2.1.1.2 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 that are far inland	areas that are protected from marine influence. Are inland areas other than those
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 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 (eg. cool stores, animal shelters, fertiliser storage). Will require specific material selection for sheeting, fasteners and netting. Contact Dimond.

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™	Climaseal 4®	Galvanised
	Zinc/Aluminium Coated Steel (150g/m²)	–	Zincalume®	Climaseal 4®	Zincalume®
		Polyester, Acrylic	ColorCote® ZR8™/Colorsteel® Endura™	Climaseal 4®	Post Painted Steel
		PVF²	Colorcote® ZRX™*	Climaseal 4®	Post Painted Steel
	Aluminium	–	Plain or embossed finish	304 Stainless Steel or Alum.**	Aluminium
		Polyester, Acrylic	ColorCote® AR8™	304 Stainless Steel or Alum.**	Post Painted Aluminium
		PVF²	ColorCote® ARX™	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	Colorsteel® MAXX™*	Climaseal 4®	Post Painted Steel
	Zinc/Aluminium Coated Steel (150g/m²)	PVF²	ColorCote® ZRX™*	Climaseal 4®	Post Painted Steel
	Aluminium	–	Plain or Embossed	304 Stainless Steel or Alum.**	Aluminium
		Polyester, Acrylic	ColorCote® AR8™	304 Stainless Steel or Alum.**	Post Painted Aluminium
		PVF²	ColorCote® ARX™	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	Colorsteel® MAXX™*	Climaseal 4®	Post Painted Steel
	Aluminium	–	Plain or embossed finish	304 Stainless Steel or Alum.**	Aluminium
		Polyester, Acrylic	ColorCote® AR8™	304 Stainless Steel or Alum.**	Post Painted Aluminium
		PVF²	ColorCote® ARX™	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.

2.1.1.3 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 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.

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 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 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 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, and 20 years in Very Severe Marine, 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.

2.1.1.3 Continued

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 exposed underside of roofing in soffits are not warrantied, 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

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 on the Zincalume surface 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.

2.1.3.1 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 ultimate wind load capacity does not exceed 1.5 kPa. 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 ultimate wind load of 2 kPa.

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	Steel	0.4	2.0	3.0	2.4	3.7	N/R	N/A	250
	(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
Minimum pitch	Aluminium	0.7	1.6	2.5	1.7	2.6	N/R	N/A	250
3 degrees	H36	0.9	2.5	3.8	2.6	3.9	120	N/A	350
	Duraclad	1.7	1.0	1.5	1.4	2.1	30	N/A	250
Topspan	Steel	0.4	2.0	3.0	2.4	3.7	N/A	N/A	250
	(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
Minimum pitch	Aluminium	0.7	1.6	2.5	1.7	2.6	N/R	N/A	250
3 degrees	H36	0.9	2.5	3.8	2.6	3.9	120	N/A	350
	Duraclad	1.7	1.0	1.5	1.4	2.1	30	N/A	250
DP955	Steel	0.4	1.6	2.4	2.6	3.0	N/R	N/A	250
	(G550)	0.55	2.7	4.0	2.9	4.3	70	N/A	350
BB 900	Steel	0.4	1.5	2.2	1.9	2.9	N/R	N/A	250
	(G550)	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
Minimum pitch	Aluminium	0.7	1.1	1.7	1.6	2.4	N/R	N/A	200
3 degrees	H36	0.9	1.9	2.8	2.8	3.7	90	N/A	300
	Duraclad	1.7	0.8	1.2	1.8	2.1	24	N/A	200
LT7	Steel	0.4	1.2	1.8	1.6	2.4	80	900	250
	(G550)	0.55	1.9	2.9	1.9	2.9	50	400	350
Minimum pitch	Aluminium	0.7	0.9	1.3	1.2	1.8	80	N/A	200
3 degrees	H36	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
V Rib	Steel	0.4	1.2	1.8	1.9	2.9	20	400	200
	(G550)	0.55	1.7	2.5	2.3	3.5	16	400	300
Minimum pitch	Aluminium	0.7	0.9	1.2	1.6	2.4	20	N/A	150
4 degrees	H36	0.9	1.4	2.1	1.9	2.9	16	N/A	250
	Duraclad	1.7	0.8	1.2	0.9	1.4	20	N/A	150

Note: N/A = not available, N/R = not recommended, * = Roll curve only. Refer to Section 2.1.4 – Specific Design by Profile for a manufacturing locality guide for each profile.

Table continued overleaf

2.1.3.1 Continued

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)
Styleline	Steel	0.4	1.0	1.6	1.6	2.4	80	900	200
	(G550)	0.55	1.5	2.2	2.0	3	40	400	250
Min pitch 3°	Aluminium	0.7	0.8	1.2	1.2	1.8	80	N/A	100
	H36	0.9	1.1	1.7	1.7	2.6	40	400	200
	Duraclad	1.7	0.7	1.1	1.1	1.7	12	N/A	100
Veedek™	Steel	0.4	1.0	1.6	1.6	2.4	N/R	N/A	200
	(G550)	0.55	1.5	2.2	2.0	3	N/R	N/A	250
Min pitch 3°	Aluminium	0.7	0.8	1.2	1.2	1.8	N/R	N/A	100
	H36	0.9	1.1	1.7	1.7	2.6	N/R	N/A	200
	Duraclad	1.7	0.7	1.1	1.1	1.7	N/R	N/A	100
Corrugate	Steel	0.4	0.7	1	1.1	1.7	12	450*	100
	(G550)	0.55	1	1.5	1.6	2.4	10	450*	150
Min pitch 8°	Aluminium	0.7	0.5	0.8	0.8	1.2	12	450*	75
	H36	0.9	0.8	1.2	1.4	2.1	10	450*	150
	Duraclad	1.7	0.6	0.9	0.9	1.3	8	N/A	100
Dimondek 630	Steel (G550)	0.48	2.0	3.0	1.4	2.1	250	N/A	150
		0.55	2.4	3.7	1.7	2.6	250	N/A	250
Dimondek 400	Steel	0.55	1.1	1.6	1.0	1.3	70	N/A	250
	(G300)	0.75	1.5	2.2	1.3	1.9	70	N/A	300
Min pitch 3°	Aluminium H36	0.9	0.9	1.3	0.7	1.0	70	N/A	200
	Copper 1/2 hard	0.55	0.9	1.4	0.7	1.1	70	N/A	200
Dimondek 300	Steel	0.55	1.3	2	1.2	1.9	N/R	N/A	250
Min pitch 3°	(G550)	0.75	1.5	2.3	1.5	2.3	N/R	N/A	350
	Aluminium H36	0.9	1.1	1.6	1.0	1.5	N/R	N/A	200
	Copper 1/2 hard	0.55	1.1	1.8	1.1	1.7	N/R	N/A	200
Super Six Min pitch 3°	Duraclad	1.7	1	1.2	1.8	2	28	N/A	250
Dimondclad	Steel (G550)	0.4	N/R	N/R	0.9	1.4	N/R	N/A	100
Wall cladding only	Aluminium	0.7	N/R	N/R	0.9	1.4	N/R	N/A	75
	H36	0.9	N/R	N/R	0.9	1.4	N/R	N/A	100
Baby Corrugate	Steel	0.4	N/R	N/R	0.4	0.6	N/R	N/A	75
Wall cladding only	(G550)	0.55	N/R	N/R	0.4	0.8	N/R	N/A	75
Fineline	Steel (G550)	0.55	N/R	N/R	0.3	0.3	N/R	N/A	N/R
Wall cladding only	Aluminium H36	0.9	N/R	N/R	0.3	0.3	N/R	N/A	N/R
Sahara	Steel	0.40	N/R	N/R	1.3	2.0	N/R	N/A	N/R
Wall cladding only	(G550)	0.55	N/R	N/R	1.5	2.3	N/R	N/A	N/R
	Aluminium H36	0.7	N/R	N/R	1.0	1.4	N/R	N/A	N/R
Pacific	Steel	0.40	N/R	N/R	1.3	2.0	N/R	N/A	N/R
Wall cladding only	(G550)	0.55	N/R	N/R	1.6	2.4	N/R	N/A	N/R
	Aluminium H36	0.7	N/R	N/R	1.1	1.7	N/R	N/A	N/R

Note: N/A = not available, N/R = not recommended, * = Roll curve only. Refer to Section 2.1.4 – Specific Design by Profile for a manufacturing locality guide for each profile.

2.1.3.3 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 2.11 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 www.metalroofing.org.nz.

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

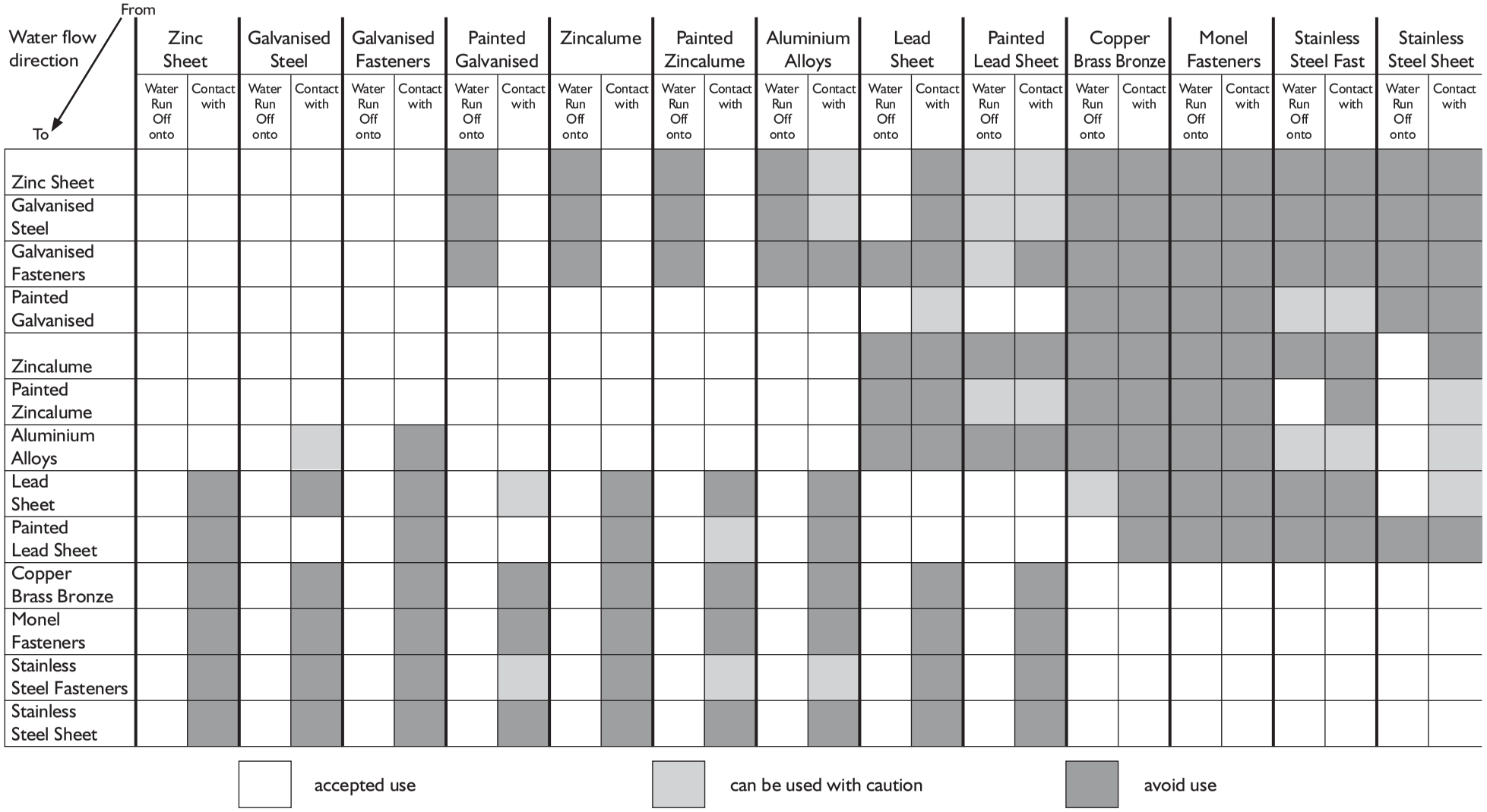
- Inert catchment – where water running from a non-zinc surface onto unpainted galvanised steel can cause rapid consumption of galvanising. The guilty surfaces include glass, plastic including GRP sheeting, painted or unpainted Zincalume®, painted galvanised steel, concrete tiles and butyl rubber. (The 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.
- Where galvanised netting has not been correctly isolated and has made contact with the Aluminium roof underside, piting of the aluminium will occur. Either avoid using galvanised netting or isolate contact with inert strip such as a Dimond purlin protection strip building paper can not be relied on as an inert strip especially in severe marine environments.
- When stainless steel fixings are used through aluminium roofs without a clearance hole around the fixing and a profiled washer and EPDM seal have not been used, any moisture especially salt laiden air creates a corrosive cell between the stainless steel and the Aluminium which results in rapid corrosion of the Aluminium. Clouts or staples are another good example to avoid when in contact with aluminium roofs.

Table 2.11 Dissimilar Metals Guide – Overleaf

2.1.3.3 Continued

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.



2.3.1 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.

2.3.2 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 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 Climaseal® Tek® 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.

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 up the slope of the roof from guttering to ridge and secured to the purlins as necessary before laying the roof sheet and fixing down. Joins should be lapped by a minimum of 150mm. Supports 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 1200mm.

When used under roofing, all underlays must be supported on wire netting or strapping at 300mm maximum spacings (except Greenwrap which may be used over purlin spacings 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 7m for fire retarded. Longer runs are to be end lapped 150mm.

In general it is recommended that prolonged exposure of the underlay to the weather is avoided by fixing the roofing over the same day.

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.
- Timber packers must be fixed to steel purlins when installing to allow insulation to fit between. Avoid compressing the insulation when the full 'R' value from the insulation is required.

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™, DD300, DD400 and V-Rib.

Vertical run cladding does not require a cavity batten system on any risk matrix wall provided the details and installation is carried out in accordance with recommendations in this manual, which are based on past history where Dimond profiles have successfully been fixed.

Installation in this way will not be in acccordance with E2/ASI: June 05 and is an alternative solution.

Continued on next page...

2.3.2 Continued

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.
- Screw 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 and Dimondek 630 products 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 vertically on steel girts or horizontally 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.
- Clad on the same day as installation (4 weeks maximum) provided the product is kept dry and undamaged.

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2.3.2 Continued

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 0.55 0.75	1500 2000 2400
Aluminium	0.70 0.90	1500 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 – 16 x 16mm Hex head Tek® screws
10 – 12 x 20mm 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.
- 32mm Weatherlok washers must be used as specified.
- 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.

2.3.3 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 as 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.

2.3.3 Continued

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.

Dektites®
Dektite® pipe flashings must not be positioned in such a way that a dam is formed across a water channel. It is preferred that Dektites® are positioned on the 'bias' rather than square across the sheet.
If the pipe and Dektite® flashing dam up the pan or restrict the water flow around the pipe and flashing, an additional cover over flashing to the ridge and sealing of the Dektite® 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.

2.1.3.6 Continued

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 less than 10°	For all pitches in very high wind zones and for all wind zones roof pitch is 10° or greater
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 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.

2.3.4 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 sole 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.

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 area 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.

Continued on next page...

2.3.4 Continued

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 buildup.

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.

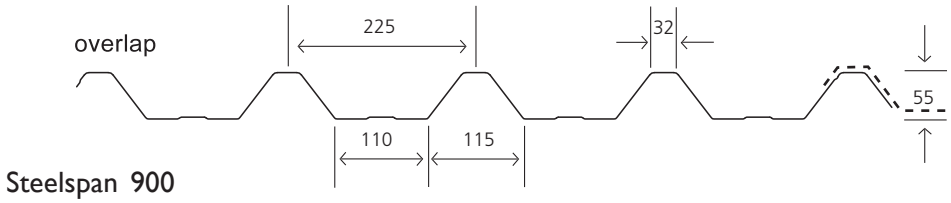
Scratches and Touch-up
Scratches that have not penetrated to the base metal (on coated materials) and minor surface abrasions should be left alone, as touch up painting will become obvious in time.

Sheets with heavy scratch damage (e.g.: scratches readily visible from a 3 metre distance that expose the base metal) should be replaced.

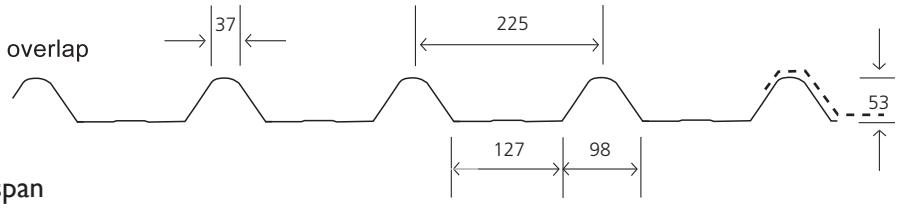
Buckled Ribs
Minor buckles that have occurred in profile ribs and will not retain water can be left alone. More severe buckles that will retain water or weaken the sheet should be pushed out from underneath, or be capped over with a rib section extending a minimum 50mm beyond the damaged section, fully sealed with silicone sealant and held onto the roofing rib with 5 – 3.2mm 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, ie 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.

