

# Prestressed Lintels

CI/SfB	31.9

**NAYLOR**  
L I N T E L S

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NAYLOR SPECIALIST LINTELS

## **SPECIFIERS' HANDBOOK**

JANUARY 2006



INVESTOR IN PEOPLE



Certificate No. FM40598



# **NAYLOR LINTELS**

## **SPECIFIERS' HANDBOOK**

This technical handbook has been prepared to assist in the specification of Naylor Lintels. Should any further technical information be required please contact our freephone technical hotline on **0800 542 4192**, or email **technical@naylor.co.uk**

Drawings may be emailed direct to **specifications@naylor.co.uk**

Naylor Lintels can be specified directly from NBSPlus Clause F30:740

A free design and technical service is available and advice is gladly given for particular requirements and applications. Lintels schedules and calculations can be provided from working drawings. We have both office based and external technical personnel able to answer queries and provide specialist knowledge.

Canary Wharf

**Free Technical Hotline 0800 5424192 [www.naylorlintels.co.uk](http://www.naylorlintels.co.uk)**

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# Technical Definitions

## Explanations of Technical Data Sheet

Ms	Serviceability Moment of Resistance.
Mu	Ultimate Moment of Resistance.
MU/1.5	Where separate values of live and dead loads are not known a partial safety factor may be used when checking against unfactored loads.
Limiting MR	This is the lowest value of Ms & MU/1.5. Used to generate load span tables.
VCO100	Ultimate Shear Capacity of the section for 100mm Bearing.
VCO100/1.5	Ultimate Shear Capacity divided by a partial safety factor for 100mm bearing.
VCO150	Ultimate Shear Capacity of the section for 150mm bearing.
VCO150/1.5	Ultimate Shear Capacity divided by a partial safety factor for 150mm bearing.
VCO200	Ultimate Shear Capacity of the section for 200mm bearing.
VCO200/1.5	Ultimate Shear Capacity divided by a partial safety factor for 200mm bearing.
Effective Depth	Depth to centroid of strand(s) from top of lintel, used to determine effective span.
Self Weight	Weight per linear metre of lintel.
(A)	Allowable load calculated from Limiting MR minus self weight.
(B)	Allowable load calculated from shear resistance with 100mm or 150mm bearing.
(C)	Lowest of (A) or (B)

# Quality Standards

The design of Naylor prestressed concrete lintels complies with BS8110: part 1:1997: section 4.

Naylor lintels are manufactured in accordance with BSEN845: part 2:2003.

Materials used in the manufacture of Naylor prestressed lintels comply with BSEN206 and BS8500.

The prestressing strand/wire complies with BS5896.

Naylor lintels have a low water absorption and as a result of the quality controlled hi-spec dense concrete mix used in their manufacture, they can therefore be used underground provided that the ends of the lintels have a minimum 45mm cover of mortar to the ends of the reinforcing strands.

L-Strip lintels are manufactured from steel strip complying with BSEN10025 with the minimum yield stress of 275 N/mm<sup>2</sup>. Zinc coating is galvanised to BS2989Z2. L-Strip is also produced in austenitic stainless steel conforming to grade 304:S15:BS1449: part 2.

## Lengths

Naylor lintels are available as standard in lengths from 600mm to 3600mm. Longer and intermediate lengths are available on request.

## Scope of Manufacture

Limitations      Weight    max 4 tonne  
                         Width     max 2 metre

Fixings, channels, inserts etc can easily be accommodated.

## Load Bearing

Lintels are usually supplied with the following allowances for bearing at each end:

100mm for openings up to/including 1000mm

150mm for openings up to/including 3000mm

200mm for openings over 3000mm.

It is however, the responsibility of the building designer to ensure that these are sufficient to avoid over-stressing the masonry at the supports.

## Typical Projects

Typical projects where Naylor lintels are specified and used include: hospitals, schools, nursing homes, sheltered and student accommodation, flats, offices, industrial developments and sports stadia.

## New Regulations

Implementation of the amendments to Parts E and L of the building regulations came into force in 2002. Amongst the new measures it is required that the thermal bridging and fabric insulation be improved (Part L) and the Resistance to Sound Reverberation, especially at low frequencies, required (Part E) be increased.

**Compliance with the new requirements can easily be achieved using our HI-SPEC range of lintels and L-STRIP.**

## SPECIALIST LINTELS



**FAIR FACED RANGE** A range of lintels with the same high performance characteristics as the Hi-Spec Range.

**FINISH** Type 'C' fair faced finish.

To specify units from this range, prefix the Hi-Spec reference with the word 'Faced'. **Example: FacedS5**



**FIRE-SPEC RANGE** A range of lintels available with fire resistance of up to 2 hours as standard. For fire resistance of over 2 hours, please contact our technical department.

**FINISH** Ex-steel mould.

To specify units from this range, prefix the Hi-Spec reference with the word 'Fire'. **Example: FireS5**



**FAIR FACED FIRE-SPEC RANGE** A range of fair faced (type C finish) lintels available with fire resistance of up to 2 hours. For fire resistance of over 2 hours, please contact our technical department.

**FINISH** Ex-steel mould.

To specify units from this range, prefix the Hi-Spec reference with the word 'Faced Fire'.

**Example: FacedFireS5**



**COLOUR-SPEC RANGE** A range of lintels colour washed to suit particular site requirements. The wash acts as a stain, penetrating the concrete surface and equalizing colour variations. It has a proven long life finish, reduces surface dusting and increases light reflectivity. Colour-Spec lintels have the same high performance characteristics as the Hi-Spec Range.

**FINISH** Type 'C' fair faced finish with a colour wash.

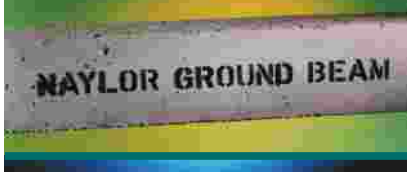
To specify units from this range, prefix the Hi-Spec reference with the word 'Colour'. **Example: ColourS5**



**CHEM-SPEC RANGE** Lintels containing additives for withstanding aggressive conditions such as for use in contaminated land. Typical contaminants may include sulphates, lead, petrochemicals, etc.

**FINISH** As Hi-Spec Range.

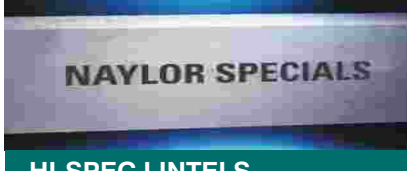
To specify units from this range, prefix the Hi-Spec reference with the word 'Chem'. **Example: ChemS5**



**GROUND BEAMS** Naylor lintels are suitable for use as Ground Beams. They may be built directly off pad foundations, regardless of ground conditions.

**FINISH** As Hi-Spec Range.

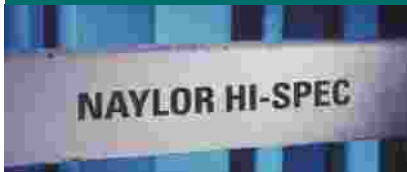
To specify units from this range, prefix the Hi-Spec reference with the word 'Ground'. **Example: GroundS5**



**SPECIALS SERVICE** A speedy and efficient service offering solutions to difficult site situations. Examples include large and unusual shaped sections, lintels with inserts cast in and units with chamfers and notches. Individual performance calculations are available upon request.

To specify units please contact our technical/sales office.

## HI-SPEC LINTELS



**HI-SPEC LINTEL RANGE** Naylor Hi-Spec lintels are the most widely specified range of prestressed concrete lintels in the country. The system comprises a range of high performance prestressed concrete units and steel front trays.

**FINISH** Ex-steel mould. Possibility of air holes, small amounts of aggregates on the surfaces and seepage of concrete fines to the bottom arrises. Ideally suited to plastered finishes, not exposed situations - see Fair Faced-Strip.

To specify units from this range, use the Hi-Spec references on the load tables. **Example: S5**



**L-STRIP STEEL FRONT LINTEL RANGE** L-Strip is available in either stainless (prefix LS) or galvanised steel (prefix LG) and is also available with a wider flange suitable for stonework outer leaf. It is designed for use independently in traditional or timber framed construction. Special sections available on request.

To specify units from this range, please use the references as shown on the tables.

## ECONOMY LINTELS



**ECONOMY LINTEL RANGE** A cost effective range of lintels for stockists, all fully reversible and available in packs for ease of handling/ordering. All Economy Lintels are suitable for use with L-Strip.

**FINISH** Ex-steel mould. Possibility of air holes, small amounts of aggregates on the surfaces and seepage of concrete fines to the bottom arrises.

