

Standardised Foundation Bolt Kits

Over the last few years, SpeediBolt® and the Australian Institute of Steel Construction, now the Australian Steel Institute [ASI], in a joint initiative, have worked to establish the standardisation of building column base plates and holding-down bolt configurations for the Australian market.

In the past, structural designers did not have the opportunity to select base plates and holding-down bolt configurations conforming to recognised standard patterns that suited a major proportion of the range of the steel sections used for columns in Australia. Traditionally, these items have been custom made to suit each project.

The SpeediBolt® FootiPak® range of products allows the designer to select pre-engineered, off-the-shelf kits of foundation bolts, complete with prefabricated cages and base plate templates to suit 150UB to 610UB, 700WB, 100UC to 310UC, 76CHS to 165CHS, 89x89 SHS to 150x150SHS, and 102x76RHS to 200x150RHS sections.

This rationalised range of FootiPak® kits, available as stock items, provides a practical and economical alternative to custom made product for a majority of column base applications.

Features

- Pre-engineered
- Practical size configurations
- Published design details and Load Tables
- Available 'off-the-shelf'
- Compact packaging in knock-down form
- Fully galvanised
- Foundation anchoring bolts included
- Hex nuts and flat washers included [2 per bolt]
- Prefabricated WebLok® ligature included
- Timber template included
- Simple to assemble
- Centre lines marked on template
- Bolts can be turned to allow insertion into rebar cage, then returned to original location
- WebLok® ligature can be repositioned without dis-assembling
- No welding required
- Non standard sizes available subject to quote

Kit Components (typical 4 bolt FootiPak)