2.1.4.1 (a) 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	Steel			Aluminium		Duraclad
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)	250	450	600	250	350	250

(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 – 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. Refer Section 2.1.3.4.

2.1.4.1 (b) Continued

STEELSPAN 900 AND TOPSPAN LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall
2. Restricted-Access Roof
1. Unrestricted-Access Roof

G550 Steel 0.40mm	End Span	1200	1300	1500	1800	2000	2200	2300	2400
	Internal Span	1800	2000	2200	2700	3000	3300	3500	3700
	Serviceability	3.4	2.7	2.6	2.0	1.6	1.5	1.3	1.2
	Ultimate	4.5	4.5	4.5	4.0	3.2	3.0	2.6	2.4
G550 Steel 0.55mm	End Span		2000	2300	2400	2900	3300	3400	3600
	Internal Span		3000	3500	3600	4300	5000	5100	5500
	Serviceability		2.3	1.8	1.7	1.3	1.0	0.9	0.6
	Ultimate (See note 6)		4.5	3.9	3.7	2.8	2.2	1.9	1.1
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	
	Ultimate (See note 6)		2.5	2.4	2.0	1.8	1.7	1.6	
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		
	Ultimate		4.3	4.2	3.8	2.8	2.5		
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		
	Ultimate		3.4	3.1	2.9	2.4	2.0		
Duraclad 1.7mm (Note 4)	End Span				900	1000	1100	1300	1500
	Internal Span					1500	1600	1900	2200
	Serviceability					-	-	-	-
	Ultimate	N/R	N/R			4.4	3.6	2.4	1.8

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.
   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 sections 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 $\phi = 0.8$ 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.

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2.1.4.1 (b) Continued

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 Cladding Pan	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	100	T17 – 14 – 10 x 100	50 M6 x 50 HG-Z4	Roofzip
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 either profiled metal washers and 36mm EPDM seals, or 32mm Weatherlok washers for Duraclad only).

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	2900 mm	2900 mm
Internal Span	4300 mm	4300 mm
Serviceability	1.3 kPa	0.6 kPa
Ultimate	2.8 kPa	1.4 kPa

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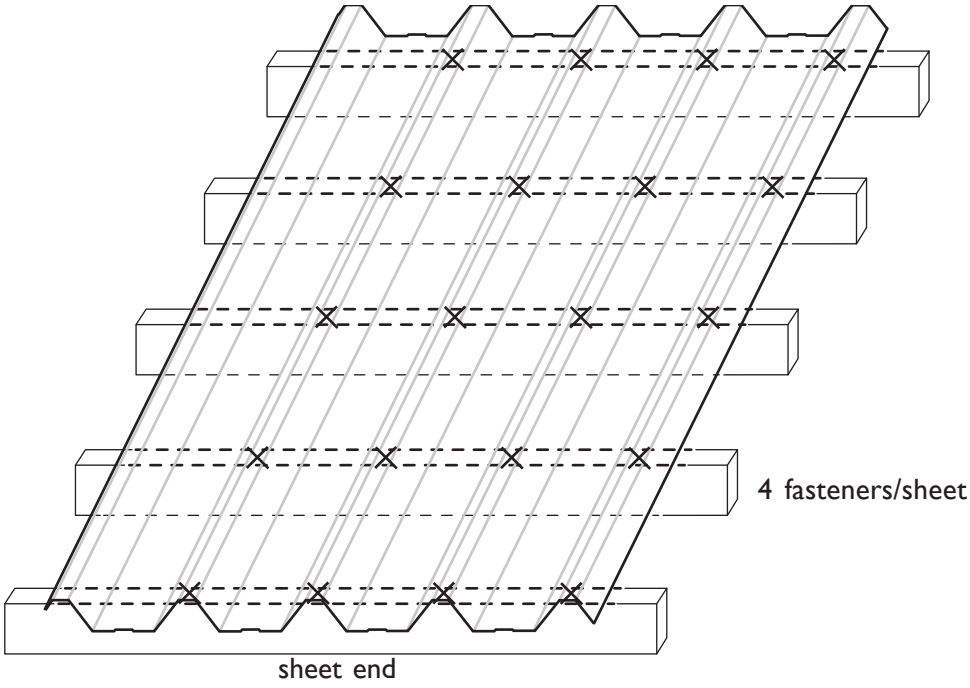
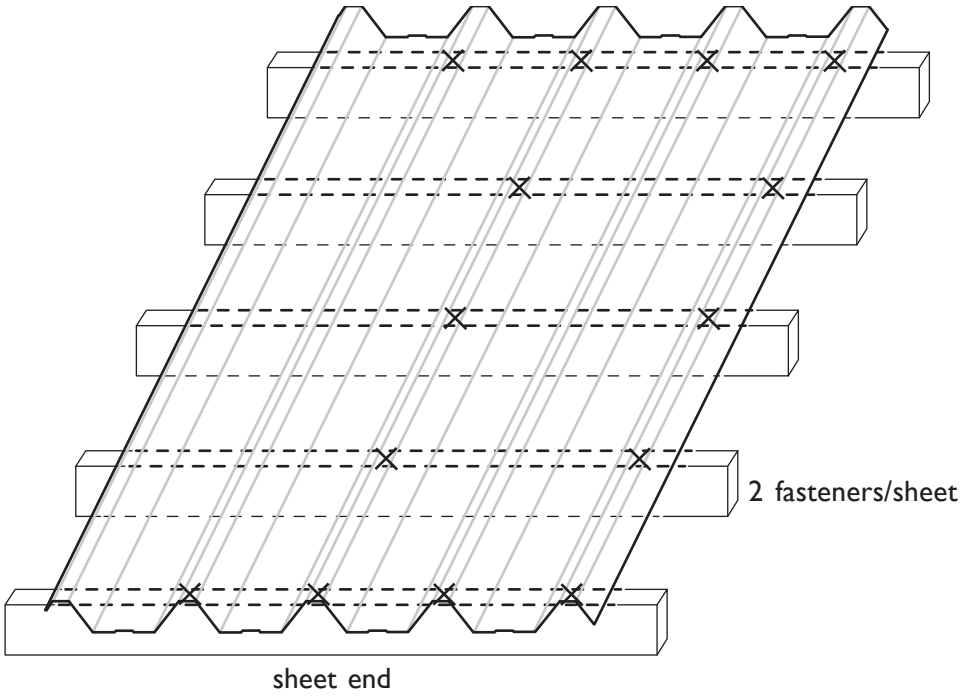
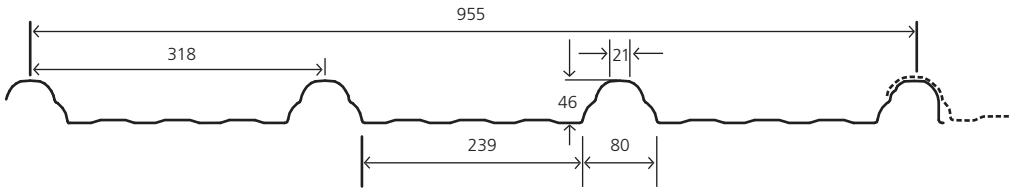
2.1.4.1 (b) Continued

DIMOND STEELSPAN 900 AND TOPSPAN FASTENER LAYOUT OPTIONS





2.1.4.18 (a) 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	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)	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 0.4m or 2m for 0.55m, the side lap 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 will be available in Christchurch from May 2012

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.

2.1.4.18 (b) Continued

DP955 LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall
2. Restricted-Access Roof
1. Unrestricted-Access Roof

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
	Ultimate			4.5	3.8	3.2	2.6	2.2	2.0
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	
	Ultimate	4.0	3.6	3.2	2.8	2.6	2.4	2.2	

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 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.

   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

   It is recommended that to obtain a dependable design strength capacity for the ultimate limit state, a reduction factor of $\phi = 0.8$ is applied.

   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
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.
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.
Non-access roof or wall	Walls or roofs where no foot traffic access is possible or permitted. If necessary, "No Roof Access" signs used.

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2.1.4.18 (b) Continued

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 M6 x 50 HG-Z4	Roofzip
Steel	75	Tek – 14 – 10 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 Dimond 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
Ultimate	2.4 kPa

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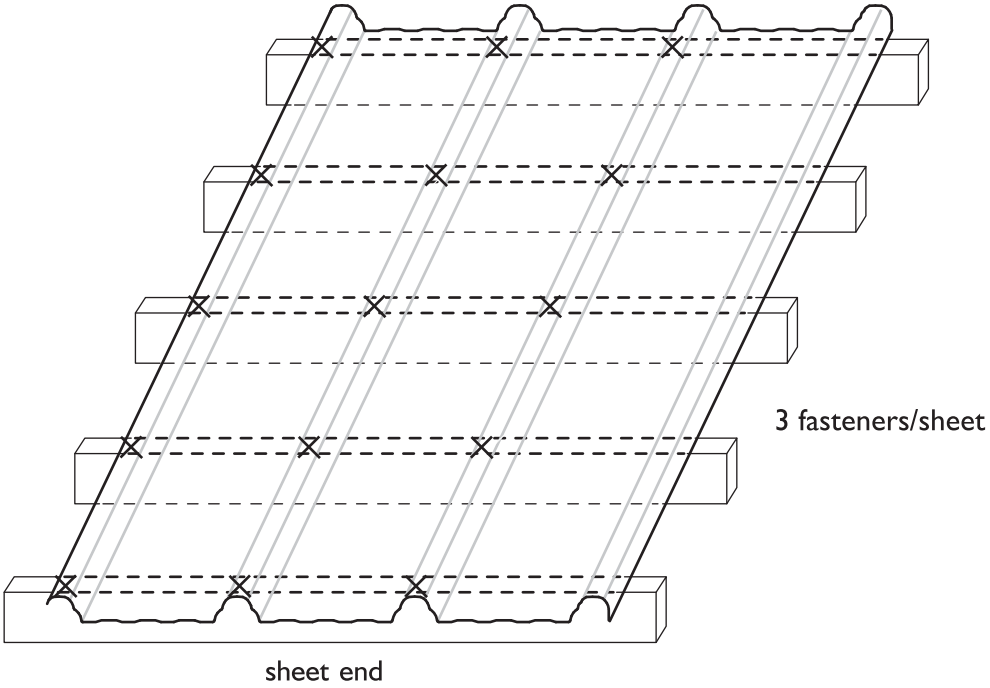
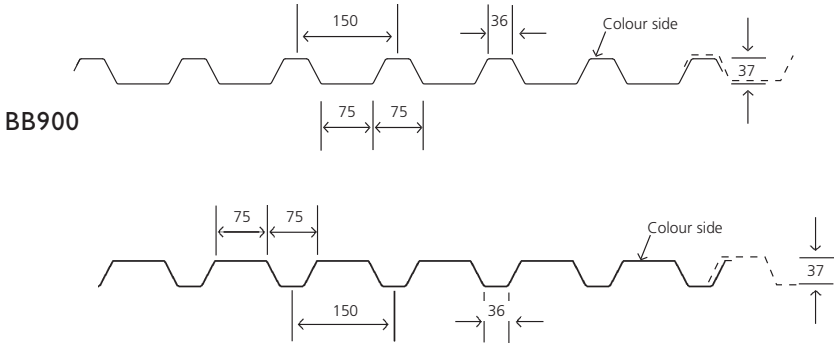
2.1.4.18 (b) Continued

DIMOND DP955
FASTENER LAYOUT OPTIONS



2.1.4.2 (a) DIMOND BROWNBUILT 900 (BB900) PROFILE PERFORMANCE



BB900 Reverse Run Profile (for horizontal 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 horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –0mm.

Material Options	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	1200
Machine crimp curved – roof min. radius (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Unsupported overhang (2)	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.

2.1.4.2 (b) Continued

BROWNBUILT 900 LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall

2. Restricted-Access Roof

1. Unrestricted-Access Roof

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
	Ultimate		4.5	4.5	4.5	4.0	3.6	3.2	2.4
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
	Ultimate		4.5	4.5	4.5	4.0	3.8	3.4	3.0
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	
	Ultimate		4.5	4.5	4.5	4.2	4.0	2.6	
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
	Ultimate		4.5		4.5	3.7	3.4	3.0	2.4
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
	Ultimate		4.5	4.5	4.5	4.2	4.0	3.0	2.4
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 4.5 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.
   System Design
   The span capacity of Brownbuilt 900 is determined from the Brownbuilt 900 Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

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2.1.4.2 (b) Continued

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	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber	75	T17 – 14 – 10 x 75	50 M6 x 50 HG-Z4	Roofzip
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 either profiled metal washers and 36mm EPDM seals, or 32mm Weatherlok washers).

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 by using 3 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	2300 mm	2300 mm
Internal Span	3400 mm	3400 mm
Serviceability	2.0 kPa	1.0 kPa
Ultimate	4.0 kPa	2.0 kPa

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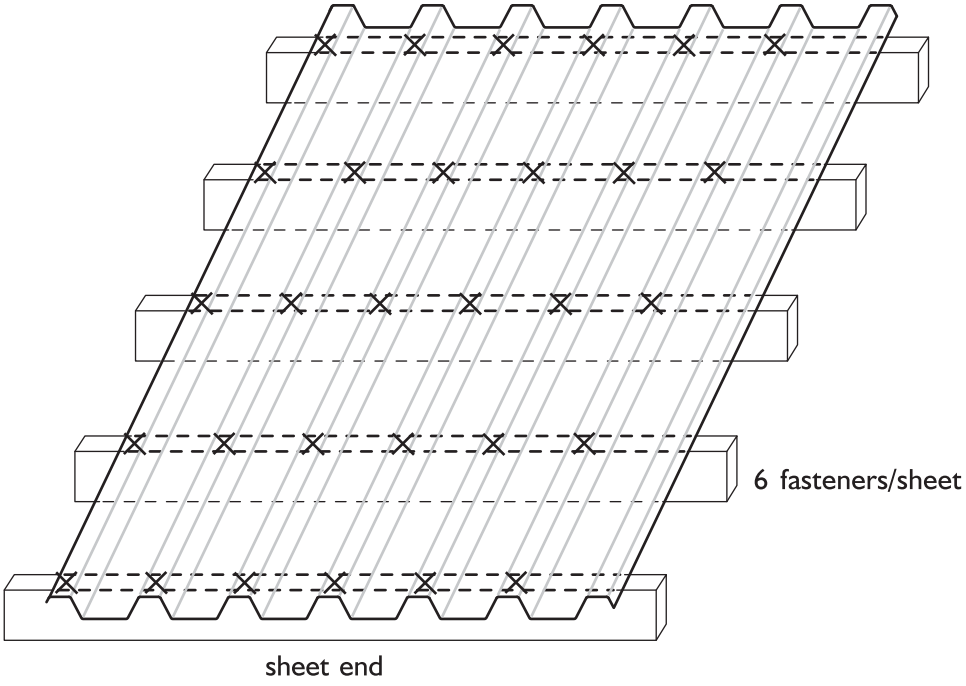
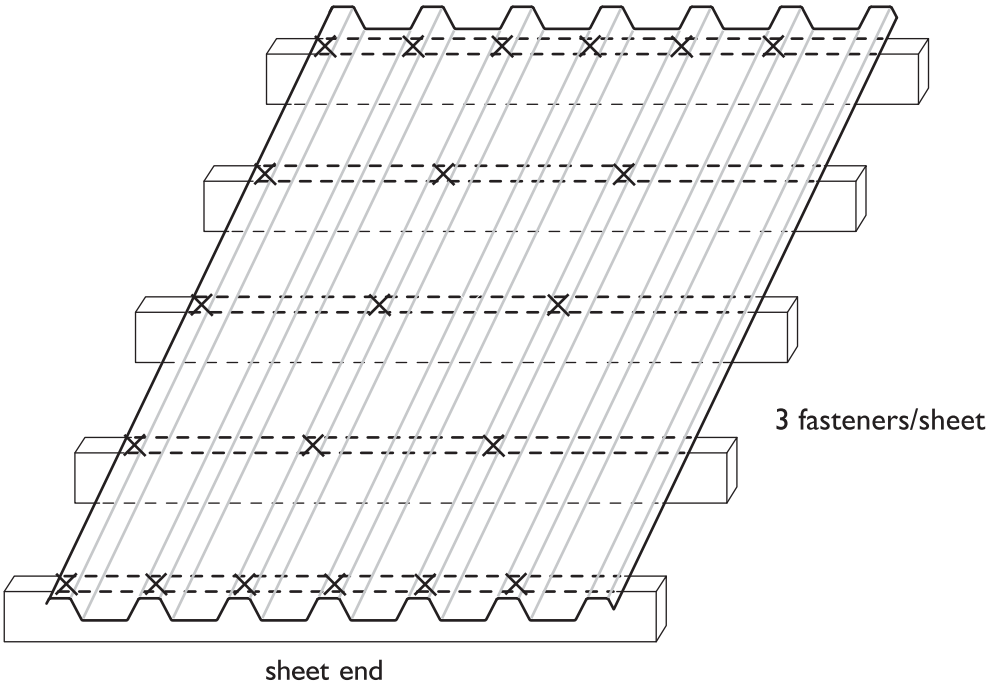
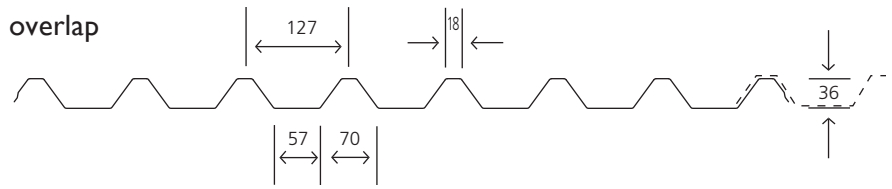
2.1.4.2 (b) Continued

DIMOND BROWNBUILT 900
FASTENER LAYOUT OPTIONS





2.1.4.3 (a) DIMOND LT7 PROFILE PERFORMANCE



Cover (mm)	889
Sheet width (mm)	933
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	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	2.90
Drape curved roof – min. radius (m)	80	50	80	50	24
Purlin spacings for drape curved roof (m) (1)	1.4	2.2	1.4	2.2	1.2
Machine crimp curved – roof min. radius (mm)	900	400	n/a	400	n/a
Unsupported overhang (2)	250	350	200	300	200

(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: Palmerston North

Manufacturing location for Duraclad: Auckland

Sheet lengths: LT7 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.