To specify units from this range, use the Economy references on the load tables. **Example: ER1**

## PADSTONES



**PADSTONES RANGE** A comprehensive range of dense concrete padstones including non standard sections and profiles which are available upon request.

**P100**

ChemP100

Section Properties	
Height	70mm
Width	100mm
Ms	1.092 kNm
Mu	1.832 kNm
MU/1.5	1.221 kNm
Limiting Mr	1.092 kNm
Vco 100	14.15 kN
Vco 100/1.5	9.45 kN
Vco 150	15.33 kN
Vco 150/1.5	10.22 kN
Effective Depth	40mm
Self Weight	17 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m				
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)	
900	700	740	17.67	25.53		17.67	
1100	900	940	10.89			10.89	
1200	1000	1040	8.86			8.86	
1500	1200	1240	6.18			6.18	
1800	1500	1540	3.95			3.95	
2100	1800	1840	2.72			2.72	
2400	2100	2140	1.96			1.96	
2700	2400						
3000	2700						
3300	3000						
3600	3200						

**S4**

FacedS4  
ChemS4  
ColourS4

Section Properties	
Height	110mm
Width	100mm
Ms	2.815 kNm
Mu	5.525 kNm
MU/1.5	3.683 kNm
Limiting Mr	2.815 kNm
Vco 100	20.21 kN
Vco 100/1.5	13.47 kN
Vco 150	21.39 kN
Vco 150/1.5	14.26 kN
Effective Depth	80mm
Self Weight	26 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m				
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)	
900	700	780	36.75	34.27		34.27	
1100	900	980	23.18	27.22		23.18	
1200	1000	1080	19.04			19.04	
1500	1200	1280	13.48			13.48	
1800	1500	1580	8.75			8.75	
2100	1800	1880	6.10			6.10	
2400	2100	2180	4.47			4.47	
2700	2400	2480	3.39			3.39	
3000	2700	2780	2.64			2.64	
3300	3000						
3600	3200						

**R6**

FacedR6  
ChemR6  
ColourR6  
GroundR6

Section Properties	
Height	145mm
Width	100mm
Ms	5.564 kNm
Mu	9.609 kNm
MU/1.5	6.406 kNm
Limiting Mr	5.564 kNm
Vco 100	30.46 kN
Vco 100/1.5	20.31 kN
Vco 150	32.28 kN
Vco 150/1.5	21.52 kN
Effective Depth	95mm
Self Weight	35 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m				
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)	
900	700	795	70.07	50.74		50.74	
1100	900	995	44.61	40.47		40.47	
1200	1000	1095	36.77	36.74		36.74	
1500	1200	1295	26.19		32.88	26.19	
1800	1500	1595	17.14			17.14	
2100	1800	1895	12.04			12.04	
2400	2100	2195	8.89			8.89	
2700	2400	24.95	6.80			6.80	
3000	2700	2795	5.34			5.34	
3300	3000	3095	4.29			4.29	
3600	3200	3295	3.75			3.75	

**R9**

215  
100

50, 50  
70  
30  
30

FacedR9  
ChemR9  
ColourR9  
GroundR9

Section Properties	
Height	215mm
Width	100mm
Ms	12.396 kNm
Mu	23.867 kNm
MU/1.5	15.912 kNm
Limiting Mr	12.396 kNm
Vco 100	47.22 kN
Vco 100/1.5	31.48 kN
Vco 150	49.39 kN
Vco 150/1.5	32.93 kN
Effective Depth	141.67mm
Self Weight	52 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m			Limiting (C)
				SR100 (B)	SR150 (B)		
900	700	800	154.43	78.18			78.18
1100	900	1000	98.65	62.44			62.44
1200	1000	1100	81.44	56.72			56.72
1500	1200	1341.67	54.57			48.57	48.57
1800	1500	1641.67	36.27			39.60	36.27
2100	1800	1941.67	25.78				25.78
2400	2100	2241.67	19.21				19.21
2700	2400	2541.67	14.83				14.83
3000	2700	2841.67	11.76				11.76
3300	3000	3141.67	9.53				9.53
3600	3200	3341.67	8.36				8.36

**R12**

290  
100

50, 50  
70  
30  
30

FacedR12  
ChemR12  
ColourR12  
GroundR12

Section Properties	
Height	290mm
Width	100mm
Ms	20.505 kNm
Mu	37.237 kNm
MU/1.5	24.825 kNm
Limiting Mr	20.505 kNm
Vco 100	60.45 kN
Vco 100/1.5	40.30 kN
Vco 150	62.33 kN
Vco 150/1.5	41.55 kN
Effective Depth	205mm
Self Weight	69 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m			Limiting (C)
				SR100 (B)	SR150 (B)		
900	700	800	255.61	100.05			100.05
1100	900	1000	163.34	79.90			79.90
1200	1000	1100	134.87	72.53			72.57
1500	1200	1350	89.31			60.85	60.85
1800	1500	1650	59.55			49.66	49.66
2100	1800	1950	42.44			41.91	41.91
2400	2100	2250	31.70			36.23	31.70
2700	2400	2550	24.53				24.53
3000	2700	2850	19.49				19.49
3300	3000	3150	15.83				15.83
3600	3200	3400	13.49				13.49

**P140**

70  
140

70, 70  
40  
30

ChemP140

Section Properties	
Height	70mm
Width	140mm
Ms	1.258 kNm
Mu	2.299 kNm
MU/1.5	1.533 kNm
Limiting Mr	1.258 kNm
Vco 100	18.32 kN
Vco 100/1.5	12.21 kN
Vco 150	19.65 kN
Vco 150/1.5	13.10 kN
Effective Depth	40mm
Self Weight	24 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m			Limiting (C)
				SR100 (B)	SR150 (B)		
900	700	740	18.14	32.76			18.14
1100	900	940	11.15				11.15
1200	1000	1040	9.06				9.06
1500	1200	1240	6.31				6.31
1800	1500	1540	4.00				4.00
2100	1800	1840	2.73				2.73
2400	2100	2140	1.96				1.96
2700	2400						
3000	2700						
3300	3000						
3600	3200						

**R3**

100  
140

FacedR3  
ChemR3  
ColourR3

Section Properties	
Height	100mm
Width	140mm
Ms	3.906 kNm
Mu	6.757 kNm
MU/1.5	4.505 kNm
Limiting Mr	3.906 kNm
Vco 100	28.51 kN
Vco 100/1.5	19.00 kN
Vco 150	30.52 kN
Vco 150/1.5	20.34 kN
Effective Depth	67.5mm
Self Weight	34 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	767.5	52.71	49.17		49.17
1100	900	967.5	33.04	38.94		33.04
1200	1000	1067.5	27.08			27.08
1500	1200	1267.5	19.11			19.11
1800	1500	1567.5	12.38			12.38
2100	1800	1867.5	8.62			8.62
2400	2100	2167.5	6.31			6.31
2700	2400	2467.5	4.79			4.79
3000	2700	2767.5	3.74			3.74
3300	3000					
3600	3200					

**FireR3**  
**FacedFireR3**  
1.0 Hr

100  
140

Section Properties	
Height	100mm
Width	140mm
Ms	2.926 kNm
Mu	4.916 kNm
MU/1.5	3.277 kNm
Limiting Mr	2.926 kNm
Vco 100	29.19 kN
Vco 100/1.5	19.46 kN
Vco 150	31.30 kN
Vco 150/1.5	20.87 kN
Effective Depth	55mm
Self Weight	34 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	755	40.72	51.21		40.72
1100	900	955	25.32			25.32
1200	1000	1055	20.69			20.69
1500	1200	1255	14.52			14.52
1800	1500	1555	9.34			9.34
2100	1800	1855	6.46			6.46
2400	2100	2155	4.70			4.70
2700	2400	2455	3.54			3.54
3000	2700	2755	2.74			2.74
3300	3000					
3600	3200					

**FireR3**  
**FacedFireR3**  
1.5 Hr

100  
140

Section Properties	
Height	100mm
Width	140mm
Ms	1.455 kNm
Mu	
MU/1.5	
Limiting Mr	1455 kNm
Vco 100	24.66 kN
Vco 100/1.5	16.44 kN
Vco 150	26.06 kN
Vco 150/1.5	17.37 kN
Effective Depth	40mm
Self Weight	34 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	740	20.92	44.09		20.92
1100	900	940	12.83			12.83
1200	1000	1040	10.42			10.42
1500	1200	1240	7.23			7.23
1800	1500	1540	4.57			4.57
2100	1800	1840	3.10			3.10
2400	2100	2140	2.20			2.20
2700	2400	2440	1.61			1.61
3000	2700	2740	1.21			1.21
3300	3000					
3600	3200					

