



PLANNING BY DESIGN

FROM CONCEPT TO COMPLETION

Structural Engineering Calculations

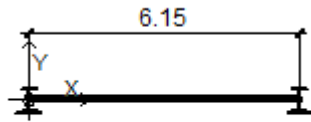


PLANNING BY DESIGN
FROM CONCEPT TO COMPLETION

PLANNING BY DESIGN

Whether you want to make changes to your home or business, want to build a new home or are a commercial developer, our experts in planning permission and architectural design can help you achieve development goals.

UC bending design



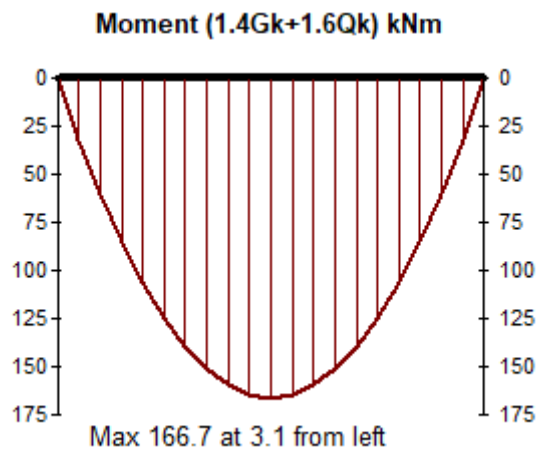
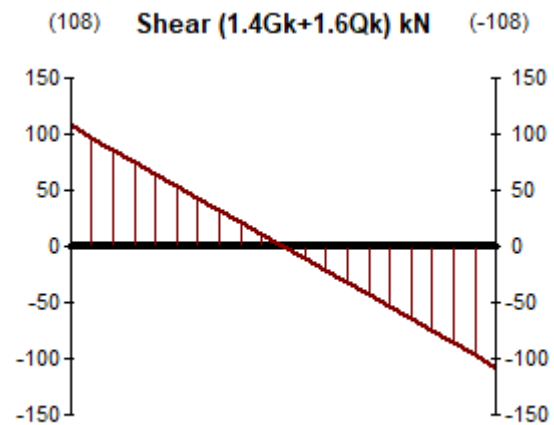
Calculations in accordance with BS5950:Part1:2000 and the SCI 'Steelwork Design Guide to BS5950'

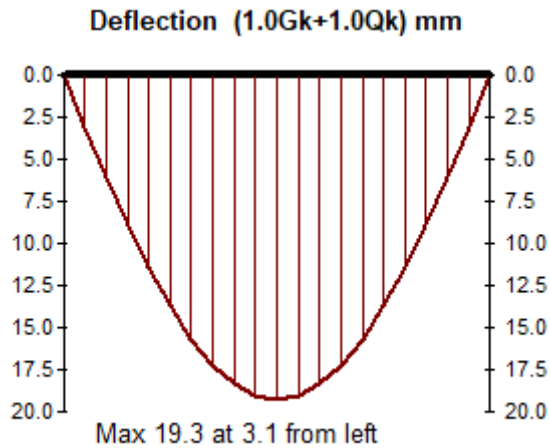
Span = 6.15 m
 Section size = 254x254x73 UC
 Section class = 1 (Plastic)
 Steel grade = S 275
 Design strength of steel = 275 N/mm²

Design forces

- maximum span moment = 166.7 kNm
- left support reaction = 108.4 kN
- right support reaction = 108.4 kN

Load Description	Type	A	B	C	Gk	Qk
Main pitched roo	UDL	0	6.15		5.28	3.3
2.7m cavity wall	UDL	0	6.15		11.07	0.0
Timber floor	UDL	0	6.15		0.84	2.1
Glazing roof	UDL	0	6.15		0.42	0.7
Self weight	UDL	0	6.15		0.6	0.0





End restraint type: (As defined in Table 13)

Left hand end - Compression flange laterally unrestrained. Both flanges free to rotate on plan. Partial torsional restraint against rotation about longitudinal axis provided only by pressure of bottom flange onto supports.

Right hand end - Compression flange laterally unrestrained. Both flanges free to rotate on plan. Partial torsional restraint against rotation about longitudinal axis provided only by pressure of bottom flange onto supports.

Compression flange unrestrained with no intermediate restraints.

Determine capacity of the section

Shear capacity

In accordance with clause 4.2.3.

$$P_v = 0.6 \cdot p_y \cdot A_v$$

where

$$\begin{aligned} A_v &= D \cdot t \\ &= 254 \cdot 8.6 \\ &= 2184 \text{ mm}^2 \end{aligned}$$

and hence

$$\begin{aligned} P_v &= 0.6 \cdot p_y \cdot A_v / 10^3 \\ &= 0.6 \cdot 275 \cdot 2184 / 10^3 \\ &= 360.4 \text{ kN} \end{aligned}$$

The maximum applied shear force is less than $0.6 \cdot P_v$, hence section subject to LOW SHEAR.