2.1.4.3 (b) Continued

LT7 LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall

2. Restricted-Access Roof

1. Unrestricted-Access Roof

G550 Steel 0.40mm	End Span		800	900	1000	1200	1300	1500	1800	2000
	Internal Span		1200	1300	1500	1800	1900	2300	2700	3000
	Serviceability		2.5	2.2	2.1	1.7	1.6	1.1	0.8	0.6
	Ultimate		4.5	4.4	4.2	3.4	3.2	2.2	1.6	1.2
G550 Steel 0.55mm	End Span		1300	1400	1700	1900	2000	2300	2500	3000
	Internal Span		2000	2100	2500	2900	3000	3400	3800	4500
	Serviceability		2.2	2.1	1.8	1.5	1.4	1.2	1.1	0.7
	Ultimate		2.8	2.6	2.3	2.0	1.9	1.6	1.5	1.4
5052, H36 Aluminium 0.70mm	End Span					900	900	1100	1400	1600
	Internal Span					1300	1400	1700	2100	2400
	Serviceability					1.7	1.6	1.3	0.9	0.7
	Ultimate	N/R	N/R			3.4	3.2	2.6	1.9	1.4
5052, H36 Aluminium 0.90mm	End Span		1100	1100	1300	1500	1600	1900	2100	2400
	Internal Span		1600	1700	2000	2300	2400	2800	3200	3600
	Serviceability		2.3	2.3	2.1	1.7	1.6	1.2	0.9	0.7
	Ultimate		3.0	2.9	2.7	2.5	2.4	2.1	1.7	1.4
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	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 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 load, 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.
   System Design
   The span capacity of LT7 is determined from the LT7 Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

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2.1.4.3 (b) Continued

Fastener Design

LT7 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	75	T17 – 14 – 10 x 75	50 M6 x 50 HG-Z4	Roofzip
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 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 either profiled metal washers and 36mm EPDM seals, or 32mm Weatherlok washers).

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 0.75.

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 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	1900 mm	1900 mm
Internal Span	2900 mm	2900 mm
Serviceability	1.5 kPa	1.1 kPa
Ultimate	2.0 kPa	1.5 kPa

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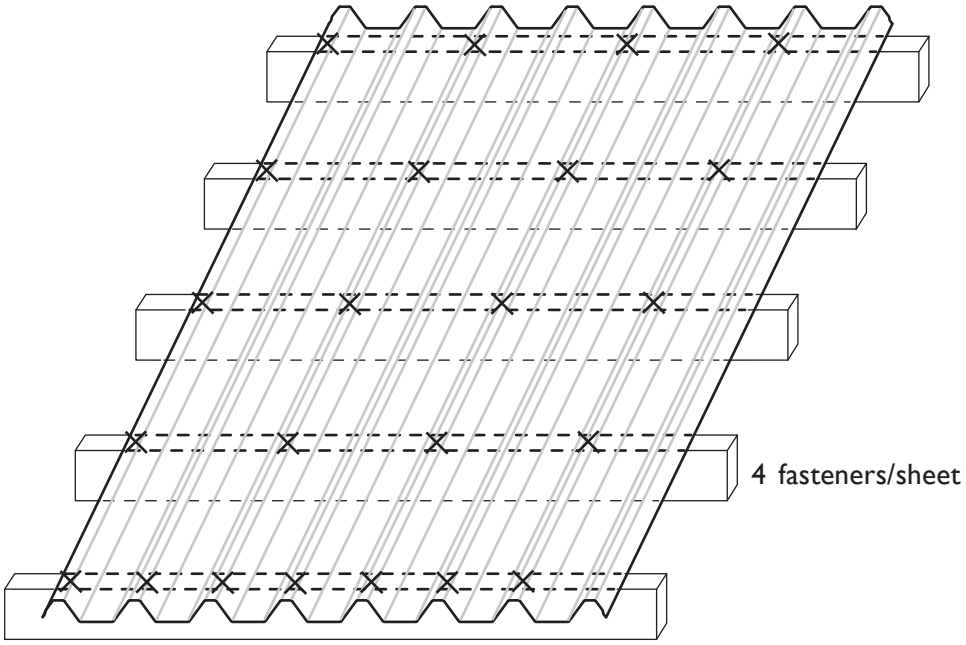
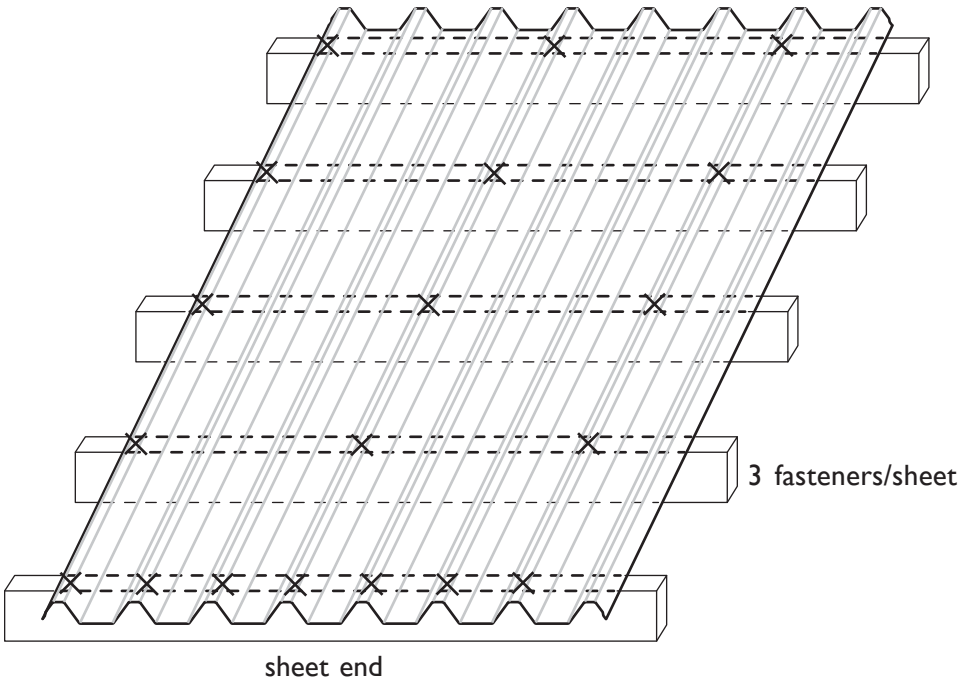
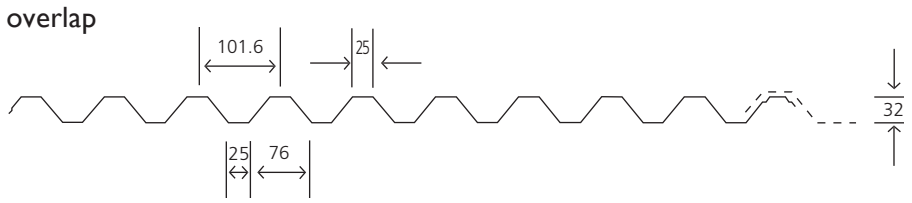
2.1.4.3 (b) Continued

DIMOND LT7
FASTENER LAYOUT OPTIONS





2.1.4.4 (a) 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	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)	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.

2.1.4.4 (b) Continued

V-RIB LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall

2. Restricted-Access Roof

1. Unrestricted-Access Roof

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
	Ultimate		4.5	4.5	4.5	4.5	4.5	3.8	2.8	2.1
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
	Ultimate		4.5	4.5	4.5	4.1	4.0	2.8	2.0	1.6
5052, H36 Aluminium 0.70mm	End Span					800	900	1100	1400	1600
	Internal Span					1200	1300	1700	2100	2400
	Serviceability					2.5	2.4	1.8	1.3	1.0
	Ultimate	N/R	N/R			3.5	3.4	3.0	2.6	2.0
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
	Ultimate		4.5	4.5	4.5	4.2	3.8	2.8	2.0	1.4
Duraclad 1.7mm (Note 4)	End Span					700	800	1000	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 load, 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.
   System Design
   The span capacity of V-Rib is determined from the V-Rib Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

Continued on next page ...

2.1.4.4 (b) Continued

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 65 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 either profiled metal washers and 36mm EPDM seals, or 32mm Weatherlok washers).

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
Ultimate	4.1 kPa	2.5 kPa

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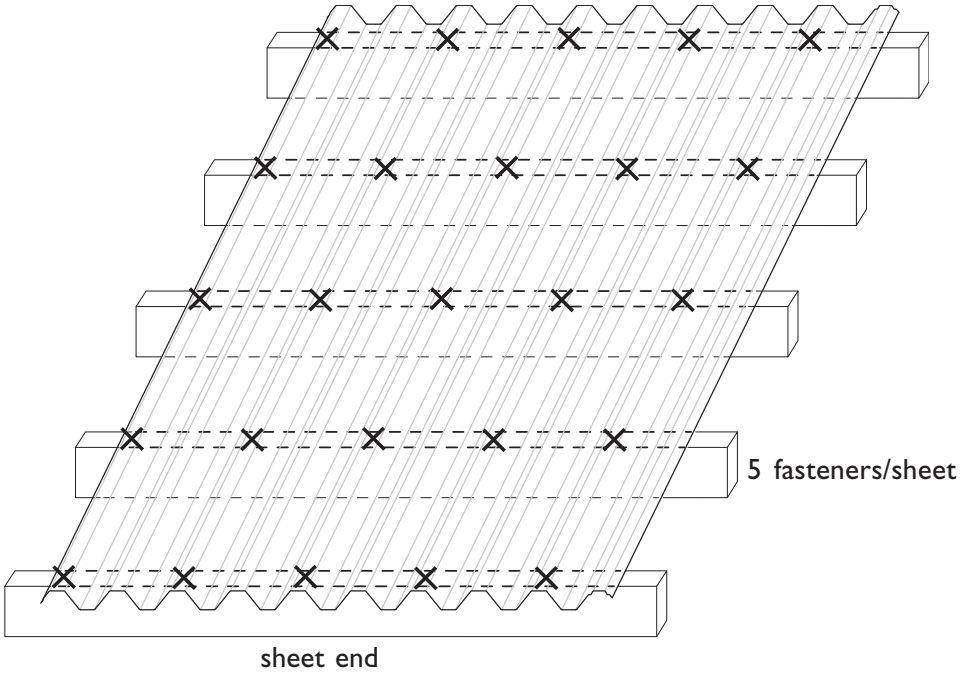
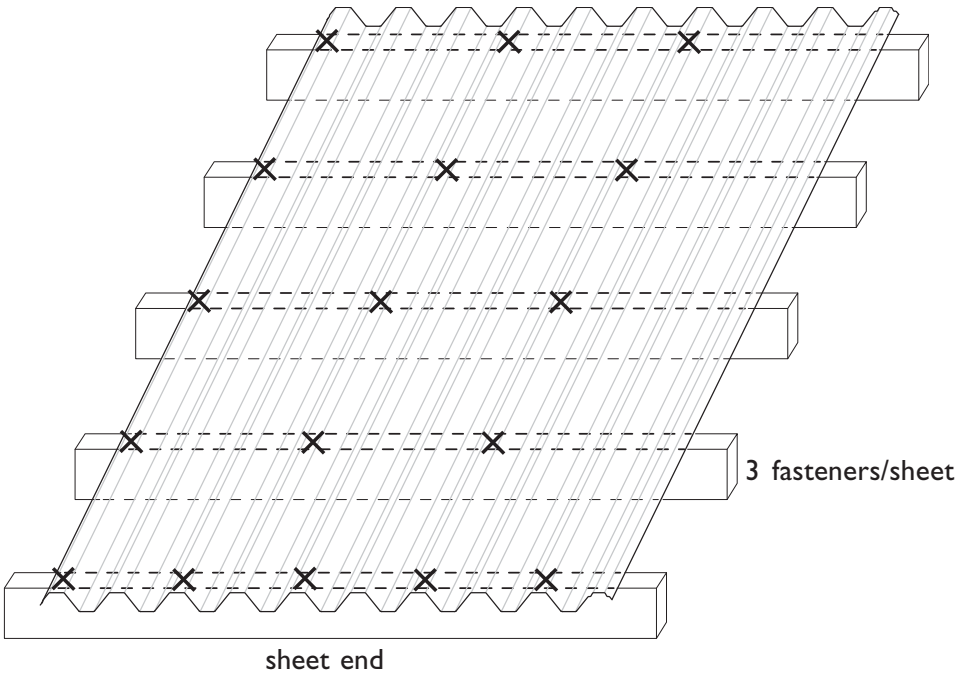
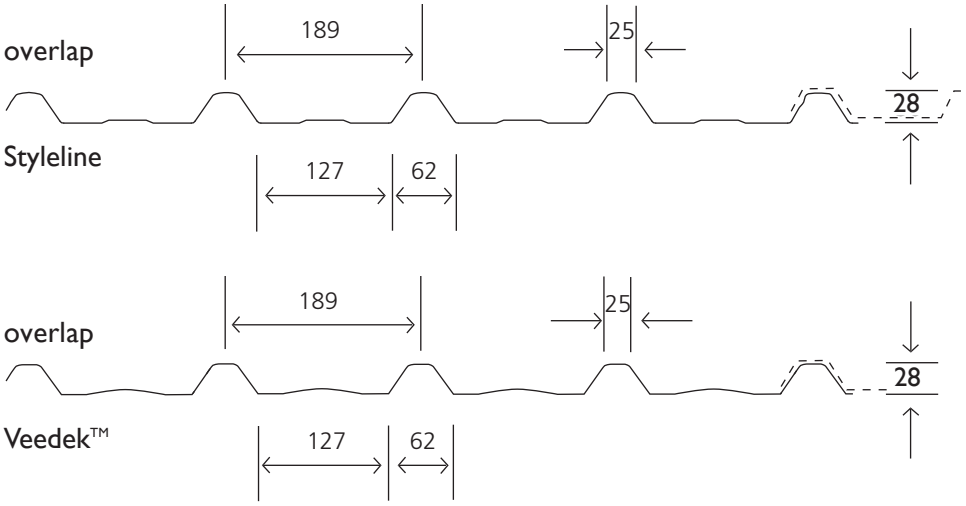
2.1.4.4 (b) Continued

DIMOND V-RIB
FASTENER LAYOUT OPTIONS





2.1.4.5 (a) DIMOND STYLELINE AND VEEDEK™ PROFILE PERFORMANCE



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	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
Crimp curved – min. radius (mm)*	900	400	n/a	400	n/a
Unsupported overhang (2)	200	250	100	200	100

***Please note: only Styleline is suitable for drape curving or crimp curving**

(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 facilities for Styleline at: Auckland, Hamilton, Christchurch, Palmerston North

Roll-forming facilities for Veedek™ at: Auckland, Hamilton, New Plymouth, Palmerston North, Christchurch, Dunedin

Manufacturing location for Duraclad: Auckland

Sheet lengths: Styleline and Veedek™ 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.

