LYSAGHT®

150 years of Global excellence!

CEE-plus™ & ZED-plus™
Purlin & Girt

Purlin & Girt

BLUESCOPE LYSAGHT

INTRODUCTION

We create our world according to our imagination. Our only limit is the tools and materials at hand. The construction industry, as it stands today, is woven with the fabric of beauty and strengthened with the stamp of quality.

The construction industry has witnessed an iridescent boom in the past decade. Though the leaders of this field have mastered the art of delivering quality; achieving the delicate balance between superior construction methods and environment friendly solutions still remains the toughest challenge. The need is acute for a construction solution which is durable, which does not compromise on life, efficacy, quality, economy, yet which cares for the environment. To sum it up precisely, the need today is for pre-engineered, pre-cut, superior quality, ready-to-assemble line of construction solutions or products.

LYSAGHT CEE-plus™ and ZED-plus™ are products specially designed and developed for purlin and girt application, which not only provides economy to the building construction, but also help in keeping the site clean and environment friendly.

LYSAGHT CEE-plus™ and ZED-plus™ sections are accurately roll-formed from high strength zinc-coated steel, pre-punched to the required dimensions to provide an efficient, lightweight, economical purlin and girts.

These products are suitable for roof and wall support and portal framing up to a certain span. The system, which includes bridging and a comprehensive range of accessories, is supplied as ready for erection.

ZED-plus™

CEE-plus™

CEE-plus™ and ZED-plus™

BENEFITS

• **Greater Spanning Capability**

Cold formed galvanised purlin have a minimum yield strength approximately 60% greater than that of hot rolled steel typically used for purlins. This high strength – to – weight ratio in most application allows extra spanning capability for most cost effective structures.

• **Easier to Handle**

The higher strength to lower weight ratio provides further benefits through easier handling of the lighter sections, both in transportation to site and during erection.

• **Lower maintenance costs**

Surface damage that can be caused during transportation and erection can have adverse effects on the appearance of purlins. The continuously hot-dipped galvanised finish is an effective barrier and is superior to paint in toughness and adhesion.

Superior corrosion resistance of the zinc coating means that potentially high maintenance costs are avoided.

• **Cladding Fixes Easier, Quicker**

Because of the relatively thin sections of the high strength galvanised cold rolled sections (as compared with alternatives that have equivalent load bearing capacity), fixing times can be reduced using self drilling, self tapping screws.

Tata BlueScope Building Products comprehends this need and translates it into high quality products under the brand name LYSAGHT® solutions.

CORROSION PROTECTION

PERFORMANCE

In accordance with the provisions of AS/ANZ 4600:1996 cold-formed steel structures, load capacities have been calculated for LYSAGHT® sections using approved LYSAGHT® bridging systems, bolting and other accessories. Sections chosen using the data provided in the tables (Ref. Technical Manual) will perform as specified when the design, fabrication and erection are carried out in accordance with Tata BlueScope Building Products recommendations and accepted building practice.

APPLICATION AREA

LYSAGHT ZED-plus™ sections may be used over single spans, un-lapped continuous and lapped continuous spans in multi-bay buildings. Lapped continuous spans result in a considerable capacity increase in the system. LYSAGHT CEE-plus™ sections may be used in single spans and un-lapped continuous spans in multi-bay buildings. CEE-plus™ sections are ideal as eave Purlin or where compact sections are required for detailing. CEE-plus™ sections cannot be lapped.

CORROSION PROTECTION

A zinc coating of Z275 (275 g/m^2 minimum coating mass) is the standard coating class provided with LYSAGHT CEE-plus™ and ZED-plus™ sections. This will provide a long and trouble-free life for enclosed buildings and open-sided rural buildings, in a non-aggressive environment. A non-aggressive environment is 1000 m from rough surf, 750 m from industrial emission and fossil fuel combustion and 300 m from calm salt waters. Consideration must be given to the nature of activities performed within the building. For corrosive environment, please seek advice from Tata BlueScope Building Products office.

