Date: 01-08-2023

DESIGN OF STEEL MEMBERS

FOR

PROPOSED DEVELOPMENT AT DRUMCOR, LOUGHDUFF, CO. CAVAN

FOR

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Submitted By

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Revision: R1

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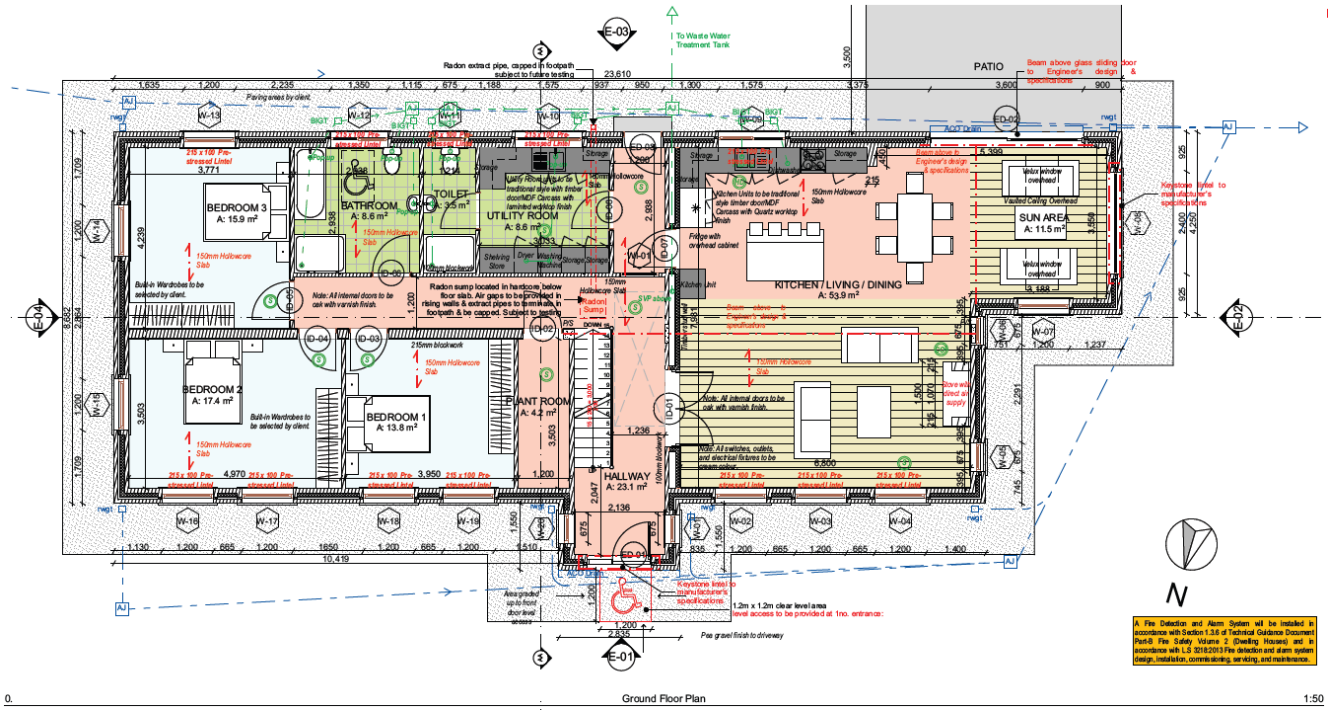
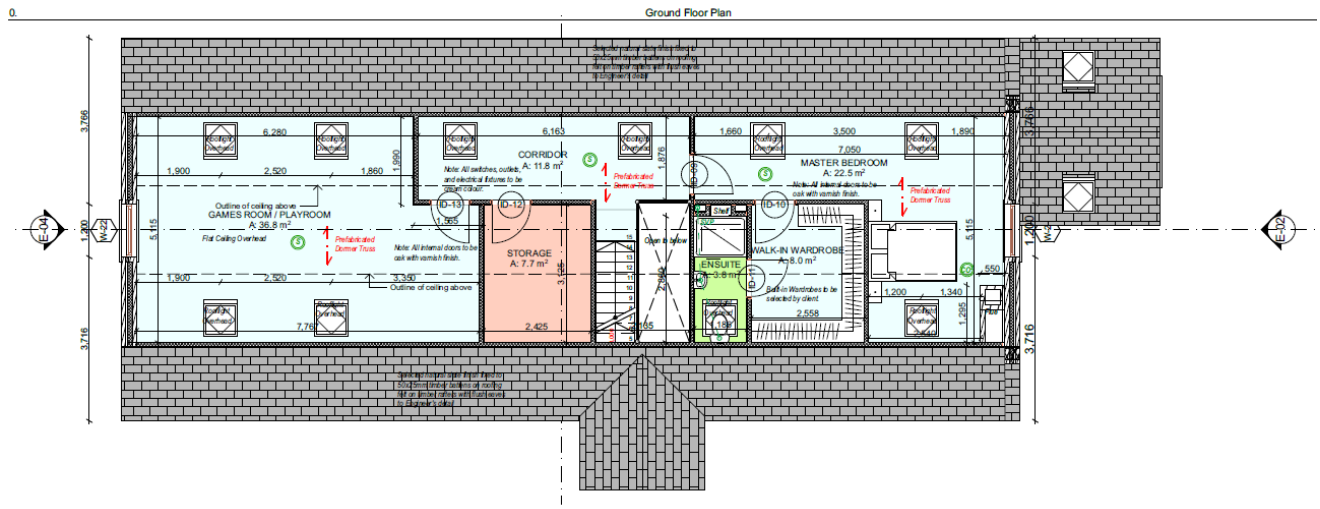
1. INTRODUCTION