Dimond

2.1.4.5 (b) Continued

STYLELINE AND VEEDEK™ LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall

2. Restricted-Access Roof

1. Unrestricted-Access Roof

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
	Ultimate	N/R	N/R	4.5	4.5	3.6	3.2	2.4	1.8
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
	Ultimate	4.5	4.5	4.5	4.4	4.0	3.6	3.0	2.2
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
	Ultimate	N/R	N/R		4.2	3.3	3.0	2.2	1.6
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
	Ultimate		4.3	4.0	3.7	3.5	3.1	2.4	2.0
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 load, 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.

   System Design

   The span capacity of Styleline and Veedek™ is determined from the Styleline and Veedek™ Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

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2.1.4.5 (b) Continued

Fastener Design

Styleline 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 Fixed	
	Screw Length* (mm)	Designation	Screw Length* (mm)	Designation
Timber with steel based sheet	65	T17 – 14 – 10 x 75 Roofzip M6 x 65 HG-Z4	50	Roofzip M6 x 50 HG-Z4
Timber with aluminium based sheet	73	14g x 73mm Alutite with 8mmØ clearance hole and an aluminium profiled washer and 36Ø EPDM seal	Non cavity 35	12g x 35mm or 14g x 55mm Alutite with 8mmØ 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 either profiled metal washers and 36mm EPDM seals, or 32mm Weatherlok washers).

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	1500 mm	1500 mm
Internal Span	2200 mm	2200 mm
Serviceability	2.0 kPa	1.0 kPa
Ultimate	4.0 kPa	2.0 kPa

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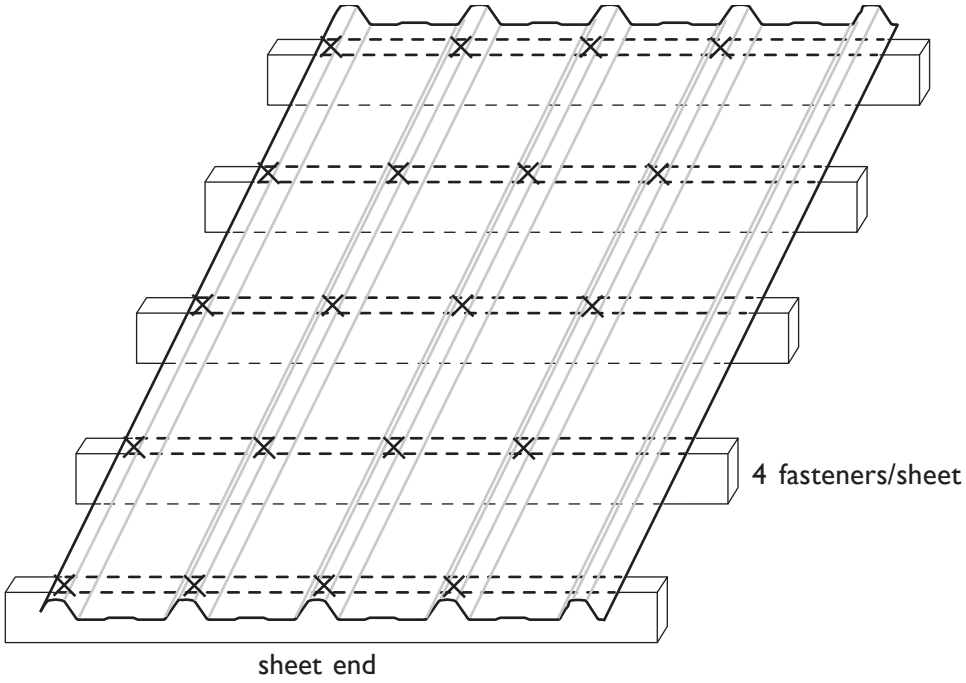
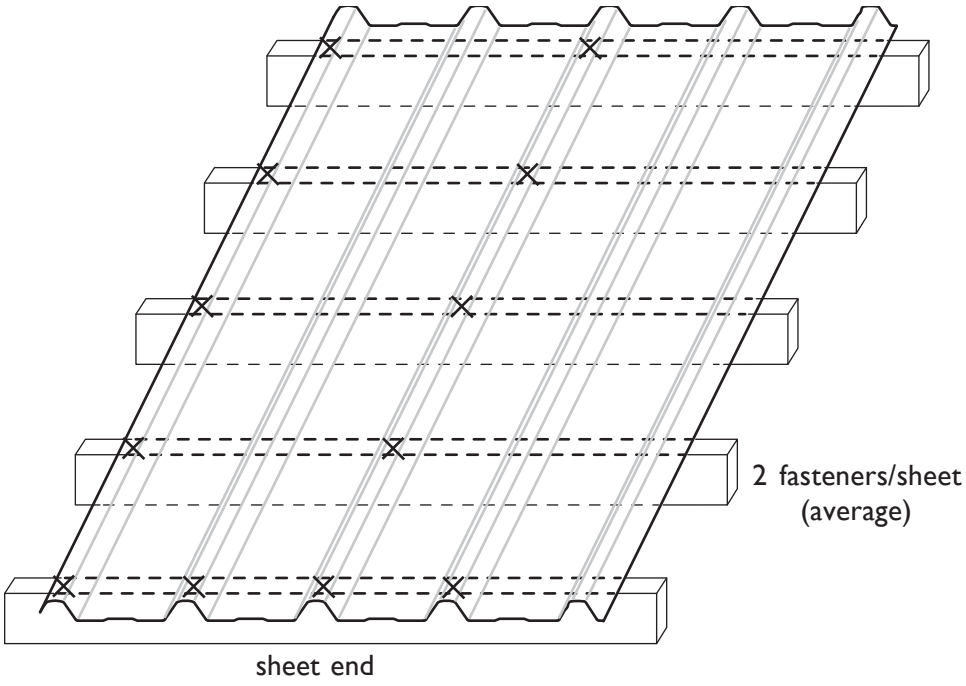
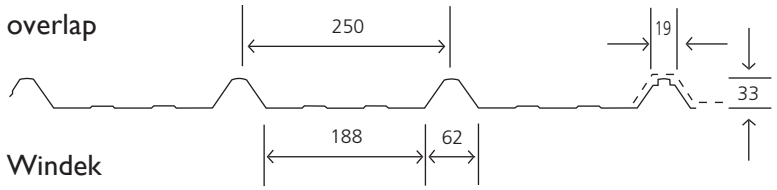
2.1.4.5 (b) Continued

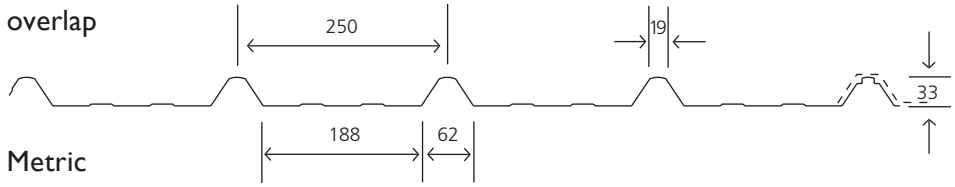
DIMOND STYLELINE AND VEEDEK™ FASTENER LAYOUT OPTIONS





2.1.4.6 (a) DIMOND WINDEK / METRIC PROFILE PERFORMANCE





Windek	Metric	
Cover	750	1000
Sheet width	793	1043
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	Steel		Aluminium
Thickness (BMT) mm	0.4	0.55	0.9
Nominal weight/lineal metre (kg/m) – Windek	3.17	4.27	2.28
– Metric	4.12	5.55	2.96
Drape curved roof – min. radius (m)	n/r	n/r	n/r
Purlin spacings for drape curved roof (m) (1)	n/r	n/r	n/r
Machine crimp curved – roof min. radius (mm)	400	400	400
Unsupported overhang (2)	150	200	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

Roll-forming & crimp curving facilities at: Palmerston North

Sheet lengths: Windek and Metric 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.

2.1.4.6 (b) Continued

WINDEK/METRIC LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall

2. Restricted-Access Roof

1. Unrestricted-Access Roof

G550 Steel 0.40mm	End Span				700	900	1000	1200	1400	1600
	Internal Span				1000	1400	1500	1800	2100	2400
	Serviceability				4.1	2.7	2.5	2.0	1.6	1.2
	Ultimate	N/R	N/R		4.5	4.5	4.2	3.4	3.2	2.4
G550 Steel 0.55mm	End Span		800	900	1000	1200	1300	1500	1800	2000
	Internal Span		1200	1300	1500	1800	1900	2200	2600	3000
	Serviceability		4.5	4.5	4.0	2.9	2.6	2.0	1.5	1.2
	Ultimate		4.5	4.5	4.5	4.5	4.5	4.0	3.0	2.4
5052, H36 Aluminium 0.90mm	End Span		700	700	900	1000	1100	1300	1400	1600
	Internal Span		1000	1100	1300	1500	1600	1900	2100	2400
	Serviceability		4.5	4.2	3.5	2.7	2.4	1.8	1.5	1.2
	Ultimate		4.5	4.5	4.5	4.5	4.1	3.6	3.0	2.4

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 for Windek.
3. Loads given are limited to a maximum of 4.5 kPa. If design requirements exceed this limit, contact Dimond 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 load, 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.

   System Design

   The span capacity of Windek/Metric is determined from the Windek/Metric Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

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2.1.4.6 (b) Continued

Fastener Design

Windek/Metric 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	65	T17 – 12 – 11 x 65 Roofzip M6 x 65 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 3 screw fasteners/Windek sheet/purlin or 4 screw fasteners/Metric sheet/purlin without the use of load spreading washers.

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 caus e dishing of the crest of the profile rib.

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 Windek has a maximum end span of 1200mm and a maximum internal span of 1800mm. The following distributed load capacities apply.

	3 fasteners/sheet
End Span	1200 mm
Internal Span	1800 mm
Serviceability	2.9 kPa
Ultimate	4.5 kPa

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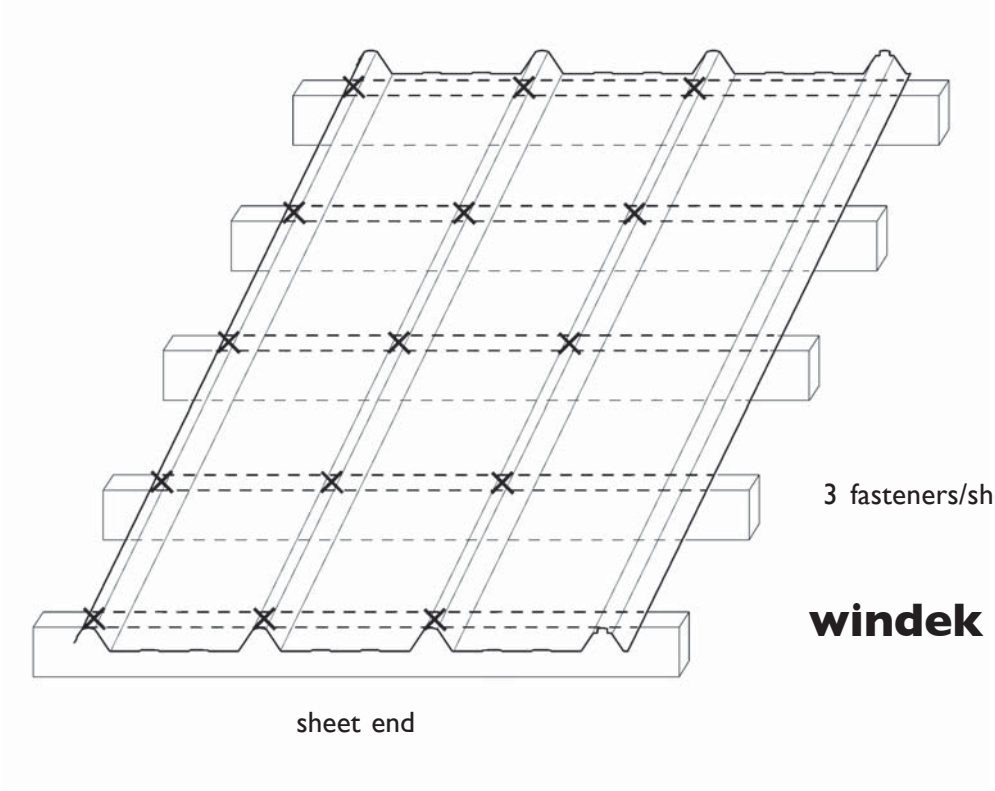
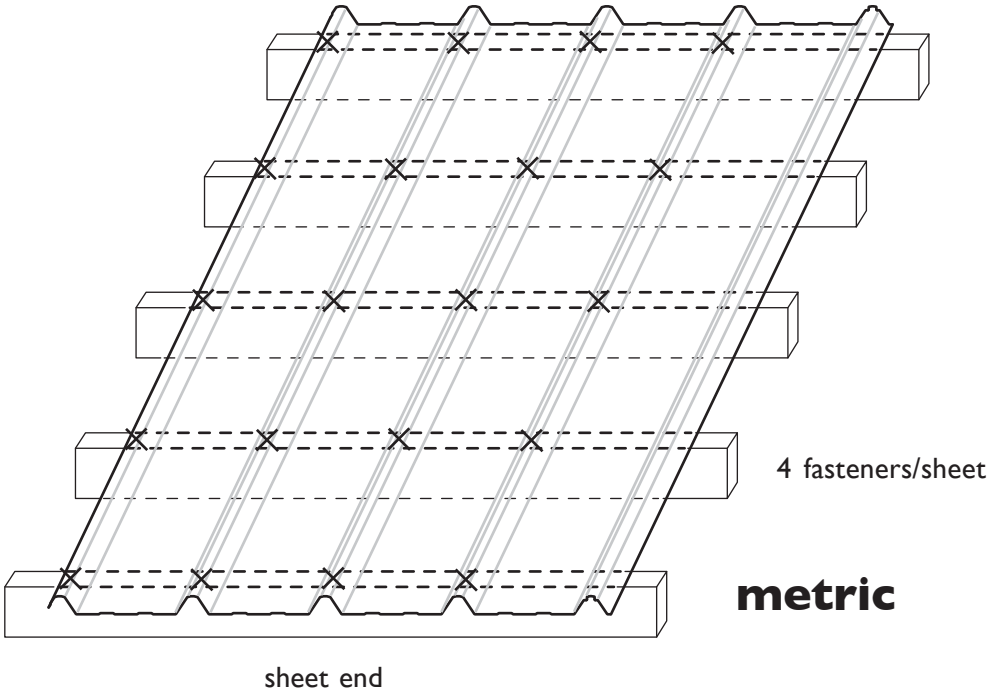
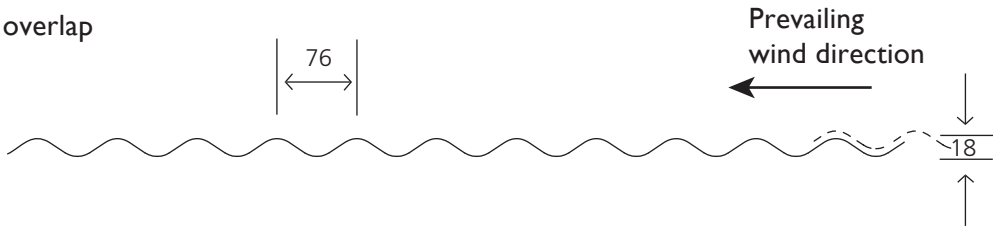
2.1.4.6 (b) Continued

DIMOND WINDEK / METRIC FASTENER LAYOUT OPTIONS





2.1.4.8 (a) DIMOND CORRUGATE PROFILE PERFORMANCE



Cover (mm)	762
Sheet width (mm)	851
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	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 (mm) (1)	800	1100	800	1100	900
Machine roll-curved – min. radius (mm)	450	450	450	450	n/a
Unsupported overhang (2)	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, New Plymouth, Palmerston North, Christchurch, Dunedin

Roll-curving facilities at: Hamilton, Christchurch

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. Refer Section 2.1.3.4.

2.1.4.8 (b) Continued

CORRUGATE LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall

2. Restricted-Access Roof

1. Unrestricted-Access Roof

G550 Steel 0.40mm	End Span				500	700	800	1000	1100	
	Internal Span				700	1000	1100	1400	1700	
	Serviceability				2.1	1.8	1.7	1.4	1.2	
	Ultimate	N/R	N/R		4.5	3.6	3.4	2.8	2.0	
G550 Steel 0.55mm	End Span		700	700	900	1000	1100	1300	1500	1600
	Internal Span		1000	1100	1300	1500	1600	1900	2200	2400
	Serviceability		3.7	3.5	2.9	2.5	2.2	1.7	1.4	1.1
	Ultimate		4.5	4.5	4.5	4.5	4.4	3.4	2.8	2.2
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	
	Ultimate	N/R	N/R			2.8	2.6	2.2	1.6	
5052, H36 Aluminium 0.90mm	End Span		500		600	800	900	1000	1200	1400
	Internal Span		800		900	1200	1300	1500	1800	2100
	Serviceability		3.5		3.2	2.2	2.0	1.7	1.3	1.1
	Ultimate		4.5		4.5	4.4	4.0	3.4	2.7	2.2
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 load, 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.