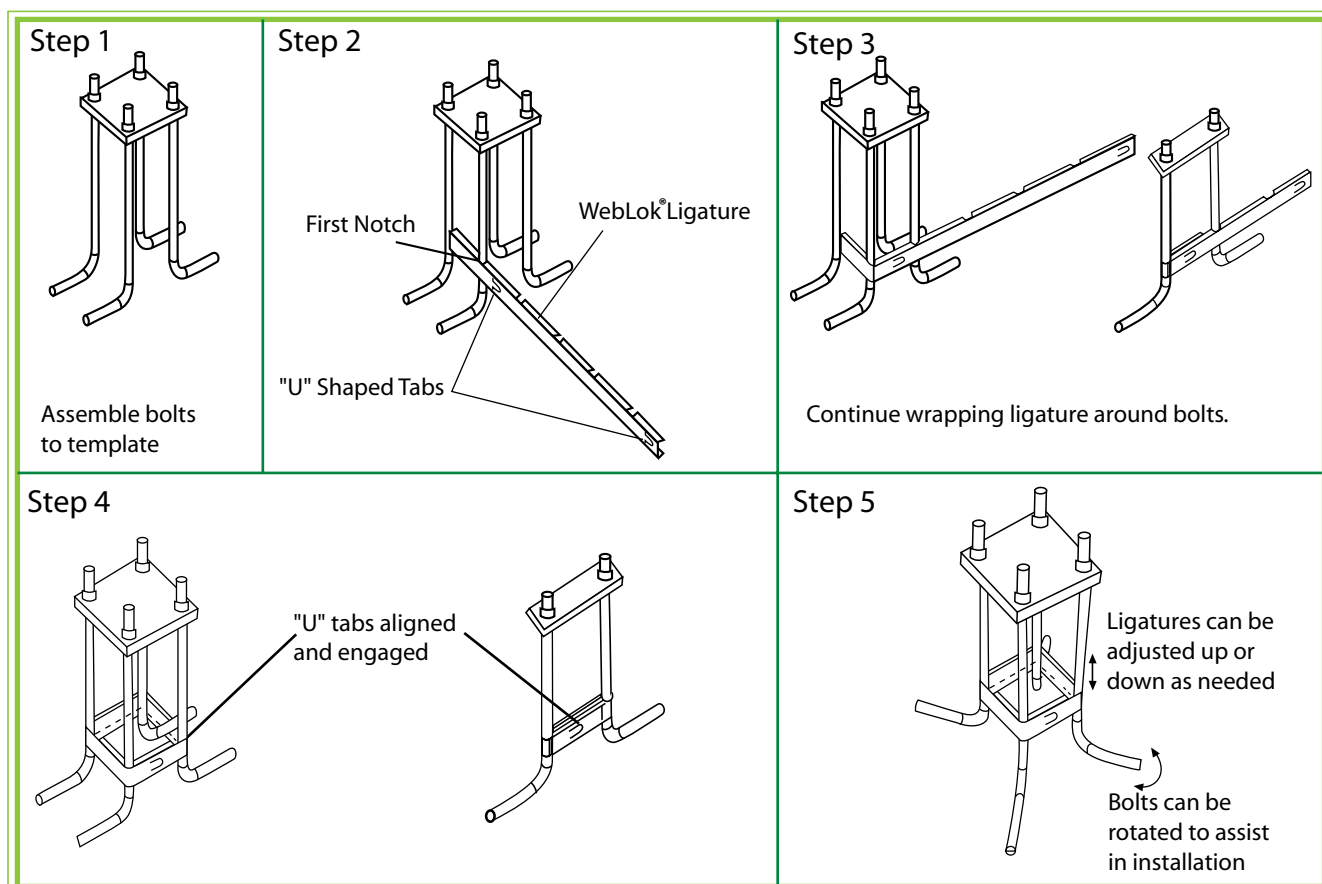


Kit Components for each kit

- 1 Steel template
- 4 foundation anchoring bolts (in 4 bolt kit)
- 2 nuts and 2 washers per bolt
- 1 Weblock® ligature
- Installation guide

Advantages

Participant	Advantages
Structural Engineer	Simple selection of suitable design details Load tables give reliable, quick and easy answers
Engineering Draftsperson	Simple reproduction of suitable design details gives quick and easy solution
Workshop Detailer	Practical standard design details Easy to detail and use standard items
Fabricator	Readily available, economical stock items Cost-effective and practical design details
Builder	Readily available on short lead times Transport in knock-down form, assemble on site Easily adjusted to avoid reinforcing and services



Standardised Foundation Kits for Open Sections [UB's and UC's]

FootiPak® Designation	Number of Bolts	Nom Bolt Diameter	HD Bolt Gauge S _g [mm]	HD Bolt Pitch S _p [mm]	To suit column sections	
					Preferred	Non - Preferred
FPK 2 16 100	2	M16	100	0	100UC, 150UB, 180UB	200UB
FPK 2 20 100	2	M20	100	0	150UC	200UB, 250UB
FPK 4 16 1010	4	M16	100	100	200UB, 250UB	
FPK 4 20 1010	4	M20	100	100	200UC	250UB, 310UB
FPK 4 20 1020	4	M20	100	200	310UB, 360UB, 410UB	460UB
FPK 4 24 1212	4	M24	120	120	250UC, 310UC	
FPK 4 24 1230	4	M24	120	300	460UB, 530UB	
FPK 4 30 1430	4	M30	140	300	610UB, 700WB	530UB

Standardised Foundation Kits for Hollow Sections [SHS, CHS and RHS]

FootiPak® Designation	Number of Bolts	Nom Bolt Diameter	HD Bolt Gauge S _g [mm]	HD Bolt Pitch S _p [mm]	To suit column sections	
					Preferred	Non - Preferred
FPK 2 16 200	2	M16	200	0	89CHS, 76CHS, 89SHS, 75SHS	
FPK 2 20 200	2	M20	200	0	10276RHS, 10050RHS	
FPK 4 16 1818	4	M16	180	180	150150RHS, 12575RHS, 12751RHS, 10276RHS, 102CHS, 114CHS, 140CHS, 100SHS, 89SHS	
FPK 4 16 2222	4	M16	220	220	165SH S	
FPK 4 20 1818	4	M20	180	180	15050RHS, 12575RHS, 12751RHS, 10276RHS, 102CHS, 114CHS, 140CHS, 100SHS, 89SHS	
FPK 4 20 2222	4	M20	220	220	165SH S	
FPK 4 24 1818	4	M24	180	180	200100RHS, 150100RHS, 15276RHS, 15050RHS, 100SHS	
FPK 4 24 2222	4	M24	220	220	200150RHS, 150SHS, 125SHS	

- Note.**
1. Four-bolt cages are preferred to provide support to columns during erection - refer to AS 3828 Guidelines for the Erection of Building Steelwork.
 2. Bolt configurations are based on practical considerations of typical installation and erection requirements.
 3. The FootiPak® range of products is supplied to change without notice.

