

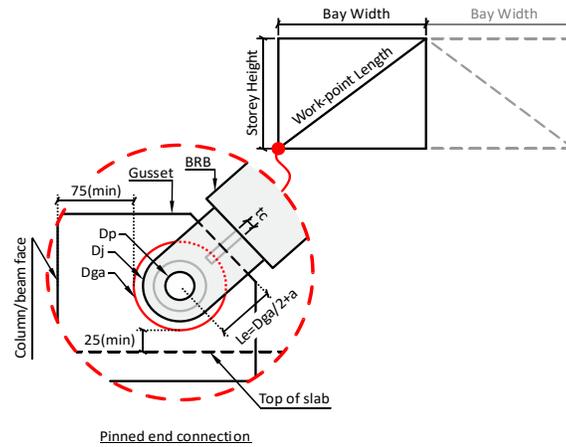
**PINNED BRB DESIGN TABLES**

BRB		Stiffness Modification Factor (Q)										
Ac (mm <sup>2</sup> )	Fy (MPa)	Py (kN)	Work-point Length, Lwp (m)									
			5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0		
670	300	200	1.45	1.36	1.30	1.26	1.23	1.20	1.18	1.17		
1340	300	400	1.48	1.38	1.32	1.27	1.24	1.21	1.19	1.18		
2000	300	600	1.51	1.40	1.33	1.28	1.25	1.22	1.20	1.18		
2670	300	800	1.63	1.49	1.40	1.34	1.29	1.26	1.23	1.21		
3340	300	1000	1.57	1.44	1.36	1.31	1.27	1.24	1.22	1.20		
4000	300	1200	1.74	1.56	1.45	1.38	1.33	1.29	1.26	1.24		
4670	300	1400	1.69	1.52	1.42	1.36	1.31	1.28	1.25	1.23		
5340	300	1600	1.64	1.49	1.40	1.34	1.29	1.26	1.23	1.21		
6000	300	1800	1.72	1.54	1.44	1.37	1.32	1.28	1.25	1.23		
6670	300	2000	1.68	1.52	1.42	1.35	1.31	1.27	1.24	1.22		
7340	300	2200	1.81	1.60	1.48	1.40	1.35	1.31	1.27	1.25		
8000	300	2400	1.77	1.57	1.46	1.39	1.33	1.29	1.26	1.24		
8670	300	2600	1.73	1.55	1.44	1.37	1.32	1.28	1.26	1.23		
9340	300	2800	1.92	1.67	1.53	1.44	1.38	1.33	1.30	1.27		
10000	300	3000	1.88	1.64	1.51	1.43	1.37	1.32	1.29	1.26		
11340	300	3400	1.96	1.69	1.54	1.45	1.39	1.34	1.30	1.28		
12670	300	3800	1.88	1.64	1.51	1.43	1.37	1.32	1.29	1.26		
12000	350	4200	2.05	1.75	1.59	1.48	1.41	1.36	1.32	1.29		
13150	350	4600	2.09	1.77	1.60	1.50	1.42	1.37	1.33	1.30		

BRB		Yield Length Ratio (YLR)										
Ac (mm <sup>2</sup> )	Fy (MPa)	Py (kN)	Work-point Length, Lwp (m)									
			5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0		
670	300	200	0.65	0.70	0.74	0.77	0.79	0.81	0.82	0.83		
1340	300	400	0.62	0.67	0.72	0.75	0.77	0.79	0.81	0.82		
2000	300	600	0.60	0.66	0.70	0.74	0.76	0.78	0.80	0.81		
2670	300	800	0.54	0.61	0.66	0.70	0.73	0.76	0.77	0.79		
3340	300	1000	0.55	0.62	0.67	0.71	0.74	0.76	0.78	0.80		
4000	300	1200	0.49	0.58	0.63	0.67	0.71	0.73	0.75	0.77		
4670	300	1400	0.50	0.58	0.64	0.68	0.71	0.74	0.76	0.77		
5340	300	1600	0.51	0.59	0.64	0.68	0.71	0.74	0.76	0.78		
6000	300	1800	0.49	0.57	0.63	0.67	0.70	0.73	0.75	0.77		
6670	300	2000	0.49	0.58	0.63	0.67	0.71	0.73	0.75	0.77		
7340	300	2200	0.45	0.54	0.60	0.64	0.68	0.71	0.73	0.75		
8000	300	2400	0.45	0.54	0.60	0.65	0.68	0.71	0.73	0.75		
8670	300	2600	0.46	0.55	0.61	0.65	0.69	0.72	0.74	0.76		
9340	300	2800	0.41	0.51	0.57	0.62	0.66	0.69	0.72	0.74		
10000	300	3000	0.42	0.51	0.58	0.63	0.66	0.69	0.72	0.74		
11340	300	3400	0.38	0.48	0.55	0.60	0.65	0.68	0.70	0.73		
12670	300	3800	0.39	0.49	0.56	0.61	0.65	0.68	0.71	0.73		
12000	350	4200	0.35	0.46	0.53	0.59	0.63	0.66	0.69	0.71		
13150	350	4600	0.33	0.44	0.52	0.58	0.62	0.65	0.68	0.71		