COMPATIBILITY WITH OTHER STEEL PRODUCTS

The zinc coating on purlin is fully compatible with the zinc and aluminum / zinc coatings used on roof and wall sheeting. If minor damage occurs to the purlin coating, the base steel is protected by its own surrounding coating. Furthermore, the protective coating on the sheeting is not corroded by an un-protected base steel nearby.

Hanger

Indoor Stadium

Commercial Buildings

DESIGN

The design of cold formed sections is subject to the requirement of AS/NZS 4600:1996 cold formed steel structures code. The code contains the rule by which the physical design of the section should be carried out and its load capacities calculated. It is intended as a supplement to and should be used in conjunction with, AS4100 (the SAA steel structure code) to carry out the structural design.

Any part of a steel structure must be designed for load laid down in a number of codes specified in AS4100. Purlin loads are generally established from AS1170, the SAA loading code. In practice, the loads are dead load, roof live load and wind load and in some area, snow load. The net load effect may act inward or outward and the Purlin may need to be analysed for both cases.

Design Loads

Our design manual provides the Limit State Capacity Tables for Inward and Outward Loading. (*Please request a copy of Technical manual of Purlin and Girts from nearest Tata BlueScope Building Products office)* Following methodology is to be used to determine the Design Loads:

Dead Load = DL in kN/m
Live Load = LL in kN/m
Determination of Wind Load

Design Wind Speed **Vz = Vb K1 K2 K3**
Vz = Design Wind Speed in m/sec
Vb = Basic Wind Speed in m/sec for 50 year return period - IS 875
K1 = Probability factor (risk coefficient) - Table 1 of IS 875
K2 = Terrain , Height factor -Table 2 of IS 875
K3 = Topography factor - Clause 5.3.3 of IS 875

Design Wind Pressure Pz = 0.6 Vz2 /1000 kN/sqm
Wind Load WL = [(Cpe -Cpi) Pz] x Purlin spacing in m
Cpe = External pressure Coefficient as per IS 875/MBMA (user defined)
Cpi = Internal Pressure Coefficient as per IS 875/MBMA (user defined)

Local pressure coefficients have to be considered for purlins at ridges, eaves, roof corners as per IS 875.

Design Limit State Inward and Limit State Outward Loads (kN/m) are based on the following Limit State Load combination factors from new IS 800 (draft):

Combination	Limit State of Strength					Limit State of Serviceability			
	DL	LL		WL/EL	AL	DL	LL		WL/EL
		Leading	Accompanying				Leading	Accompanying	
DL+LL+CL	1.5	1.5	1.05	-	-	1.0	1.0	1.0	-
DL+LL+CL+	1.2	1.2	1.05	0.6	-	0.8	0.8	0.8	0.8
WL/EL	1.2	1.2	0.53	1.2	-				
DL+WL/EL	1.5 (0.9)	-	-	1.5	-	1.0	-	-	-
DL+ER	1.2	1.2	-	-	-	-	-	-	-
DL+LL+AL	1.0	0.35	0.35	-	1.0	-	-	-	-

Where
DL - Dead Load
LL - Live Load
EL - Earthquake Load
CL -Crane Load
AL- Accidental Load
ER- Erection Load
* This value is to be considered when the Dead Load contributes to stability against overturning, is critical or the dead load causes reduction in stress due to other loads.
Example:
1.5DL+ 1.5LL,
1.5DL+1.5WL
The same methodology needs to be used to determine the loads to be fed into the Purlin Software program.
The values in the Capacity Tables assume uniformly distributed loading. However, in many applications (like mounting of services and maintenance equipment), Point Load has to be applied. We recommend using the Purlin Software for Point Load applications.
Using ASCE or AS1170 codes can lead to lower values of Limit State Design Loads, thereby providing economy.

Load Table: For design ease, we provide detailed load table that are either calculated in accordance with AS/ NZS 4600, or established by test.