   System Design

   The span capacity of Corrugate is determined from the Corrugate Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

Continued on next page ...

2.1.4.8 (b) Continued

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 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

	Roof – rib fixed		Wall – pan fixed		
Purlin or frame material	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 8mm dia clearance hole, alum. profiled washer and 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 Alutite with a 8mm dia clearance hole, alum. profiled washer and 36mm dia EPDM seal	Non cavity	Tek 12g – 14 x 20 Class 4	Stainless steel grade 304 14g x 20mm Alutite with a 15mm dia bonded washer through an 8mm dia clearance hole
			Cavity	Tek 12 – 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm Alutite with a 15mm dia bonded washer through an 8mm dia clearance hole
Steel 1.5mm to 4.5mm thick	Tek 12g – 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm Alutite with an 8mm dia clearance hole, alum. profiled washer and 36mm dia EPDM seal	Non cavity	Tek 12g – 14 x 20 Class 4	Stainless steel grade 304 14g x 20mm Alutite with a 15mm dia bonded washer through an 8mm dia clearance hole
			Cavity	Tek 12 – 14 x 35 Class 4	Stainless steel grade 304 14g x 50mm Alutite with a 15mm dia bonded washer through an 8mm 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 either profiled metal washers and 36mm EPDM seals, or 32mm Weatherlok washers).

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	1000 mm	1000 mm
Internal Span	1500 mm	1500 mm
Serviceability	2.5 kPa	1.5 kPa
Ultimate	4.5 kPa	2.7 kPa

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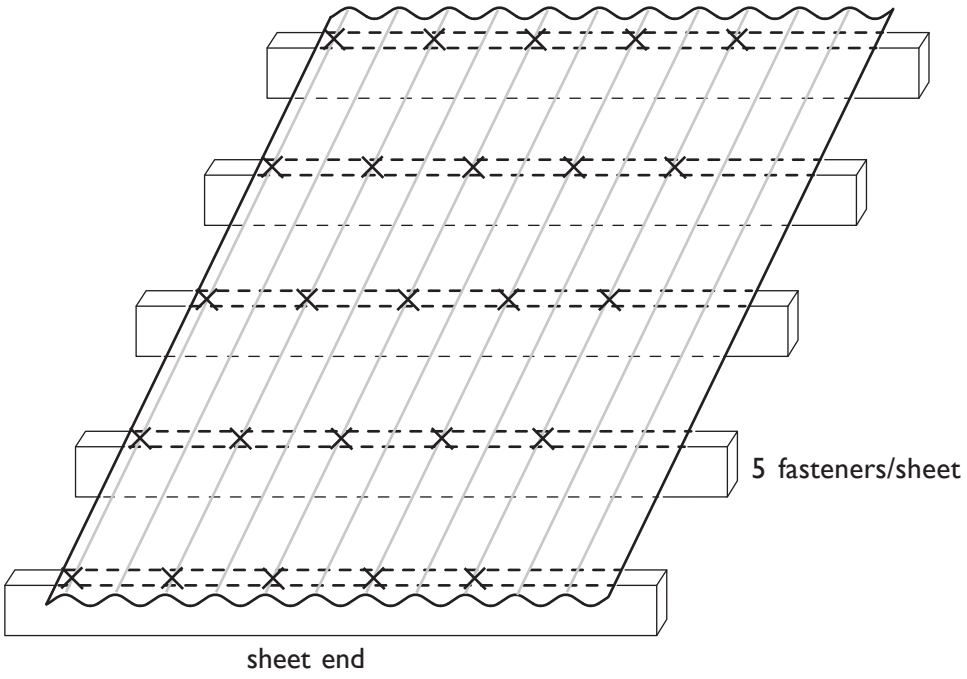
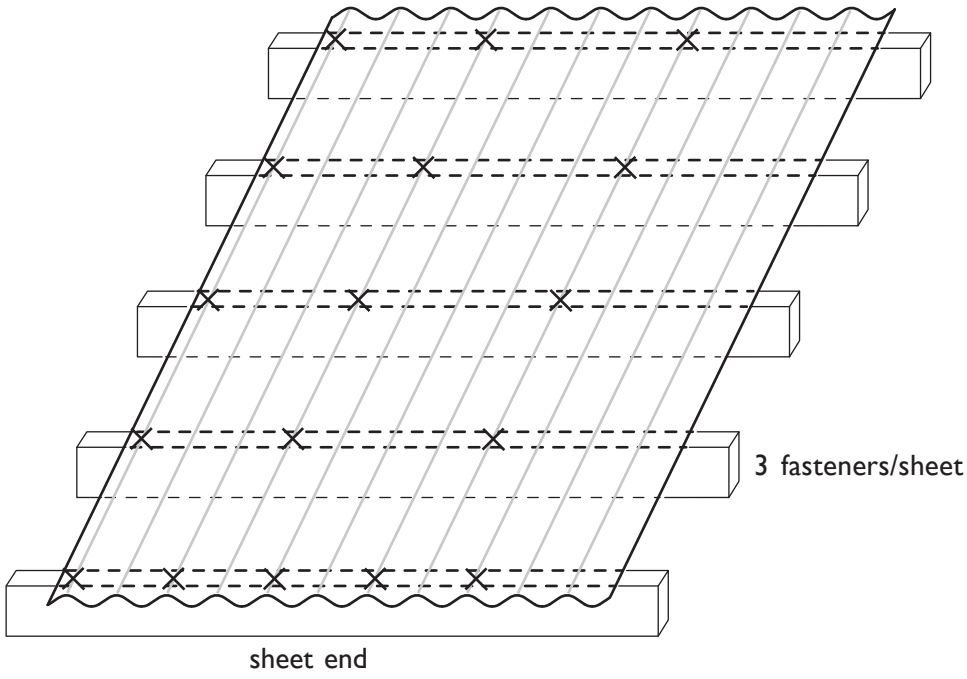
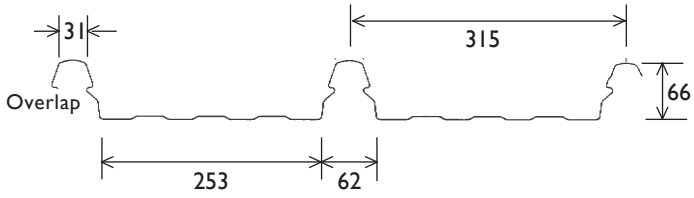
2.1.4.8 (b) Continued

DIMOND CORRUGATE
FASTENER LAYOUT OPTIONS





2.1.4.15 (a) 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. For horizontal wall cladding where notified at time of order of intended use, tighter tolerances can be achieved +3mm, –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 (mm) (1)	2400	3300
Machine roll-curved – min. radius (mm)	n/a	n/a
Unsupported overhang (mm) (2)	150	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

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 400222 to discuss.

*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.

2.1.4.15 (b) Continued

DIMONDEK 630 LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall
2. Restricted-Access Roof
1. Unrestricted-Access Roof

G550 Steel 0.48mm	End Span			1400	1600	1800	2000	2200	2400	2600
	Internal Span			2100	2400	2700	3000	3300	3600	3900
	Serviceability & Ultimate[5]			2.6	2.3	2.0	1.8	1.7	1.4	1.2
G550 Steel 0.55mm	End Span	1500	1700	2000	2200	2400	2600	2800	See Note 4	See Note 4
	Internal Span	2300	2600	3000	3300	3600	3900	4200		
	Serviceability & 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 4.2m 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 sheet detachment from clips or fastener withdrawal resulting in clip detachment due to wind up-lift (outward) loads.

   System Design

   The span capacity of Dimondek 630 is determined from the Dimondek 630 Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

Continued on next page ...

2.1.4.15 (b) Continued

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	Clip Fastener
Timber	Roofzip M6 x 50 HG-Z4
Steel	12g x 20mm 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.

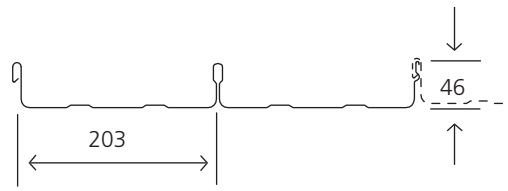
The Limit State Load / Span Capacity Chart is based on every rib being clip fastened to every purlin or girt.

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	2800 mm
Internal Span	4200 mm
Ultimate	1.2 kPa

2.1.4.9 (a) DIMONDEK 400 PROFILE PERFORMANCE

overlap



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 (mm) (1)	1200	1500	900	1000
Machine roll-curved – min. radius (mm)	n/a	n/a	n/a	n/a
Unsupported overhang (2)	250	300	200	200

(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, Palmerston North, Christchurch, and a mobile machine based in Hamilton which can be moved to site as required.

*Dimondek 400 is available in Copper ex Auckland only, subject to coil availability.

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.

**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.

2.1.4.9 (b) Continued

DIMONDEK 400 LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall
2. Restricted-Access Roof
1. Unrestricted-Access Roof

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		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	

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 2.0 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
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**

   Ultimate Limit State

   No sheet detachment from clips or fastener withdrawal resulting in clip detachment due to wind up-lift (outward) loads.

   System Design

   The span capacity of Dimondek 400 is determined from the Dimondek 400 Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

Continued on next page ...

2.1.4.9 (b) Continued

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	Clip Fastener
Timber	50mm nail or 10g x 45mm Timbertite wafer head screw
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.

When using Aluminium Dimondek 400, nylon coated steel clips must be used. Available through Dimond.

For screw size range refer Section 2.2.3.1.

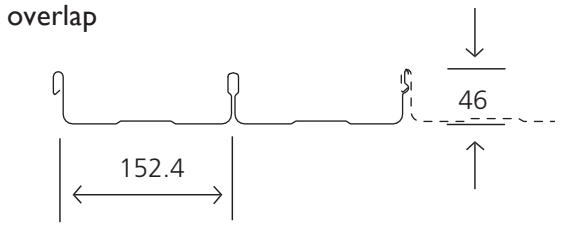
Underslung Fixing
- When using Dimondek 400 as an underslung roof, the ribs are required to be fixed under the steel structure, using a Dimond stainless steel tee bolt and stainless steel clip with neo's on every rib.
- There should be 1 row of clips on each structural member, each alternating side of the flange to avoid the Dimondek 400 falling off the structural steel.
- It is important to pre drill a 5mm diameter hole, through the centre of each rib of Dimondek 400, within 10mm of the edge of the structural steel member.
- For roofing lengths over 18m, an allowance for thermal expansion must be made.
- From the underside the tee bolt is then passed through the hole in the Dimondek 400, a neo seal fitted, then the clip is secured against and on top of the flange of the structural steel, before a neo seal washer and lock nut are tightened down, to compress the seals and hold the clip in place.

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

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

2.1.4.10 (a) DIMONDEK 300 PROFILE PERFORMANCE



Cover (mm)	305
Sheet width (mm)	310
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)	2.31	3.12	1.24	2.50
Drape curved roof – min. radius (m)	n/r	n/r	n/r	n/r
Purlin spacings for drape curved roof (m) (1)	n/r	n/r	n/r	n/r
Machine roll-curved – min. radius (mm)	n/a	n/a	n/a	n/a
Unsupported overhang (2)	250	350	200	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 facilities for Dimondek 300 at: Hamilton

*Dimondek 300 is available in Copper, subject to coil availability.

Sheet lengths: Dimondek 300 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.

2.1.4.10 (b) Continued

DIMONDEK 300 LIMIT STATE LOAD / SPAN CAPACITY CHART

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

Serviceability Category

3. Non-Access Roof or Wall
2. Restricted-Access Roof
1. Unrestricted-Access Roof

G300 Steel 0.55mm	End Span		900	1000	1100	1300	1400	1600
	Internal Span		1400	1500	1700	2000	2100	2400
	Ultimate[5]		2.2	2.2	2.2	1.9	1.7	1.3
G300 Steel 0.75mm	End Span		1100	1100	1300	1500	1600	1900
	Internal Span		1600	1700	2000	2300	2400	2800
	Ultimate[5]		2.2	2.2	2.2	2.1	1.9	1.2
5052, H36 Aluminium 0.90mm	End Span		800		900	1100	1200	1700
	Internal Span		1100	1200	1400	1600	1700	2000
	Ultimate[5]		2.2	2.2	2.1	1.9	1.8	1.3
½ hard Copper 0.55mm	End Span		600		800	1100	1200	1500
	Internal Span		1100	1300	1500	1800	1900	2200
	Ultimate[5]		2.2	2.2	2.2	1.9	1.7	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 2.2 kPa. If design requirements exceed this limit, contact Dimond for specific advice.
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**

   Ultimate Limit State

   No sheet detachment from clips or fastener withdrawal resulting in clip detachment due to wind up-lift (outward) loads.

   System Design

   The span capacity of Dimondek 300 is determined from the Dimondek 300 Limit State Load / Span Capacity Chart using the sections 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 $\phi = 0.8$ 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.

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2.1.4.10 (b) Continued

Fastener Design

Dimondek 300 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	Clip Fastener
Timber	50mm nail or 10g x 45mm Timbertite wafer head screw
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.

When using Aluminium Dimondek 300, nylon coated steel clips must be used. Available through Dimond.

For screw size range refer Section 2.2.3.1.

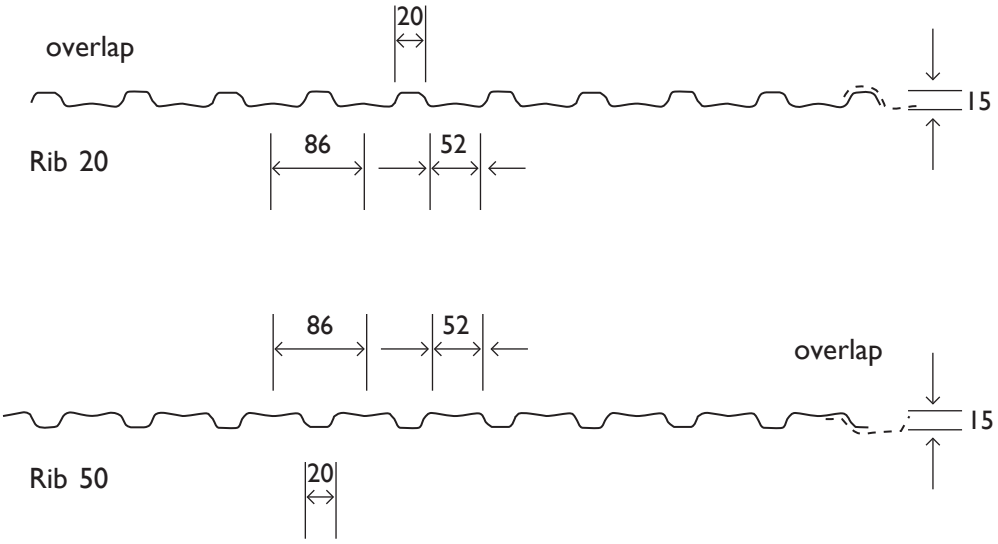
The Limit State Load / Span Capacity Chart is based on every rib being clip fastened to every purlin or girt.

Design Example

Restricted access roof, 0.55mm G300 steel Dimondek 300 has a maximum end span of 1300mm and a maximum internal span of 2000mm. The following distributed load capacities apply.

End Span	1300mm
Internal Span	2000mm
Ultimate	1.9 kPa

2.1.4.12 (a) DIMONDCLAD RIB 20 & RIB 50 PROFILE PERFORMANCE



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 (mm) (1)	100	75	100

(1) Not intended to support point loads.