**S5**

140  
140

70, 70  
50  
30

FacedS5  
ChemS5  
ColourS5  
GroundS5

Section Properties	
Height	140mm
Width	140mm
Ms	6.349 kNm
Mu	11.976 kNm
MU/1.5	7.984 kNm
Limiting Mr	6.349 kNm
Vco 100	38.04 kN
Vco 100/1.5	25.36 kN
Vco 150	40.14 kN
Vco 150/1.5	26.76 kN
Effective Depth	95mm
Self Weight	47 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	795	79.89	63.32		63.32
1100	900	995	50.83	50.50		50.50
1200	1000	1095	41.89	45.84		41.89
1500	1200	1295	29.81			29.81
1800	1500	1595	19.49			19.49
2100	1800	1895	13.67			13.67
2400	2100	2195	10.07			10.07
2700	2400	2495	7.68			7.68
3000	2700	2795	6.03			6.03
3300	3000	3095	4.83			4.83
3600	3200	3295	4.20			4.20

**FireS5  
FacedFireS5  
1.0 Hr**

140  
140

Section Properties	
Height	140mm
Width	140mm
Ms	6.349 kNm
Mu	11.976 kNm
MU/1.5	7.984 kNm
Limiting Mr	6.349 kNm
Vco 100	38.04 kN
Vco 100/1.5	25.36 kN
Vco 150	40.14 kN
Vco 150/1.5	26.76 kN
Effective Depth	95mm
Self Weight	47 kg/m

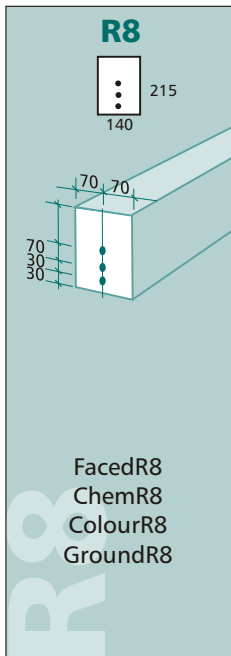
LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	795	79.89	63.32		63.32
1100	900	995	50.83	50.50		50.50
1200	1000	1095	41.89	45.84		41.89
1500	1200	1295	29.81			29.81
1800	1500	1595	19.49			19.49
2100	1800	1895	13.67			13.67
2400	2100	2195	10.07			10.07
2700	2400	2495	7.68			7.68
3000	2700	2795	6.03			6.03
3300	3000	3095	4.83			4.83
3600	3200	3295	4.20			4.20

**FireS5  
FacedFireS5  
1.5 Hr**

140  
140

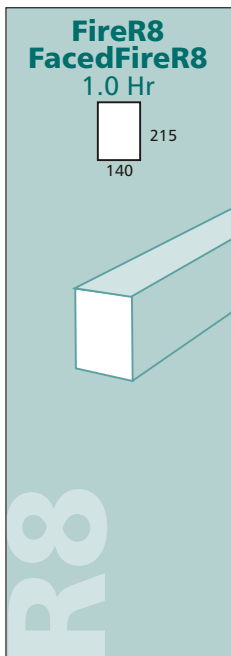
Section Properties	
Height	140mm
Width	140mm
Ms	3.444 kNm
Mu	5.989 kNm
MU/1.5	3.993 kNm
Limiting Mr	3.444 kNm
Vco 100	32.80 kN
Vco 100/1.5	21.86 kN
Vco 150	34.18 kN
Vco 150/1.5	22.79 kN
Effective Depth	80mm
Self Weight	47 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	780	44.81	55.58		44.81
1100	900	980	28.21			28.21
1200	1000	1080	23.15			23.15
1500	1200	1280	16.34			16.34
1800	1500	1580	10.56			10.56
2100	1800	1880	7.32			7.32
2400	2100	2180	5.32			5.32
2700	2400	24.80	4.00			4.00
3000	2700	2780	3.09			3.09
3300	3000	3080	2.43			2.43
3600	3200	3280	2.09			2.09



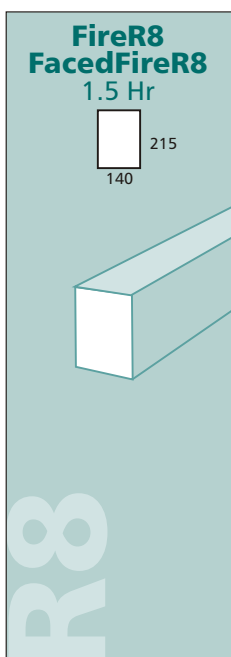
Section Properties	
Height	215mm
Width	140mm
Ms	14.259 kNm
Mu	25.71 kNm
MU/1.5	17.14 kNm
Limiting Mr	14.259 kNm
Vco 100	60.79 kN
Vco 100/1.5	40.52 kN
Vco 150	63.35 kN
Vco 150/1.5	42.23 kN
Effective Depth	141.67mm
Self Weight	72 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m				
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)	
900	700	800	177.51	100.57		100.57	
1100	900	1000	113.35	80.31		80.31	
1200	1000	1100	93.55	72.95		72.95	
1500	1200	1341.67	62.64		62.22	62.22	
1800	1500	1641.67	41.60		50.72	41.60	
2100	1800	1941.67	29.53			29.53	
2400	2100	2241.67	21.97			21.97	
2700	2400	2541.67	16.93			16.93	
3000	2700	2841.67	13.40			13.40	
3300	3000	3141.67	10.83			10.83	
3600	3200	3341.67	9.49			9.49	



Section Properties	
Height	215mm
Width	140mm
Ms	14.259 kNm
Mu	25.710 kNm
MU/1.5	17.140 kNm
Limiting Mr	14.259 kNm
Vco 100	60.79 kN
Vco 100/1.5	40.52 kN
Vco 150	63.35 kN
Vco 150/1.5	42.23 kN
Effective Depth	141.67mm
Self Weight	72 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m				
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)	
900	700	800	177.51	100.57		100.57	
1100	900	1000	113.35	80.31		80.31	
1200	1000	1100	93.55	72.95		72.95	
1500	1200	1341.67	62.64		62.22	62.22	
1800	1500	1641.67	41.60		50.72	41.60	
2100	1800	1941.67	29.53			29.53	
2400	2100	2241.67	21.97			21.97	
2700	2400	2541.67	16.93			16.93	
3000	2700	2841.67	13.40			13.40	
3300	3000	3141.67	10.83			10.83	
3600	3200	3341.67	9.49			9.49	



Section Properties	
Height	215mm
Width	140mm
Ms	12.257 kNm
Mu	20.619 kNm
MU/1.5	13.746 kNm
Limiting Mr	12.257 kNm
Vco 100	61.35 kN
Vco 100/1.5	40.90 kN
Vco 150	63.95 kN
Vco 150/1.5	42.63 kN
Effective Depth	126.67mm
Self Weight	73 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m				
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)	
900	700	800	152.49	101.52		101.52	
1100	900	1000	97.33	81.07		81.07	
1200	1000	1100	80.31	73.64		73.64	
1500	1200	1326.67	54.98		63.73	54.98	
1800	1500	1626.67	36.33			36.33	
2100	1800	1926.67	25.69			25.69	
2400	2100	2226.67	19.05			19.05	
2700	2400	2526.67	14.63			14.63	
3000	2700	2826.67	11.55			11.56	
3300	3000	3126.67	9.30			9.30	
3600	3200	3326.67	8.13			8.13	

**R11**

FacedR11  
ChemR11  
ColourR11  
GroundR11

Section Properties	
Height	290mm
Width	140mm
Ms	24.889 kNm
Mu	47.725 kNm
Mu/1.5	31.817 kNm
Limiting Mr	24.889 kNm
Vco 100	77.39 kN
Vco 100/1.5	51.59 kN
Vco 150	79.54 kN
Vco 150/1.5	53.03 kN
Effective Depth	216.67m
Self Weight	97.4 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m			Limiting (C)
				SR100 (B)	SR150 (B)		
900	700	800	310.13	128.00			128.00
1100	900	1000	198.13	102.20			102.20
1200	1000	1100	163.58	98.82			98.82
1500	1200	1350	108.27			77.58	77.58
1800	1500	1650	72.16			63.30	63.30
2100	1800	1950	51.38			53.41	51.38
2400	2100	2250	38.35				38.35
2700	2400	2550	29.64				29.64
3000	2700	2850	23.53				23.53
3300	3000	3150	19.09				19.09
3600	3200	3400	16.25				16.25