This document forms the Engineering Design Basis for Analysis and Design of Structural steel Members for proposed development at Drumcor, Loughduff, Co. Cavan.

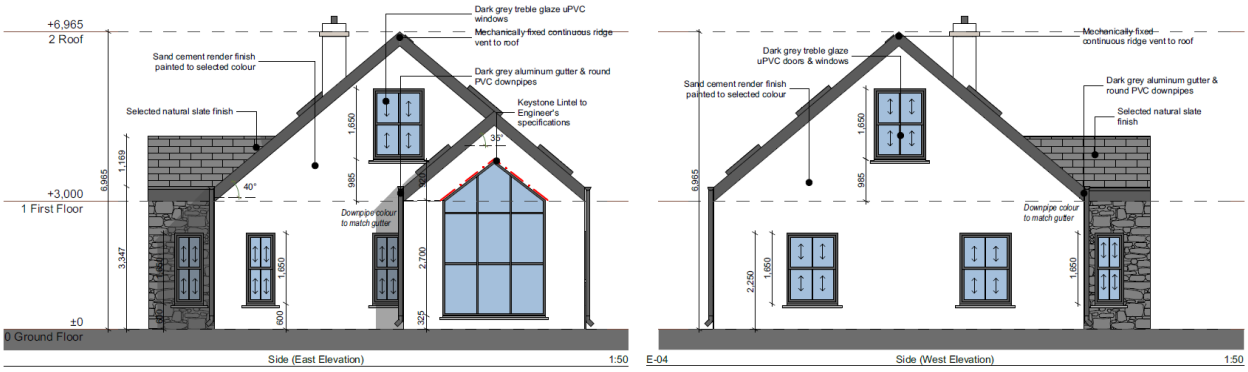


Proposed Ground Floor plan



Proposed First Floor plan

Proposed front and rear elevations



Proposed both side elevations

2. MATERIAL PROPERTIES

Material Specifications

Section Type	Hot rolled
Material grade	S355
Design Strength	355 N/mm^2
Density	78.33 kN/m^3
Modulus of elasticity "Es"	205.0kN/mm^2
Shear modulus "Gs"	78846.0 MPa
Poisson's ratio "μ"	0.3
Co-efficient of linear expansion	$12*10^{-6}$ / °C