BRB		Circular Casing Diameter (mm)										
Ac (mm <sup>2</sup> )	Fy (MPa)	Py (kN)	Work-point Length, Lwp (m)									
			5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0		
670	300	200	168	168	168	219	219	219	219	273		
1340	300	400	219	219	219	273	273	273	273	324		
2000	300	600	219	219	273	273	273	273	273	324		
2670	300	800	273	273	273	273	273	273	324	324		
3340	300	1000	273	273	273	273	273	324	324	356		
4000	300	1200	324	324	324	324	324	324	356	356		
4670	300	1400	324	324	324	324	324	324	356	406		
5340	300	1600	324	324	324	324	324	356	406	406		
6000	300	1800	356	356	356	356	356	356	406	406		
6670	300	2000	356	356	356	356	356	406	406	457		
7340	300	2200	406	406	406	406	406	406	406	457		
8000	300	2400	406	406	406	406	406	406	457	457		
8670	300	2600	406	406	406	406	406	406	457	457		
9340	300	2800	457	457	457	457	457	457	457	508		
10000	300	3000	457	457	457	457	457	457	457	508		
11340	300	3400	457	457	457	457	457	457	457	508		
12670	300	3800	457	457	457	457	457	457	457	508		
12000	350	4200	508	508	508	508	508	508	508	508		
13150	350	4600	508	508	508	508	508	508	508	508		

BRB		Pinned Connection Sizes (mm)										Material Grade		
Ac (mm <sup>2</sup> )	Py (kN)	tc	Dj	Dp	tg	a	Le	Dga	Tga	Fillet Weld	Core	Lug	Gusset	
670	200	12	100	40	16	25	85	120	10	8				
1340	400	16	130	50	20	25	100	150	12	10				
2000	600	20	150	60	25	25	110	170	16	13				
2670	800	25	190	80	32	25	130	210	20	16				
3340	1000	25	190	80	32	25	130	210	20	16				
4000	1200	32	230	100	40	25	150	250	25	20				
4670	1400	32	230	100	40	25	150	250	25	20				
5340	1600	32	230	100	40	25	150	250	25	20				
6000	1800	40	240	110	50	30	160	260	32	26				
6670	2000	40	240	110	50	30	160	260	32	26				
7340	2200	40	280	120	50	30	180	300	32	26				
8000	2400	40	280	120	50	30	180	300	32	26				
8670	2600	40	280	120	50	30	180	300	32	26				
9340	2800	50	305	140	60	35	198	325	40	32				
10000	3000	50	305	140	60	35	198	325	40	32				
11340	3400	50	335	150	60	40	218	355	40	32				
12670	3800	50	335	150	60	40	218	355	40	32				
12000	4200	50	360	160	60	40	230	380	40	32				
13150	4600	50	380	160	60	40	240	400	40	32				



**BIM Modelling Notes:**

- Gusset plates have reinforcing plates on both sides.
- The recommended minimum clearances to adjacent members are measured from "Dga". The clearances can be smaller, provided that they remain sufficient to allow for gusset welding and BRB installation.
- Pinhole is 1mm larger than the pin diameter "Dp".
- BRB end-to-end length "Lbrb" is measured from end to end of "Dj".

**Structural Design Notes:**

- "Ac" is the minimum cross-sectional area of the yielding segment of the BRB core, "Fy" is the specified minimum yield stress of the BRB core, and "Py" is the nominal design yield strength equal to "FyAc".
- The effective WP to WP stiffness of BRB is defined by  $K_{eff} = Q(EAc/Lwp)$ , where "E" is the modulus of elasticity of steel, and "Lwp" is the work-point length.
- Q factors, yield length ratios, and casing sizes are approximations based on a 45° brace angle and the assumed beam/column sizes. Different geometry and beam/column sizes will result in different values. It is recommended to allow for a typical ±15% tolerance in Q factors and yield length ratios.
- The effective area from BRB end to WP is taken to be 5 times that of the BRB end region.
- Factors of 1.2 for material overstrength "Ry", 1.4 for strain hardening "ω", and 1.15 for compression strength adjustment "β" are considered to conservatively estimate the maximum expected tensile and compressive strengths of typical BRBs at 2% core strain.
- Welds connecting the gusset plates to adjacent members should be complete penetration butt welds or fillet welds sized to meet the yield strength of the gusset plate.
- Values given are intended for preliminary design only. Contact GRAYSON for project-specific information.



For design assistance, please contact:  
**Grayson Engineering (2015) Limited**  
 25 Langley Road, Manukau City  
 Auckland 2104, New Zealand  
 Phone: +64 9 2783366  
 +64 21 839 293  
 www.grayson-brb.co.nz  
 www.grayson-engineering.co.nz