**FireR11  
FacedFireR11  
1.0 Hr**

Section Properties	
Height	290mm
Width	140mm
Ms	24.889 kNm
Mu	47.725 kNm
Mu/1.5	31.817 kNm
Limiting Mr	24.889 kNm
Vco 100	77.39 kN
Vco 100/1.5	51.59 kN
Vco 150	79.54 kN
Vco 150/1.5	53.03 kN
Effective Depth	216.67m
Self Weight	97.4 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m			Limiting (C)
				SR100 (B)	SR150 (B)		
900	700	800	310.13	128.00			128.00
1100	900	1000	198.13	102.20			102.20
1200	1000	1100	163.58	98.82			98.82
1500	1200	1350	108.27			77.58	77.58
1800	1500	1650	72.16			63.30	63.30
2100	1800	1950	51.38			53.41	51.38
2400	2100	2250	38.35				38.35
2700	2400	2550	29.64				29.64
3000	2700	2850	23.53				23.53
3300	3000	3150	19.09				19.09
3600	3200	3400	16.25				16.25

**FireR11  
FacedFireR11  
1.5 Hr**

Section Properties	
Height	290mm
Width	140mm
Ms	22.941 kNm
Mu	43.377 kNm
Mu/1.5	28.918 kNm
Limiting Mr	22.941 kNm
Vco 100	78.18 kN
Vco 100/1.5	52.12 kN
Vco 150	80.39 kN
Vco 150/1.5	53.59 kN
Effective Depth	200mm
Self Weight	97.4 kg/m

LOAD TABLE							
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m			Limiting (C)
				SR100 (B)	SR150 (B)		
900	700	800	285.78	129.32			129.32
1100	900	1000	182.55	103.26			103.26
1200	1000	1100	150.70	93.78			93.78
1500	1200	1350	99.72			78.41	78.41
1800	1500	1650	66.43			63.98	63.98
2100	1800	1950	47.29			53.99	47.29
2400	2100	2250	35.26				35.27
2700	2400	2550	27.25				27.25
3000	2700	2850	21.62				21.62
3300	3000	3150	17.52				17.52
3600	3200	3400	14.90				14.90

**P190**

ChemP190

Section Properties	
Height	70mm
Width	190mm
Ms	2.136 kNm
Mu	3.529 kNm
MU/1.5	2.353 kNm
Limiting Mr	2.136 kNm
Vco 100	27.29 kN
Vco 100/1.5	18.19 kN
Vco 150	29.52 kN
Vco 150/1.5	19.68 kN
Effective Depth	40mm
Self Weight	32 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		Limiting (C)
				SR100 (B)	SR150 (B)	
900	700	740	30.88	49.16		30.88
1100	900	940	19.02			19.02
1200	1000	1040	15.48			15.48
1500	1200	1240	10.79			10.79
1800	1500	1540	6.88			6.88
2100	1800	1840	4.72			4.72
2400	2100	2140	3.41			3.41
2700	2400					
3000	2700					
3300	3000					
3600	3200					

**R2**

FacedR2  
ChemR2  
ColourR2  
GroundR2

Section Properties	
Height	145mm
Width	190mm
Ms	7.681 kNm
Mu	14.502 kNm
MU/1.5	9.968 kNm
Limiting Mr	7.681 kNm
Vco 100	49.51 kN
Vco 100/1.5	33.01 kN
Vco 150	51.90 kN
Vco 150/1.5	34.60 kN
Effective Depth	100mm
Self Weight	66 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		Limiting (C)
				SR100 (B)	SR150 (B)	
900	700	800	95.35	81.86		81.86
1100	900	1000	60.78	65.35		60.78
1200	1000	1100	50.12			50.12
1500	1200	1300	35.69			35.69
1800	1500	1600	23.34			23.34
2100	1800	1900	16.36			16.36
2400	2100	2200	12.03			12.03
2700	2400	2500	9.17			9.17
3000	2700	2800	7.17			7.17
3300	3000	3100	5.73			5.73
3600	3200	3300	4.98			4.98

**FireR2  
FacedFireR2  
1.0 Hr**

Section Properties	
Height	145mm
Width	190mm
Ms	7.681 kNm
Mu	14.502 kNm
MU/1.5	9.968 kNm
Limiting Mr	7.681 kNm
Vco 100	49.51 kN
Vco 100/1.5	33.01 kN
Vco 150	51.90 kN
Vco 150/1.5	34.60 kN
Effective Depth	100mm
Self Weight	66 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		Limiting (C)
				SR100 (B)	SR150 (B)	
900	700	800	95.35	81.86		81.86
1100	900	1000	60.78	65.35		60.78
1200	1000	1100	50.12			50.12
1500	1200	1300	35.69			35.69
1800	1500	1600	23.34			23.34
2100	1800	1900	16.36			16.36
2400	2100	2200	12.03			12.03
2700	2400	2500	9.17			9.17
3000	2700	2800	7.17			7.17
3300	3000	3100	5.73			5.73
3600	3200	3300	4.98			4.98

**FireR2  
FacedFireR2  
1.5 Hr**

Section Properties	
Height	145mm
Width	190mm
Ms	6.257 kNm
Mu	11.853 kNm
MU/1.5	7.902 kNm
Limiting Mr	6.257 kNm
Vco 100	49.96 kN
Vco 100/1.5	33.30 kN
Vco 150	52.41 kN
Vco 150/1.5	34.93 kN
Effective Depth	85mm
Self Weight	66 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		Limiting (C)
				SR100 (B)	SR150 (B)	
900	700	785	80.56	84.17		80.56
1100	900	985	50.93			50.93
1200	1000	1085	41.85			41.85
1500	1200	1285	29.65			29.65
1800	1500	1585	19.26			19.26
2100	1800	1885	13.42			13.42
2400	2100	2185	9.82			9.82
2700	2400	2485	7.44			7.44
3000	2700	2785	5.79			5.79
3300	3000	3085	4.59			4.59
3600	3200	3285	3.97			3.97

**FireR2  
FacedFireR2  
2.0 Hr**

Section Properties	
Height	145mm
Width	190mm
Ms	4.667 kNm
Mu	-
MU/1.5	-
Limiting Mr	4.667 kNm
Vco 100	50.07 kN
Vco 100/1.5	33.38 kN
Vco 150	52.53 kN
Vco 150/1.5	35.02 kN
Effective Depth	70mm
Self Weight	66 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		Limiting (C)
				SR100 (B)	SR150 (B)	
900	700	770	62.31	86.04		62.31
1100	900	970	39.02			39.02
1200	1000	1070	31.94			31.94
1500	1200	1270	22.48			22.48
1800	1500	1570	14.48			14.48
2100	1800	1870	10.01			10.01
2400	2100	2170	7.26			7.26
2700	2400	2470	5.45			5.45
3000	2700	2770	4.20			4.20
3300	3000	3070	3.30			3.30
3600	3200	3270	2.83			2.83

**R190**

FacedR190  
ChemR190  
ColourR190  
GroundR190

Section Properties	
Height	215mm
Width	190mm
Ms	16.121 kNm
Mu	26.787 kNm
Mu/1.5	17.858 kNm
Limiting Mr	16.121 kNm
Vco 100	76.48 kN
Vco 100/1.5	50.99 kN
Vco 150	79.37 kN
Vco 150/1.5	52.92 kN
Effective Depth	141.67mm
Self Weight	98 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	200.53	126.49		126.49
1100	900	1000	127.98	101.00		101.00
1200	1000	1100	105.60	91.72		91.72
1500	1200	1341.67	70.66		77.90	70.66
1800	1500	1641.67	46.87			46.87
2100	1800	1941.67	33.22			33.22
2400	2100	2241.67	24.68			24.68
2700	2400	2541.67	18.98			18.98
3000	2700	2841.67	14.99			14.99
3300	3000	3141.67	12.08			12.08
3600	3200	3341.67	10.56			10.56

**FireR190**  
**FacedFireR190**  
1.0 Hr

Section Properties	
Height	215mm
Width	190mm
Ms	16.121 kNm
Mu	26.787 kNm
Mu/1.5	17.858 kNm
Limiting Mr	16.121 kNm
Vco 100	76.48 kN
Vco 100/1.5	50.99 kN
Vco 150	79.37 kN
Vco 150/1.5	52.92 kN
Effective Depth	141.67mm
Self Weight	98 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	200.53	126.49		126.49
1100	900	1000	127.98	101.00		101.00
1200	1000	1100	105.60	91.72		91.72
1500	1200	1341.67	70.66		77.90	70.66
1800	1500	1641.67	46.87			46.87
2100	1800	1941.67	33.22			33.22
2400	2100	2241.67	24.68			24.68
2700	2400	2541.67	18.98			18.98
3000	2700	2841.67	14.99			14.99
3300	3000	3141.67	12.08			12.08
3600	3200	3341.67	10.56			10.56

