0800 DIMOND to confirm availability. The material is suitable for use where bends are required as the product can be mitre cut and joint soldered. Zinc elbow bends must not be used due to dissimilar metal contact.

Other materials subject to confirmation. Call 0800 DIMOND.

FLASHINGS

As required to saddle abutting gutter terminations at high point between downpipes.

Flashings overlapping the back upstand of the gutter and extending under the roof sheeting may be used for extra security against leakage into the building, e.g. if gutter flow is blocked by hail or ice.

STOP ENDS

Zinc cast stop ends, powder coated to match, are available for use on Deep Quad and Quad SI. These stop ends have locating lugs which allow the stop ends to be located on the cut end of the gutter and provide secure positioning before sealing with a neutral silicon sealing and riveting onto the gutter with 2 x 4.3mm diameter aluminium rivets.

DROPPERS

Droppers are available as a standard in 65mm, 75mm and 100mm diameter in either 0.55mm ColorCote® MagnaFlow™ (formerly ZM8) material, Titania colour or in PVC material. A rectangular PVC 100x50mm is also available. Other sizes can be custom made in the following materials: 0.6mm copper, 0.9mm unpainted aluminium and 0.9mm ColorCote® AlumiGard™ (formerly AR8/ARX) depending on coil availability.

HANDLING & STORAGE

Correct handling of rainwater disposal products is critical to ensure damage does not occur during transportation and storage of the material. The following comments are made as guidelines to use when inspecting Dimond rainwater disposal systems during the installation process.

Visual inspection of materials when they are delivered to the site should be carried out to ensure they are in a dry condition, free from damage and are the correct material grade for the environment they are being installed in.

All components stored on site must be kept dry. Site storage should be out of direct sunlight and if outside, must be protected by covers that remain clear of the material surface at all times. The strippable film that is applied to prepainted rainwater disposal product should be removed within half a day of delivery to site and when exposed to sunlight must be removed immediately upon gutter installation. Otherwise glue residue will be left on the gutter sruface.

The need to keep the products dry applies to all metal types. If aluminium is stored wet it will suffer black staining that detracts from appearance. If prepainted Zincalume® or MagnaFlow™ products are stored wet, the paint finish will blister due to moisture absorption and eventual under-film corrosion. If unpainted Zincalume® products are stored wet the surface will stain and can suffer loss of protection that will show up in time as premature corrosion.

LAYOUT & FASTENING

The following comments are made as guidelines to use when inspecting Dimond rainwater disposal systems during and after installation.

The gutter will be delivered to site in custom run lengths up to 6 metres maximum.

Brackets shall be fixed to the outside face of the fascia panel at specified centres to a line to provide sufficient fall to the outlet position to avoid ponding in the gutter. To achieve this, a minimum fall of 1:500 is recommended. The levelness of the structure shall not be relied upon to determine fall. String lines or laser lines are recommended.

Any exposed metal foot on the brackets should be protected with a suitable paint system.

Fixings can be screws or nails depending on the substrate and gutter size, and shall have a durability equal to or better than the anticipated durability of the bracket or gutter making sure the materials are compatible. Large gutter sizes above Box 125 will require fixings to also resist wind uplift loads.

Where possible, gutter runs shall be continuous from corner to corner within the 6 metre standard length limitation.
Laps shall be formed to suit water flow direction and where possible away from the line of sight. All laps shall be positioned away from doorways and access ways. All laps must be sealed and rivetted with no sealant build-up on the inside lap edge. For gutters supported by external brackets, it is good practice to position laps such that they are covered by a gutter bracket.

Internal brackets should be positioned and fixed under roof profile rib and not the pan or trough, to allow unobstructed discharge into the gutter.

Stop ends shall be formed wherever gutter runs are terminated, except where the termination occurs at a rainhead.

Placement of downpipes must be to suit the roof catchment area for the flow capacity of that gutter size. Droppers must be positioned at the lowest point of the gutter run.