Moment capacity

The section capacity for low shear in accordance with clause 4.2.5 is

$$\begin{aligned} M_{cx} &= p_y \cdot S_{xx} / 10^6 \\ &= 275 \cdot 992000 / 10^6 \\ &= 272.8 \text{ kNm} \end{aligned}$$

Lateral torsional buckling

Determine effective length of beam

Effective length for left hand restraint condition

$$L_e \text{ left} = 1.2 \cdot \text{span} + 2 \cdot D$$

where - D = Beam depth

and for the right hand restraint condition

$$L_e \text{ right} = 1.2 \cdot \text{span} + 2 \cdot D$$

where - D = Beam depth

the average of this giving the effective length of the beam as

$$L_e = 7888 \text{ mm}$$

Check lateral torsional buckling of the section, where in accordance with clause 4.3.6.2, the following condition should be satisfied

$$M_x \leq M_b / m_{LT}$$

where M_x - the maximum major axis moment of the segment
 M_b - the lateral torsional resistance moment
 m_{LT} - the equivalent uniform moment factor

In accordance with clause 4.3.6.6. and the equation in Table 18:

Sub-beam subject to normal loads

- $M_1 = 0$
- $M_2 = 125$
- $M_3 = 166.7$
- $M_4 = 125$
- $M_5 = 1.7E-18$

and hence

- $m_{LT} = 0.925$

Lateral torsional resistance moment

Based on the equivalent slenderness, to clause 4.3.6.7:

$$\lambda_{LT} = u * v * \lambda * (\beta_w)^{0.5}$$

where $\lambda = L_e / r_{yy}$
 $= 7888 / 64.8$
 $= 121.73$
 $u = 0.849$

and from Table 19, based on $v = 0.5$ and $\lambda/x = 7.04$

$$v = 0.73$$

and from clause 4.3.6.9. for a class 1 section

$$\beta_w = 1$$

hence

$$\lambda_{LT} = u * v * \lambda * (\beta_w)^{0.5}$$

$$= 0.849 * 0.73 * 121.73 * (1)^{0.5}$$

$$= 75.44$$

and using Appendix B.2.1 $M_b = 174 \text{ kNm}$

(Note: M_b can never be greater than M_{cx})

Hence, $M_b / m_{LT} = 188.1 \text{ kNm}$ which is not exceeded by the maximum major axis moment 166.7 kNm.

Deflection

The maximum deflections for

$$E = 205000 \text{ N/mm}^2$$

$$I_{xx} = 11400 \text{ cm}^4$$

for total load

$$\delta_{tot} = 19.3 \text{ mm}$$

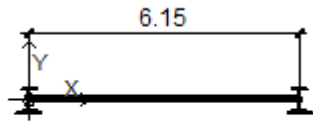
(span / 319)

and for imposed load

$$\delta_{imp} = 4.8 \text{ mm}$$

(span / 1281)

UB bending design



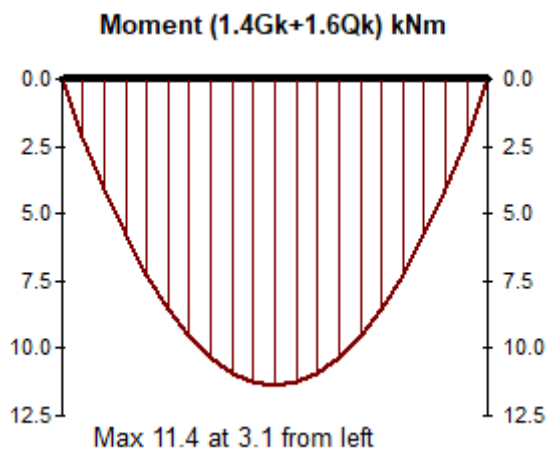
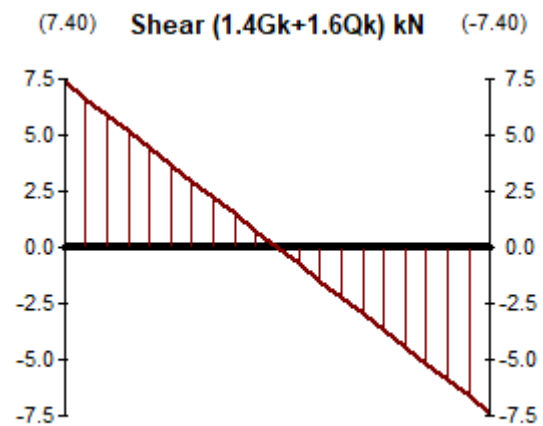
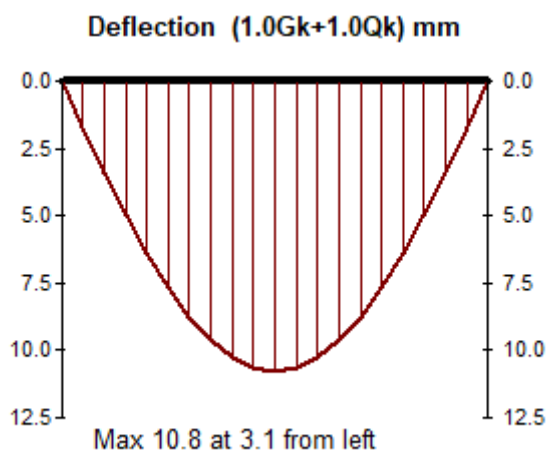
Calculations in accordance with BS5950:Part1:2000 and the SCI 'Steelwork Design Guide to BS5950'