**FireR190**  
**FacedFireR190**  
1.5 Hr

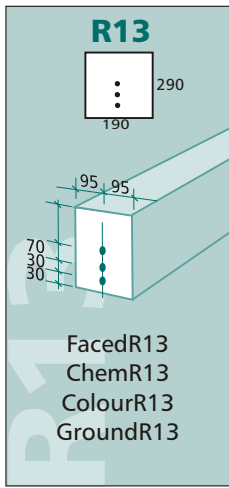
Section Properties	
Height	215mm
Width	190mm
Ms	16.121 kNm
Mu	26.787 kNm
Mu/1.5	17.858 kNm
Limiting Mr	16.121 kNm
Vco 100	76.48 kN
Vco 100/1.5	50.99 kN
Vco 150	79.37 kN
Vco 150/1.5	52.92 kN
Effective Depth	141.67mm
Self Weight	98 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	200.53	126.49		126.49
1100	900	1000	127.98	101.00		101.00
1200	1000	1100	105.60	91.72		91.72
1500	1200	1341.67	70.66		77.90	70.66
1800	1500	1641.67	46.87			46.87
2100	1800	1941.67	33.22			33.22
2400	2100	2241.67	24.68			24.68
2700	2400	2541.67	18.98			18.98
3000	2700	2841.67	14.99			14.99
3300	3000	3141.67	12.08			12.08
3600	3200	3341.67	10.56			10.56

**FireR190**  
**FacedFireR190**  
2.0 Hr

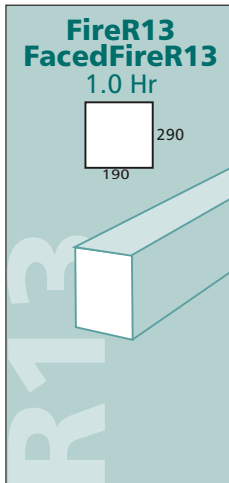
Section Properties	
Height	215mm
Width	190mm
Ms	14.692 kNm
Mu	27.761 kNm
Mu/1.5	18.508 kNm
Limiting Mr	14.692 kNm
Vco 100	76.80 kN
Vco 100/1.5	51.20 kN
Vco 150	79.73 kN
Vco 150/1.5	53.15 kN
Effective Depth	131.67mm
Self Weight	98 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	182.67	127.02		127.02
1100	900	1000	116.55	101.42		101.42
1200	1000	1100	96.15	92.11		92.11
1500	1200	1331.67	65.29		78.84	65.29
1800	1500	1631.67	43.16			43.16
2100	1800	1931.67	30.51			30.51
2400	2100	2231.67	22.61			22.61
2700	2400	2531.67	17.35			17.35
3000	2700	2831.67	13.67			13.67
3300	3000	3131.67	11.00			11.00
3600	3200	3331.67	9.60			9.60



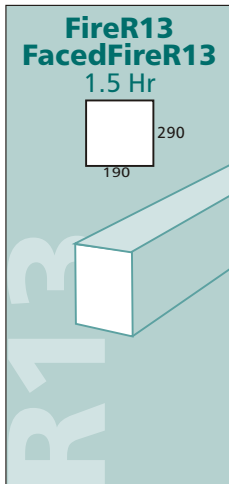
Section Properties	
Height	290mm
Width	190mm
Ms	27.598 kNm
Mu	48.993 kNm
MU/1.5	32.66 kNm
Limiting Mr	27.598 kNm
Vco 100	98.12 kN
Vco 100/1.5	65.41 kN
Vco 150	100.56 kN
Vco 150/1.5	67.04 kN
Effective Depth	212mm
Self Weight	132 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	343.65	162.20		162.20
1100	900	1000	219.46	129.49		129.49
1200	1000	1100	181.14	117.60		117.60
1500	1200	1350	119.82		97.99	97.99
1800	1500	1650	79.77		79.93	79.77
2100	1800	1950	56.74			56.74
2400	2100	2250	42.28			42.28
2700	2400	2550	32.63			32.63
3000	2700	2850	25.85			25.85
3300	3000	3150	20.92			20.92
3600	3200	3400	17.77			17.77



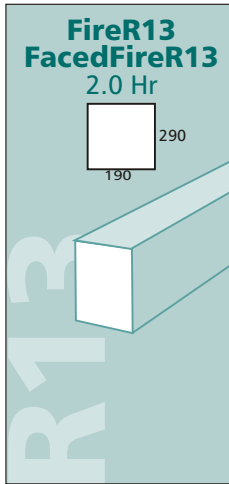
Section Properties	
Height	290mm
Width	190mm
Ms	27.598 kNm
Mu	48.993 kNm
MU/1.5	32.66 kNm
Limiting Mr	27.598 kNm
Vco 100	98.12 kN
Vco 100/1.5	65.41 kN
Vco 150	100.56 kN
Vco 150/1.5	67.04 kN
Effective Depth	212mm
Self Weight	132 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	343.65	162.20		162.20
1100	900	1000	219.46	129.49		129.49
1200	1000	1100	181.14	117.60		117.60
1500	1200	1350	119.82		97.99	97.99
1800	1500	1650	79.77		79.93	79.77
2100	1800	1950	56.74			56.74
2400	2100	2250	42.28			42.28
2700	2400	2550	32.63			32.63
3000	2700	2850	25.85			25.85
3300	3000	3150	20.92			20.92
3600	3200	3400	17.77			17.77



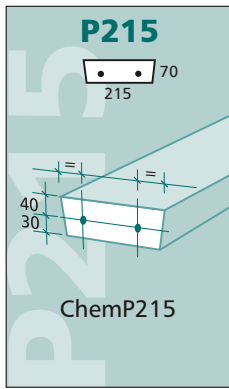
Section Properties	
Height	290mm
Width	190mm
Ms	27.598 kNm
Mu	48.993 kNm
MU/1.5	32.66 kNm
Limiting Mr	27.598 kNm
Vco 100	98.12 kN
Vco 100/1.5	65.41 kN
Vco 150	100.56 kN
Vco 150/1.5	67.04 kN
Effective Depth	212mm
Self Weight	132 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	343.65	162.20		162.20
1100	900	1000	219.46	129.49		129.49
1200	1000	1100	181.14	117.60		117.60
1500	1200	1350	119.82		97.99	97.99
1800	1500	1650	79.77		79.93	79.77
2100	1800	1950	56.74			56.74
2400	2100	2250	42.28			42.28
2700	2400	2550	32.63			32.63
3000	2700	2850	25.85			25.85
3300	3000	3150	20.92			20.92
3600	3200	3400	17.77			17.77



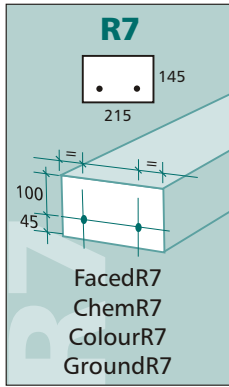
Section Properties	
Height	290mm
Width	190mm
Ms	25.186 kNm
Mu	46.263 kNm
MU/1.5	30.841 kNm
Limiting Mr	25.186 kNm
Vco 100	98.46 kN
Vco 100/1.5	65.64 kN
Vco 150	100.92 kN
Vco 150/1.5	67.28 kN
Effective Depth	201.67mm
Self Weight	132.2 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Allowable Load - kN/m			
			Mr (A)	SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	313.50	162.77		162.77
1100	900	1000	200.16	129.95		129.95
1200	1000	1100	165.19	118.02		118.02
1500	1200	1350	109.23		98.35	98.35
1800	1500	1650	72.68		80.22	72.68
2100	1800	1950	51.66			51.66
2400	2100	2250	38.47			38.47
2700	2400	2550	29.66			29.66
3000	2700	2850	23.48			23.48
3300	3000	3150	18.98			18.98
3600	3200	3350	16.63			16.63



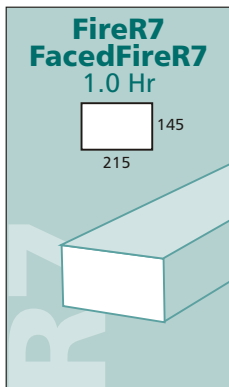
Section Properties	
Height	70mm
Width	215mm
Ms	2.252 kNm
Mu	3.853 kNm
MU/1.5	2.568 kNm
Limiting Mr	2.252 kNm
Vco 100	29.97 kN
Vco 100/1.5	19.98 kN
Vco 150	32.34 kN
Vco 150/1.5	21.56 kN
Effective Depth	40mm
Self Weight	36 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	MR (A)	Allowable Load - kN/m SR100 (B)	SR150 (B)	Limiting (C)
900	700	740	32.53	53.63		32.53
1100	900	940	20.02			20.02
1200	1000	1040	16.29			16.29
1500	1200	1240	11.35			11.35
1800	1500	1540	7.23			7.23
2100	1800	1840	4.96			4.96
2400	2100	2140	3.57			3.57
2700	2400					
3000	2700					
3300	3000					
3600	3200					