There should always be an overflow outlet provided as a secondary means to allow water to discharge to the building outside, should a blockage occur or in heavy rainfall conditions beyond the scope of design. This must eliminate water from the gutter entering the building. Overflows cross sectional area should be at least the same cross-section area as the primary outlet size.

GENERAL WORKMANSHIP

The following comments are made as guidelines for designers to use when inspecting Dimond rainwater disposal systems during and after installation.

Dissimilar Materials

Care should be taken to ensure that incompatible materials have not been used. Where necessary, water run-off from dissimilar materials should be contained and discharged using compatible materials.

Drilling and Cutting

Where gutter lengths require cutting, only shears, powered nibblers or hand shears should be used to leave a cleanly cut edge.

Any drilling should be carried out well clear of other lengths of gutter. All drilling swarf should be removed from the surface of the gutter immediately.

Ponding

Gutters shall be laid with a positive fall to the outlet to avoid ponding. Any ponding that occurs should drain or dry away within hours otherwise it may affect any material warranty.

General Appearance

Laps shall be formed to avoid the water flow entering them and where possible to suit the line of sight.

Sealants

Only neutral cure silicone sealants should be used.
Where outlets (droppers) are fitted to the sole of the gutter, sealant must not restrict the flow of water to the downpipe or hold unnecessary dirt.

All sealed joints must be mechanically fastened, and excessive sealant removed to prevent unnecessary dirt build-up.

Strippable Film

Protective films must be removed immediately upon product installation. Prolonged UV exposure will make removal difficult. The film must be removed from laps and difficult to access areas prior to final fixing in place. Strippable film must not remain in direct sunlight for more than half a day.

Scratches and Touch-up

Scratches that have not penetrated to the base metal (on prepainted material) and minor surface abrasions should be left alone, as touch-up painting will become obvious in time.

Any product with heavy scratch damage (e.g. scratches readily visible from a 3-4 metre distance and that exposes the base metal) should be replaced.

Copper Joints

These can either be Silfosed together or use copper rivets and sealant. Care must be taken to get rid of any spirits of salts by washing the joint thoroughly. Providing for expansion and contraction should be allowed for as detailed in the MRM Metal & Roofing Code of Practice.

DURABILITY, WARRANTY, MAINTENANCE

PRODUCT TECHNICAL STATEMENT

(a) Statement of Building Code Compliance

NZBC Compliance

Test information available from Pacific Coilcoaters and BHP NZ Steel, and past history of fascia systems, indicate that provided the product use and maintenance is in line with the guidelines contained in the current literature referenced, Dimond Rainwater Disposal Systems can be expected to meet the performance criteria in clause E2 of the New Zealand Building Code, for a period of not less than 5 years.

Use Outside the Stated Guidelines

If the need arises to use Dimond Rainwater Disposal Systems outside the limitations and procedures given in this or other referenced literature, or, if any doubt exists on product handling or use, written approval for use must be obtained from Dimond, before the project commences.

(b) Scope of Use

Dimond Fascia 147, 165 Paltec, F180 and 185 are coated steel fascia systems intended for use as fascia and barge boards to support gutter systems, covering roof truss ends and gable ends around the roof perimeter on timber trussed residential buildings. External gutters are then fixed directly to the fascia to allow collection and discharge of rainwater.

Suitable for use with longrun metal roofing, metal tiles or concrete tiled roofs. Reference should be made to Section 2.1.1.2 Environments, to ensure the correct coated material on the fascia is chosen for the environment.

Dimond do not recommend fascia systems are used in very severe marine or geothermal environments as fascia is not available in plain aluminium, AR8, ARX, stainless steel or copper. Tradition timber fascia should be used in these environments.

Typically 185 panel is used up the gable ends while 147 panel is used along the front.

165 Paltec fascia is an older very distinct profile with a wide foot. F180 is a modern 180 deep slim profile.

(c) Consenting Instructions

Metal fascia systems have been used successfully on timber trussed residential buildings for the last 20 years.

For consenting it is important to check the correct prepainted finish has been selected for the environment. Refer to Section 2.1.1.2.