Span = 6.15 m
 Section size = 178x102x19 UB
 Section class = 1 (Plastic)
 Steel grade = S 275
 Design strength of steel = 275 N/mm²

Design forces

- maximum span moment = 11.4 kNm
- left support reaction = 7.4 kN
- right support reaction = 7.4 kN

Load Description	Type	A	B	C	Gk	Qk
Glazing roof	UDL	0	6.15		0.42	0.7
Self weight	UDL	0	6.15		0.5	0.0



End restraint type: (As defined in Table 13)

Left hand end - Compression flange laterally unrestrained. Both flanges free to rotate on plan. Partial torsional restraint against rotation about longitudinal axis provided only by pressure of bottom flange onto supports.
 Right hand end - Compression flange laterally unrestrained. Both flanges free to rotate on plan. Partial torsional restraint against rotation about longitudinal axis provided only by pressure of bottom flange onto supports.

Compression flange unrestrained with no intermediate restraints.

Determine capacity of the section

Shear capacity

In accordance with clause 4.2.3.

$$P_v = 0.6 \cdot p_y \cdot A_v$$

where

$$\begin{aligned} A_v &= D \cdot t \\ &= 178 \cdot 4.8 \\ &= 854 \text{ mm}^2 \end{aligned}$$

and hence

$$\begin{aligned} P_v &= 0.6 \cdot p_y \cdot A_v / 10^3 \\ &= 0.6 \cdot 275 \cdot 854 / 10^3 \\ &= 140.9 \text{ kN} \end{aligned}$$

The maximum applied shear force is less than $0.6 \cdot P_v$, hence section subject to LOW SHEAR.

Moment capacity

The section capacity for low shear in accordance with clause 4.2.5 is

$$\begin{aligned} M_{cx} &= p_y \cdot S_{xx} / 10^6 \\ &= 275 \cdot 171000 / 10^6 \\ &= 47.0 \text{ kNm} \end{aligned}$$

Lateral torsional buckling

Determine effective length of beam

Effective length for left hand restraint condition

$$L_e \text{ left} = 1.2 \cdot \text{span} + 2 \cdot D$$

where - D = Beam depth

and for the right hand restraint condition

$$L_e \text{ right} = 1.2 \cdot \text{span} + 2 \cdot D$$

where - D = Beam depth

the average of this giving the effective length of the beam as

$$L_e = 7736 \text{ mm}$$

Check lateral torsional buckling of the section, where in accordance with clause 4.3.6.2, the following condition should be satisfied

$$M_x \leq M_b / m_{LT}$$

where M_x - the maximum major axis moment of the segment
 M_b - the lateral torsional resistance moment
 m_{LT} - the equivalent uniform moment factor

In accordance with clause 4.3.6.6. and the equation in Table 18:

Sub-beam subject to normal loads

$$\begin{aligned} - & M_1 = 0 \\ - & M_2 = 8.5 \\ - & M_3 = 11.4 \\ - & M_4 = 8.5 \\ - & M_5 = 0 \\ - & m_{LT} = 0.924 \end{aligned}$$

and hence

Lateral torsional resistance moment

Based on the equivalent slenderness, to clause 4.3.6.7:

$$\lambda_{LT} = u * v * \lambda * (\beta_w)^{0.5}$$

where $\lambda = L_e / r_{yy}$
 $= 7736 / 23.7$
 $= 326.41$
 $u = 0.886$

and from Table 19, based on $v = 0.5$ and $\lambda/x = 14.44$

$$v = 0.54$$

and from clause 4.3.6.9. for a class 1 section

$$\beta_w = 1$$

hence

$$\begin{aligned}\lambda_{LT} &= u * v * \lambda * (\beta_w)^{0.5} \\ &= 0.886 * 0.54 * 326.41 * (1)^{0.5} \\ &= 156.17\end{aligned}$$

and using Appendix B.2.1

$$M_b = 10.7 \text{ kNm}$$

(Note: M_b can never be greater than M_{cx})

Hence, $M_b / m_{LT} = 11.6 \text{ kNm}$ which is not exceeded by the maximum major axis moment 11.4 kNm.

