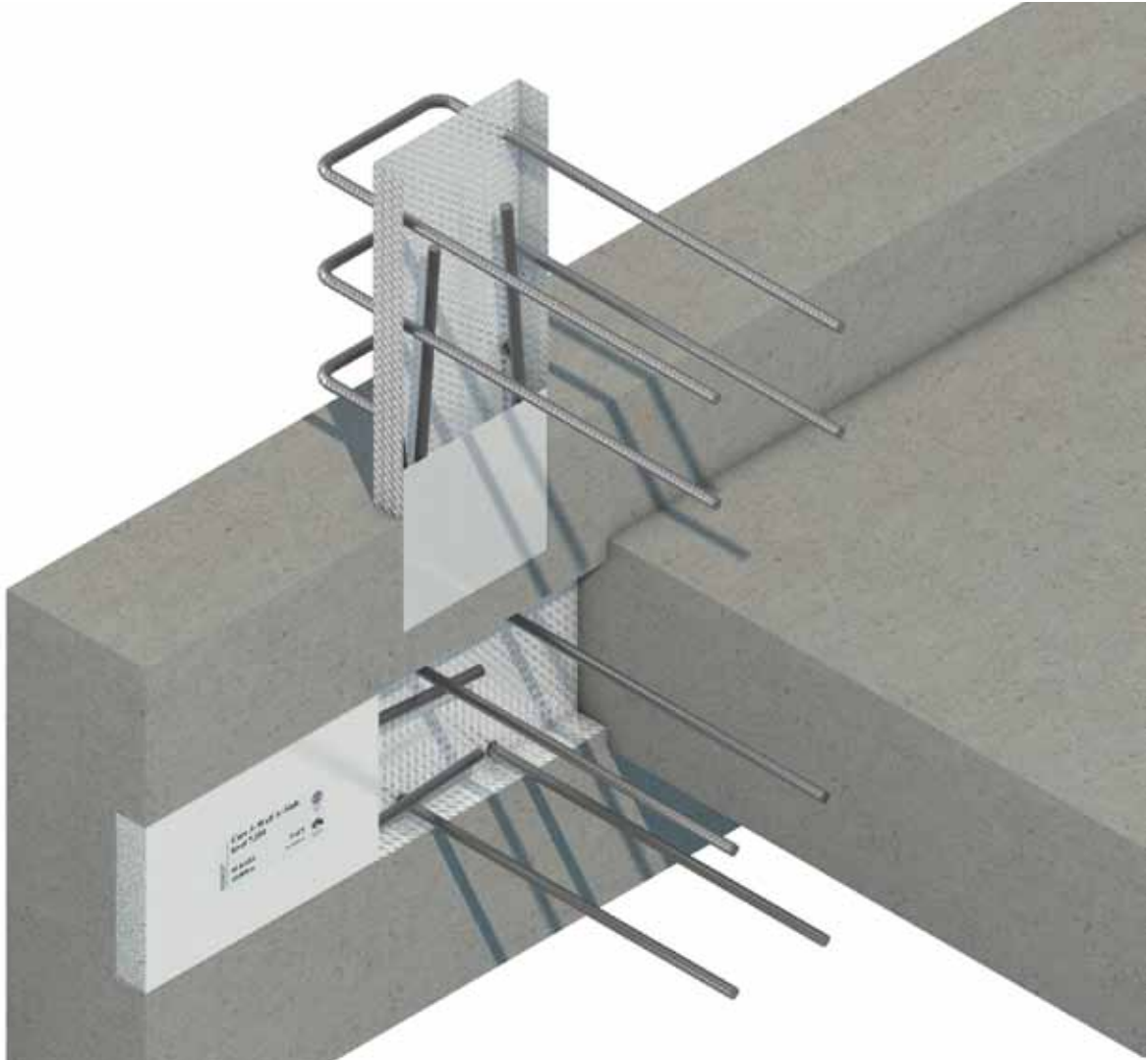


FERBOX®



REINFORCEMENT CONTINUITY SYSTEM





Introduction

Product description

FERBOX by H-BAU is a reinforcement continuity system, designed to maintain structural continuity across construction joints in reinforced concrete structures. The FERBOX casing houses suitably proven reinforcement, which is factory pre-bent and factory-fitted. On the construction site, the FERBOX unit is secured inside the formwork at the front face of the structural member (often a wall), in advance of the concrete pour. The FERBOX casing is designed to remain embedded in the concrete, providing a useful rebate and key for the subsequent concrete pour. The galvanised and indented profile of the embedded casing obviates the need for traditional scabbling at the joint interface. After striking the formwork, the casing lid is revealed and removed, providing access to the connection legs (starter bars) which lay inside. These legs are bent outwards (at 90 degrees) by the contractor, then ordinarily lapped with loose reinforcement of the subsequent structural member/concrete pour.

Advantages

- Almost infinite ability to bespoke casing to reinforcement requirements.
- Supply advantage of volume production by H-BAU.
- Dedicated UK-local manufacturing facility for all 'specials' up to 16mm diameter.
- UK CARES approval for vertical as well as horizontal applications.

Product range

- 22 no. 'off the shelf' configurations: 12mm and 16mm diameter reinforcement.
- 19 no. 'special' bar shape configurations; dimensionally variable in diameters 10mm, 12mm and 16mm.

Technical approval



Following a rigorous testing and evaluation programme, both plant operations (Germany and UK) are UK-CARES approved to the assessment requirements of EC2.