The gutter size should be chosen for its water carrying capacity in accordance with Section 3.1.4 and should ensure the size of the bracket and gutter can physically fit the panel depth with correct overflow allowances.

DESCRIPTION

Dimond coated steel fascia systems are available in 147mm, 165 Paltec, F180 and 185mm high panel, roll formed in 0.55mm BMT Zincalume® with a prepainted finish only. Unpainted Zincalume® product, copper, stainless steel and aluminium are not available.

The outer edge of the soffit lining is retained at the bottom of the fascia in a rolled Soffit groove.

DESIGN INSTRUCTIONS

- The set out of the fascia support brackets are shown in the construction details in Section 3.4.4.
- Level or sloping soffi ts up to 22.5° pitch can be used.
- When installing Fascia rafter brackets for a shingle roof over ply on top of the rafters the set out is

	Dimension "B"*
147 Fascia Panel	145
185 Fascia Panel	175

Using these dimensions allows for a 10-12mm gap between the fascia and underside of the ply
* Refer to section 3.4.4 for the location of Dimension "B"

- Brackets are nailed or screw fixed to the soffit bearer or rafters when sloping soffits are used.
- The recommended set out heights must be maintained to avoid birds and vermin entering the roof space.
- Steel products should not come into contact with concrete and must avoid dissimilar metal contact.
- When selecting the gutter to use with the fascia system it is important to:

  i) Consider the catchment area for each downpipe draining into the gutter (called flow load) to ensure the capacity of the gutter (called flow capacity) has not been exceeded. Refer to Section 3.1.4 for the method.

  ii) Ensure the gutter with bracket can physically fit onto the fascia vertical face, laid to a fall of a minimum 1:500 and give an acceptable appearance. If not, select another smaller gutter size.

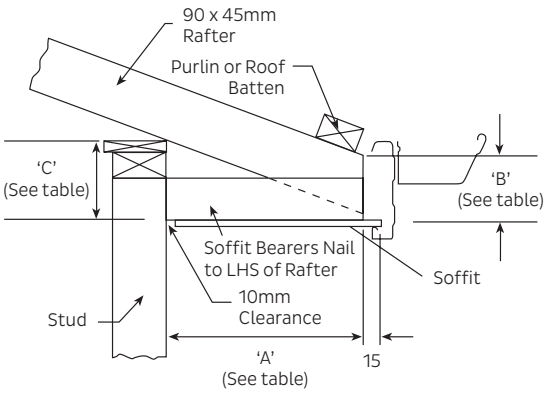
CONSTRUCTION INSTRUCTIONS

Selection of metal fascias needs to be made before the trusses are manufactured as the set out dimension may vary between the different systems available.

- Builders must ensure the timber soffit bearers are correctly set out using the published guidelines for the roof type being used prior to the fascia installation.
- Fascia brackets are nailed or screwed onto the soffit bearers to a level and true alignment using a string line.
- 6m maximum length of fascia are then fitted to the fascia brackets, cut back in length where necessary, and lengths joined together using normal roofing practice with silicone sealant and 4mm diameter rivets at 150mm maximum centres. Corner soaker caps are fitted over the fascias and rivetted on to cover corner joints or can be mitred cut.
- Metal fascia are specialised system that require specialised installers. Metal roofers do not normally install fascia.
- We do not recommend, support or approve DIY installations. Specialist companies throughout New Zealand install Dimond fascia. Contact Dimond for a list of installers in your area. Phone 0800 DIMOND (0800 346 663).