Deflection

The maximum deflections for

$$\begin{aligned}E &= 205000 \text{ N/mm}^2 \\ I_{xx} &= 1360 \text{ cm}^4\end{aligned}$$

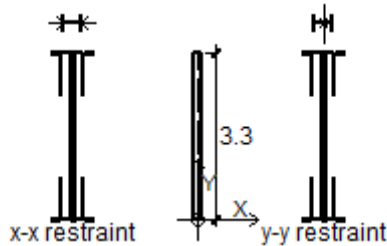
for total load

$$\begin{aligned}\delta_{tot} &= 10.8 \text{ mm} \\ &(\text{span} / 569)\end{aligned}$$

and for imposed load

$$\begin{aligned}\delta_{imp} &= 4.7 \text{ mm} \\ &(\text{span} / 1309)\end{aligned}$$

SHS/RHS sections subject to direct compression (Hot rolled sections only)



Calculations in accordance with BS5950:Part1:2000 and the SCI 'Steelwork Design Guide to BS5950'

Section size - 80x80x3.6 RHS (Adopt 80x80x5-buildability)
Section class - 1 (Plastic)
Steel grade - S 275
Design strength of steel = 275 N/mm²

Length = 3300 mm

Applied ultimate compressive load = 110 kN

End restraint type: (As defined in Table 22)

Bottom, x-x axis - Effectively held in position but not restrained in direction.
Top, x-x axis - Effectively held in position but not restrained in direction.
Bottom, y-y axis - Effectively held in position but not restrained in direction.
Top, y-y axis - Effectively held in position but not restrained in direction.

Determine the member slenderness

The effective length factor for the x-x axis combination of restraints is

$$L_{fx} = 1$$

and for the y-y axis is

$$L_{fy} = 1$$

For the x-x axis the slenderness is

$$\begin{aligned}\lambda_x &= L_0 * L_{fx} / r_{xx} \\ &= 3300 * 1 / 31 \\ &= 106.5\end{aligned}$$

and for the y-y axis

$$\begin{aligned}\lambda_y &= L_0 * L_{fy} / r_{yy} \\ &= 3300 * 1 / 31 \\ &= 106.5\end{aligned}$$

Determine the capacity of the section

The y-y axis slenderness is greatest. The allowable compressive strength from Table 24(a) is

$$p_c = 143.6 \text{ N/mm}^2$$

and hence the capacity of the section in accordance with clause 4.7.4 is

$$\begin{aligned}P_c &= p_c * A_g / 1000 \\ &= 143.6 * 1090 / 1000 \\ &= 156.5 \text{ kN} > 110 \text{ kN}\end{aligned}$$

Masonry wall capacity check for

52 Adley Street

Wall reference: Foundation Capacity

Reaction force from beam B1 (kn,ULS)= 110

Foundation capacity check

Assumed allowable ground bearing pressure (kn/m²)= 90

Foundation width (m)= 0.6

Effective foundation length (m)= 1.6

Induced ground bearing pressure (kn/m²)= 82 < 90 Passed

Notes: Effective foundation length=

400+600+600=1600

OPEN BACK LINTELS

- **90-105mm** cavity
- **100-115mm** inner leaf

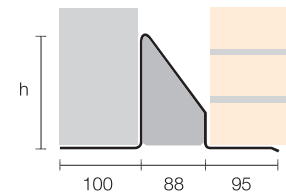
Standard Duty



CG90/100

Standard lengths (mm)	750-1500	1650-1800	1950-2100	2250-2400	2550-2700	2850-3600
SWL 1:1/3:1 (kN)	15	18	20	22	26	26
Weight (kg/m)	6.1	7.6	8.3	8.9	10.2	13.0
Nominal height 'h' (mm)	140	140	160	180	220	220

Standard lengths are available in 150mm increments up to 3000mm, 300mm at lengths from 3000mm to 3600mm.



All ratios are shown inner to outer

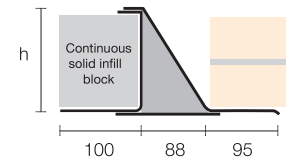
Heavy Duty



CH90/100

Standard lengths (mm)	900-1800	1950-2100	2250-2400
SWL 1:1/19:1 (kN)	32	48	45
Weight (kg/m)	11.2	14.0	14.0
Nominal height 'h' (mm)	157	157	157

Standard lengths are available in 150mm increments.