Materials

- Embedded casing rolled or fabricated from galvanised steel sheet.
- Steel reinforcement grade B500B or B500C to BS4449:2005, manufactured by the 'hot-rolled and cold-stretched' or 'quenched and self-tempered' process routes.
- Removable lid fabricated from light-gauge galvanised steel sheet or PVC.

Casing lengths

- Standard lengths either 1.25m or 1.20m.
- Special types - any singular length up to 2.40m (individual casing lengths are optimised to suit overall application/joint length) / 10mm, 12mm and 16mm diameter reinforcement.



The FERBOX unit is either nailed (through casing) to the shutter face, or the projecting anchorage reinforcement is securely wired back to the main reinforcement cage and the shutter offered up to it.

The FERBOX unit is therefore sandwiched in position between the shutter and the main reinforcement cage. The concrete is then poured and the entire unit is cast into the face of the concrete element/wall (Fig.1).

Stripping the shutter reveals the lid on the wall face. The lid is removed to reveal the connection legs (Fig.2), which should be bent out using the available straightening tool (Fig.2 and Page 4).

Anchorage is achieved via the reinforcement delivered projecting out of the casing. Lap is achieved via the bent out connection legs, which are spliced to the main reinforcement of the subsequent concrete pour (Fig.3).



Fig.1

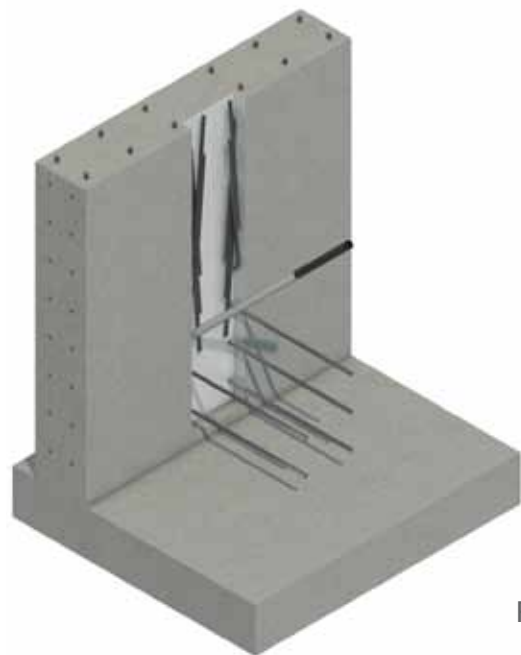


Fig.2

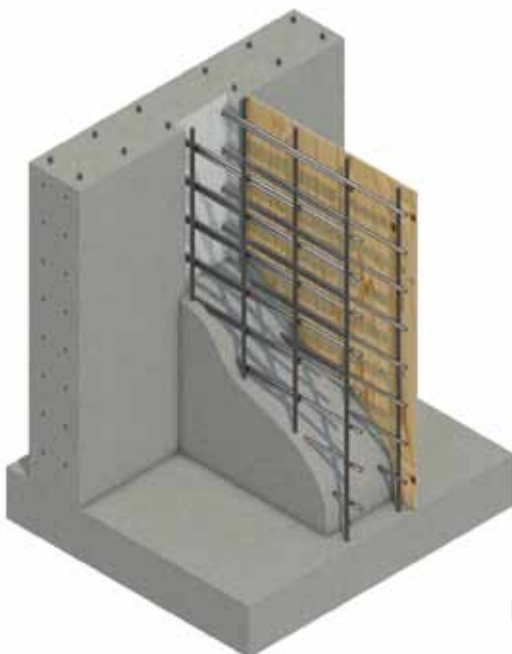


Fig.3

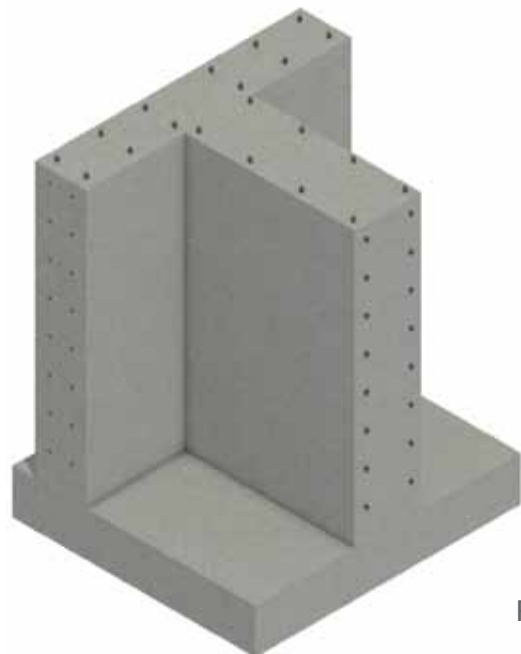


Fig.4



Casing styles & tools



Light dimpling

Rolled from galvanised steel coil to standard widths and depths (see types prefixed 'HB' in upper-half of table on page 5). The casing element, which remains embedded in the concrete, has a longitudinal series of indentations and strengthening grooves on the back and sides. The sacrificial lid is supplied in a green PVC material.



Heavy dimpling

Fabricated from galvanised steel sheet, to bespoke widths and depths to suit application need. The casing element, which remains embedded in the concrete, is indented across its entire surface area (i.e. base and sides). The sacrificial lid is normally supplied in light-gauge steel. This casing style is prefixed with an 'M' (e.g. see lower-half of table on page 5).