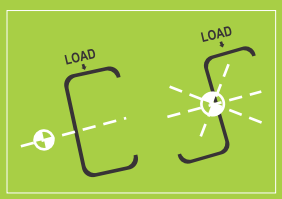
DESIGN FLEXIBILITY

Bridging

Light gauge cold formed purlins are capable of carrying loads over quite large span in relation to their depth (commonly 40 D and more). But because of this, they have a tendency to twist or buckle laterally. In the case of CEE-plus™ sections, this is due to the shear center lying outside the section; with ZED-plus™ sections, it's because the loading axes do not coincide with the principle axes.

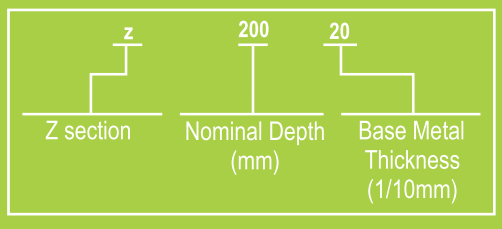
This problem can be overcome by using lateral bracing. Running transverse to the purlins, bridging braces stabilizes the Purlin webs usually at mid span or approximately third points.

A boltless bridging system provides bridging that is designed to hook into and lock the purlins in position quickly and easily, without the need for nuts, bolts or tie rods. The boltless bridging systems can reduce installation and construction cost, as well as increase the safety for riggers installing the purlins.



SIZE AND DIMENSIONS

The standard sizes for purlins are produced in nominal depth of 100,150, 200, 250 and 300 mm. The sections are generally designed by code number signifying the nominal depth and material thickness and letter prefix to indicate the profile. Purlins are generally produced in thickness of 1.0, 1.2, 1.5, 1.9, 2.0 and 2.4mm

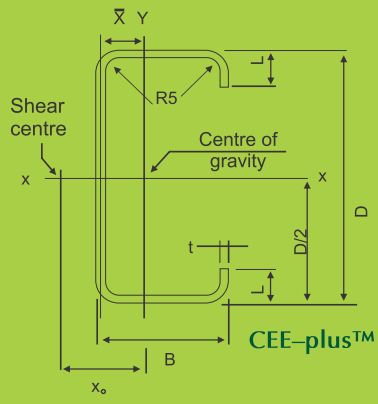


SHAPES AND SECTIONS

Two basic cold formed shapes - CEE-plus™ and ZED-plus™ are used for purlins and girts. While each has individual characteristics, both perform effectively and in many instances the choice of one section over the other can come down to the personal preference of the designer.