FASCIA 147 AND 165 PALTEC INSTALLATION GUIDE

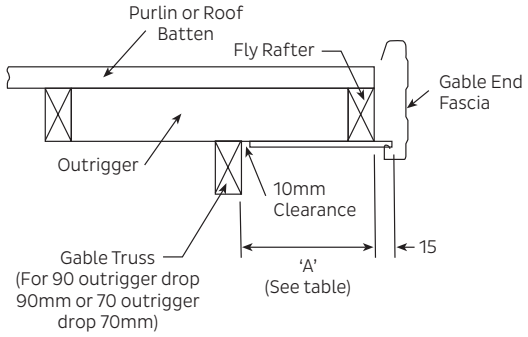
Metal Tiles and Metal Roofs



Hip & Gable Roof - Eaves Detail

Soffit Width (mm)	300	450	600	750	900
Dimension 'A' (mm)	295	445	595	745	895

Notes:
- A 10mm soffit clearance has been allowed for:
- Soffit bearers fixed to LEFT hand side of rafter (viewed from outside).
- Based on minimum Purlin/Roof batten thickness of 45mm.



Gable End Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

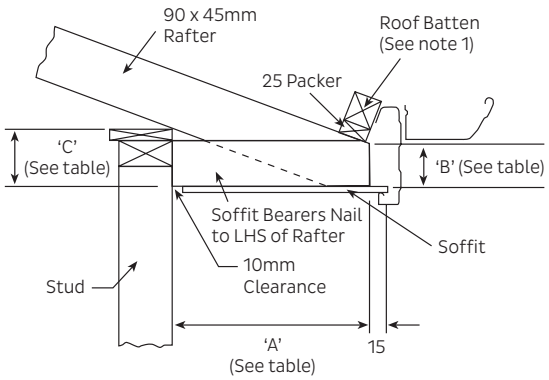
Note:
Fascia brackets must be fitted to all rafters. The installation of gutter brackets and snow straps in snow areas is to be as per section 3.1.4.7 of the Dimond manual. Snow areas N4 and N5 require 5 fasteners per Rafter bracket.

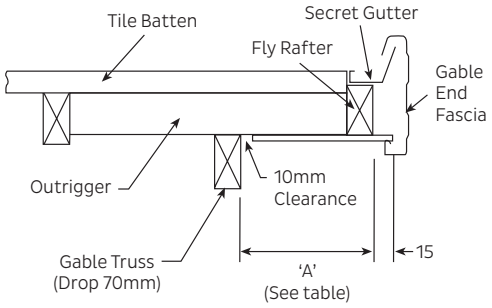
Roof Pitch (Degrees)	Drop Heights - Dimensions 'C' (mm) *See note 8 Soffit Width (mm)										Dim. 'B' Toe Cut 147 Cable end	'B' Toe Cut Paltec
	300		450		600		750		900			
	147	165 Paltec	147	165 Paltec	147	165 Paltec	147	165 Paltec	147	165 Paltec		
10	**60**	73	**86**	100	**113**	127	**139**	154	**165**	184	**95**	92
12.5	**72**	87	**105**	121	**138**	155	**171**	189	**205**	223	**95**	93
15	**87**	101	**127**	142	**167**	183	**208**	224	**248**	265	**96**	96
17.5	**98**	115	**145**	163	**192**	211	**240**	259	**287**	307	**96**	94
20	**113**	129	**167**	184	**222**	239	**277**	294	**331**	349	**97**	96
22.5	**129**	145	**191**	205	**253**	265	**315**	325	**377**	385	**101**	96
25	**142**	155	**212**	225	**282**	295	**352**	365	**422**	435	**105**	100
30	**170**	189	**257**	275	**344**	361	**430**	447	**516**	533	**109**	104
35	**206**	220	**311**	325	**416**	430	**521**	535	**626**	640	**116**	112
40	**247**	253	**373**	380	**499**	507	**625**	635	**751**	762	**122**	118
45	**280**	293	**420**	442	**580**	591	**730**	740	**880**	889	**129**	125

Notes for Installers
1. To ensure birds cannot enter the roof space, there should be no gap between the bottom purlin and the back face of the gutter after the system has been installed.
2. The 147 small panel fascia system is suitable for use with metal tiles and roofs with sloping soffits up to 22.5° roof pitch.
3. Over 25° roof pitch, a kickout may be required on all gable ends.
4. As an alternative to note 3, for gable end roofs, outriggers to be from finished timber sizes 70mm x 45mm i.e. gable end truss drop 70mm, avoiding kickouts up to 40° roof pitch.
5. NOTE: Soffit bearers are required on all hip corners and should be cut back 20mm to all free movement of the spouting.
6. Zincalume® coated gutters should have a minimum fall of at least 1:500 and should not have permanent ponding.
7. Where loose fill insulation is used, the soffit must be blocked off at the top plate to prevent the insulation coming into contact with the metal fascia. Check with your nearest distributor for further details.
8. Allows for a 16-18mm gap for easy fascia panel removal. If gap is not required dimensions will need to be altered.