Straightening of bars

Reinforcement should only be straightened when the temperature of the steel is 5°C or above. Where the temperature of the reinforcement is below 5°C, reinforcement may be indirectly warmed to a temperature not exceeding 100°C but no form of direct heat treatment should be applied to the reinforcement.

The available straightening tool (see below) enables the connection legs to be straightened correctly and efficiently.

The use of other implements (e.g. hammers/scaffold tubes) could result in unacceptable work hardening of the reinforcement or adversely kinked starter bars that may adversely affect performance of the system.



The straightening tool is a steel tube with a specially shaped end and an internal diameter only slightly greater than the diameter of the bar to be straightened. The tube wall thickness adequately ensures that the tube will not flex under load. The length of the tube provides adequate leverage to eliminate undesirable 'jerky' movements.

The tube should be placed over the full length of the bar and located at the start of the bend (Fig.2 page 3). The end of the tube is specially shaped (see left) in order to minimise undesirable point contact of the tube on the bar and, more importantly, to provide continuous support to the outside of the bend during straightening.

The straightening operation should be smooth and progressive and the tube must be allowed to continuously 'slip' around the bend as it becomes straightened, so in its final 'rest' position, the tube should be in contact with the interface of the embedded case and the bar now projecting from it.

The tube should then be withdrawn and the bar checked for suitable alignment through the joint with due consideration to the intended concrete cover.

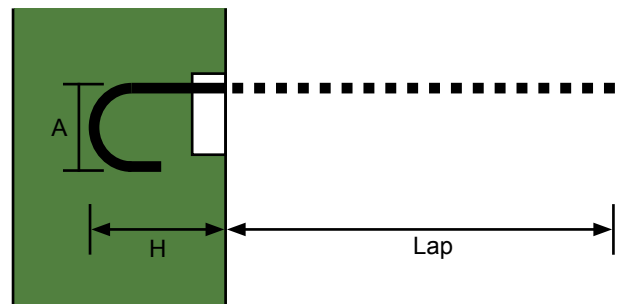
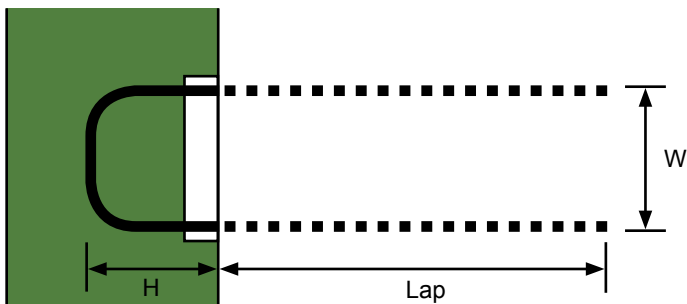
FERBOX® "off-the-shelf" range



Ordering reference	Casing				Reinforcement						Weight per unit (kg)
	Abbreviated*	Length (metres)	Width (mm)	Depth (mm)	Dimpling style	Type & Dia	Centres C (mm)	H (mm)	W (mm)	Lap L (mm)	
HB14S B12 C150	1.25	145	40	Light	B12	150	170	120	500	-	12.3
HB14S B12 C200	1.25	145	40	Light	B12	200	170	120	500	-	9.7
HB16S B12 C150	1.25	165	40	Light	B12	150	170	140	500	-	12.7
HB16S B12 C200	1.25	165	40	Light	B12	200	170	140	500	-	10.1
HB18S B12 C150	1.25	185	40	Light	B12	150	170	160	500	-	13.0
HB18S B12 C200	1.25	185	40	Light	B12	200	170	160	500	-	10.4
HB20S B12 C150	1.25	205	40	Light	B12	150	170	180	500	-	13.3
HB20S B12 C200	1.25	205	40	Light	B12	200	170	180	500	-	10.6
HB22S B12 C150	1.25	225	40	Light	B12	150	170	200	500	-	13.6
HB22S B12 C200	1.25	225	40	Light	B12	200	170	200	500	-	10.9
M19D B16 C150	1.20	190	50	Heavy	B16	150	170	170	600	-	23.7
M19D B16 C200	1.20	190	50	Heavy	B16	200	170	170	650	-	19.5
M22D B16 C150	1.20	220	50	Heavy	B16	150	170	200	650	-	25.7
M22D B16 C200	1.20	220	50	Heavy	B16	200	170	200	650	-	20.0
M24D B16 C150	1.20	240	50	Heavy	B16	150	170	220	650	-	26.1
M24D B16 C200	1.20	240	50	Heavy	B16	200	170	220	650	-	20.4
M24S B12 C150	1.20	240	35	Heavy	B12	150	170	220	500	-	13.8
M24S B12 C200	1.20	240	35	Heavy	B12	200	170	220	500	-	11.2
M9S B12 C150	1.20	90	35	Heavy	B12	150	170	-	500	100	7.0
M9S B12 C200	1.20	90	35	Heavy	B12	200	170	-	500	100	5.7
M11D B16 C150	1.20	110	50	Heavy	B16	150	170	-	650	130	14.1
M11D B16 C200	1.20	110	50	Heavy	B16	200	170	-	650	130	11.1

*It is possible to provide an extended order reference (optional) by simply including the H/W/L details after the abbreviated reference. eg. HB14S B12 C150 H170 W120 L500

Abbreviated Optional





Scheduling specials

In response to market need, we have developed a manufacturing commitment towards 'specials', to the extent that 'specials are our standard'. Specials are therefore cost-effective and proportionately carry little or no premium. Delivery lead times are variable according to complexity and/or quantity, but are typically 4-5 working days.