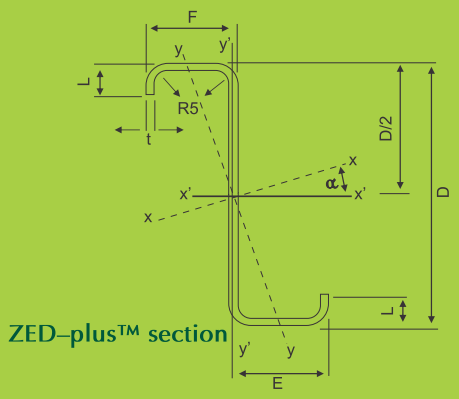
DIMENSIONS OF PURLINS AND GIRTS

Purlin Catalouge No.	Thickness	D	Mass per unit length	ZED-plus™			CEE–plus™	
				E	F	L	B	L
	(mm)	mm	(kg/m)	(mm)	(mm)	(mm)	(mm)	(mm)
C/Z10010	1	102	1.75	53	49	12.5	51	12.5
C/Z10012	1.2	102	2.09	53	49	12.5	51	13.5
C/Z10015	1.5	102	2.59	53	49	13.5	51	14
C/Z10019	1.9	102	3.27	53	49	14.5	51	15.5
C/Z10020	2.0	102	3.27	53	49	14.5	51	15.5
C/Z10024	2.4	102	4.11	53	49	17	51	17
C/Z15010	1	152	2.36	65	61	13.5	64	12.5
C/Z15012	1.2	152	2.86	65	61	15.5	64	15.5
C/Z15015	1.5	152	3.56	65	61	16.5	64	16
C/Z15019	1.9	152	4.49	65	61	17.5	64	17.5
C/Z15020	2.0	152	4.49	65	61	17.5	64	17.5
C/Z15024	2.4	152	5.64	65	61	19.5	64	19
C/Z20012	1.2	203	3.59	79	74	15	76	15.5
C/Z20015	1.5	203	4.46	79	74	16	76	16
C/Z20019	1.9	203	5.70	79	74	20	76	19.5
C/Z20020	2.0	203	5.70	79	74	20	76	19.5
C/Z20024	2.4	203	7.17	79	73	21.5	76	21.5
C/Z25015	1.5	254	5.13	79	74	18	76	15.5
C/Z25019	1.9	254	6.46	79	74	19	76	16
C/Z25024	2.4	254	8.13	79	73	21	76	19.5
C/Z30019	1.9	300	7.98	100	93	27	96	26.5
C/Z30024	2.4	300	10.04	100	93	28	96	27.5
C/Z30030	3	300	12.52	100	93	29.5	96	29.5

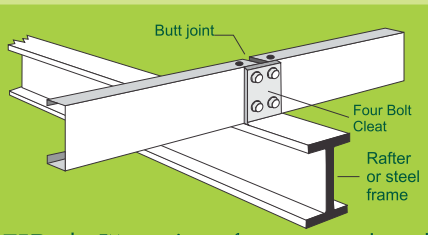


CEE–plus™ section

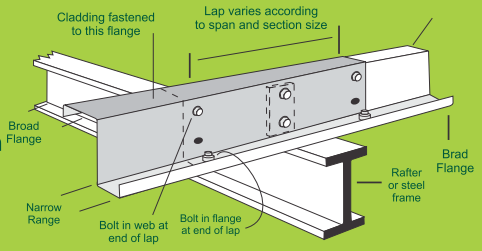
x and y axes coincide with x′ and y′ axes respectively