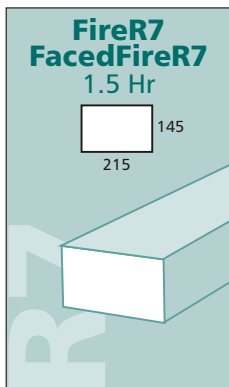
Section Properties	
Height	145mm
Width	215mm
Ms	8.077 kNm
Mu	14.859 kNm
MU/1.5	9.906 kNm
Limiting Mr	8.077 kNm
Vco 100	54.54 kN
Vco 100/1.5	36.36 kN
Vco 150	57.03 kN
Vco 150/1.5	38.02 kN
Effective Depth	100mm
Self Weight	75 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	MR (A)	Allowable Load - kN/m SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	100.21	90.15		90.15
1100	900	1000	63.86	71.97		63.86
1200	1000	1100	52.65			52.65
1500	1200	1300	37.48			37.48
1800	1500	1600	24.49			24.49
2100	1800	1900	17.15			17.15
2400	2100	2200	12.60			12.60
2700	2400	2500	9.59			9.59
3000	2700	2800	7.49			7.49
3300	3000	3100	5.97			5.97
3600	3200	3300	5.18			5.18



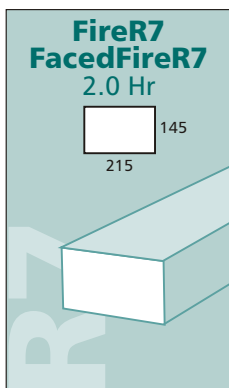
Section Properties	
Height	145mm
Width	215mm
Ms	8.077 kNm
Mu	14.859 kNm
MU/1.5	9.906 kNm
Limiting Mr	8.077 kNm
Vco 100	54.54 kN
Vco 100/1.5	36.36 kN
Vco 150	57.03 kN
Vco 150/1.5	38.02 kN
Effective Depth	100mm
Self Weight	75 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	MR (A)	Allowable Load - kN/m SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	100.21	90.15		90.15
1100	900	1000	63.86	71.97		63.86
1200	1000	1100	52.65			52.65
1500	1200	1300	37.48			37.48
1800	1500	1600	24.49			24.49
2100	1800	1900	17.15			17.15
2400	2100	2200	12.60			12.60
2700	2400	2500	9.59			9.59
3000	2700	2800	7.49			7.49
3300	3000	3100	5.97			5.97
3600	3200	3300	5.18			5.18



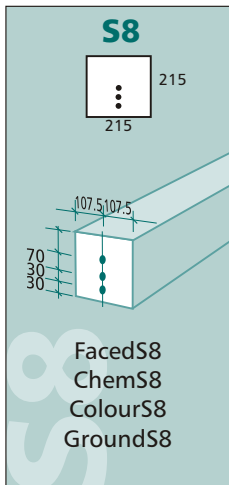
Section Properties	
Height	145mm
Width	215mm
Ms	6.611 kNm
Mu	12.223 kNm
MU/1.5	8.148 kNm
Limiting Mr	6.611 kNm
Vco 100	54.94 kN
Vco 100/1.5	36.62 kN
Vco 150	57.49 kN
Vco 150/1.5	38.33 kN
Effective Depth	85mm
Self Weight	75 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	MR (A)	Allowable Load - kN/m SR100 (B)	SR150 (B)	Limiting (C)
900	700	785	85.07	92.55		85.07
1100	900	985	53.76			53.76
1200	1000	1085	44.17			44.17
1500	1200	1285	31.28			31.28
1800	1500	1585	20.30			20.30
2100	1800	1885	14.13			14.13
2400	2100	2185	10.32			10.32
2700	2400	2485	7.81			7.81
3000	2700	2785	6.07			6.07
3300	3000	3085	4.80			4.80
3600	3200	3285	4.15			4.15



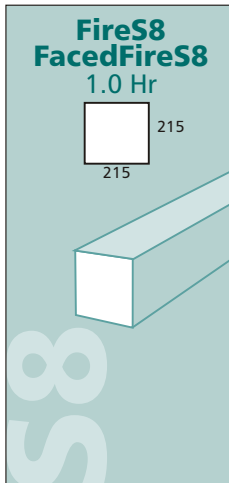
Section Properties	
Height	145mm
Width	215mm
Ms	4.724 kNm
Mu	-
MU/1.5	-
Limiting Mr	4.724 kNm
Vco 100	55.02 kN
Vco 100/1.5	36.68 kN
Vco 150	57.59 kN
Vco 150/1.5	38.39 kN
Effective Depth	70mm
Self Weight	75 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	MR (A)	Allowable Load - kN/m SR100 (B)	SR150 (B)	Limiting (C)
900	700	770	62.99	94.52		62.99
1100	900	970	39.41			39.41
1200	1000	1070	32.26			32.26
1500	1200	1270	22.68			22.68
1800	1500	1570	14.58			14.58
2100	1800	1870	10.06			10.06
2400	2100	2170	7.27			7.27
2700	2400	2470	5.44			5.44
3000	2700	2770	4.17			4.17
3300	3000	3070	3.26			3.26
3600	3200	3270	2.78			2.78



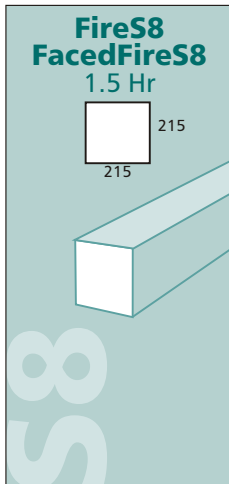
Section Properties	
Height	215mm
Width	215mm
Ms	16.96 kNm
Mu	26.257 kNm
MU/1.5	17.504 kNm
Limiting Mr	16.96 kNm
Vco 100	84.03 kN
Vco 100/1.5	56.02 kN
Vco 150	87.06 kN
Vco 150/1.5	58.04 kN
Effective Depth	141.67mm
Self Weight	111 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	210.89	138.94		138.94
1100	900	1000	134.57	110.93		110.93
1200	1000	1100	93.11	92.25		92.25
1500	1200	1341.67	74.26		85.41	74.26
1800	1500	1641.67	49.23			49.23
2100	1800	1941.67	34.87			34.87
2400	2100	2241.67	25.89			25.89
2700	2400	2541.67	19.89			19.89
3000	2700	2841.67	15.69			15.69
3300	3000	3141.67	12.63			12.63
3600	3200	3341.67	11.04			11.04



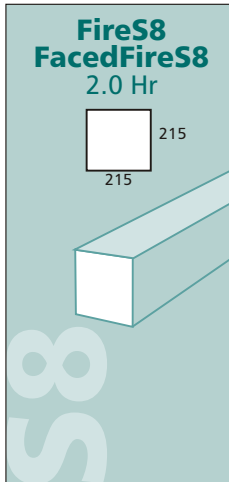
Section Properties	
Height	215mm
Width	215mm
Ms	16.96 kNm
Mu	26.257 kNm
MU/1.5	17.504 kNm
Limiting Mr	16.96 kNm
Vco 100	84.03 kN
Vco 100/1.5	56.02 kN
Vco 150	87.06 kN
Vco 150/1.5	58.04 kN
Effective Depth	141.67mm
Self Weight	111 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	210.89	138.94		138.94
1100	900	1000	134.57	110.93		110.93
1200	1000	1100	93.11	92.25		92.25
1500	1200	1341.67	74.26		85.41	74.26
1800	1500	1641.67	49.23			49.23
2100	1800	1941.67	34.87			34.87
2400	2100	2241.67	25.89			25.89
2700	2400	2541.67	19.89			19.89
3000	2700	2841.67	15.69			15.69
3300	3000	3141.67	12.63			12.63
3600	3200	3341.67	11.04			11.04