All ratios are shown inner to outer

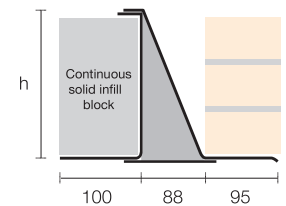
Extra Heavy Duty



CX90/100

Standard lengths (mm)	900-2700	2850-3000	3300-3900	4200-4800
SWL 1:1/19:1 (kN)	60	55	50	32
Weight (kg/m)	16.9	16.9	20.5	20.5
Nominal height 'h' (mm)	232	232	232	232

Standard lengths are available in 150mm increments up to 3000mm, 300mm at lengths 3000mm to 4800mm (including 4575mm, but excluding 4500mm).



All ratios are shown inner to outer

The SWL (safe working load) is based on the total UDL (uniform distributed load) over maximum span using 150mm end bearings.

Concrete Floor Loads

When using the Catnic CH and CX Open Back ranges with concrete floors, always ensure that the blockwork is built tight against the inner vertical face of the lintel and that a mortar joint is added to the top of the blockwork so that the floor units have an even spread over the inner flange of the lintel. For guidance on installation refer to page 73.



Where CH & CX lintels are required to support greater loads than the figures published please contact our Technical Services Department on **029 2033 7900**.

Note: To achieve the 'CH & CX' loading figures indicated, lintels must be built-in as illustrated, ensuring that the blockwork infill is well-jointed during construction and compatible with the strength of the masonry above.

Hi-Spec & Fair Faced Ranges



All units are prestressed to ensure optimum performance and come with 30 minutes fire rating as standard. With a range of 18 different sections sizes and with lengths available up to 4800mm on certain sections sizes.

Hi-Spec Finish

An extruded concrete finish for use normally in plastered situations. **Not for use in exposed painted situations.**

Fair Faced Finish

Type C Fair Faced Finish. All corners, arrises and faces on the lintel are perfect. **For use in exposed/painted situations.**

Order/Specification Code

Use the Hi-Spec reference on our load Tables (e.g. S5). For Fair Faced Lintels precede the lintel reference with the word 'Faced', ie Faced S5.

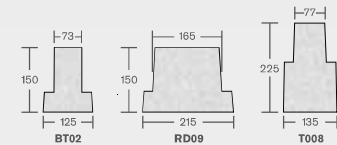
Hi-Spec Range		S4	R6	R9	R12
Load Table Units suitable for 100mm wide walls					
Fire Resistance Available (mins)		30	30	30	30
Suitable for Foundation Use		yes	yes	yes	yes
Maximum Stock Length Available		3000mm	3600mm	3600mm Longer lengths available on request - up to 4800mm	3600mm
Available Range Finish		Faced	Faced	Faced	Faced
UNFACTORED LOADS IN kN / m					
Length	Clear Span	100x100	100x140	100x215	100x290
900mm	700mm	18.00	38.90	78.18	100.05
1100mm	900mm	14.20	29.06	62.44	79.90
1200mm	1000mm	12.80	25.20	55.80	72.57
1500mm	1200mm	11.25	17.70	38.70	60.85
1800mm	1500mm	7.25	12.60	27.90	49.65
2100mm	1800mm	5.02	9.10	21.20	41.91
2400mm	2100mm	3.66	6.70	16.80	31.70
2700mm	2400mm	2.77	5.00	13.60	24.53
3000mm	2700mm	2.15	4.97	11.30	19.49
3300mm	3000mm	n/a	3.80	9.53	15.83
3600mm	3200mm	n/a	2.50	8.20	13.49
Lintel Weight kg/m		23	34	53	70

Structural Performance

Load-span Tables



Prestressed beam details



Beam Reference	Width (mm)	Height (mm)	Weight (kN/m)	Weight (kg/m)	Max Length
BT02	125	150	0.326	32.8	5.5
RD09	215	150	0.622	64.2	6.8
T008	135	225	0.576	58.7	7.9

The load-span tables opposite are given as a guide only. Further advice is available on request.

Camber details

Bison Precast prestressed concrete beams exhibit an upward curve known as camber which is a result of the compressive force near the bottom generated by the prestressing tendons. An allowance of span/300 should be taken into account in floor finishes or bearing levels.

Construction details

All Bison Precast flooring systems are supported by comprehensive layout drawings, specifications and relevant details applicable to each application.

There are three beam types which are produced in standard profiles of 150 x 125mm, 150 x 215mm and 225 x 135mm (depth x width) to give a range of capacities to suit all loading options. Beams are placed at appropriate centres depending on span and applied load (see loadspan chart).

The beams are positioned in accordance with the layout drawings, perpendicular to the end supports with a nominal bearing of 100mm to each end when supported by brick or block. A 75mm nominal bearing is required when supported by steelwork.

The beams may be staggered at the internal walls and multiple beams may be required to support partition walls.