ZED–plus™ section



Typical connection

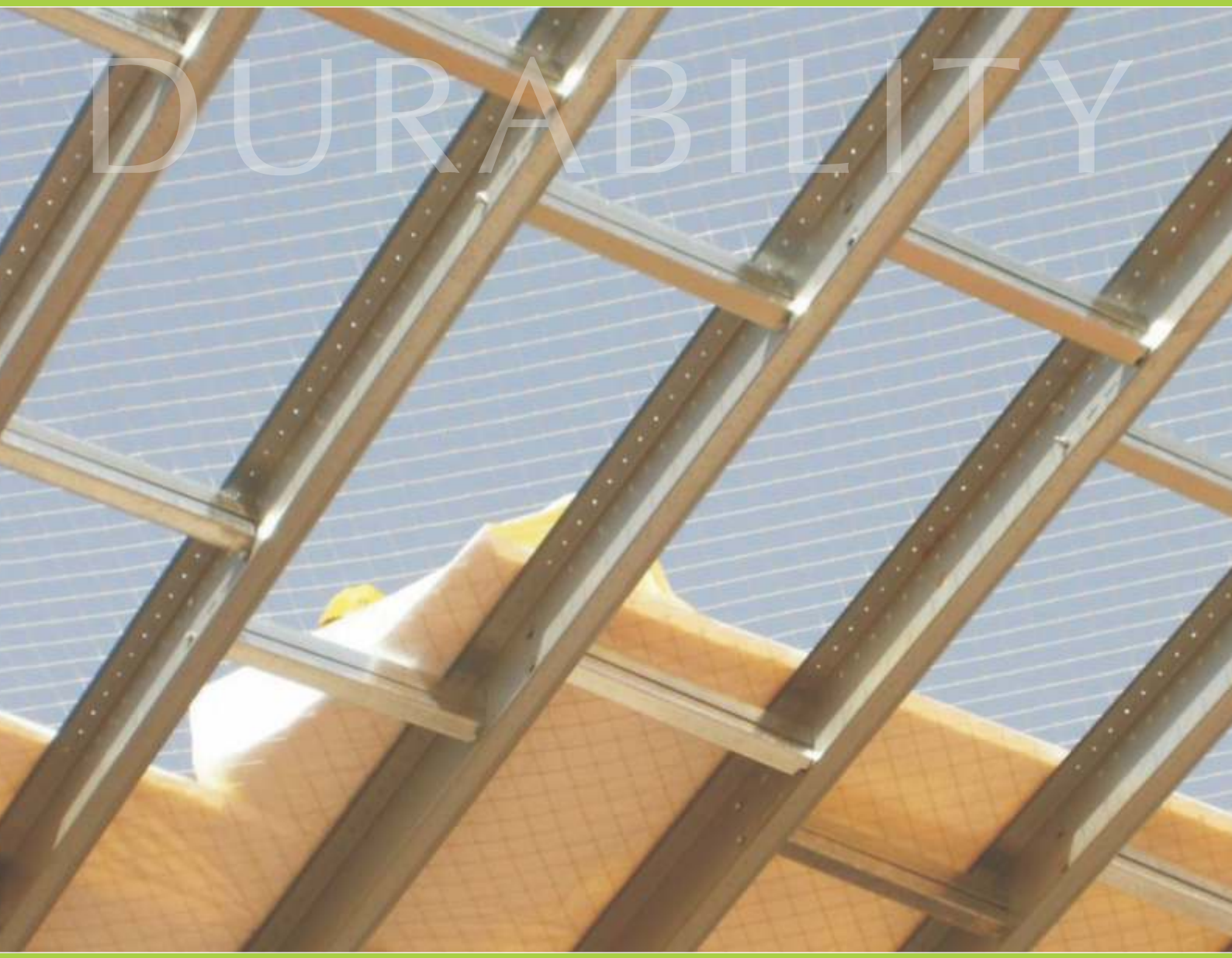


LYSAGHT ZED-plus™ sections feature one broad and one narrow flange, sized so that two sections of the same size fit together snugly, making them suitable for lapping. Continuous lengths of purlin result in better economy, but lapping provides two thicknesses of metal over interior supports. Lapping increases the strength of the sections where bending moments and shear are at a maximum, thus improving the load capacity and rigidity of the system.

LYSAGHT ZED-plus™ sections of the same depth and different thicknesses can be lapped in any combination and may also be used over simple spans.

For shorter spans they may be used continuously over two or more spans without laps—thus producing reduced deflection compared with simple spans—but it does not give the strength of a fully lapped system. LYSAGHT ZED-plus™ sections with one lip turned outward (called downturned lip purlins) may be used in simple or continuous spans with the ends butted.

LYSAGHT CEE-plus™ sections have equal flanges and are used for simple span construction with the purlins butted at internal supports. In case where a defection is a design limitation and the building is of a suitable size, single CEE-plus™ sections can be used over two or more bays. CEE-plus™ sections cannot be lapped.



NON-STANDARD SECTIONS

We can supply a wide range of non-standard sizes (up to 400 mm) and shapes, including CEE-plus™ and ZED-plus™ with down turned lip. For non-standard sections availability and lead time, please contact your nearest Tata BlueScope Building Products office.

MATERIAL SPECIFICATIONS

LYSAGHT CEE-plus™ and ZED-plus™ sections are roll-formed from galvanised steel complying with AS1397-2001. In the grades shown, the number prefixed with G indicates minimum yield stress in MPa; and the number prefixed with Z indicates minimum coating mass in g/m^2.

- 1.0 mm BMT: G550, Z275
- 1.2 mm BMT: G500, Z275
- 1.5, 1.9 and 2.4 mm BMT: G450, Z275

Note: LYSAGHT CEE™ and ZED™ section are also available in Zinc coating mass of 120 g/m^2 on requst. Please contact nearest Tata BlueScope Building Products office for further information.

BOLT SPECIFICATION

LYSAGHT® purlin bolts and nuts have integral washers. Tighten all bolts to 55 Nm torque.