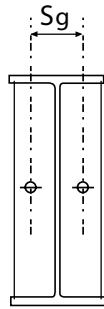
Standardised Foundation Anchoring Bolts

Nom Bolt Diameter	Bolt Length A [mm]	Bolt Cog B [mm]	Bolt Thread T [mm]	Bolt Projection P [mm]	Embedment Depth L _d [mm]	Edge Distance A _c [mm]	Design Load Capacity	
							Tension [kN]	Shear [kN]
M16	400	100	125	100	300	225	50.2	28.6
M20	450	150	150	125	325	300	78.4	44.6
M24	550	200	150	125	425	375	113	64.3
M30	650	200	170	140	510	450	180	103

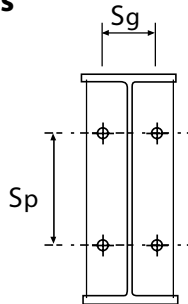
- Note.**
1. Bolts have formed threads.
 2. Bolt projections allow for nominal 50mm grouting or mortar bedding under base plate, or nominal 75mm concrete bedding under base plate.
 3. Edge distances are recommended to allow holding-down bolts to develop full capacity in 25 MPa normal-class concrete.
 4. Design load capacities have been determined to AS 4100 Steel Structures.
 5. The cog lengths have been confirmed by detailed testing. The anchorage capacity has been shown to exceed the ultimate design capacities of Grade 4.6 holding-down bolts.
 6. The FootiPak range of products is subject to change without notice.

Non standard sizes available subject to quote

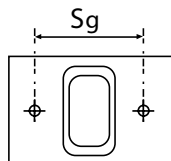
Foundation anchoring bolt configurations for open section bare plates with 2 bolts



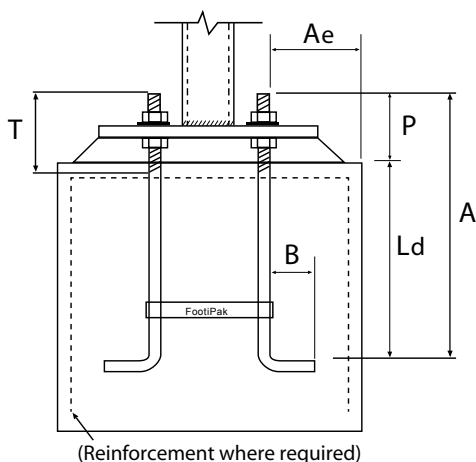
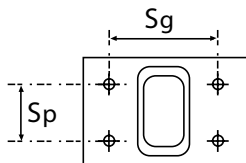
Foundation anchoring bolt configurations for open section base plates with 4 bolts



Foundation anchoring bolt configurations for hollow section base plates with 2 bolts



Foundation anchoring bolt configurations for hollow section base plates with 4 bolts



Foundation anchoring bolts

Material	Finish
Grade 4.6 AS 1111	Galvanised AS/NZS 4680

Nuts and Washers

Material	Finish
Grade 4.6 AS 1237	Galvanised AS 1650

WebLok® Ligatures

Material	Finish
AS 1397/G2 Z275	Galvanised

Concrete

Foundation anchoring bolt embedment lengths and minimum edge distances have been determined using the design model given for unreinforced concrete so as to exceed the ultimate design capacities of Grade 4.6 foundation anchoring bolts. For embedment lengths or edge distances less than these values, fully developed reinforcement must be provided to intercept potential cracking planes.

Intersection of overlapping cracking zones has been considered in determining unreinforced concrete capacities for the actual bolt configurations used.