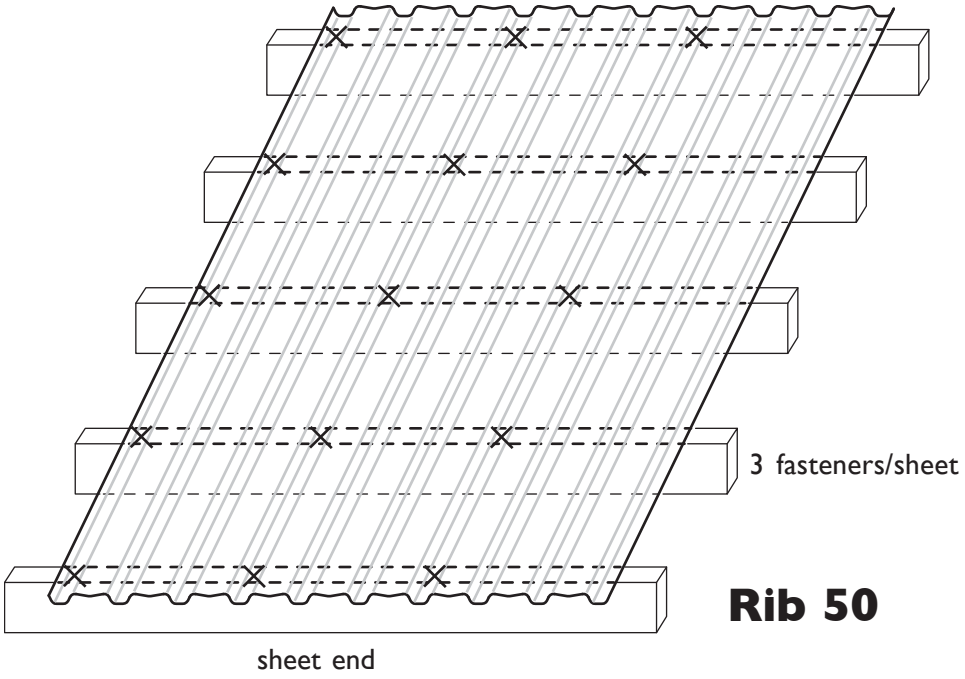
Roll-forming facility at: Hamilton

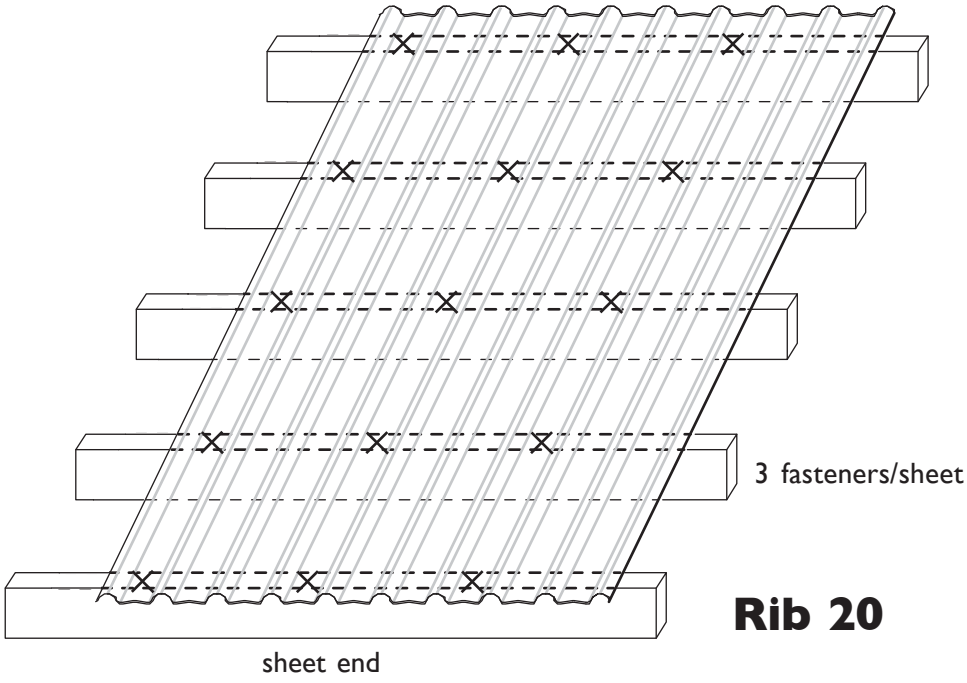
Sheet lengths: Dimondclad Rib 20 and Rib 50 are custom run to order. Where long sheets are used consideration must be given to:

– 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.

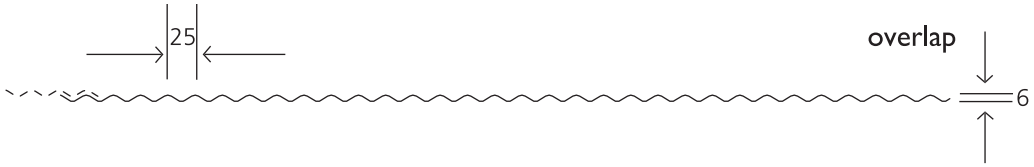
2.1.4.12 (b) Continued

DIMONDCLAD
FASTENER LAYOUT OPTIONS





2.1.4.13 (a) DIMOND BABY CORRUGATE PROFILE PERFORMANCE



	Northern Region	Central Region	Southern Region
Cover (mm)	815	840	*
Sheet width (mm)	840	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 (mm) (1)	75	75

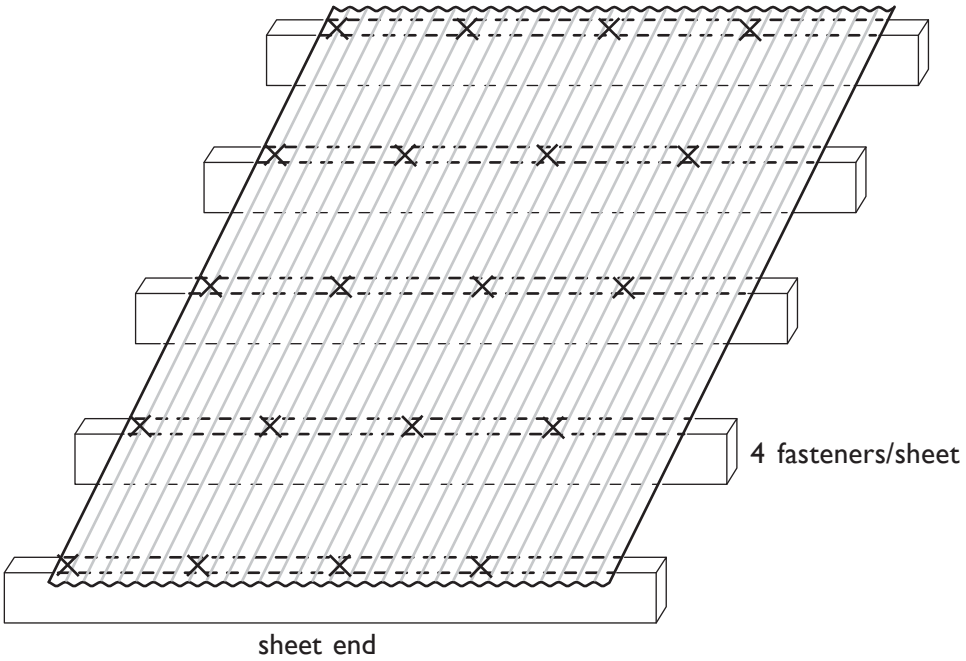
(1) Not intended to support point loads.

Baby Corrugate is available ex Auckland or Palmerston North.

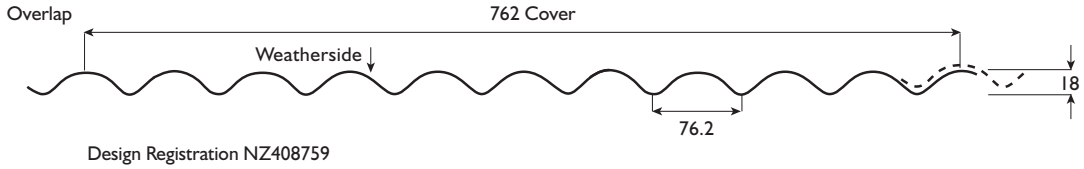
Sheet lengths: Baby Corrugate is available in lengths up to 6m long.

2.1.4.13 (b) Continued

DIMOND BABY CORRUGATE FASTENER LAYOUT OPTIONS



2.1.4.16 (a) DIMOND SAHARA PROFILE PERFORMANCE



Design Registration NZ408759

Cover (mm)	762
Sheet width (mm)	851
Minimum Pitch	Wall cladding only

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	Steel		Aluminium
Thickness (BMT) mm	0.4	0.55	0.7
Nominal weight/lineal metre (kg/m)	3.17	4.27	1.78

Roll-forming facility at: Auckland

Sheet lengths: Dimond Sahara is custom run to order. Where long sheets are used consideration must be given to:

– site access for special lifting equipment
– fixing techniques to accommodate thermal expansion. Refer Section 2.1.3.4.
– physically lifting and laying sheets over 8m long, while achieving an acceptable level of alignment with previously laid sheet

2.1.4.16 (b) DIMOND SAHARA – 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 Dimond Sahara is determined by the serviceability requirement for acceptable appearance.

SAHARA WALL CLADDING LIMIT STATE LOAD / SPAN CAPACITY CHART

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

G550 Steel 0.40mm	End Span	700	900	1100	1300
	Internal Span	1100	1400	1700	2000
	Serviceability	3.5	2.8	2.3	1.8
	Ultimate	3.8	3.1	2.6	2.0
G550 Steel 0.55mm	End Span	1100	1300	1500	1700
	Internal Span	1600	1900	2200	2500
	Serviceability	3.6	2.8	2.1	1.4
	Ultimate	4.0	3.1	2.3	1.7
5052 H36 Aluminium 0.7mm	End Span	600	800	1000	1200
	Internal Span	900	1200	1500	1800
	Serviceability	3.5	2.5	1.7	1.1
	Ultimate	3.9	2.8	1.9	1.2

The Dimond Sahara profile is not intended for use as a roofing product, and must not be used in situations where foot traffic point loads can be applied.

The capacities given do not apply for cyclonic wind conditions.

Fastener Design

Dimond Sahara should be screw fixed through the pan of the profile on each stud-line into either timber or steel framing. The use of an M6 x 50mm Roofzip screw on both a non cavity and cavity system (or when fixing aluminium use a 12g x 35mm Alutite) will ensure failure by fastener pull out will not occur under the load limitations given in Dimond technical literature.

Sahara Wall Cladding Fastener Designation for Pan Fixing

	Steel based sheet	Aluminium based sheet	
Timber framing	Non cavity	M6 x 50mm HG-Z4 Roofzip with double neo	12g x 35mm Alutite with double neos, no washer
	Cavity	M6 x 50 HG-Z4 Roofzip with double neo	14g x 55mm Alutite with double neos, no washer
Steel up to 1.5mm thick	Non cavity	M6 x 50mm HG-Z4 Roofzip with double neo	NR
	Cavity	M6 x 50 HG-Z4 Roofzip with double neo	NR
Steel 1.5mm to 4.5mm thick	Non cavity	Tek 12 – 14 x 20mm long with double neo	NR
	Cavity	Tek 12 – 14 x 35mm long with double neo	NR

1. NR = Not recommended.
2. Based on a maximum sheet length of 5m for aluminium, before an allowance of expansion is required.
3. For aluminium sheet lengths longer than 5m contact Dimond on 0800 Roofspec.
4. Length of screws for a cavity is based on a 20mm deep cavity. Deeper cavities may need a longer screw. Contact Dimond 0800 Roofspec for further advice.

The Span Capability and Sheet Appearance is based on 3 fasteners spaced across the sheet, pan fixed without the use of washers.

Spans greater than 1000mm will require the specification and use of side lap stitching fasteners – see Section 2.3.2C Installation Information: Layout and Fastening, for fastener type.

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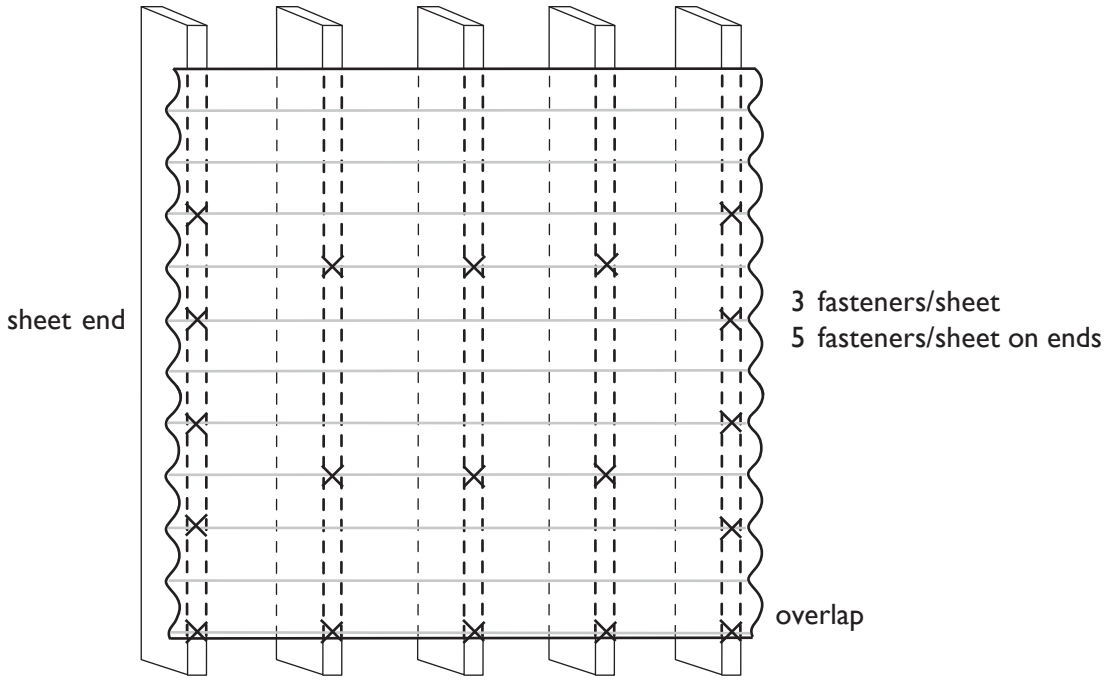
2.1.4.16 (b) Continued

DIMOND SAHARA
FASTENER LAYOUT OPTIONS



2.1.4.16 (c) SHORT FORM SPECIFICATION – DIMOND METAL WALL CLADDING SYSTEM

(For a full specification please refer to the Full Specification Statement, in Section 4 of this manual.)

The cladding profile will be Dimond Sahara. The Cladding Material (1), (2). Thickness (3). The Paint system (4) (only if material is pre-painted). The colour will be Dimond Habitats (5).

All flashing material shall be (6), (2), (4). Thickness (7). (if pre-painted)

(The flashing paint system should be the same as the one chosen for the cladding.)

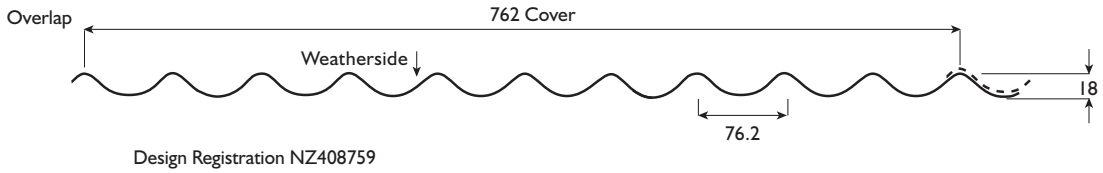
The primary fasteners shall be (8), material (9). Fastener placement shall be at 305mm maximum spacing across the sheet.

The wall underlay shall be (10).

All materials used must be compatible with each other. All work is to be carried out by a Dimond Certified Commercial Installer.

	Choose From:	Reference
1.	Grade G550 (steel), or grade 5052, H36 (aluminium)	2.1.1
2.	zinc / aluminium coated steel sheet (Zincalume) pre-painted steel sheet plain mill finish / embossed aluminium sheet pre-painted aluminium sheet	2.1.1 2.2.1
3.	0.40mm BMT (steel) 0.55mm BMT (steel) 0.70mm (aluminium)	2.1.3 2.1.3 2.1.4
4.	ColorCote® ZR8™ (steel) ColorCote® AR8™ (aluminium) ColorCote® ZRX™ (steel) ColorCote® ARX™ (aluminium) Colorsteel® ENDURA™ (steel) Colorsteel® MAXX™ (steel)	2.1.1 2.2.1
5.	Choose from the Dimond Habitats Colour Collection	1.3
6.	Grade G300 (steel), or grade 5052, H34 (aluminium)	2.1.3.6
7.	0.55mm BMT (steel), or 0.90mm (aluminium)	2.1.3.6
8.	Roofzip M6 x 50mm (direct fixed cladding) Alutite 12g x 35mm or 14g x 55mm with double neos (for aluminium)	2.1.4
9.	Climaseal 4®, or aluminium	2.1.1 2.2.3
10.	Bitumac 710 or 750 or Thermakraft 213 or Framegard G3 Flamestop 950	2.2.2

2.1.4.17 (a) DIMOND PACIFIC PROFILE PERFORMANCE



Design Registration NZ408759

Cover (mm)	762
Sheet width (mm)	851
Minimum Pitch	Wall cladding only

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	Steel		Aluminium
Thickness (BMT) mm	0.4	0.55	0.7
Nominal weight/lineal metre (kg/m)	3.17	4.27	1.78

Roll-forming facility at: Auckland

Sheet lengths: Dimond Pacific is custom run to order. Where long sheets are used consideration must be given to:

– site access for special lifting equipment
– fixing techniques to accommodate thermal expansion. Refer Section 2.1.3.4.
– physically lifting and laying sheets over 8m long, while achieving an acceptable level of alignment with previously laid sheet

2.1.4.17 (b) DIMOND PACIFIC – 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 Dimond Pacific is determined by the serviceability requirement for acceptable appearance.