Nominal section size (mm)

100, 150, 200, 250	M12 LYSAGHT® purlin bolt standard(grade 4.6) or high strength (grade 8.8)
300, 350*, 400*	M16 LYSAGHT® purlin bolt standard(grade 4.6) or high strength (grade 8.8)

*Non Standard Items

AVAILABLE LENGTHS

LYSAGHT® purlins are available custom-cut in any transportable length. Length tolerance for all sections is 5 mm.

PACKAGING

LYSAGHT CEE-plus™ and ZED-plus™ sections are delivered in strapped bundles. The actual quantity in each bundle will vary with section size, order and length. The bundle mass is generally approximately one tonne. Tata BlueScope Building Products accessories are delivered in strapped or wired bundles, bags or packages as appropriate.

HANDLING AND STORAGE

Like other building material, Purlin requires appropriate care during storage on site. Ideally, deliveries should be arranged so that the period between delivery and installation is minimised.

If not required for immediate use, bundles of purlins should be neatly stacked off the ground and on a slight slope so that water can drain away. If in the open, it should be protected with waterproof covers to prevent the entry of water and /or condensation. Such moisture can not evaporate readily and can cause unsightly coating damage which can reduce the life of the product.

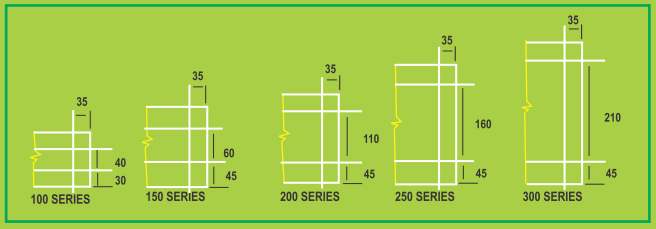
If bundle becomes wet, the purlins should be separated, wiped dry and covered. Other accessories should be treated similarly. Bolts and nuts in particular should be kept clean, dry and free of dirt or dust to prevent difficulties when tightening.

Bundles of purlins must be lifted carefully to avoid damage. Long length should be lifted using a separator bar and fabric slings. Care should be taken to prevent local damage at the lifting points.

INSTALLATION

Purlins are bolted to the primary frames by cleats welded to the frame to the rafters or columns by the steel fabricator. The cleats and the associated hole geometry have been standardised in the AISC standard structural connections.

Bolts are usually M12 grade 4.6 requiring snug tightening to make an effective connection.



Clearance Holes

To allow for minor variations in frame alignment, purlins made from steel generally have quite large clearance holes; typically 18mm diameter holed for 12 mm diameter bolts. Some manufacturers produce 18mmx22mm slots for greater adjustment. These generous clearances make for easier assembly, but won't affect structural performance.

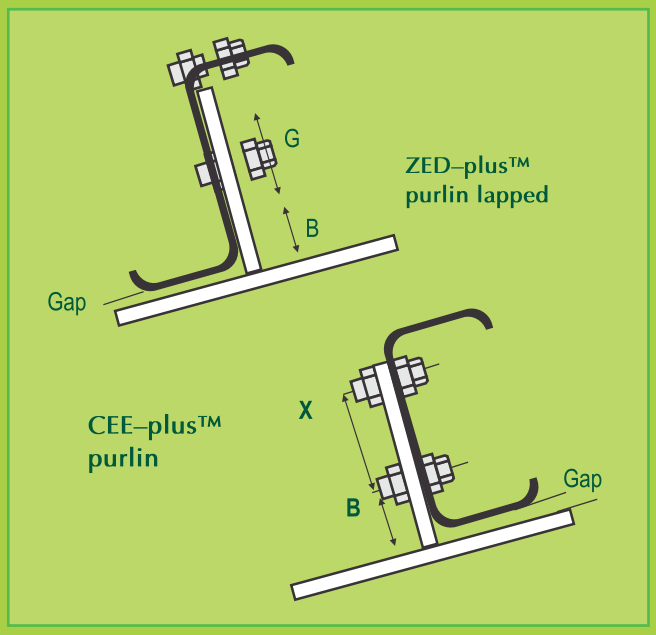
When ZED-plus™ purlins are lapped, additional holes are provided to ensure structural continuity. It's here that the extra clearances are especially useful. Purlins are usually engineered for M12 bolts and in these cases, M16 should not be used. In fact, with lapped ZED-plus™ Purlins, in some of the thicker gauges, the holes cover one another sufficiently to prevent assembly with M16 bolts unless they are forced.