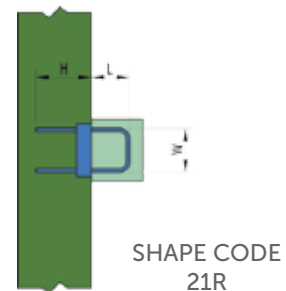
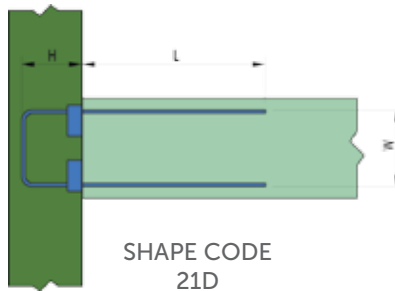
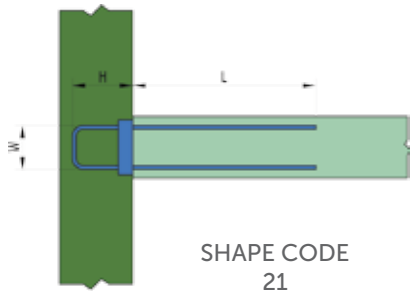
In theory, any of the following bar shapes can be supplied in bar diameters 10, 12 and 16mm. To relay requirements for our appraisal, select the required bar shape configuration, then refer to the Scheduling Form on page 8 (also available to download from jp-uk.com), the footer of which contains supporting notes for its completion.

There are two basic approaches to completing the form; the first (using columns 3, 4 and 5) is to

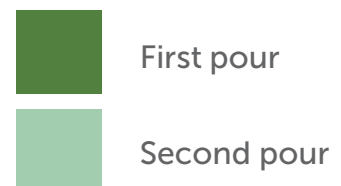
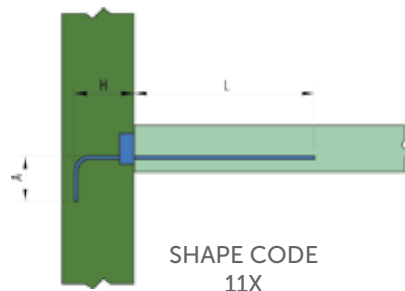
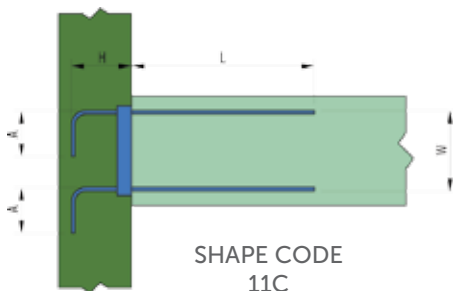
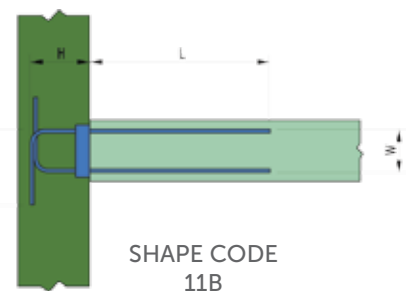
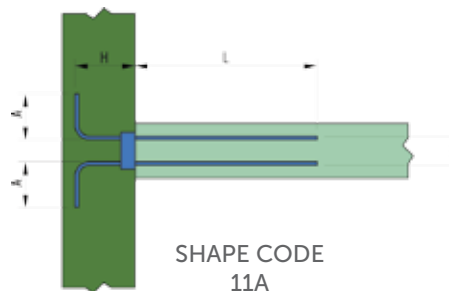
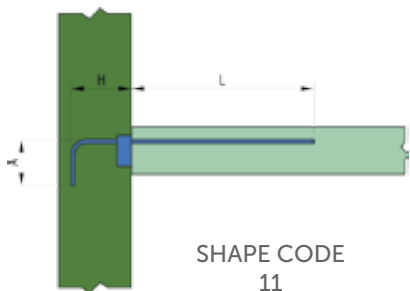
provide the number of structural members and the quantity of bars in each. From this information, J&P then optimises the individual casing lengths to satisfy the number of bars required. The second option is to schedule the quantity and preferred casing lengths, with quantity of bars in each (using columns 13, 14 and 15). However, if using this latter option, please give due consideration to minimum casing lengths, as a rule of thumb being twice the required lap length.

A professional labelling system complements the system and ensures correct positioning on site, so don't forget to add preferred labelling requirements (using column 16). Finally, please bear in mind the geometrical limitations regarding lap lengths, as explained on page 9.