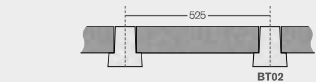
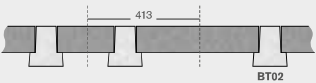
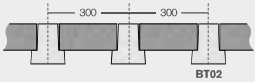
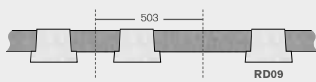
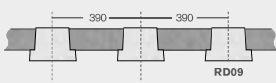
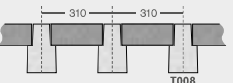
A wide range of infill blocks are available for use with the system including Thermalite, Aircrete and Floorblock.

Bison Precast also provides a choice of medium and dense aggregate blocks.

Where required, blocks should be cut using suitable mechanical means to leave a clean, vertical, square-edged face.

Once all the blocks have been placed in position the floor is grouted using a 4:1 sharp sand/cement mixture, which is brushed in the direction of the beams and then at right angles to ensure all joints are completely filled.

Load-span tables



Ref	Self weight kN/m ²	Finishes of 1.8kN/m ²						150mm Beam
		Imposed load in kN/m ²						
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
IJ1	1.86	3.95	3.90	3.75	3.60	3.20	3.10	

Ref	Self weight kN/m ²	Imposed load in kN/m ²						150mm Beam
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
IJ2	1.96	4.30	4.30	4.20	4.00	3.40	3.50	

Ref	Self weight kN/m ²	Imposed load in kN/m ²						150mm Beam
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
IJ3	2.15	4.75	4.75	4.75	4.65	3.70	3.90	

Ref	Self weight kN/m ²	Finishes of 1.8kN/m ²						150mm Beam
		Imposed load in kN/m ²						
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
RDJ4	2:10	5.35	5.10	4.90	4.75	4.40	4.15	

Ref	Self weight kN/m ²	Imposed load in kN/m ²						150mm Beam
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
RDJ5	2.25	5.85	5.60	5.40	5.20	4.85	4.55	

Ref	Self weight kN/m ²	Imposed load in kN/m ²						150mm Beam
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
RDJ6	2.47	6.45	6.25	6.05	5.80	5.45	5.15	

*The floor self weight includes the weight of the beams and the concrete blocks.

Ref	Self weight kN/m ²	Finishes of 1.8kN/m ²						225mm Beam
		Imposed load in kN/m ²						
		1.5	2.0	2.5	3.0	4.0	5.0	
Maximum Clear Span (m)								
TJ1	2.33	6.45	6.15	5.90	5.70	5.35	5.00	

Ref	Self weight kN/m ²	Imposed load in kN/m ²						225mm Beam
		1.5	2.0	2.5	3.0	4.0	5.0	
		Maximum Clear Span (m)						
TJ2	2.56	7.10	6.80	6.55	6.35	5.95	5.60	

Ref	Self weight kN/m ²	Imposed load in kN/m ²						225mm Beam
		1,5	2,0	2,5	3,0	4,0	5,0	
		Maximum Clear Span (m)						
TJ3	2,98	7,75	7,75	7,45	7,20	6,80	6,40	

*The floor self weight includes the weight of the beams and the concrete blocks.

General notes:

1. The structural specification within this document is to be read in conjunction with all relevant architectural drawings, the standard notes that are contained on the drawings and any other relevant project information.
2. The drawings within this document are indicative only, and represent design intent only. No dimensions are to be scaled from drawings contained within this document. Refer to the architectural drawings for all dimensions. All dimensions should be checked on site by the contractor before fabrication and ordering of materials.
3. Unless noted otherwise, all dimensions are in millimetres and all levels are in metres from the site datum.
4. The information within this document cannot be guaranteed as dimensionally exact. Figured dimensions must be used for setting out and detailing.
5. The contractor is responsible for the design of all temporary works, and is also responsible for the safe maintenance and stability of the existing building/s at all times.
6. All party wall awards are entirely the responsibility of the client
7. The contractor (or client) must report any differences between the structural drawings and site conditions to the structural engineer.
8. The contractor (or client) must notify the structural engineer of any design changes that could affect the structural specification before work commences.
9. The contractor shall at the outset, establish with the local authority their requirements for inspecting the works, and adhere to these.
10. All dimensions and levels shown on the drawings are based on survey drawings and the contractor is to satisfy himself that dimensions, levels, etc., are sufficiently accurate and complete for fabrication within the specified tolerances of all prefabricated elements.
11. If in doubt about the information shown on this drawing or any related drawings - please ask.
12. The contractor has sole responsibility for the design of all temporary works.
13. All lintels to have a minimum 150mm end bearing into new/existing wall.
14. All existing lintels are to be inspected and replaced if they show signs of deterioration, cracking or distress. The material nature of any replacement is to be approved by the local authority prior to installation.
15. All existing walls to be examined by the contractor for lack of bond/delamination, etc. If such areas are noted, the client's engineer is to be informed immediately. The contractor shall arrange for the design and installation of a suitable remedial tie system.
16. Should any existing wall prove to be inadequately restrained, the contractor allow for the design and installation of suitable remedial works to provide adequate lateral restraint and submit the design to the local authority for approval.
17. The contractor is to provide temporary works to provide lateral and vertical restraint to existing walls prior to demolition of any part of the existing building commencing.