Top flange facing up

Purlins should always be installed with the top flange facing up the slope from the cleat, i.e.:

- CEE-plus™ sections should be fitted on the high side of the cleat, open face facing up the slope.
- ZED-plus™sections should be fitted with the web on the low side of the cleat, with the top flange above it.

This is to minimise the tendency of the sections to rotate between supports or bridgings.



Fitting the bridging and cladding

While purlin fixing is quite straightforward, the sections are very flexible until they become part of the total sheeted system. The aim, therefore, should be to maintain a stable framework by fitting the bridging as the purlins are attached.

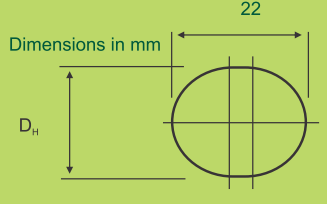
Ideally, the cladding should also be progressively fixed, although this isn't always practical if the jobs are handled by different sub-contractors.

Bundles of roof sheeting should not be placed on unsheeted purlins, as this can cause overloading and result in permanent deformation of the sections.

HOLES & CLEATS

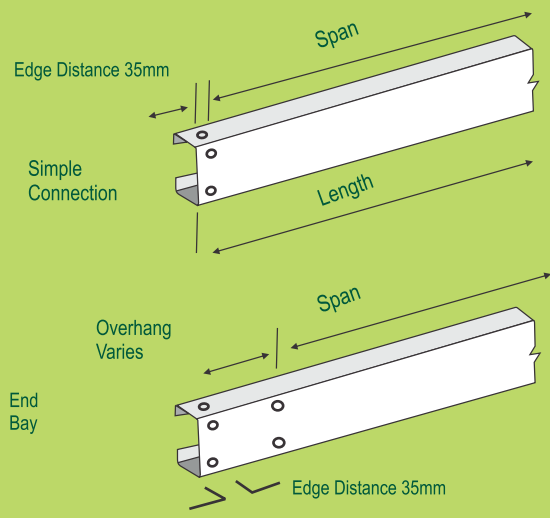
LYSAGHT CEE-plus™ and ZED-plus™ Purlin are normally supplied with holes punched to the Australian Institute of Steel Construction (AISC) gauge lines. The holes are required at cleat supports at ends of laps and at bridging points.

For the 100, 150, 200 and 250 deep sections, the holes are elongated with dimensions of 18 mm x 22 mm suitable for M12 bolts. For non standard sections like 300, 350 and 400 deep sections the holes are 22 mm diameter suitable for M16 bolts. Sections are also available un-punched, if required.