PACIFIC WALL CLADDING LIMIT STATE LOAD / SPAN CAPACITY CHART

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

G550 Steel 0.40mm	End Span	700	900	1100	1300
	Internal Span	1100	1400	1700	2000
	Serviceability	3.5	2.8	2.1	1.8
	Ultimate	3.9	3.2	2.5	2.0
G550 Steel 0.55mm	End Span	1100	1300	1500	1700
	Internal Span	1600	1900	2200	2500
	Serviceability	3.8	2.9	2.2	1.5
	Ultimate	4.1	3.2	2.4	1.7
5052 H36 Aluminium 0.7mm	End Span	600	800	1000	1200
	Internal Span	900	1200	1500	1800
	Serviceability	3.9	2.9	2.2	1.6
	Ultimate	4.3	3.3	2.5	1.9

The Dimond Pacific profile is not intended for use as a roofing product, and must not be used in situations where foot traffic point loads can be applied.

The capacities given do not apply for cyclonic wind conditions.

Fastener Design

Dimond Pacific should be screw fixed through the pan of the profile on each stud-line into either timber or steel framing. The use of an M6 x 50mm Roofzip screw on both a non cavity and cavity system (or when fixing aluminium use a 12g x 35mm Alutite or 14g x 55mm Alutite) will ensure failure by fastener pull out will not occur under the load limitations given in Dimond technical literature.

Pacific Wall Cladding Fastener Designation for Pan Fixing

	Steel based sheet	Aluminium based sheet	
Timber framing	Non cavity	M6 x 50 HG-Z4 Roofzip	12g x 35mm Alutite with neo, no washer
	Cavity	M6 x 50 HG-Z4 Roofzip with neo, no washer	14g x 55mm Alutite
Steel up to 1.5mm thick	Non cavity	M6 x 50 HG-Z4 Roofzip	NR
	Cavity	M6 x 50 HG-Z4 Roofzip	NR
Steel 1.5mm to 4.5mm thick	Non cavity	Tek 12 – 14 x 20mm long	NR
	Cavity	Tek 12 – 14 x 45mm long	NR

1. NR = Not recommended.
2. Based on a maximum sheet length of 5m for aluminium, before an allowance of expansion is required.
3. For aluminium sheet lengths longer than 5m contact Dimond on 0800 Roofspec.
4. Length of screws for a cavity is based on a 20mm deep cavity. Deeper cavities may need a longer screw. Contact Dimond 0800 Roofspec for further advice.

The Span Capability and Sheet Appearance is based on 3 fasteners spaced across the sheet, pan fixed without the use of washers.

Spans greater than 1000mm will require the specification and use of side lap stitching fasteners – see Section 2.3.2C Installation Information: Layout and Fastening, for fastener type.

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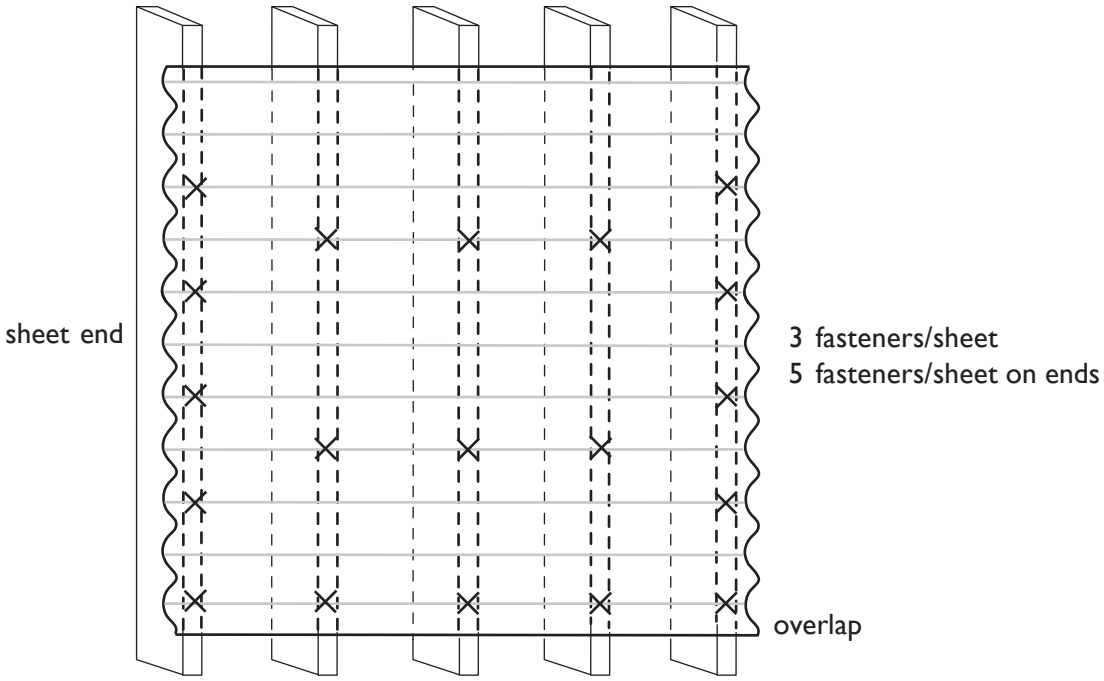
2.1.4.17 (b) Continued

DIMOND PACIFIC
FASTENER LAYOUT OPTIONS



2.1.4.17 (c) SHORT FORM SPECIFICATION – DIMOND METAL WALL CLADDING SYSTEM

(For a full specification please refer to the Full Specification Statement, in Section 4 of this manual.)

The cladding profile will be Dimond Pacific. The Cladding Material (1), (2). Thickness (3). The Paint system (4) (only if material is pre-painted). The colour will be Dimond Habitats (5).

All flashing, ridge and hip material shall be (6), (2), (4). Thickness (7). (if pre-painted)

(The flashing paint system should be the same as the one chosen for the cladding.)

The primary fasteners shall be (8), material (9). Fastener placement shall be at 305mm maximum spacing across the sheet.

The wall underlay shall be (10).

All materials used must be compatible with each other. All work is to be carried out by a Dimond Certified Commercial Installer.

	Choose From:	Reference
1.	Grade G550 (steel), or grade 5052, H36 (aluminium)	2.1.1
2.	zinc / aluminium coated steel sheet (Zincalume) pre-painted steel sheet plain mill finish / embossed aluminium sheet pre-painted aluminium sheet	2.1.1 2.2.1
3.	0.40mm BMT (steel) 0.55mm BMT (steel) 0.70mm (aluminium)	2.1.3 2.1.3 2.1.4
4.	ColorCote® ZR8™ (steel) ColorCote® AR8™ (aluminium) ColorCote® ZRX™ (steel) ColorCote® ARX™ (aluminium) Colorsteel® ENDURA™ (steel) Colorsteel® MAXX™ (steel)	2.1.1 2.2.1
5.	Choose from the Dimond Habitats Colour Collection	1.3
6.	Grade G300 (steel), or grade 5052, H34 (aluminium)	2.1.3.6
7.	0.55mm BMT (steel), or 0.90mm (aluminium)	2.1.3.6
8.	Roofzip M6 x 50mm (direct fixed cladding) Alutite 12g x 35mm or 14g x 55mm with double neos (for aluminium)	2.1.4
9.	Climaseal 4®, or aluminium	2.1.1 2.2.3
10.	Bitumac 710 or 750 or Thermakraft 213 or Framegard G3 Flamestop 950	2.2.2

2.4.1.1 PERFORMANCE

2.4.1.1.1 NATURAL LIGHTING SYSTEM PERFORMANCE STATEMENT

Description

Dimond Natural Lighting Systems comprise:

- Maxilite®, Maxilite Ultra®, Durolite®, Durolite HeatGuard® 4, Durolite HeatGuard® 8, Durolite Webglass™ and Durolite DSR 5™ translucent fibreglass sheeting products.
- Fasteners, washers and seals
- Flashings
- Underlays and safety netting
- Additional mid span support members

Material Properties

	Maxilite® & Durolite® including Durolite HeatGuard® 4 & Durolite HeatGuard® 8	Durolite Webglass™
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	
Flash Ignition Temperature	340-400°C	
Self Ignition Temperature	480-490°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-engineering methods can be used to demonstrate compliance with Clauses C2 and C3 in certain circumstances.

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.

2.4.1.1.2 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 (Maxilite® Range).

Table 2.4A Durability Guide

	Maxilite®	Maxilite® Ultra	Durolite®	Durolite HeatGuard® 4 (HG4)	Durolite HeatGuard® 8 (HG8)	Durolite Webglass™	Durolite Webglass™ Plus
Performance Requirement	Good for low cost residential, light industrial and commercial buildings	Medium term light transmission design and build buildings	Best for long term light transmission in industrial/ commercial buildings.	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 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 20 micron thick UV protected polyester surface film	GRP sheet with 30 micron thick UV protected polyester 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		
Visible Light Transmission of New Clear Sheet	63%	63%	63%	64%	49%	–	–
Total Solar Transmission	63%	63%	63%	50%	36%	–	–
Expected Useful Life As Skylighting	10 years	15 years	25 years	25 years	25 years	20 years	20 years
Sheet Characteristics at End of this Useful Life Loss of Original Light Transmission	Up to 30%	Up to 30%	Up to 25%	Up to 25%	Up to 25%	Up to 25%	–
Surface Coating Condition	Film degraded but still covering glass fibres	Film degraded but still covering glass fibres	Minimal surface degradation, gloss retained	Minimal surface degradation, gloss retained	Minimal surface degradation, gloss retained	Minimal surface degradation, gloss retained	Minimal surface degradation, gloss retained
Glass Fibre Appearance	Noticeable pattern apparent	Noticeable pattern apparent	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent	Minimal pattern apparent
Sheeting Yellowing	Noticeable	Noticeable	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 ϕ 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.	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) & salt solutions.

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2.4.1.1.5 LOAD SPAN DESIGN

Table 2.4K provides the maximum spans 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 (eg. 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	1.1	1.8	1200	1000	900	5	3
	1.4	2.4	1400	1200	1000	5	3
Min pitch 8°	1.7	3.0	1500	1300	1200	5	3
Veedek/Styleline	1.1	1.8	1400	1200	1000	4	4
	1.4	2.4	1700	1500	1200	4	4
Min pitch 3°	1.7	3.0	1900	1700	1400	4	4
V-Rib	1.1	1.8	1400	1200	1000	5	3
	1.4	2.4	1700	1500	1200	5	3
Min pitch 4°	1.7	3.0	1900	1700	1400	5	3
LT7	1.1	1.8	1600	1400	1300	7	4
	1.4	2.4	1900	1700	1500	7	4
Min pitch 3°	1.7	3.0	2100	1800	1700	7	4
BB900	1.1	1.8	1700	1400	1300	6	3
	1.4	2.4	2000	1700	1500	6	3
Min pitch 3°	1.7	3.0	2300	1900	1700	6	3
DP955	1.1	1.8	1400	1000	750	3	3
	1.4	2.4	1900	1300	900	3	3
Min pitch 3°	1.7	3.0	2500	1600	1200	3	3
SS900/Topspan	1.1	1.8	1800	1600	1400	4	4
	1.4	2.4	2000	1800	1500	4	4
Min pitch 3°	1.7	3.0	2300	2000	1700	4	4
Super Six	1.1	1.8	1800	1400	1200	4	4
	1.4	2.4	2000	1600	1400	4	4
Min pitch 3°	1.7	3.0	2300	1800	1600	4	4
Dimondek 400	0.75	1.9	1400	1200	1000	1 Clip	1 Clip
Min pitch 3°	0.9	2.3	1600	1400	1200	1 Clip	1 Clip
Dimondek 630	1.4	2.4	900	900	900	3	3
Min pitch 3° Note 6	1.7	3.0	900	900	900	3	3

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.
6. Span for Dimondek 630 is limited by the side lap fastener to either mid span support or purlin, at centres shown above up to a maximum number of 2 mid span supports.

Continued on next page...

2.4.1.1.5 Continued

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 ½ 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.

2.4.1.1.6 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. Refer 2.4.1.1.10 Detailed Drawings Fig. 2. 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.

2.4.1.1.7 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.

1. Acceptable as a lining wherever the minimum requirement for spaces in buildings applies (eg. storage activity in warehouses) as defined in C3/AS1 Table 4.
2. Acceptable in any building as a roof covering for small constructions external to the building with at least one side fully open (eg. carports, verandahs, awnings).
3. Acceptable in CS and CL purpose building with less than 250 occupants, at least two exits and a floor level difference at the exits of no more than 600mm (eg. theatres, restaurants, museums, schools, swimming pool enclosures).

Dimond Natural Lighting products do not drip molten or burning material that can create a hazard to occupants and to the Fire Service.

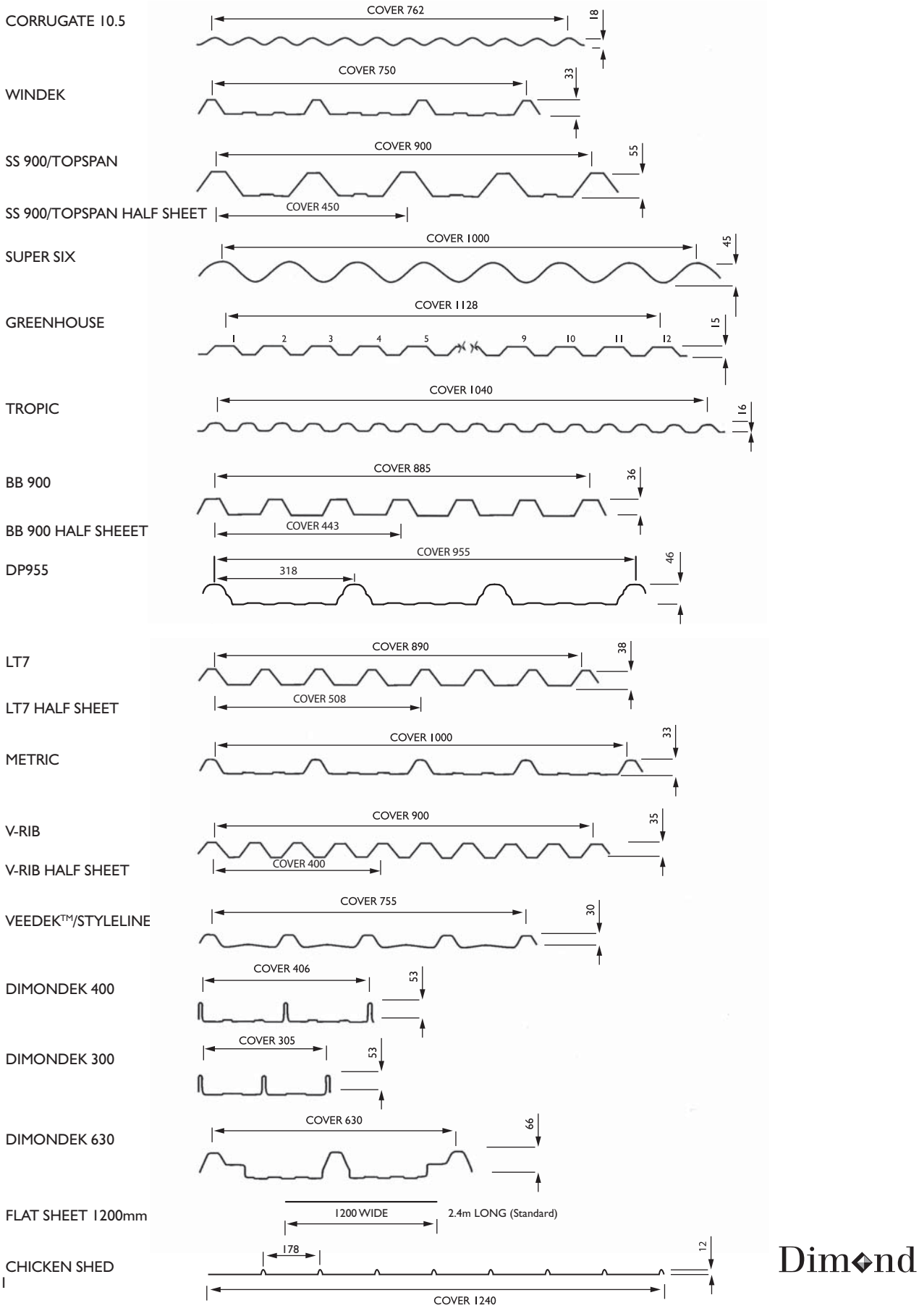
Dimond Natural Lighting products provide some means of venting smoke and heat from a building but because the sheets do not soften and collapse they will not provide an unobstructed open vent space.

Fire Retardant Sheet and Fire Engineering
The use of Dimond Natural Lighting sheets in any building is feasible within the requirements of the New Zealand Building Code if an alternative solution is proposed using a fire engineering approach. To assist in this regard, a Natural Lighting product manufactured from fire retardant resin can be made available for projects using over 750m of Durolite. Contact Dimond, phone 0800 Roofspec (0800 766 377).

2.4.1.2 COMPONENTS

2.4.1.2 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.