FASCIA 147 AND 165 PALTEC INSTALLATION GUIDE

Concrete Tile Roofs





Hip & Gable Roof – Eaves Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

Notes:
- A 10mm soffit clearance has been allowed for:
- Soffit bearers fixed to LEFT hand side of rafter (viewed from outside).
- Based on minimum Purlin/Roof batten thickness of 47mm.

Gable End Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

Notes:
Finished timber sizes
- Outriggers 70mm x 45mm
- Fly rafter 90mm x 45mm

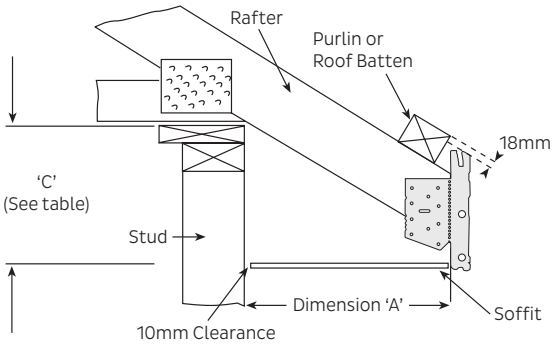
Fascia brackets must be fitted to all rafters. The installation of gutter brackets and snow straps in snow areas is to be as per section 3.1.4.7 of the Dimond manual. Snow areas N4 and N5 require 5 fasteners per Rafter bracket.

Roof Pitch (Degrees)	Drop Heights - Dimensions 'C' (mm) *See note 8 Soffit Width (mm)										Dim 'B' Toe Cut 147	Dim 'B' Toe Cut Paltec
	300		450		600		750		900			
	147	165 Paltec	147	165 Paltec	147	165 Paltec	147	165 Paltec	147	165 Paltec		
17.5	**72**	109	**119**	162	**166**	209	**213**	260	**261**	309	**85**	95
20	**84**	125	**141**	185	**195**	238	**250**	295	**305**	352	**88**	96
22.5	**101**	138	**163**	202	**226**	267	**288**	332	**350**	396	**91**	99
25	**117**	155	**187**	227	**257**	300	**327**	373	**397**	445	**95**	100
30	**150**	181	**237**	268	**323**	355	**410**	441	**497**	528	**100**	104
35	**187**	220	**292**	327	**397**	435	**502**	544	**607**	651	**112**	111
40	**227**	251	**353**	378	**479**	502	**605**	628	**731**	756	**124**	118
45	**275**	285	**425**	430	**575**	574	**725**	719	**875**	836	**135**	125

Notes for Installers
1. To ensure birds cannot enter the roof space, there should be no gap between the bottom purlin and the back face of the gutter after the system has been installed.
2. The 147 small panel fascia is not suitable on concrete tile roofs with sloping soffits.
3. For concrete tile gable end roofs, outriggers to be from finished timber sizes 70mm x 45mm i.e. gable end truss drop 70mm.
4. Over 25° roof pitch, a kickout is required on all gable ends.
5. NOTE: Soffit bearers are required on all hip corners and should be cut back 20mm to allow free movement of the spouting.
6. Zincalume® coated gutters should have a minimum fall of at least 1:500 and should not have permanent ponding.
7. Where loose fill insulation is used, the soffit must be blocked off at the top plate to prevent the insulation coming into contact with the metal fascia. Check with your nearest distributor for further details.
8. Allows for a 16-18mm gap for easy fascia panel removal. If gap is not required dimensions will need to be altered.