Section Properties	
Height	215mm
Width	215mm
Ms	16.96 kNm
Mu	26.257 kNm
MU/1.5	17.504 kNm
Limiting Mr	16.96 kNm
Vco 100	84.03 kN
Vco 100/1.5	56.02 kN
Vco 150	87.06 kN
Vco 150/1.5	58.04 kN
Effective Depth	141.67mm
Self Weight	111 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	210.89	138.94		138.94
1100	900	1000	134.57	110.93		110.93
1200	1000	1100	93.11	92.25		92.25
1500	1200	1341.67	74.26		85.41	74.26
1800	1500	1641.67	49.23			49.23
2100	1800	1941.67	34.87			34.87
2400	2100	2241.67	25.89			25.89
2700	2400	2541.67	19.89			19.89
3000	2700	2841.67	15.69			15.69
3300	3000	3141.67	12.63			12.63
3600	3200	3341.67	11.04			11.04



Section Properties	
Height	215mm
Width	215mm
Ms	15.492 kNm
Mu	28.625 kNm
MU/1.5	19.083 kNm
Limiting Mr	15.492 kNm
Vco 100	84.33 kN
Vco 100/1.5	56.22 kN
Vco 150	87.38 kN
Vco 150/1.5	58.26 kN
Effective Depth	131.67mm
Self Weight	111 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	192.54	139.44		139.44
1100	900	1000	122.82	111.33		111.33
1200	1000	1100	101.31	101.10		101.10
1500	1200	1331.67	68.77		86.38	68.77
1800	1500	1631.67	45.44			45.44
2100	1800	1931.67	32.10			32.10
2400	2100	2231.67	23.77			23.77
2700	2400	2531.67	18.22			18.22
3000	2700	2831.67	14.34			14.34
3300	3000	3131.67	11.52			11.52
3600	3200	3331.67	10.05			10.05

**R14**

FacedR14  
ChemR14  
ColourR14  
GroundR14

Section Properties	
Height	290mm
Width	215mm
Ms	29.08 kNm
Mu	49.773 kNm
Mu/1.5	33.182 kNm
Limiting Mr	29.08 kNm
Vco 100	108.06 kN
Vco 100/1.5	72.04 kN
Vco 150	110.60 kN
Vco 150/1.5	73.73 kN
Effective Depth	212mm
Self Weight	150 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	362.00	178.60		178.60
1100	900	1000	231.14	142.58		142.58
1200	1000	1100	190.76	129.48		129.48
1500	1200	1350	126.15		107.73	107.73
1800	1500	1650	83.95		87.87	83.95
2100	1800	1950	59.68			59.68
2400	2100	2250	44.45			44.45
2700	2400	2550	34.28			34.28
3000	2700	2850	27.14			27.14
3300	3000	3150	21.94			21.94
3600	3200	3400	18.62			18.62

**FireR14 FacedFireR14 1.0 Hr**

Section Properties	
Height	290mm
Width	215mm
Ms	29.08 kNm
Mu	49.773 kNm
Mu/1.5	33.182 kNm
Limiting Mr	29.08 kNm
Vco 100	108.06 kN
Vco 100/1.5	72.04 kN
Vco 150	110.60 kN
Vco 150/1.5	73.73 kN
Effective Depth	212mm
Self Weight	150 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	362.00	178.60		178.60
1100	900	1000	231.14	142.58		142.58
1200	1000	1100	190.76	129.48		129.48
1500	1200	1350	126.15		107.73	107.73
1800	1500	1650	83.95		87.87	83.95
2100	1800	1950	59.68			59.68
2400	2100	2250	44.45			44.45
2700	2400	2550	34.28			34.28
3000	2700	2850	27.14			27.14
3300	3000	3150	21.94			21.94
3600	3200	3400	18.62			18.62

**FireR14 FacedFireR14 1.5 Hr**

Section Properties	
Height	290mm
Width	215mm
Ms	29.08 kNm
Mu	49.773 kNm
Mu/1.5	33.182 kNm
Limiting Mr	29.08 kNm
Vco 100	108.06 kN
Vco 100/1.5	72.04 kN
Vco 150	110.60 kN
Vco 150/1.5	73.73 kN
Effective Depth	212mm
Self Weight	150 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	362.00	178.60		178.60
1100	900	1000	231.14	142.58		142.58
1200	1000	1100	190.76	129.48		129.48
1500	1200	1350	126.15		107.73	107.73
1800	1500	1650	83.95		87.87	83.95
2100	1800	1950	59.68			59.68
2400	2100	2250	44.45			44.45
2700	2400	2550	34.28			34.28
3000	2700	2850	27.14			27.14
3300	3000	3150	21.94			21.94
3600	3200	3400	18.62			18.62

**FireR14 FacedFireR14 2.0 Hr**

Section Properties	
Height	290mm
Width	215mm
Ms	27.613 kNm
Mu	47.062 kNm
Mu/1.5	31.375 kNm
Limiting Mr	27.613 kNm
Vco 100	108.35 kN
Vco 100/1.5	72.23 kN
Vco 150	110.92 kN
Vco 150/1.5	73.94 kN
Effective Depth	201.67mm
Self Weight	150 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	800	343.66	179.07		179.07
1100	900	1000	219.40	142.96		142.96
1200	1000	1100	181.06	129.83		129.83
1500	1200	1350	119.71		108.04	108.04
1800	1500	1650	79.64		88.12	79.64
2100	1800	1950	56.59			56.59
2400	2100	2250	42.13			42.13
2700	2400	2550	32.47			32.47
3000	2700	2850	25.70			25.70
3300	3000	3150	20.76			20.76
3600	3200	3400	17.61			17.61

**P254**

254

70

40

30

ChemP254

Section Properties	
Height	70mm
Width	254mm
Ms	2.415 kNm
Mu	4.299 kNm
Mu/1.5	2.866 kNm
Limiting Mr	2.415 kNm
Vco 100	34.02 kN
Vco 100/1.5	22.68 kN
Vco 150	36.53 kN
Vco 150/1.5	24.37 kN
Effective Depth	40mm
Self Weight	43 kg/m

LOAD TABLE						
O/all Length	Clear Span	Eff. Span	Mr (A)	Allowable Load - kN/m		
				SR100 (B)	SR150 (B)	Limiting (C)
900	700	740	34.85	60.87		34.85
1100	900	940	21.43			21.43
1200	1000	1040	17.43			17.43
1500	1200	1240	12.13			12.13
1800	1500	1540	7.71			7.71
2100	1800	1840	5.27			5.27
2400	2100	2140	3.79			3.79
2700	2400					
3000	2700					
3300	3000					
3600	3200					

**LG85  
LS85**

85

90

30

Self weight 5kg/m

**LG85  
LS85  
Stone**

85

130

30

Self weight 6kg/m

LOAD TABLE		
O/all Length	Clear Span	Allowable Load - kN/m
900	700	22.85
1100	900	14.63
1200	1000	12.09
1500	1200	8.02
1800	1500	5.37
2100	1800	3.42
2400	2100	
2700	2400	
3000	2700	
3300	3000	
3600	3200	

**LG165  
LS165**

165

90

30

Self weight 7kg/m

**LG165  
LS165  
Stone**

165

130

30

Self weight 8kg/m

LOAD TABLE		
O/all Length	Clear Span	Allowable Load - kN/m
900	700	62.10
1100	900	39.75
1200	1000	32.85
1500	1200	21.15
1800	1500	13.25
2100	1800	8.51
2400	2100	5.46
2700	2400	3.54
3000	2700	
3300	3000	
3600	3200	

**LG215  
LS215**

215

90

30

Self weight 9kg/m

**LG215  
LS215  
Stone**

215

130

30

Self weight 10kg/m

LOAD TABLE		
O/all Length	Clear Span	Allowable Load - kN/m
900	700	32.75
1100	900	20.96
1200	1000	17.32
1500	1200	11.50
1800	1500	7.69
2100	1800	5.51
2400	2100	4.14
2700	2400	3.22
3000	2700	2.58
3300	3000	2.11
3600	3200	1.86



# Thermal Bridging Information Sheet

The amendments to Approved Document L of the Building Regulations, which took effect from 1 April 2002 call for conservation of fuel and power and are considerably more onerous than the previous ones.

In general, thermal bridges can occur at any junction between building elements or where the building structure changes. Reduced internal surface temperature and increased heat loss, compared with that of the unbridged structure, are the two primary effects associated with a thermal bridge.

Consequently there may be an increased risk of condensation and mould growth at the thermal bridge and a significant additional heat loss through the thermal bridge.

Approved Documents L1 and L2 specify that provision should be made to limit thermal bridging at junctions and around openings, in order to avoid excessive additional heat loss and the possibility of local condensation problems. Paragraphs 1.31 of AD L1 (and 1.10 of AD 1 L2) indicate that one way of demonstrating that such provision has been made is to adopt the arrangement given in "Robust construction details".