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2.4.1.2.2 BARRIER 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™, Dimondclad into timber or steel purlins and 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.

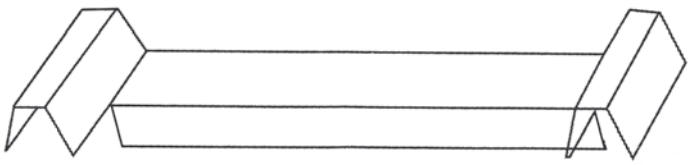
2.4.1.2.5 FLASHINGS

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 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

Safety mesh – 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.

2.4.1.3 INSTALLATION INFORMATION

2.4.1.3.1 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.

Maxilite® sheets have a thin plastic film laminated to each surface. As these films are critical to the products' long term performance, it is highly important that damage to sheet surfaces is avoided during handling, installation and subsequent use. 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.

2.4.1.3.2 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 sheet, 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. Profiled washers with 36 dia EPDM seals into 8mm dia 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...

2.4.1.3 Continued

(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

Where one sheet of Natural Lighting is fixed between metal Dimondek 630, the sheets are laid over using the following method. The centre support rib of the fixing clip is required to be removed. If the spans of the Natural Lighting are greater than 900mm, span breakers are required, up to a maximum of 900mm centre modules. Span breakers can only be installed one way around with the larger rib on the span breaker clipping and snapping up into the underside of the overlap rib of the metal Dimondek 630 when installed from above. The span breakers are then positioned in their correct positions and the sheets are placed over, before a 10mm clearance hole is drilled though the Natural Lighting. The position of the hole is in the horizontal area adjacent to the side lap at both the purlin and mid span supports, using the side lap clips as a template. On top of each metal rib, either side of the Natural Lighting a continuous side lap 6mm thick x 15mm wide EPDM foam seal is adhered to run the full length of the Natural Lighting sheet. Then the sheet is held in position by fixing a 12g x 65mm tek screw through the side lap clip and Natural Lighting sheet into the span breaker. This allows the Natural Lighting sheet to expand and contract without being connected to the metal roofing sheet.
A centre fixing using a 14g x 95mm long tek through a 10mm clearance hole and a Dimondek 630 profiled washer with 36 diameter EPDM seal is required on the purlin line only.
On the ends of Natural Lighting sheet 70x50x25mm thick foam blocks are pushed up between the metal and the Natural Lighting sheet to fill in the gap created. Refer Fig. 10 in Section 2.4.1.1.10.
With end lapped sheet that will form runs over 25m, we recommend overlapping 200mm, applying 4 beads of neutral curing silicone sealant approx. 10mm ø in size. Allow these to tack off for 20 mins 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 treatment of sheet ends.

2.4.1.3.3 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.

2.4.1.3.4 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.

2.4.2.1.3 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

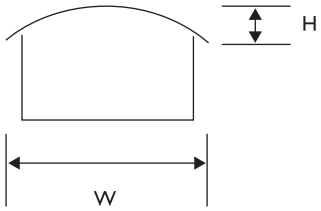
Recommended Profile	Recommended Radius							
	Minimum (m)							Maximum (m)
	G550 Steel		H36 5052 Aluminium		Natural Lighting		Duraclad	
	0.40mm	0.55mm	0.70mm	0.90mm	1.1mm	1.4mm	1.7mm	
Corrugate	12	10	12	10	4	5	8	Note 1
V Rib	20	16	20	16	12	14	20	Note 2
Styleline	80	40	80	40	8	9	12	Note 2
LT7	80	50	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/R	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

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.

Radius Calculation

N/R = Not recommended, N/A = Not available.

$$\text{Curve Radius} = \frac{W^2 + 4H^2}{8H}$$



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2.4.2.3 INSTALLATION DETAILS

Installation recommendations for straight sheets apply together with the following additional requirements for all curved roofing systems.

2.4.2.3.1 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.

2.4.2.3.2 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.

3.1.2 DURABILITY, WARRANTY, MAINTENANCE

3.1.2.1 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.

3.1.2.2 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 (0800 346663).

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.

3.1.2.3 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.

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.

3.1.4 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 3.1.4.6.

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.

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3.1.4 Continued

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, eg., 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 20m.

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
Whangarei	100	130
Auckland	100	130
Hamilton	100	130
Tauranga	120	170
Rotorua	100	130
New Plymouth	100	125
Napier/Hastings	85	120
Palmerston North	85	120
Wellington	70	90
Nelson	90	120
Christchurch	70	110
Dunedin	55	75

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 1994.

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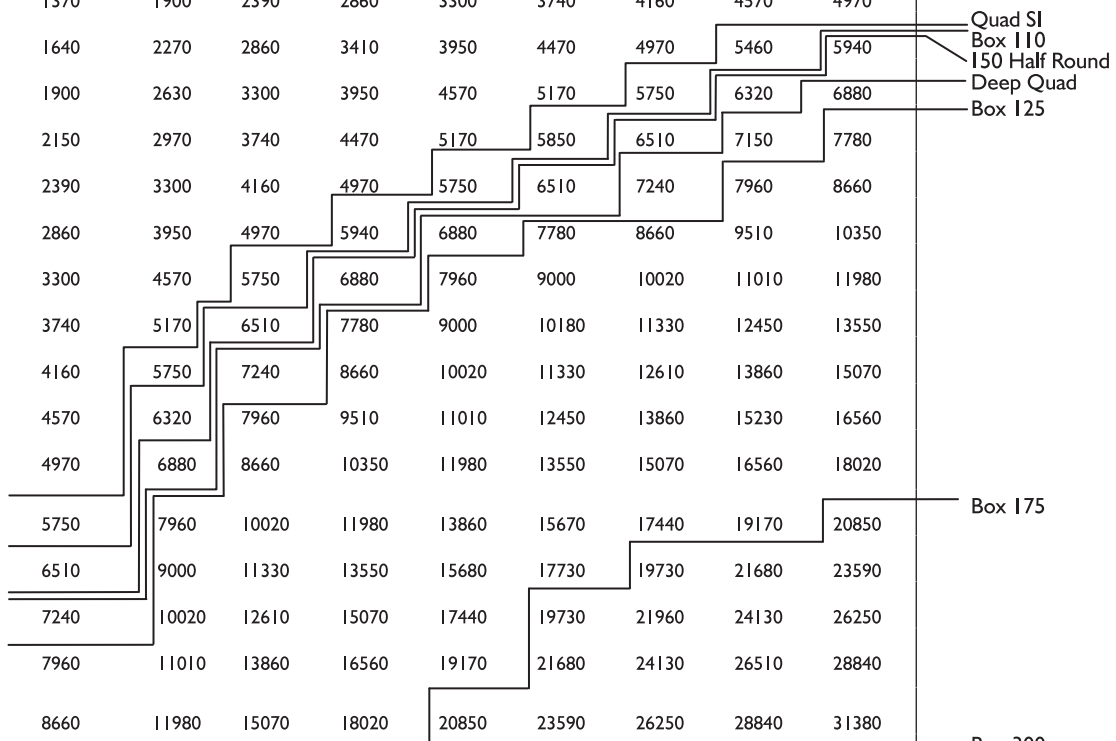
3.1.4 Continued

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 section 3.1.4.1 to 3.1.4.10 for detailed design information.

Table 3.1C Effective Cross Section of Gutter A_e (mm^2)

Catchment Area Per Downpipe A_c (m^2)	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			



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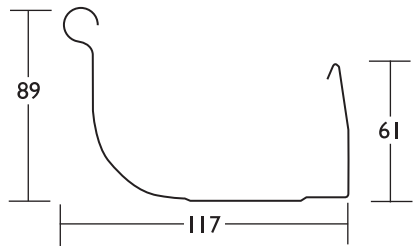
3.1.4.9 QUAD SI



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	
Minimum downpipe	Circular	63mm
	Rectangular	min. cross sectional area of 3250mm^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.

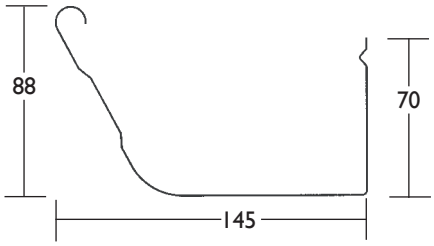
Table 3.1L

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	Zincalume®	1.15mm
	External	Zincalume®	1.15mm
		Brass	1.2mm

Recommended maximum spacings	900mm spacing (600mm maximum is recommended where snow fall is possible – in heavy snow fall areas brackets should be at 450mm maximum and snow straps should be used).
Recommended fixings	Screw or nail fastenings to suit substrate and bracket material.
Stop ends	Zinc cast stop ends are available powder coated to match fascia colour.

3.1.4.7 DEEP QUAD



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	6700mm^2	
Flow capacity	97 litres/min	
Minimum recommended fall	1:500	
Minimum downpipe	Circular	63mm
	Rectangular	min. cross sectional area of 3250mm^2, smallest dimension at least 50mm.

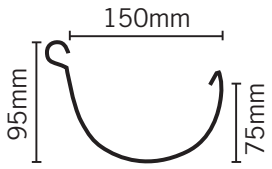
Catchment area per downpipe based on the above flow capacity is given in Table 3.1J. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

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)	145	116	97	83	73	65	58	48	41	36	32	29

Material options including thickness and grade	Steel	0.55mm G300	
	Aluminium	Not available	
	Copper	0.55mm 1/2 hard	
Roll-forming facility	Rotorua		
Gutter bracket material and thickness	Internal	Galvanised	1.15mm
		Brass	1.2mm
Recommended maximum spacings	900mm spacing (600mm maximum is recommended where snow fall is possible).		
Recommended fixings	Screw or nail fastenings to suit substrate and bracket material.		
Stop ends	Zinc cast stops are available powder coated to match fascia colour.		

3.1.4.10 150 HALF ROUND



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	6,900mm^2
Flow capacity	100 litres/min
Minimum recommended fall	1:500
Minimum downpipe	Circular 80mm

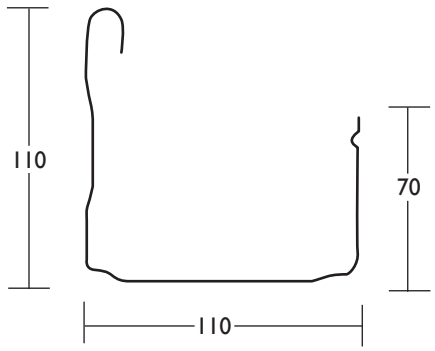
Catchment area per downpipe based on the above flow capacity is given in Table 3.1H. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1M

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)	545	435	360	310	270	240	220	180	155	135	120	110

Material options including thickness and grade	Steel	0.50mm G300
	Copper	0.55mm ½ hard
Roll-forming facility	Christchurch (Note: only available in the South Island)	
Gutter bracket material and thickness	External Aluminium	4mm x 30mm
Recommended maximum spacings	900mm (600mm maximum is recommended where snow fall is possible).	
Recommended fixings	Screw or nail fastenings to suit substrate and brackets material avoiding dissimilar metal contact.	

3.1.4.8 BOX 110



All dimensions given are nominal.

Effective cross sectional area (with 10mm free board)	6050mm^2	
Flow capacity	85 litres/min	
Minimum recommended fall	1:500	
Minimum downpipe	Circular	70mm
	Rectangular	min. cross sectional area of 4125mm^2, smallest dimension at least 50mm.

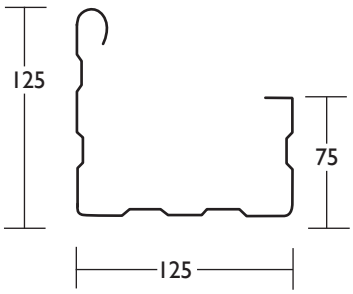
Catchment area per downpipe based on the above flow capacity is given in Table 3.1K. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1K

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)	127	102	85	73	64	57	51	42	36	32	28	25

Material options including thickness and grade	Steel	0.55mm	
	Aluminium	Not available	
	Copper	0.55mm	
Roll-forming facility	Rotorua		
Gutter bracket material and thickness	Internal	Zincalume®	1.15mm
	External	Zincalume®	1.15mm
		Brass	1.2mm
Recommended maximum spacings	900mm spacing (600mm maximum is recommended where snow fall is possible).		
Recommended fixings	Screw or nail fastenings to suit substrate and bracket material.		
Stop ends	Zinc cast stop ends are available powder coated to match fascia colour.		

3.1.4.4 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	
Minimum downpipe	Circular	70mm
	Rectangular	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

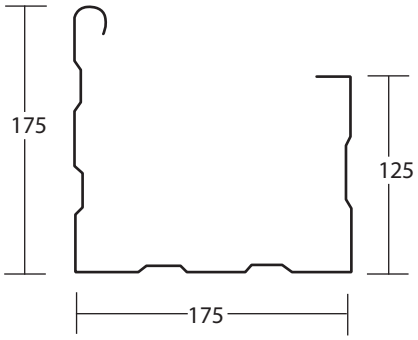
Rainfall Intensity, I (mm/hr)	40	50	60	70	80	90	100	120	140	160	180	200
Catchment Area per downpipe A_c (m^2)	168	134	111	96	84	75	67	56	48	42	37	33

Material options including thickness and grade	Steel	0.55mm G300
	Aluminium	0.90mm H34
	Copper	0.55mm 1/2 hard
	Stainless steel	refer Dimond
Roll-forming facility	Hamilton, Palmerston North (Note: all Dimond branches can fold gutter shapes)	

Gutter bracket material and thickness	Internal	Zincalume®	1.15mm
	External	Hot dipped galvanised	3mm x 32mm
		Aluminium	5mm x 30mm
		Brass	3mm x 30mm
		Stainless steel	3mm x 30mm

Recommended maximum spacings	900mm spacing (600mm maximum is recommended where snow fall is possible).
Recommended fixings	Screw or nail fastenings to suit substrate.

3.1.4.5 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	
Minimum downpipe	Circular	115mm
	Rectangular	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

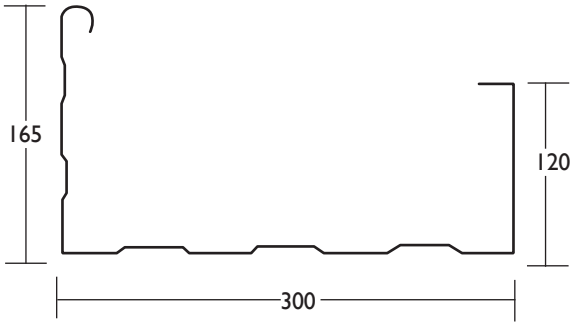
Material options including thickness and grade	Steel	0.55mm G300
	Aluminium	0.90mm H34 offered in folded shape only
	Stainless steel	refer Dimond
Roll-forming facility	Hamilton (Note: all Dimond branches can fold gutter shapes)	

Gutter bracket material and thickness	Internal (1)	Galvsteel	1.55mm
	External	Hot dipped galvanised	5mm x 30mm
		Aluminium	7mm x 30mm
		Stainless steel	5mm x 30mm

Recommended maximum spacings	900mm (600mm maximum is recommended where snow fall is possible).
Recommended fixings	Screw or nail fastenings to suit substrate or bolts.

(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).

3.1.4.6 BOX 300



All dimensions given are nominal.

Effective cross sectional area (with 15mm free board)	33,550mm^2	
Flow capacity	727 litres/min	
Minimum recommended fall	1:500	
Minimum downpipe	Circular	150mm
	Rectangular	min. cross sectional area of 18,500mm^2

Catchment area per downpipe based on the above flow capacity is given in Table 3.1 1. Use Table 3.1B (Section 3.1.4) to determine the Rainfall Intensity to be used.

Table 3.1 1

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)	1090	870	725	620	545	485	435	360	310	270	240	215

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 (closer bracket spacings are recommended where snow fall is possible). Aluminium bracket spacing at 500mm.		
Recommended fixings	Screw or nail fastenings to suit substrate or bolts.		

3.2.3 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 ZR8 or ZRX 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.

115° 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, rivetting 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 soldered.

Other materials subject to confirmation. Call 0800 Dimond.

3.2.4 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.

3.2.5 STOP ENDS

Zinc cast stop ends, powder coated to match, are available for use on Box 110, 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 rivetting onto the gutter with 2 x 3mm diameter aluminium rivets.

3.2.6 DROPPERS

Droppers are available as a standard in 65mm, 75mm and 100mm diameter in either 0.55mm ColorCote ZR8 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 AR8/ARX depending on coil availability.

3.3.1 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 one day of delivery to site and exposure to sunlight and must be removed immediately upon gutter installation.

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 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.

3.3.2 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.

Brackets shall be fixed to the outside face of the fascia panel 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.

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. 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 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 buildup 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.

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3.3.3 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 may affect any material warranty.

General Appearance
Laps shall be formed to suit the water flow 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 buildup.

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 (eg: 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 soldered. Care must be taken to get rid of any spirits of salts by washing the joint thoroughly.