3. CODES CONSIDERED

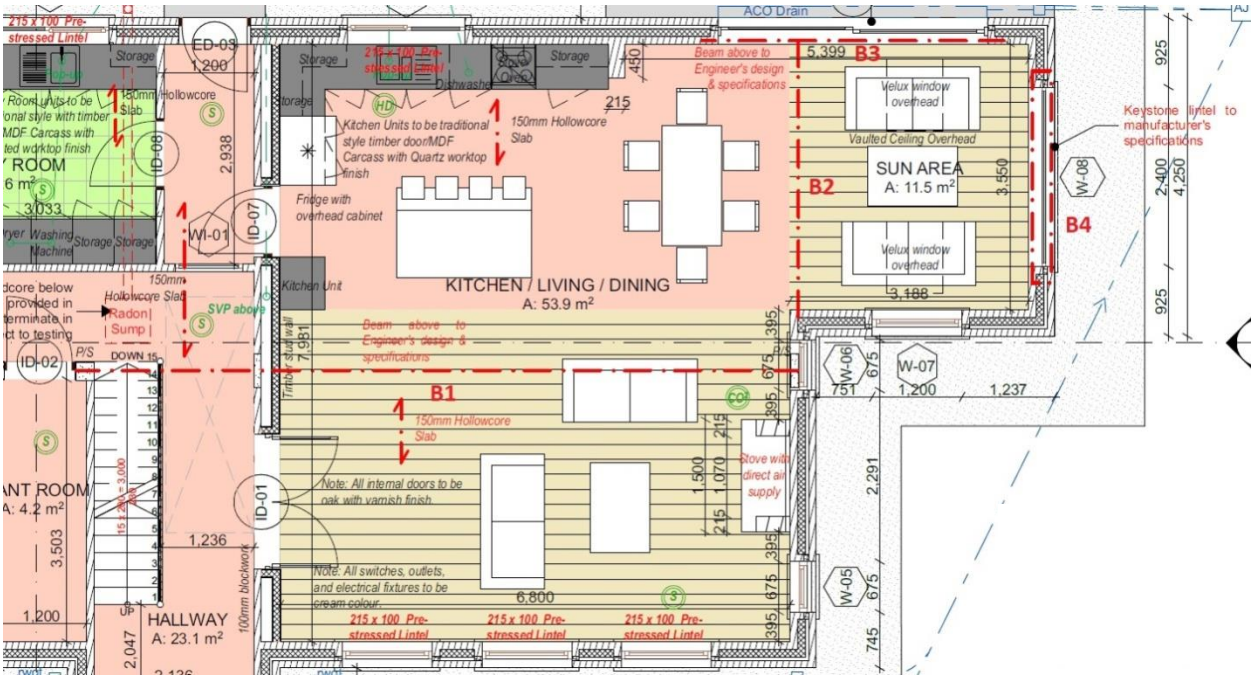
Following codes are referred for analysis and design of proposed structure.

- BS EN 1990 Eurocode Basis of Structural Design
- EN 1993-1-1 (2005) Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings
- EN 1991-1-1 (2002) Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings

4. DESIGN ASSUMPTIONS

- All members both end support conditions considered as pinned support, either supported on main steel member or on load bearing wall.

5. STRUCTURAL SYSTEM AND MEMBER LOCATION



Beam arrangement

6. LOADING DATA

6.1. Design Loads:

Building Design Loads will be in accordance with the more stringent of either the following criteria or as set forth by governing local and national codes. Structural design will be coordinated with architectural, mechanical and electrical drawings to ensure all loads impacting structural elements are adequately supported.

Load consideration/Assumptions:

Self-weight of 150mm Hollow core slab =	3kN/m^2
Weight considered for 75mm Screed (25kN/m2 x 0.075m)=	1.875kN/m^2
Internal partition wall load on beam = 0.5 x 2.81 = 1.4 (89mmtimber studs @ 600mm O.C. with 12.5mm plasterboard on both sides)	1.4kN/m
Internal partition wall load on slab per sq.m. slab area =	1 kN/m2
External wall Build up = (12.5mm plasterboard + 100mm masonry + 40mm cavity + 110mm Xtratherm Cavitytherm+ 100mm masonry + 12.5mm plasterboard)	4 kN/m^2
Live load on floor (As per Category A of BS EN 1991-1-1:2002)=	2kN/m^2
Live load on stair (As per Category H of BS EN 1991-1-1:2002)=	3kN/m^2
Weight considered for Roofing material =	0.35 kN/m^2
Weight considered for Roof finishes =	0.2 kN/m^2

6.2. Load Combinations:

Design Load Combinations as per EN 1993-1-1 (2005) Eurocode 3:

- 1.35DL+1.50LL

Serviceability Load Combination as per EN 1993-1-1 (2005) Eurocode 3:

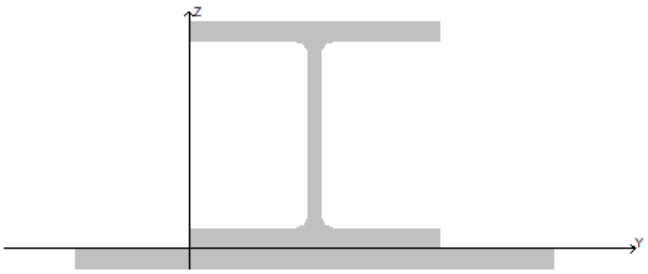
- DL+LL

7. ANALYSIS AND DESIGN OF BEAM B1:

Analysis and design of steel Beam B1 performed in STAADPro software according to EN 1993-1-1 (2005) Eurocode 3:

Refer below image showing view of beam B1 modeled in STAADPro:

7.1. Member property:



Section element	Rotation angle	Mirror	Material	E (kN/mm^2)
Universal Columns 203x203x86			Steel	205.0
Sheet 400 x 20			Steel	205.0

The overall dimensions of the section are 400 x 242 mm

Basic geometry of the section

	Parameter	Value	
A	Cross sectional area	19000.0	mm^2
α	Angle between Y-Z and U-V axes	-0.0	deg
I_y	Moment of inertia about axis parallel to Y passing through centroid	162689738.8	mm^4
I_z	Moment of inertia about axis parallel to Z passing through centroid	137966668.53	^{4}
I_t	Torsional moment of inertia (St. Venant)	2372246.41	mm^4
I_w	Warping constant	0.0	mm^6
i_y	Radius of gyration about axis parallel to Y passing through centroid	92.53	mm
i_z	Radius of gyration about axis parallel to Z passing through centroid	85.21	mm
W_{u+}	Elastic modulus about U-axis (+ve extreme)	1003703.33	mm^3
W_{u-}	Elastic modulus about U-axis (-ve extreme)	2030816.07	mm^3
W_{v+}	Elastic modulus about V-axis (+ve extreme)	689833.34	mm^3
W_{v-}	Elastic modulus about V-axis (-ve extreme)	689833.34	mm^3
W_{plu}	Plastic modulus about axis parallel to U-axis	1287316.7	mm^3
W_{plv}	Plastic modulus about axis parallel to V-axis	1255891.51	mm^3
I_u	Moment of inertia about U-axis	162689738.8	mm^4
I_v	Moment of inertia about V-axis	137966668.53	^{4}
i_u	Radius of gyration about U-axis	92.53	mm
i_v	Radius of gyration about V-axis	85.21	mm
a_{u+}	Centroid to edge of compression zone along +ve U-axis	36.31	mm
a_{u-}	Centroid to edge of compression zone along -ve U-axis	36.31	mm
a_{v+}	Centroid to edge of compression zone along +ve V-axis	52.83	mm
a_{v-}	Centroid to edge of compression zone along -ve V-axis	106.89	mm

7.2. Load calculation of beam B1

Calculation of Dead and Live load on STEEL Beam:

Span of loading as shown in above Figure 7 and Figure 8,

Loading between node 1-2

Dead Load

S.W of steel beam	Program Calculated as per section properties	
Load due to Laminate floor= (1.875 kN/m^2x 2.36m tributary span)=	4.425	kN/m
Self-weight of hollow core slab = (3 x2.36 m tributary span)=	7.08	kN/m
Uniformly distributed load of staircase (self weight+step wt+ floor finish + live load) x span/2 (25x0.15x[305/230] + 25x0.5x0.2+1+3) x 3.245/2 =	18.49	kN/m
Internal partition wall load on beam (1.00kN/m^2x 2.36 m tributary span)=	2.36	kN/m
Total Dead load on beam=	31.33	kN/m

Live load

Live load on floor = (2 kN/m^2x (4.72 m/2))=	4.72	kN/m
Total live load on beam=	4.72	kN/m