FASCIA 185 AND F180 INSTALLATION GUIDE

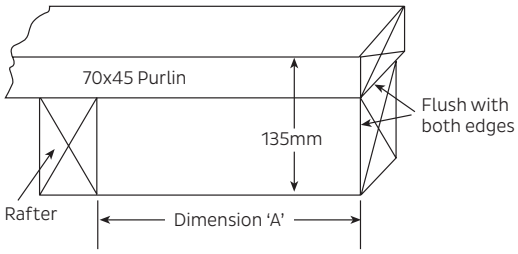
Metal Tiles and Metal Roofs



Hip & Gable Roof – Eaves Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

Notes:
- 90x45 soffit bearer used unless stated.
- Soffit bearers fixed to right or left hand side of rafter.
- 10mm clearance allowed for soffit.



Gable End Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

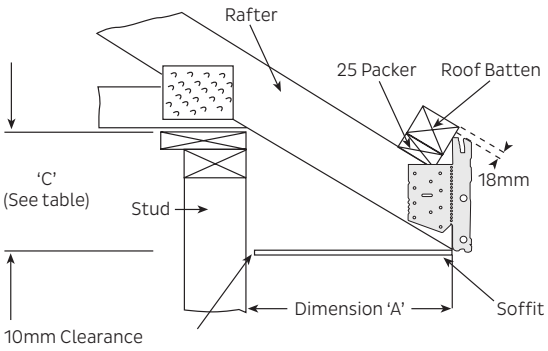
Note:
Fascia brackets must be fitted to all rafters. The installation of gutter brackets and snow straps in snow areas is to be as per section 3.1.4.7 of the Dimond manual. Snow areas N4 and N5 require 5 fasteners per Rafter bracket.

Roof Pitch (Degrees)	Drop Heights - Dimensions 'C' (mm) Soffit Width (mm)							
	300		450		600		750	
	185	F180	185	F180	185	F180	185	F180
10	**95**	85	**123**	114	**151**	143	**179**	172
12.5	**107**	100	**140**	136	**173**	172	**206**	208
15	**120**	115	**160**	157	**200**	199	**240**	241
17.5	**133**	125	**180**	175	**227**	225	**274**	275
20	**145**	142	**200**	199	**254**	256	**309**	313
22.5	**160**	155	**222**	220	**284**	285	**346**	350
25	**173**	170	**243**	244	**313**	318	**383**	392
27.5	**188**	185	**266**	268	**344**	351	**422**	434
30	**202**	205	**289**	296	**376**	387	**463**	478
35	**233**	235	**338**	342	**443**	449	**548**	556
40	**268**	268	**394**	394	**520**	520	**646**	646
45	**306**	305	**456**	456	**606**	607	**756**	758
50	**350**	350	**529**	529	**708**	708	**887**	887

Notes for Installers
1. To ensure birds cannot enter the roof space, there should be no gap between the bottom purlin and the back face of the gutter after the system has been installed.
2. NOTE: Soffit bearers are required on all hip corners and should be cut back 10mm.
3. Where loose fill insulation is used, the soffit must be blocked off at the top plate to prevent the insulation coming into contact with the metal fascia.
4. Zincalume® coated gutters should have a minimum fall of at least 1:500 and should not have permanent ponding. Check with your nearest distributor for further details.

FASCIA 185, F180 & GUTTER INSTALLATION GUIDE

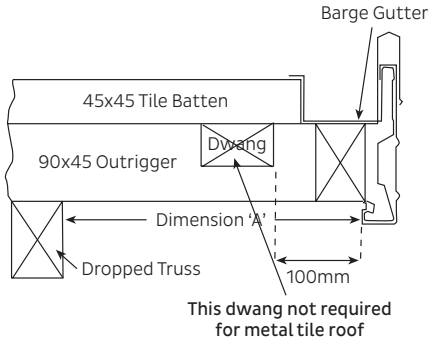
Concrete Tile Roofs



Hip & Gable Roof – Eaves Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

Notes:
- 90x45 soffit bearer used unless stated.
- Soffit bearers fixed to right or left hand side of rafter.
- 10mm clearance allowed for soffit.



