

Part 7

PURLIN CLEATS

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Part 7

PURLIN CLEATS

7.1 General

The standard purlin and girt cleat used for structural steel construction in Australia is a vertical cleat welded to the top flange of the supporting member, either the rafter or the column. This type of connection is not included at this stage for the LSB. Because of the thin gauge of the LSB and the eccentricity of the connection, the distribution of stresses from the cleat to the LSB flange is not even and so is difficult to quantify by calculation. Therefore capacities of this connection type are not available until testing can be undertaken.

However, two other economical options for purlin cleats which can be used with the LSB are presented in this manual.

- Bolted angle purlin cleat
- Welded angle purlin cleat

The design of these purlin cleats is given in Sections 7.2 and 7.3 respectively. In both cases, the design relates only to the connection of the angle to the LSB, and does not include the connection of the angle to the purlin. Refer to the purlin manufacturer for the capacity of the bolted connection to the purlin. Accordingly, the connection capacity tables presented in this section also relate only to the connection of the angle to the LSB.

7.2 Bolted Angle Purlin Cleat

The bolted angle purlin cleat uses an angle with one leg bolted to the back of the LSB web and the other leg bolted to the web of the purlin as shown in Figure 7.1.

The design method adopted is very simple. The capacity of the connection is determined by the following:

- The capacity of the angle in axial tension or compression
- The capacity of the bolted connection to the LSB

Because of the very short distance between the connection of the angle to the LSB and to the purlin, the capacity of the angle is very high in comparison with the likely design actions, even when the eccentricity of the axial force is taken into account.

The design of the bolted connection of the angle to the LSB web is the same as for the single angle cleat connection described in Section 4.4. The design procedure is taken from Hogan and Thomas (1994) with appropriate changes to incorporate the use of AS/NZS 4600 for bolting to the LSB. The bending moment on the bolt group due to the eccentricity of the design action is taken into account. The design procedure is not reproduced here.

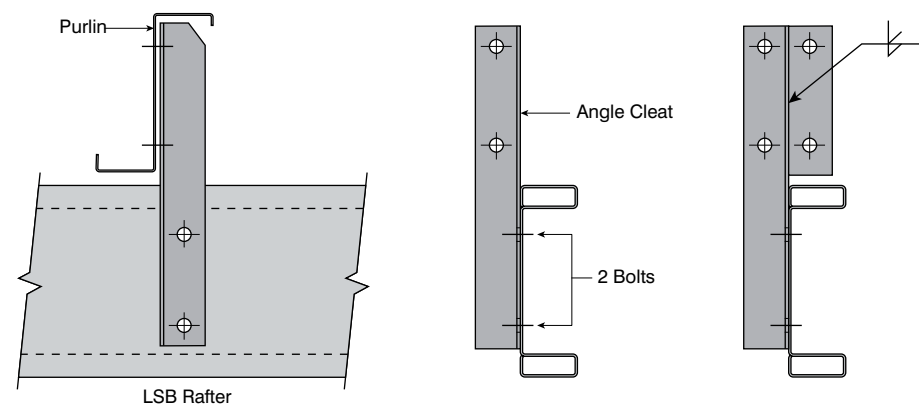


Figure 7.1: Bolted Angle Purlin Cleat

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7.3 Welded Angle Purlin Cleat

The welded angle purlin cleat uses the same angle as for the bolted cleat, but the angle is welded to the back of the LSB web instead of being bolted. Four equal length welds are required to the toe and heel of the angle at the top and bottom of the LSB web as shown in Figure 7.2.

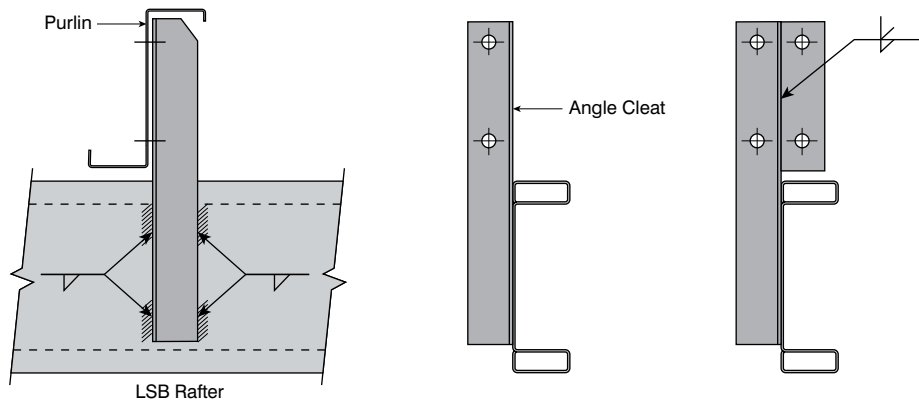


Figure 7.2: Welded Angle Purlin Cleat

A conservative approach has been taken for the design of the welds by assuming all of the design action is taken longitudinally by the two welds to the heel of the angle. In reality the other two welds to the toe of the angle will share some of the design action, both directly and due to the moment caused by the eccentricity in the connection. Connection capacities are given in Table 7.2 for a small range of weld lengths.