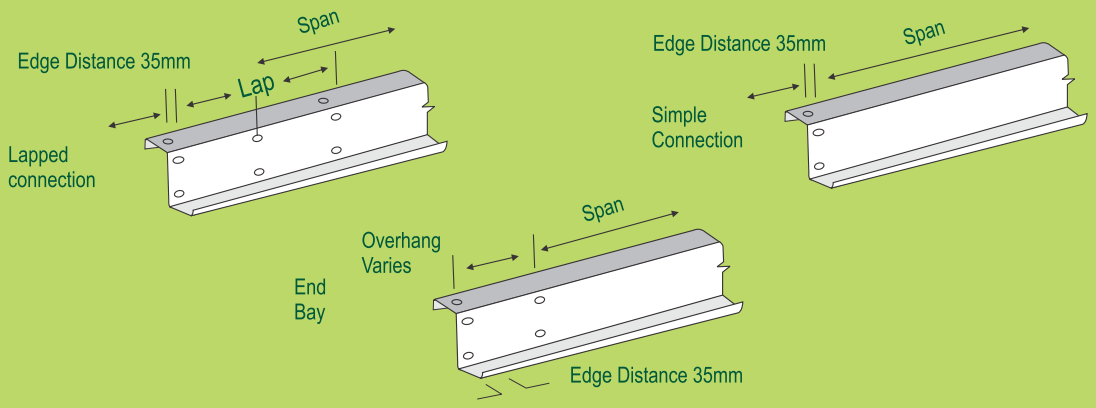


Tata BlueScope Building Products standard elongated punched hole.
Holes equally spaced above and below the line.

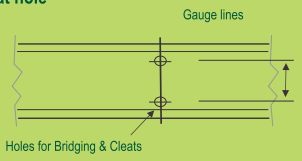
Standard hole for CEE–plus™ sections



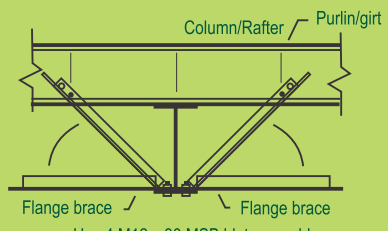
Standard hole for ZED–plus™ sections



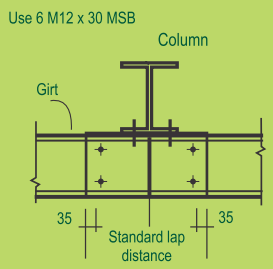
Bridging hole and cleat hole



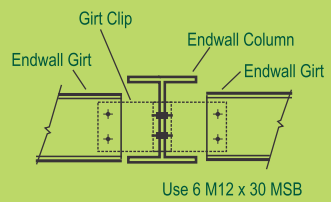
Typical assembly & connection details



Use 4 M12 x 30 MSB blot assembly
Double flange brace connection details

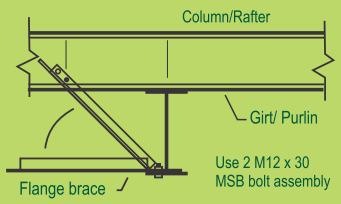


Girt by-frame connection detail with lap



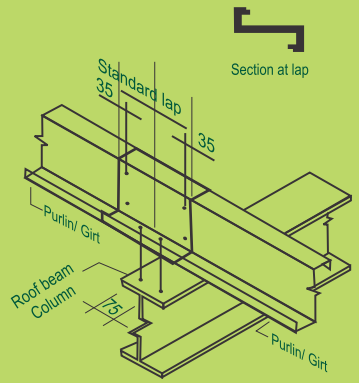
Use 6 M12 x 30 MSB

Flush girt connection detail at interior endwall column

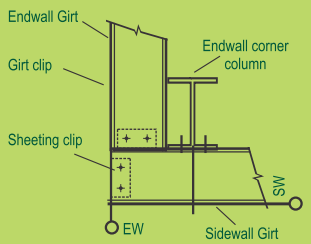


Single flange brace connection details

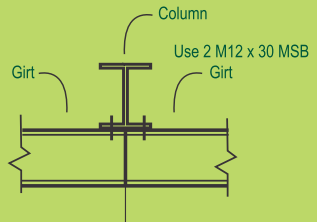
Use 4 N12 x 30 MSB bolt assembly



Purlin/ Girt lapping detail



All bolts are M12 x 30 MSB
Girt connection detail at endwall corner column



Girt by -frame simple span connection detail

LYSAGHT®

150 years of Global excellence!

HIGH STRENGTH | LIGHT WEIGHT | RECYCLABLE | ONE STOP SOLUTION
DESIGN FLEXIBILITY | ENVIRONMENT FRIENDLY | DURABLE | CORROSION RESISTANCE

For further technical assistance mail us at : marketing@bluescopesteel.lk

BLUESCOPE LYSAGHT

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