Foundation Anchoring Bolt and Base Plate Selector

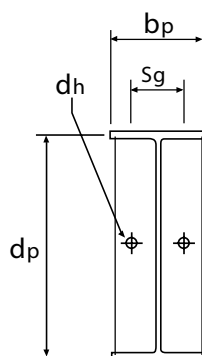
Column Size	Suggested FootiPak Designation	Holding Down Bolts				Base Plate				Design Load Capacities (AS 4100)				
		No.	Size	Gauge	Pitch	Length dp mm	Width bp mm	Thick tp mm	Hole dh mm	Strength Limit State			Combined Actions	
				Sg mm	Sp mm					Compn. kN	Tension kN	Shear kN	Shear kN	Tension kN
100UC	FPK216100	2	M16	100	0	90	150	12	20	120	96.9	28.6	28.6	50.2
150UC	FPK220100	2	M20	100	0	150	180	16	24	244	157	44.6	44.6	78.4
200UC	FPK4201010	4	M20	100	100	200	180	16	24	381	314	89.2	89.2	157
250UC	FPK4241212	4	M24	120	120	250	250	25	28	557	452	129	129	226
310UC	FPK4241212	4	M24	120	120	300	300	25	28	790	452	129	129	226
150UB	FPK216100	2	M16	100	0	150	150	12	20	196	68.7	28.6	28.6	50.2
180UB	FPK216100	2	M16	100	0	170	150	12	20	206	82.5	28.6	28.6	50.2
200UB	FPK216100	2	M16	100	0	200	150	12	20	232	90.7	28.6	28.6	50.2
200UB	FPK4161010	4	M16	100	100	200	150	12	20	232	181	57.2	57.2	100
200UB	FPK220100	2	M20	100	0	200	150	16	24	232	157	44.6	44.6	78.4
250UB	FPK4161010	4	M16	100	100	250	150	12	20	286	201	57.2	57.2	100
250UB	FPK220100	2	M20	100	0	250	180	16	24	286	157	44.6	44.6	78.4
250UB	FPK4201010	4	M20	100	100	250	180	16	24	286	314	89.2	89.2	157
310UB	FPK4201010	4	M20	100	100	300	180	16	24	347	314	89.2	89.2	157
310UB	FPK4201020	4	M20	100	200	300	180	16	24	347	314	89.2	89.2	157
360UB	FPK4201020	4	M20	100	200	350	180	16	24	545	314	89.2	89.2	157
410UB	FPK4201020	4	M20	100	200	400	180	16	24	662	314	89.2	89.2	157
460UB	FPK4201020	4	M20	100	200	450	180	16	24	746	314	89.2	89.2	157
460UB	FPK4211230	4	M24	120	300	450	200	20	28	828	452	129	129	226
530UB	FPK4241230	4	M24	120	300	520	200	20	28	967	452	129	129	226
530UB	FPK4301430	4	M30	140	300	520	250	25	34	1056	720	206	206	360
610UB	FPK4301430	4	M30	140	300	600	250	25	34	1229	720	206	206	360
700WB	FPK4301430	4	M30	140	300	690	250	25	34	877	720	206	206	360

- Note:
- 1) Design Load Capacities are applicable for pinned type base plates only where any induced bending moments are neglected
 - 2) Ends of columns are assumed to be cold sawn so that axial compression is transmitted by bearing.
 - 3) Base plate holes are 4 mm oversize as this has been shown to be most practical for typical installation and erection requirements.
2 washers may be used under anchoring nuts to satisfy the requirements of AS 4100 Cl. 14.3.5.2.
 - 4) Shear forces resisted by holding-down bolts have been limited to half the design load capacity of the bolts and linear interaction has been assumed for combined tension and shear loads. This conservative approach reflects the lack of a clear consensus in current research on shear in holding-down bolts.
 - 5) Larger shear forces may be resisted by suitable shear keys, or recessing the base plate into the footing.
 - 6) The design model is based on the model detailed in A.I.S.C. Design of Structural Connections Section 4.II - Column Base Plate - Pinned Type Connection.
 - 7) Design load capacities on column sections are based on the capacity of the web section only as the base plates are not detailed to extend to the outer extremities of the flanges in both directions. This conservative approach is used throughout the design model and yields design load capacities which exceed normal design requirements.
 - 8) The yield line method of analysis given in the design model has been used exclusively for calculation of base plate tension capacities.

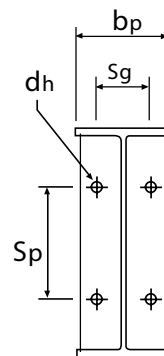
Non standard sizes available subject to quote



Base plate configurations with 2 holding down bolts



Base plate configurations with 4 holding down bolts



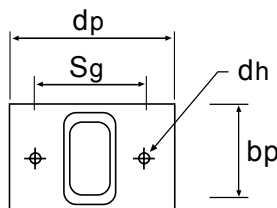
Foundation Anchoring Bolt and Base Plate Selector