Shape '21' variants

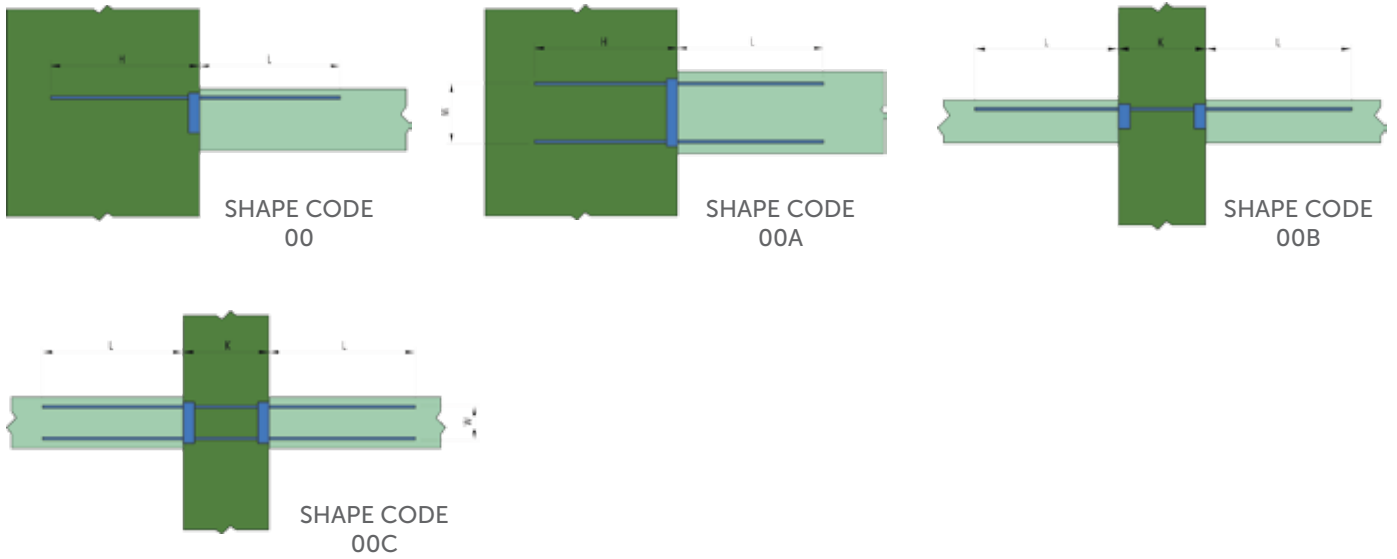


Shape '11' variants

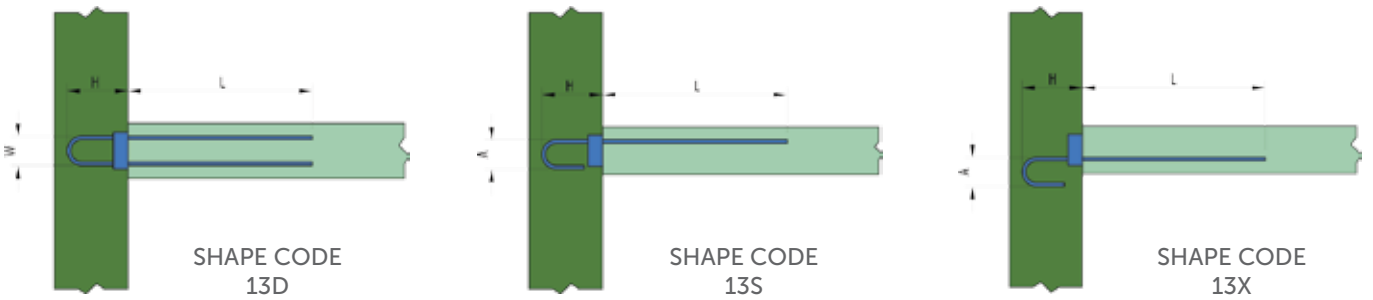




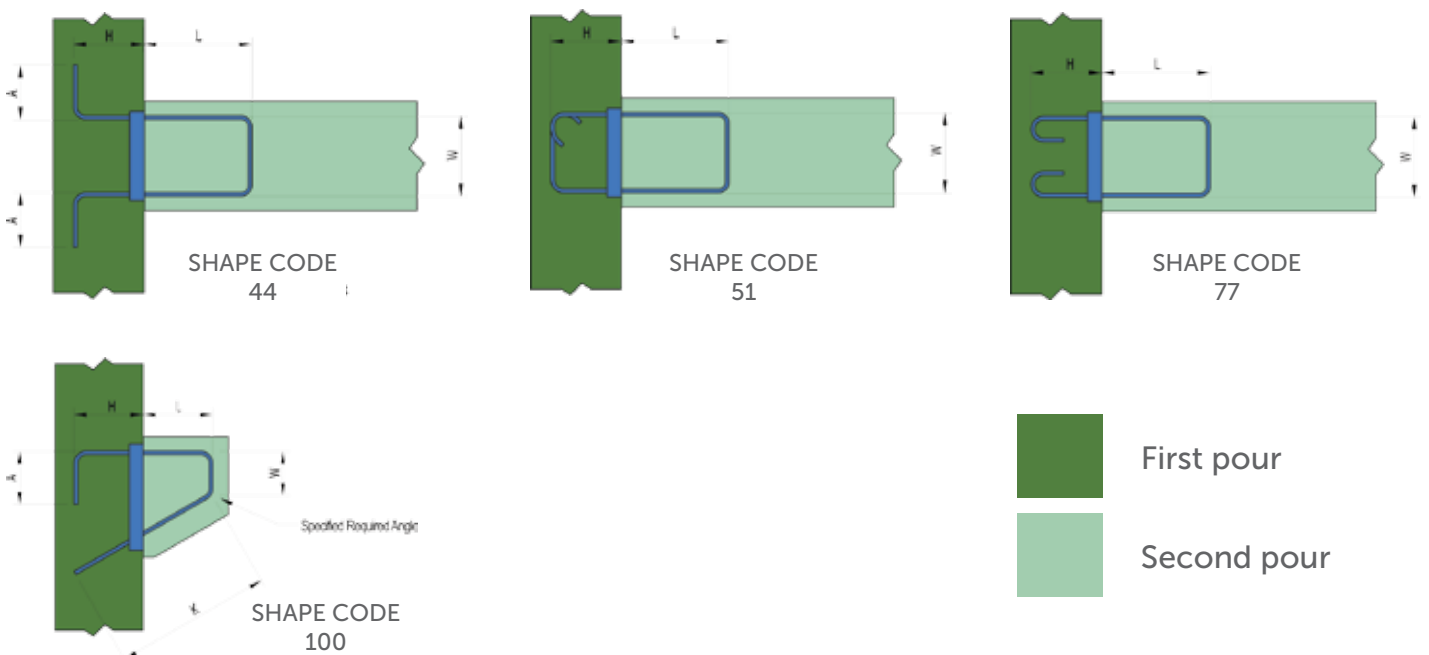
Shape '00' variants



Shape '13' variants



Pull-out 'link' variants



FERBOX® Scheduling Form



Contractor _____
Project _____
Drwg No(s). _____
Schedule Ref. _____

By _____
Date _____
Phone _____
Email _____

J&P Building Systems Ltd
Phone: 01844 215200
Fax: 01844 263257
sales@jp-uk.com



Note	Line Ref.	Bar Shape	Bar Mark	Qty of Mbrs.	Qty Bars Per Mbr.	Qty Bars Total	Bar Type & Dia.	Bar Centres	H	W	L	A	K	Preferred Casings (optional)		Labelling Requirements
														Qty	Length	
e.g.	21	104		2	26	52	B12	150	250	200	600	—	—	ONLY USE IF COLUMNS 3,4&5 NOT USED		As required
A																
B																
C																
D																
E																
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Supporting Notes (corresponding to numbers above each column heading)

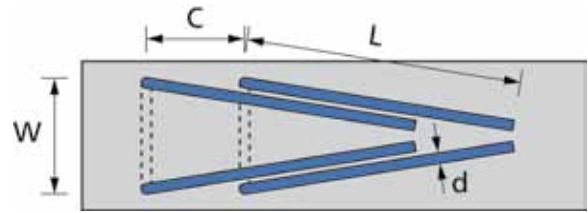
1. As per FERBOX bar shapes.	9. Overall bar width (for relevant bar shapes).
2. Optionally state bar mark per drawing.	10. The pull-out lap length (housed inside casing).
3. Number of concrete members (not cases).	11. Ninety degree bobbed-leg (for relevant shapes).
4. If 'paired' bar shapes, qty means qty of pairs.	12. Definition varies according to bar shape (rarely used).
5. Extended qty of bars.	13, 14 & 15 From bar qty info (col 4) and bar centres/lap info (col 7 & 10) J&P will calculate optimum casing qty and dims. Alternatively, state your own preference (cols 13, 14 & 15) for J&P's practicality review.
6. Ductility class (normally B) followed by bar diameter.	16. Suggest keep labelling concise for easy recognition on-site.
7. Bar centres/spacings along length of joint.	
8. Depth of anchorage into first concrete pour.	

Special note regarding mandrel diameters: In all cases, the bends which are to be rebent on site, unless otherwise instructed, will be formed using 6X (minimum) mandrels in accordance with established mechanical performance testing and safe practice. Unless otherwise instructed, the anchorage bends (i.e. those embedded in the first concrete element and not rebent) will be formed using 4X (minimum) mandrels as required by EC2 clause 8.3 (and its effective cross-reference to the local UK bending standard BS8666) to avoid damage to the reinforcement. Regarding the performance requirements of anchorage bends, EC2 clauses 8.3 and 8.4 (particularly bond and bearing stress) should be considered by the structural engineer, to determine whether a larger mandrel diameter should be specified to avoid damage to the concrete within the bends (6X is the normal practical limit).

FERBOX® lap length guidance



The geometrical relationship between bar diameter, width and centres ('d', 'W' and 'C' on sketch) dictate space available (within the casing) to accommodate lap legs ('L'). Non-preferred lap lengths are shown 'greyed-out' (mathematically possible, but impractical to manufacture and handle).



Bar 'd' 12		Bar centres 'C' (along casing length) in mm									
		75	100	125	150	175	200	225	250	275	300
Overall width of bars ('W' dimension) in mm	50	75	100	125	150	180	205	230	255	280	305
	60	105	140	175	210	245	285	320	355	390	425
	70	135	180	225	270	315	360	410	455	500	545
	80	165	220	275	330	385	440	495	550	610	665
	90	195	260	325	390	455	520	585	650	715	780
	100	225	300	375	450	525	600	675	750	825	900
	110	255	340	425	510	595	680	765	850	935	1020
	120	285	380	475	570	665	760	855	950	1045	1140
	130	315	420	520	625	730	835	940	1045	1150	1255
	140	340	455	570	685	800	915	1030	1145	1260	1375
	150	370	495	620	745	870	995	1120	1245	1370	1495
	160	400	535	670	805	940	1075	1210	1345	1480	1615
	170	430	575	720	865	1010	1155	1300	1445	1585	1730
	180	460	615	770	925	1080	1235	1385	1540	1695	1850
	190	490	655	820	985	1150	1310	1475	1640	1805	1970
	200	520	695	870	1045	1215	1390	1565	1740	1915	2090
	210	550	735	920	1100	1285	1470	1655	1840	2025	2205
	220	580	775	970	1160	1355	1550	1745	1940	2130	2325
	230	610	815	1015	1220	1425	1630	1835	2035	2240	2445
	240	640	855	1065	1280	1495	1710	1920	2135	2350	2565
250	670	895	1115	1340	1565	1785	2010	2235	2460	2680	
260	700	930	1165	1400	1635	1865	2100	2335	2565	2800	
270	730	970	1215	1460	1700	1945	2190	2430	2675	2920	
280	760	1010	1265	1520	1770	2025	2280	2530	2785	3040	
290	790	1050	1315	1575	1840	2105	2365	2630	2895	3155	
300	815	1090	1365	1635	1910	2185	2455	2730	3000	3275	