18. In all cases the existing walls will require the following remedial works:

- i) all existing steelwork and timbers required to be carefully removed. The contractor should obtain the approval of the relevant local authorities prior to this work being carried out.
- ii) all minor cracks to be repaired using 1:1:6 mortar.
- iii) any mortar/brickwork that is judged by the contractor or the client's engineer or the local authority representative to be crumbly, soft, deteriorated, etc., is to be removed and rebuilt in bonded engineering brick, facing brick or block as appropriate.
- iv) all existing internal masonry wall openings no longer required are to be in-filled in bonded brick/block as appropriate.
- v) all straight joints are to be tied across by means of proprietary galvanized steel strapping.
- vi) if cracks with an aperture greater than 2mm are uncovered, the contractor shall provide stitching using 900mm long x 100mm wide x 65mm deep pre-cast concrete lintels at 900mm centres vertically. The lintels are to be inserted on a 1:1:6 mortar bed and packed with a 1:1:6 semi-dry mortar well rammed.

19. Joists are to be doubled-up below all stud partitions. The joists to be bolted together at 600mm centres using m12 gr. 4.6 bolts with 50mm square plate washers each side and double sided toothed plate connectors.

Steelwork notes:

1. Structural steelwork design to bs5950-1:2000.
2. Design, fabrication and erection of structural steelwork to comply with the latest edition of the national structural steelwork specification (N.S.S.S.).
3. The ends of all beams are to be properly sawn/machined, in the fabrication workshop, to ensure a close bearing fit between flanges and end plates.
4. All hot rolled structural steelwork to be mild steel to grade S275JR to BS EN 10025:1993, and hollow sections grade S355J2H to BS EN 10210-1.
5. Internal steelwork - to be blast cleaned to SA21 2 to receive shop applied zinc phosphate epoxy primer (80 microns). External steelwork - to be either blast cleaned to sa21 2 and hot dipped galvanised (140 microns) or chemically cleaned and hot dipped galvanised (85 microns).
6. The steelwork fabricator is to conduct an accurate site survey to determine final dimensions for all new steelwork prior to fabrication. The survey should highlight any existing obstructions, services, etc. That need to be altered/relocated to avoid clash.
7. All bolts to be grade 8.8 in accordance with en iso 1461 unless noted otherwise on the drawings.
8. Weld tests to be carried out to comply with the latest edition of 'the national structural steelwork specification for building construction'. 'Fluid' is to be provided with copies of all weld test results.
9. All steel beams and columns are to be fire protected in accordance with the surveyors details and current building regulations. Allow minimum 60 minutes, unless noted otherwise.

Masonry notes:

1. All masonry is designed, and shall be constructed in accordance with bs 5628-1:2005 plus all latest amendments, including adequate restraint as detailed in annex 'd'
2. Brick and block strengths shown are minimum required and should be increased as necessary to suit coursing. Cut bricks/blocks below padstone's will not be accepted.
3. Test certificates confirming brick and block crushing strengths will be required for engineers approval.
4. Walls below ground level are to be built up in dense concrete blockwork (minimum 7.0kn/mm²) inner and outer leaves in 1:1 4 :3 mortar, with lean mix concrete cavity fill up to 150mm below ground level.
5. Walls above ground level to be built up in 1:1:6 mortar (cement:lime:sand) or equivalent unless shown otherwise.
6. Where blockwork walling below ground is in excess of 900mm high, then 215mm thick blockwork is to be adopted, using block laid flat and coursed at 225mm vertical centres. Backfilling is to be carried out equally either side of the walling and is to be of an approved, well graded, granular material.
7. Minimum blockwork strength to be 2.8n/mm², unless stated otherwise.
8. Contractor to obtain confirmation from manufacturers concerning suitability of blocks and bricks for use below DPC.
9. Wall ties to be stainless steel Stafix RT2 at 450crs vertically and 900crs horizontally (staggered). Ties to be positioned at 225crs vertically around all openings.