Column Size	Suggested FootiPak Designation	Holding Down Bolts				Base Plate				Design Load Capacities (AS 4100)				
		No.	Diam.	Gauge	Pitch	Length	Width	Thick	Hole	Strength Limit State			Combined Actions	
			df	sg	sp					Compn.	Tensn.	Shear	Shear	Tensn.
			mm	mm	mm	mm	mm	mm	mm	kN	kN	kN	kN	kN
76.1CHS	FPK216200	2	16	200	0	270	150	12	20	115	100	28.6	28.6	50.2
88.9CHS	FPK216200	2	16	200	0	270	150	12	20	135	100	28.6	28.6	50.2
101.6CHS	FPK4161818	4	16	180	180	250	250	12	20	155	201	57.2	57.2	100.4
101.6CHS	FPK4201818	4	20	180	180	250	250	16	24	155	314	89.2	89.2	156.8
114.3CHS	FPK4161818	4	16	180	180	250	250	12	20	197	201	57.2	57.2	100.4
114.3CHS	FPK4201818	4	20	180	180	250	250	16	24	197	314	89.2	89.2	156.8
139.7CHS	FPK4161818	4	16	180	180	250	250	12	20	236	201	57.2	57.2	100.4
139.7CHS	FPK4201818	4	20	180	180	250	250	16	24	236	314	89.2	89.2	156.8
165.1CHS	FPK4162222	4	16	220	220	280	280	12	20	280	201	57.2	57.2	100.4
165.1CHS	FPK4202222	4	20	220	220	290	290	16	24	280	314	89.2	89.2	156.8
89X89SHS	FPK4161818	4	16	180	180	250	250	16	20	378	201	57.2	57.2	100.4
100X100SHS	FPK4161818	4	16	180	180	250	250	12	20	431	201	57.2	57.2	100.4
100X100SHS	FPK4201818	4	20	180	180	250	250	16	24	431	314	89.2	89.2	156.8
75X75SHS	FPK216200	2	16	200	0	270	150	12	20	310	100	28.6	28.6	50.2
89X89SHS	FPK216200	2	16	200	0	270	150	12	20	378	100	28.6	28.6	50.2
100X100SHS	FPK2421818	4	24	180	180	250	250	20	28	472	452	128.6	128.6	226
125X125SHS	FPK4242222	4	24	220	220	280	280	20	28	614	452	128.6	128.6	226
150X150SHS	FPK4242222	4	24	220	220	300	300	20	28	755	452	128.6	128.6	226
102X76RHS	FPK220200	2	20	200	0	270	150	16	24	378	157	44.6	44.6	78.4
102X76RHS	FPK4161818	4	16	180	180	250	250	16	20	378	201	57.2	57.2	100.4
127X51RHS	FPK4161818	4	16	180	180	250	250	16	20	378	201	57.2	57.2	100.4
127X51RHS	FPK4201818	4	20	180	180	250	250	20	24	378	314	89.2	89.2	156.8
125X75RHS	FPK4161818	4	16	180	180	250	250	16	20	431	201	57.2	57.2	100.4
125X75RHS	FPK4201818	4	20	180	180	250	250	20	24	431	314	89.2	89.2	156.8
150X50RHS	FPK4161818	4	16	180	180	250	250	16	20	367	201	57.2	57.2	100.4
150X50RHS	FPK4201818	4	20	180	180	250	250	20	24	367	314	89.2	89.2	156
100X50RHS	FPK220200	2	20	200	0	270	150	16	24	310	157	44.6	44.6	78.4
150X50RHS	FPK4241818	4	24	180	180	250	250	20	28	367	452	128.6	128.6	226
152X76RHS	FPK4241818	4	24	180	180	250	250	20	28	579	452	128.6	128.6	226
150X100RHS	FPK4241818	4	24	180	180	250	250	20	28	614	452	128.6	128.6	226
200X100RHS	FPK4241818	4	24	180	180	280	280	20	28	755	452	128.6	128.6	226
200X150RHS	FPK4242222	4	24	220	220	300	300	20	28	897	452	128.6	128.6	226

- Note:
- 1) Design Load Capacities are applicable for pinned type base plates only where any induced bending moments are neglected.
 - 2) Ends of columns are assumed to be cold sawn so that axial compression is transmitted by bearing.
 - 3) Base plate holes are 4 mm oversize as this has been shown to be most practical for typical installation and erection requirements. 2 washers may be used under anchoring nuts to satisfy the requirements of AS 4100 Cl. 14.3.5.2.
 - 4) Shear forces resisted by holding-down bolts have been limited to half the design load capacity of the bolts and linear interaction has been assumed for combined tension and shear loads. This conservative approach reflects the lack of a clear consensus in current research on shear in holding-down bolts.
 - 5) Larger shear forces may be resisted by suitable shear keys, or recessing the base plate into the footing.
 - 6) Design load capacities of column sections are based on the capacity of the column section is calculated in accordance with Section 6 of AS 4100.
 - 7) The yield line method of analysis given in the design model has been used exclusively for calculation of base plate tension capacities.

Non standard sizes available subject to quote

Base plate configurations with 2 holding down bolts



Base plate configurations with 4 holding down bolts