Gable End Detail

Soffit Width (mm)	300	450	600
Dimension 'A' (mm)	295	445	595

Note:
Fascia brackets must be fitted to all rafters. The installation of gutter brackets and snow straps in snow areas is to be as per section 3.1.4.7 of the Dimond manual. Snow areas N4 and N5 require 5 fasteners per Rafter bracket.

Roof Pitch (Degrees)	Drop Heights - Dimensions 'C' (mm) Soffit Width (mm)							
	300		450		600		750	
	185	F180	185	F180	185	F180	185	F180
17.5	**107**	99	**154**	146	**201**	193	**248**	240
20	**118**	115	**173**	170	**227**	225	**282**	280
22.5	**133**	128	**195**	190	**257**	252	**319**	314
25	**145**	142	**215**	212	**285**	282	**355**	352
27.5	**160**	157	**238**	235	**316**	313	**394**	391
30	**173**	176	**260**	263	**347**	350	**434**	437
35	**202**	204	**307**	309	**412**	414	**517**	519
40	**235**	235	**361**	361	**487**	487	**613**	613
45	**271**	270	**421**	420	**571**	570	**721**	720

Notes for Installers
1. To ensure birds cannot enter the roof space, there should be no gap between the bottom purlin and the back face of the gutter after the system has been installed.
2. 185mm External Fascia and Gutter is not suitable on concrete tile roofs with sloping soffits.
3. NOTE: Soffit bearers are required on all hip corners and should be cut back 10 mm.
4. The use of concrete tiles on the barge ends is not a recommended practice as highlighted in the NZ Metal Roofing and Cladding Code of Practice Section 2 under Compatibility 2.7.2. Should people continue to use this method then there should be some sort of barrier between the two and there is no warranty offered by Pacific Coil Coaters or New Zealand Steel for corrosion if this method is used. This means that all installations should have a bottom batten around the edge of the roof line rather than let the concrete tile rest on the fascia.
5. Where loose fill insulation is used, the soffit must be blocked off at the top plate to prevent the insulation coming into contact with the metal fascia.
6. Zincalume® coated gutters should have a minimum fall of at least 1:500 and should not have permanent ponding. Check with your nearest distributor for further details.

3.4.7

MAINTENANCE REQUIREMENTS

Regular washing of all surfaces not normally washed by rainfall (called 'unwashed areas') especially around the soffit area needs to be done with clean fresh water. Regular washing may be anything from 3 monthly to 12 monthly periods. Washing should either be with a stiff soft bristled brush or water blasting at a pressure of 1500-2000 psi.

Care needs to be taken to avoid driving water into the soffit ends and roof space, by working away from soffit joints.

Should the fascia panel or parts of it become corroded over time, it must be repaired when it is first noticed. We recommend the corrosion is neutralised, then corrosion cleaned off, fascia washed down to remove dirt, oils and any grease or silicone, before priming and applying two coats of acrylic roof paint to the paint manufacturer's recommendation.

Alternatively, badly corroded lengths should be replaced, but expect colour variations due to paint fade that may not be acceptable or aesthetically pleasing for the end user.

3.4.8

TEST RESULTS

Regular material quality tests are carried out by our coil suppliers.

Dimond have tested 185 fascia for snow load to ensure it does not detach from the fi xing brackets under a sliding 1.5 kPa snow fall on a 15° roof slope. The panel stayed attached to the fixing brackets.

165 Paltec fascia it has been used successfully in the southern lakes region and Southern South Island since the early 1990's were it has had a good history of performance where regular snow falls have occurred.

3.4.9

QUALITY ASSURANCE

As part of Dimond's commitment to ensuring best quality and consistent manufacture, we run consistent quality checks on the products we produce to ensure the product meets our specifications for dimension tolerances.

3.4.10

PRODUCT SUPPORT

Contact details for Dimond:

National Sales: 0800 DIMOND (0800 346 663)

Technical: 0800 ROOFSPEC (0800 766 377)