Bar 'd' 16		Bar centres 'C' (along casing length) in mm									
		75	100	125	150	175	200	225	250	275	300
Overall width of bars ('W' dimension) in mm	50	40	50	65	80	90	105	120	130	145	160
	60	60	80	100	125	145	165	185	205	225	245
	70	85	110	140	165	195	225	250	280	310	335
	80	105	140	175	210	245	285	320	355	390	425
	90	125	170	215	255	300	340	385	430	470	515
	100	150	200	250	300	350	400	450	505	555	605
	110	170	230	285	345	405	460	520	575	635	695
	120	195	260	325	390	455	520	585	650	715	780
	130	215	290	360	435	505	580	655	725	800	870
	140	240	320	400	480	560	640	720	800	880	960
	150	260	350	435	525	610	700	785	875	960	1050
	160	285	380	475	570	665	760	855	950	1045	1140
	170	305	410	510	615	715	815	920	1020	1125	1225
	180	330	435	545	655	765	875	985	1095	1205	1315
	190	350	465	585	700	820	935	1055	1170	1290	1405
	200	370	495	620	745	870	995	1120	1245	1370	1495
	210	395	525	660	790	925	1055	1185	1320	1450	1585
	220	415	555	695	835	975	1115	1255	1395	1535	1670
	230	440	585	735	880	1025	1175	1320	1470	1615	1760
	240	460	615	770	925	1080	1235	1385	1540	1695	1850
250	485	645	805	970	1130	1290	1455	1615	1780	1940	
260	505	675	845	1015	1185	1350	1520	1690	1860	2030	
270	530	705	880	1060	1235	1410	1590	1765	1940	2120	
280	550	735	920	1100	1285	1470	1655	1840	2025	2205	
290	570	765	955	1145	1340	1530	1720	1915	2105	2295	
300	595	795	995	1190	1390	1590	1790	1985	2185	2385	



Radius & PENTAFLEX® options

Radius options

If the radius is large enough, FERBOX can sometimes be used in its normal straight form and installed in a faceted manner. If a faceted approach doesn't suit, FERBOX can be factory-radiused in either of the planes shown (Fig.1).

According to the size of the radius, during manufacture, we will snip the casing sides at appropriate intervals along its length, to allow the casing to 'flex' to the formwork radius. For small radii, it may additionally be necessary to put a 'crank' (or two) in the lap legs during manufacture, although this inevitably leads to additional rebending on site.

In FERBOX terminology, if the lid is concave (i.e. the lap legs will be bent-out towards the inner radius), we refer to this as 'RC' (radius concave). If the lid is convex (i.e. the lap legs will be bent-out towards the outer radius), we refer to this as 'RV'. Please supplement RC or RV with the desired radius in metres, e.g. 'RC 6.5m'.

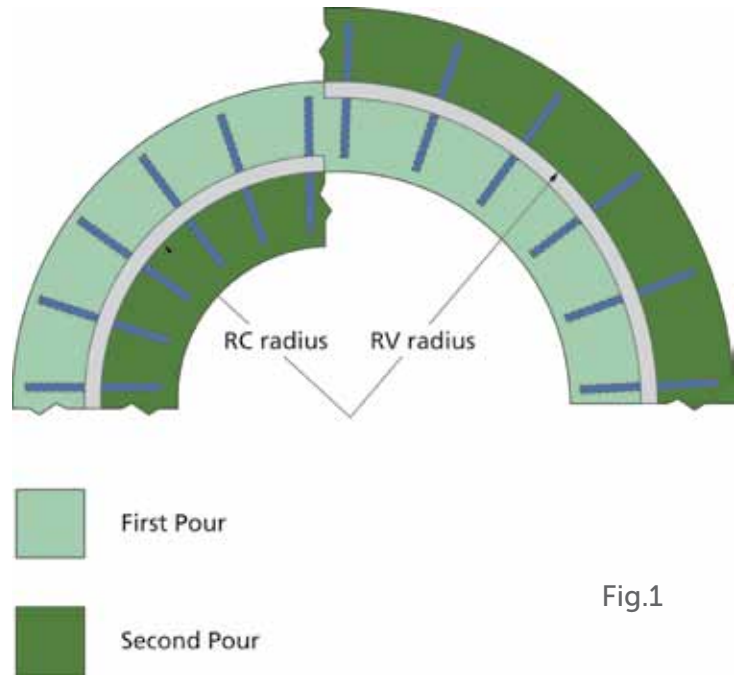
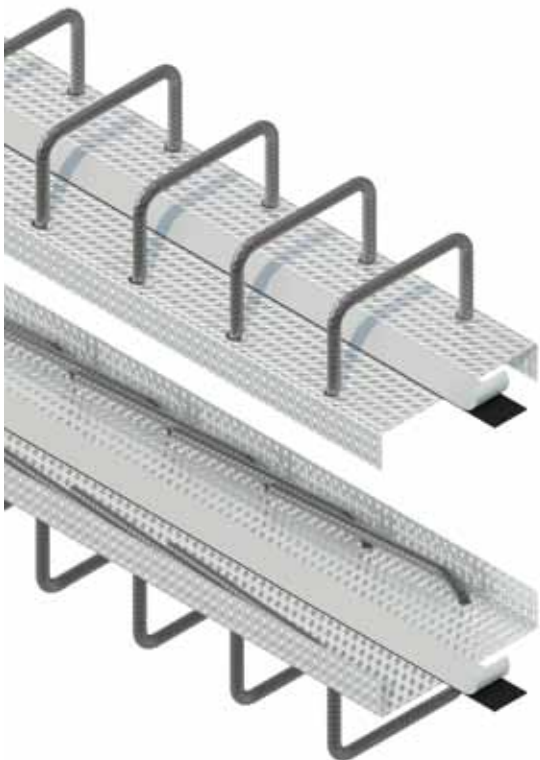