## BUILDING REGULATION STANDARDS

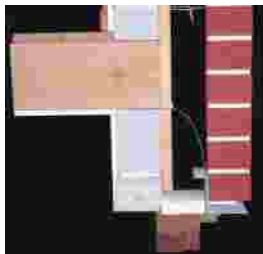
Thermal bridges at junctions and around openings can be expressed as a fraction  $\alpha$ , of the transmission heat loss coefficient for the plane building elements.

$$\alpha = \frac{U_{\text{elemental}}}{U_{\text{plane}}}$$

For dwellings  $\alpha = 0.16$  and for buildings other than dwellings  $\alpha = 0.10$ .

## THE NAYLOR SOLUTION TO THE PROBLEM OF THERMAL BRIDGING

The illustration below shows our solution to the problem of thermal bridging.



## THE ASSESMENT OF THERMAL PERFORMANCE

The quantity which describes the heat loss associated with a thermal bridge is its linear thermal transmittance,  $Y$ . This is a property of the thermal bridge and is the rate of heat flow per degree per unit length of the bridge, that is not accounted for in the U-value of the plan building element or elements containing the thermal bridge.

The transmission heat loss coefficient associated with thermal bridges can then be calculated from:

$$U_{\text{bridge}} = Y \times L$$

Where:

$L$  is the length of the thermal bridge over which  $Y$  applies.

The total transmission heat loss coefficient  $HT$  for the building is then:  $HT = U_{\text{plane}} + U_{\text{bridge}}$

If all the junction details are as recommended in 'Robust construction details', the heat loss coefficient associated with these junctions is taken to be equal to the allowance  $\alpha$ .

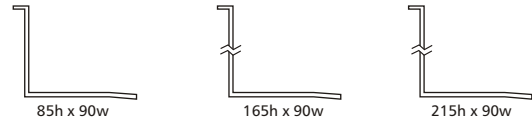
Maximum values of  $\alpha$  from 'Robust construction details' for different types of junction.

Junction detail in external wall	Maximum value of $\alpha$ (W/m.k)
Concrete lintel	0.21

If different forms of construction are being employed advice will be gladly given in respect of the lintel/insulation combination required to meet the new regulations.

To complement the existing Hi-Spec lintel system, Naylor have introduced the L-Strip, a galvanised or stainless steel lintel, which, used in conjunction with an insulated prestressed concrete backing lintel provides an effective solution to the revisions to part L of the Building Regulations.

The L-Strip supports single skin brickwork allowing the face of the brickwork to show. It is available in three standard heights and lengths from 900mm to 3600mm long.



## QUALITY STANDARDS

The design of the Naylor L-Strip complies with BS5950:Part 5:1987 and manufacture is in accordance with BS5977:Part 2:1983. And BS/EN 10025 with the minimum yield stress of 275N/mm<sup>2</sup>. Zinc coating is post galvanised to BS729. Austenitic stainless steel L-Strips conform to grade 304:S15:BS1449:Part 2.

## LOAD BEARING

Lintels are usually supplied with the following allowances for bearing at each end:

- 100mm for openings up to/including 1000mm
- 150mm for openings up to/including 3000mm
- 200mm for openings over 3000mm

Unfactored loads kN/m				
O/all Length	Clear Span	LG85 LS85	LG165 LS165	LG215 LS215
900	700	22.85	62.10	32.75
1100	900	14.63	39.75	20.96
1200	1000	12.09	32.85	17.32
1500	1200	8.02	21.15	11.50
1800	1500	5.37	13.25	7.69
2100	1800	3.42	8.51	5.51
2400	2100		5.46	4.14
2700	2400		3.54	3.22
3000	2700			2.58
3300	3000			2.11
3600	3200			1.86

## INSTALLATION NOTES

The Naylor Hi-Spec backing lintel should be installed as described in our standard literature. To meet the new thermal requirements, insulation should be fixed to the cavity face of the backing lintel. This insulation can be supplied loose for fixing on site. Where full or partial cavity fill is to be used, a plain lintel can be supplied.

When using L-Strip, a thin mortar bed should be placed on the reveals of the external leaf, and the L-Strip bedded into this.

Temporary support should be provided until the first few courses of masonry have matured: window and doorframes are normally sufficient for this particular purpose.

Please refer to our standard literature for a more detailed installation guide.

## FURTHER INFORMATION

Lintel schedules can be produced from working drawings. Calculations for submission can be provided if required. For further information or advice, please call our freephone technical hotline on 0800 5424192, who will be pleased to answer any questions you may have.

**NAYLOR LINTELS also comply with the revisions of Part E**

# Thermal Bridging Calculations

## REFERENCES

1. D.E.T.R. Consultation paper "Proposals for amending the energy efficiency provisions" of the building regulations, dated June 2000.
2. CIBSE Guide 83, "Thermal properties of building structures".

## FROM THE ABOVE CONSULTATION PAPER

From table A 18, Thermal conductivity of:-

- Brickwork (outer leaf) = 0.77 W/m.k
- Concrete (i.e. Lintel) = 1.93 W/m.k
- Lightweight plaster = 0.18 W/m.k

## FROM CIBSE GUIDE

- From table A3.5,  
Inside surface resistance of wall, horizontal heat flow, high emissivity =  $0.12\text{m}^2\text{k/w}$ .
- From table A3.6  
Outside surface resistance of wall, high emissivity of surface, normal exposure =  $0.06\text{m}^2\text{k/w}$ .
- From table A3.8  
Standard thermal resistance of unventilated airspace (i.e. Cavity), 25mm or more thick, high surface emissivity, horizontal heat flow =  $0.18\text{m}^2\text{k/w}$ .

## Resistances of elements of construction are:-

- Outer brick =  $\frac{0.102}{0.77} = 0.132\text{m}^2\text{k/w}$ .
- Inner lintel =  $\frac{0.10}{1.93} = 0.052\text{m}^2\text{k/w}$ .
- Plaster =  $\frac{0.013}{0.18} = 0.072\text{m}^2\text{k/w}$ .

## Total resistances are:-

	$0.132 + 0.052 + 0.072$	=	0.256
Plus i)	Outside surface resistance	0.06	
ii)	Cavity	0.18	
iii)	Inside surface resistance	0.12	
Total		=	<u><math>0.616\text{m}^2\text{k/w}</math></u>

To achieve an overall 'U' value of  $0.25\text{W/m}^2\text{k}$

$$\text{The total resistance required} = \frac{1}{0.25} = 4.0\text{m}^2\text{k/w}$$

Insulation within cavity required to have a resistance of  $4 - 0.616 = 3.384\text{m}^2\text{k/w}$ .

Using a typical rigid urethane board with a thermal conductivity of  $0.022\text{W/m.k}$ .

$$\text{Min thickness required} = 0.022 \cdot 3.384 = 0.074\text{m}$$

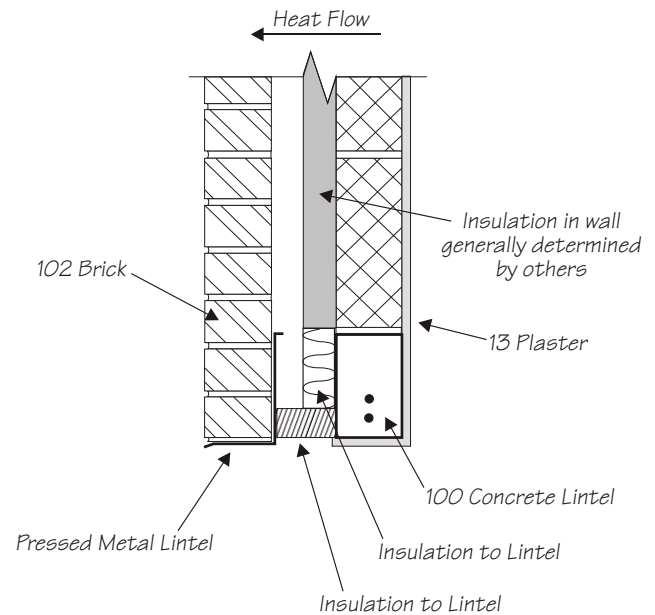
i.e. (Say) 75mm thick.

Similarly for a typical rigid phenolic board with a thermal conductivity of  $0.018\text{W/m.k}$ .

$$\text{Min thickness required} = 0.018 \cdot 3.384 = 0.061\text{m}$$

i.e. (Say) 65mm thick

## TYPICAL CROSS SECTION THROUGH HEAD OF OPENING



N.B. Contribution of pressed metal lintel and proportional contribution of cavity closer ignored in calculation of thickness of insulation required to concrete lintel.



Canary Wharf



Macintosh Village, Manchester



Millennium Stadium, Cardiff



Trafford Park, Manchester



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