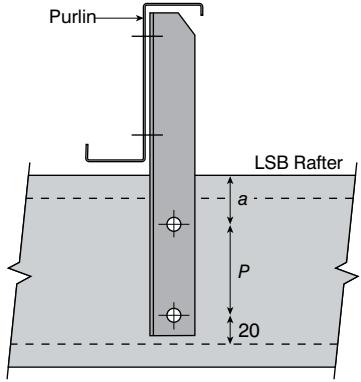
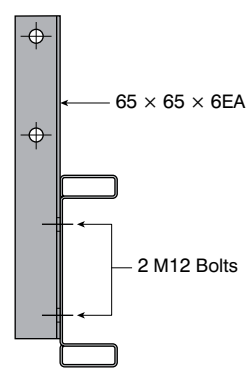
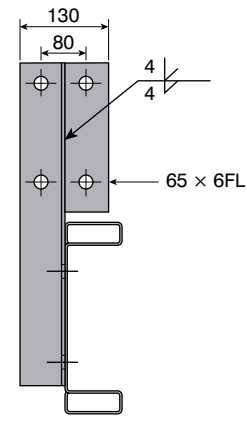
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TABLE 7.1

Bolted Angle Purlin Cleat

Bolts: M12

Bolted Angle Purlin Cleat												
			LSB Designation			Bolt Size	Hole Diameter mm	Dimensions			Connection Capacities	
			<i>d</i>	<i>b</i> , <i>t</i>				<i>p</i>	<i>a</i>	<i>e</i>	M12 – 4.6/S Bolts	M12 – 8.8/S Bolts
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
300 × 75 × 3.0	LSB	M12	14	180	60	20	28.2	58.5				
2.5	LSB	M12	14	180	60	20	28.2	49.3				
300 × 60 × 2.0	LSB	M12	14	180	60	20	27.4	27.4				
250 × 75 × 3.0	LSB	M12	14	130	60	20	26.6	55.2				
2.5	LSB	M12	14	130	60	20	26.6	46.6				
250 × 60 × 2.0	LSB	M12	14	130	60	20	26.6	34.1				
200 × 60 × 2.5	LSB	M12	14	80	60	20	22.8	39.8				
2.0	LSB	M12	14	80	60	20	22.8	31.9				
200 × 45 × 1.6	LSB	M12	14	80	60	20	21.7	21.7				
150 × 45 × 2.0	LSB	M12	14	50	50	20	17.6	24.6				
1.6	LSB	M12	14	50	50	20	17.6	19.7				

Notes:

1. Capacities are for the connection of the angle to the LSB only. The capacity of the angle to the purlin must be checked separately.
2. Washers are required under the bolt head and the nut.

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TABLE 7.2
Welded Angle Purlin Cleat

Welded Angle Purlin Cleat								
LSB Designation			Dimension	Fillet Weld Size	Connection Capacity (kN)			
<i>d</i>	<i>b_r</i>	<i>t</i>	<i>a</i>	<i>t_w</i>	Weld Length <i>L_w</i> (mm)			
mm	mm	mm	mm	mm	30	40	50	
300 × 75 × 3.0	75	3.0 LSB	30	4	39.1	52.1	65.2	
		2.5 LSB	30	4	39.1	52.1	65.2	
300 × 60 × 2.0	60	2.0 LSB	30	4	24.3	32.3	40.4	
250 × 75 × 3.0	75	3.0 LSB	30	4	39.1	52.1	65.2	
		2.5 LSB	30	4	39.1	52.1	65.2	
250 × 60 × 2.0	60	2.0 LSB	30	4	24.3	32.3	40.4	
200 × 60 × 2.5	60	2.5 LSB	25	4	39.1	52.1	65.2	
		2.0 LSB	25	4	24.3	32.3	40.4	
200 × 45 × 1.6	45	1.6 LSB	25	4	19.4	25.9	32.3	
150 × 45 × 2.0	45	2.0 LSB	20	4	24.3	32.3	40.4	
		1.6 LSB	20	4	19.4	25.9	32.3	

Notes:

1. Weld consumables E48XX or W50X.
2. All welds are SP category.
3. Capacities are for the connection of the angle to the LSB only. The capacity of the angle to the purlin must be checked separately.

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