Fig.1



PENTAFLEX® water sealing option

In water retaining applications. e.g. STW/WWTW projects, FERBOX is popularly used for the connection of chamber walls, slabs and overflow channels. In these situations, the FERBOX casing is sometimes regarded as a potential waterline through the construction joint. For reassurance, we can factory-fit the H-BAU PENTAFLEX sealing system. This is a high-tack bitumen-based tape which runs full-length of the casing, with surplus 'tails' which, to maintain a continuous seal, are lapped on site wherever the cases abut one another.

PENTAFLEX is non-reliant on expansion and adheres to fresh concrete in a composite action. Being non-reliant on expansion also means it can be left open to the elements without concern for its performance once embedded in the concrete.

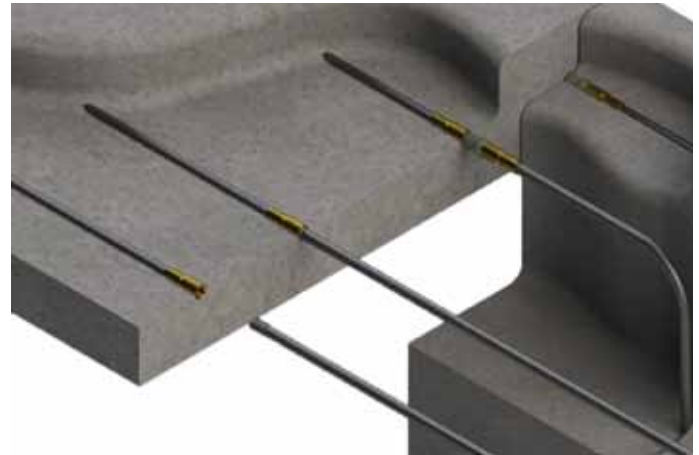
PENTAFLEX is endorsed by a German technical approval for use in potable water applications.

PH reinforcement couplers



To complement FERBOX, J&P also provide the PH Reinforcement Continuity System from PFEIFER, which provides secure, cost-effective connections at designed construction joints.

The system comprises a female socket bar which is factory-swaged to the parent reinforcement. This is internally threaded to accept the male connection bar, which has a hot-forged 'upset' end onto which a thread is rolled. As the thread diameter of each component is greater than the parent reinforcement, the coupled arrangement maintains the core diameter of the parent reinforcement and carries 100% of the tension or compression load expected of it.



Technical

German Institute of Construction Technology
general technical approval no. Z-1.5-226.

Material

- Reinforcing steel grade B500B to DIN 488.

Available lengths

- Standard from 400mm - 3.6m, available in bar diameters from 8 - 40 mm. Custom lengths on request.

Where bent bars make it impossible to rotate/thread the bars together, J&P can provide a right-left threaded connecting bolt which facilitates connection without the need to rotate the reinforcement.



Advantages

- Construction planning flexibility, enabling staggered concrete pours.
- Easy to handle PH female socket bars and male connection bars (easy to handle, fix and rotate by one person).
- Flexibility of lapped connections to main (loose) reinforcement (no need for starter bars to exceed minimum anchorage and lap lengths).
- Flexibility to accommodate bar diameter reductions at coupled zones (via special PH reducing sockets and bolts).
- Security of full-load transmission (tension & compression) through coupled connections.



Focused on construction solutions for keynote projects in the UK and Worldwide



J-UK **BALCON™**

Adjustable and insulated steel balcony connections




ISOPRO®

Insulated concrete balcony connections



JTA ANCHOR CHANNEL

For adjustable curtain wall connections



PENTAFLEX®

Concrete waterproofing systems



COLUMN SHOES

High-load connections for precast columns



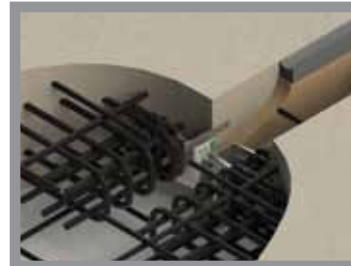
JDA

Punching shear reinforcement for concrete columns



IC **RVK/TSS**

Invisible connections for precast stair landings



JSD+

Shear dowels for concrete movement joints



FERBOX®

Reinforcement continuity strip for in-situ connections



RAPIDOBAT®

Seamless column formwork for quality architectural concrete

