ROOFING AND CLADDING SYSTEMS MANUAL

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Dimond Roofing, a division of Fletcher Steel Ltd.

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Dimond Roofing®

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

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(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
Dimondek® 300** Min pitch 3°	Steel (G300)	0.55	1.3	2.0	1.2	1.9	N/R	N/A	250
		0.75	1.5	2.3	1.5	2.3	N/R	N/A	350
	Copper 1/2 Hard	0.55	1.1	1.8	1.1	1.7	N/R	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.

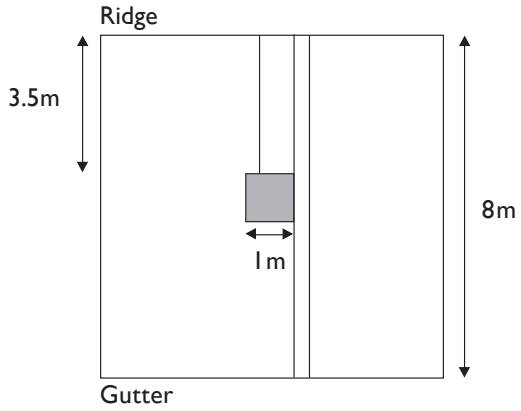
	Max Channel length (m)	Channel width (mm)
Corrugate	25	76
V-rib	80	101.6

(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.

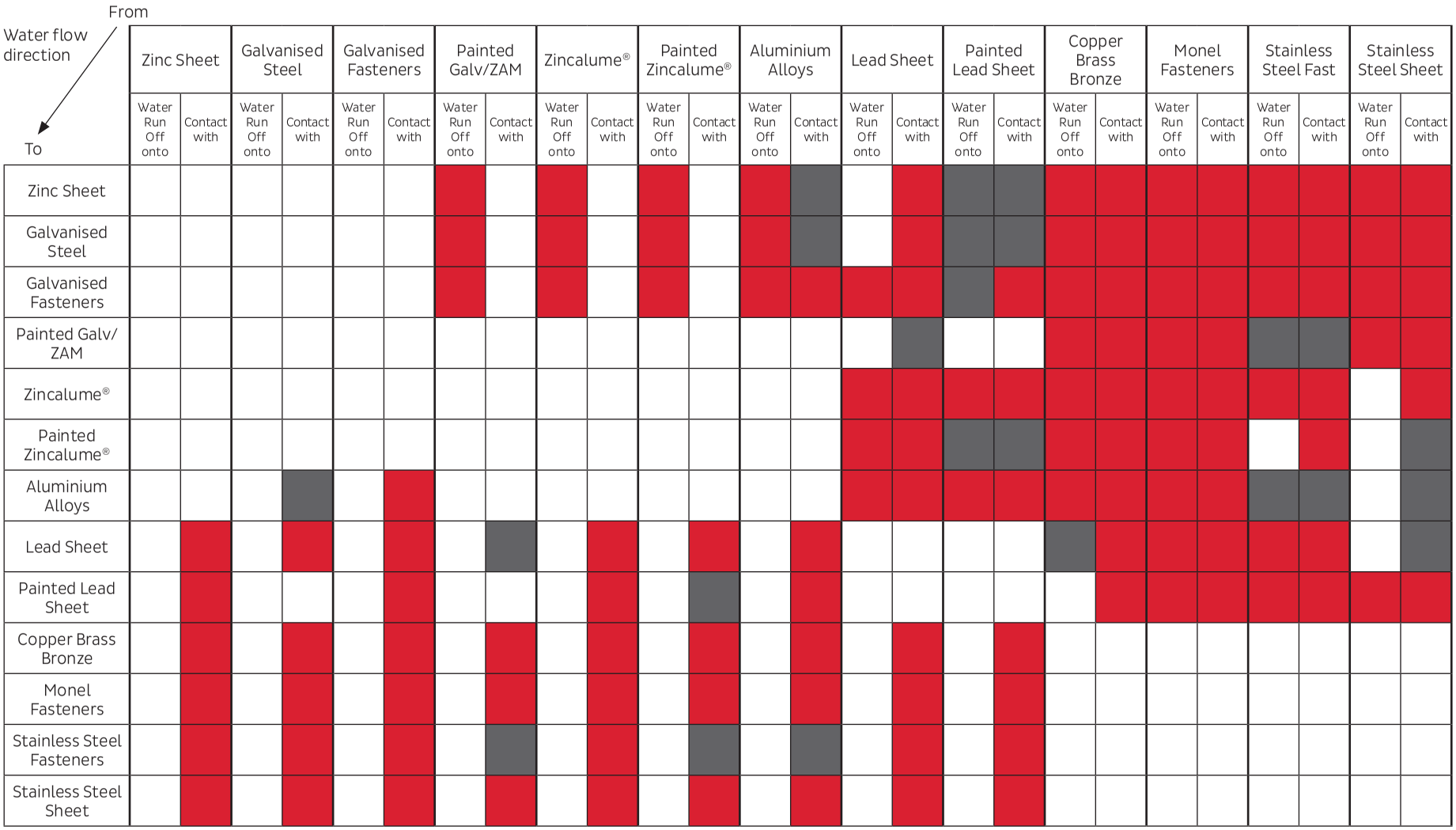
Contact with non-metal materials and water run-off from them can also cause corrosion problems. Well-known examples are:

- 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		