Timber notes:

1. Galvanised steel straps to be provided at no greater than 1000mm centres between timber and walls and or steelwork, complete with solid blocking.
2. All timber to be minimum strength class c16 unless noted otherwise.
3. All timbers projecting into cavity of cavity wall construction to have ends liberally coated in 'Wolmanol' or similar approved grain preservative.
4. All timber to be regularised and supplied at a moisture content average not exceeding 18%.
5. All connectors, bolts and washers to be galvanised.
6. All dimensions and bearing points of the trusses are to be checked prior to fabrication.
7. All roof bracing is to the design of the specialist supplier. However, all roof bracing members are to be at least 97x22, grade c16 and are to be nailed to every trussed rafter they cross with 2no. 3.35mm $\varnothing$ x 65mm long galvanised round wire nails. Where bracing members are provided in two pieces the are to be lap jointed over at least two trussed rafters and nailed as above. Timber lintel schedule: openings up to 1100mm - 150x100mm c16 lintel openings up to 1900mm - 200x100mm c16 lintel consult with structural engineer if larger openings required in stud wall.

Foundation and ground floor notes:

1. The main contractor to ensure that the ground bearing strata, minimum bearing depths and general recommendations of the soil investigation are adhered to.
2. The main contractor to undertake exploratory excavations adjacent to any existing buildings and services to determine nature and depth of existing footings etc. Contractor to ensure that all foundations to existing buildings and underground services are not undermined or disturbed in any way during the construction works.
3. Contractor to be responsible for all temporary works during construction of the superstructure and foundations to ensure that all adjacent buildings, roads, footpaths and services etc. Remain stable and free from damage.
4. Foundations are to be taken down to the depths shown on this drawing. To be checked on-site by building control officer/engineer prior to construction.
5. Unless noted otherwise thus: (600) all foundations to be a minimum 600mm wide, centred on the grid location over.
6. All formation levels, shutters and reinforcement to be checked on-site by the building control officer prior to construction.
7. Any excavations liable to remain exposed to the elements in excess of 24 hours prior to concreting (or less in inclement weather) are to receive 50mm protective blinding concrete.
8. In cohesive soils the vertical faces of all excavations must be sufficiently smooth to allow movement of the soil to take place without disturbing the foundation.
9. Foundations may be trench filled but the top level of concrete must suit brick coursing and final ground levels.
10. No service may be built through or cast into foundations without the engineer's approval.
11. Where blockwork walling below ground level is in excess of 900mm high then 215mm thick block work is to be adopted (blocks laid flat and coursed to 225mm vertical centres). Back filling is to be carried out equally either side of walling and to be of an approved, well graded granular material.
12. For existing manholes/drain runs/services reference is to be made to the architectural drawings. The depth and positions of all existing services are to be checked on site by the contractor prior to commencing work and any variation with the architectural drawings is to be reported to them prior to proceeding. If any damage is caused to the existing runs/services during these works by the contractor any making good will be at the contractors own cost.

Construction (design and management regulations) notes:

All works and site procedures must be in keeping with the latest version of the 'CDM Regulations 2015' and a principal designer is to be appointed by the client to manage and coordinate health and safety matters accordingly.

Temporary works:

1. As applicable the contractor is entirely responsible for maintaining the stability of all existing buildings and structures within, and adjacent to, the works, from the date of possession of the site until practical completion of the works. The design, installation (including sequence), maintenance and removal (including sequence) of the temporary works is entirely the responsibility of the contractor. In addition to the support of the vertical loads, due regard shall be given to the overall lateral stability of the structures, and the lateral stability of walls columns and piers, especially where adjacent existing floors and roofs are to be demolished. The temporary support systems are to be erected off a foundation/spreader system adequate for the vertical and horizontal loads required to be supported. The design of the temporary works is to be undertaken by a competent person.
2. The contractor is to ensure that all existing construction is adequately supported prior to commencing demolition works. If in doubt engineer to be consulted prior to commencing demolition.
3. Before commencing removal of temporary supports the contractor is to complete erection and connection of the new permanent supporting structure. The contractor is to ensure that the temporarily propped structure is adequately supported on the new permanent works prior to removal of any temporary supports. The contractor is to ensure that all parts of the new supporting structure have gained adequate strength prior to removing temporary supports.
4. The loadings for the temporary works design are given below, and on the drawings as appropriate. Note: all loads are unfactored. The temporary works designer must multiply these loads by the appropriate ultimate load factors as given in the relevant design standard.
 - a. Steel beams dead load = 40kn/m
 - b. Steel beams imposed load = 15kn/m

Existing services:

1. For the indicative positions of existing buried services reference is to be made to the architect's drawings. The accuracy of this information cannot be guaranteed, and therefore it is the contractor's responsibility to establish the positions and depths of all underground services (including those not shown on engineering drawings) prior to the works commencing. The contractor is to also note any overhead cables etc. That may present a hazard during the works.

Soil conditions:

1. Excavation is to proceed with great care. As excavation proceeds the contractor is to maintain vigilance for ground conditions which may affect the stability of the excavations, and the safety of operatives. (e.g weak/soft soils, water table, toxic substances/gases buried services etc,) adequate support to be provided to sides of excavations as necessary