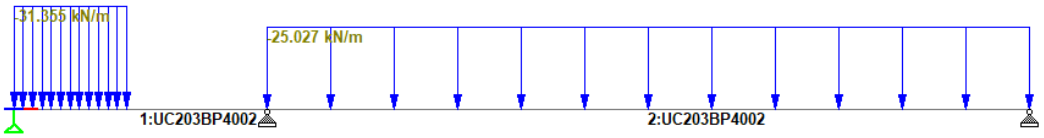
Loading between node 3-4

Dead Load

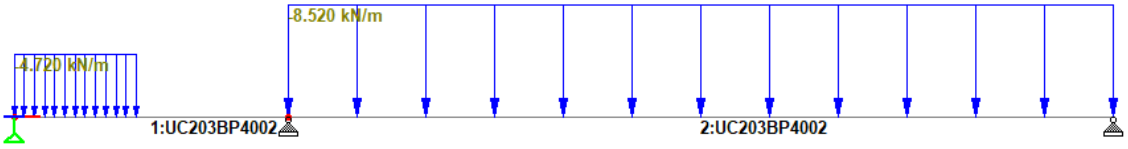
S.W of steel beam	Program Calculated as per section	
Load due to Laminate floor= (1.875 kN/m^2x 4.26m tributary span)=	7.987	kN/m
Self weight of hollow core slab = (3 kN/m^2x4.26 m tributary span)=	12.78	kN/m
Internal partition wall load (1.00kN/m^2 x 4.26m tributary span)=	4.26	kN/m
Total Dead load on beam=	25.02	kN/m

Live load

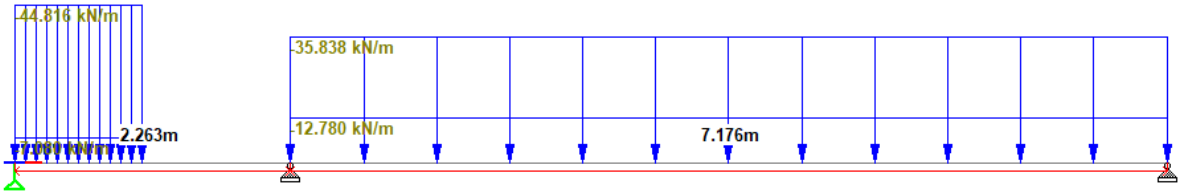
Live load on floor = (2 kN/m^2x 4.26 m tributary span)=	8.52	kN/m
Total Live load on beam	8.52	kN/m



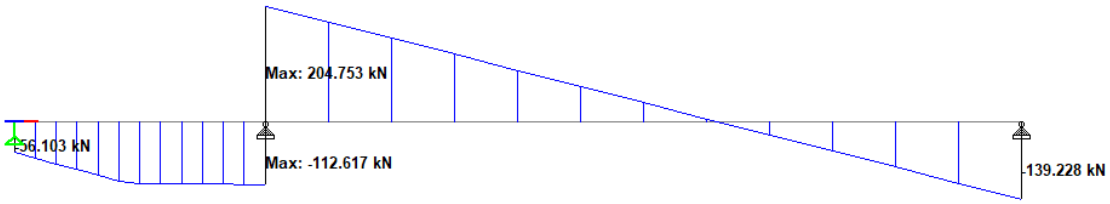
Dead load on beam B1



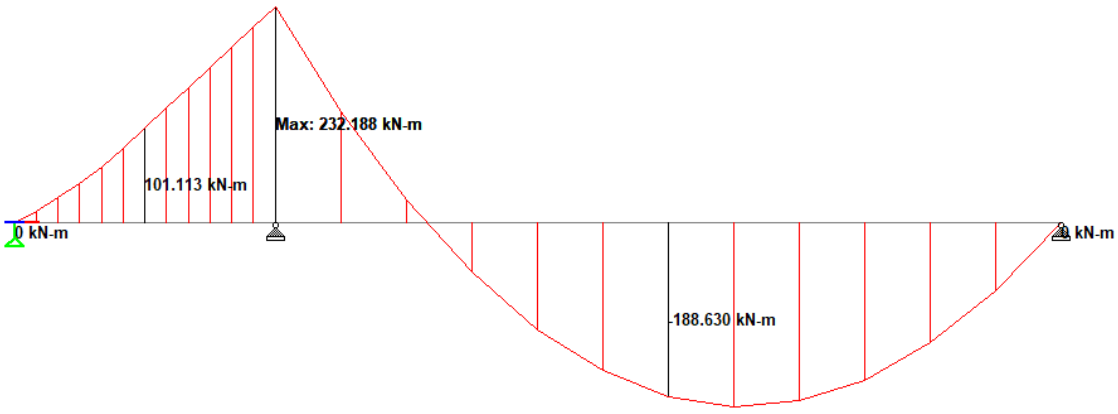
Live load on beam B1



Loading Diagram (1.35DL+1.5LL)

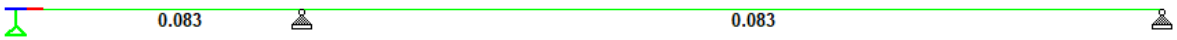


Shear force diagram (1.35DL+1.5LL)



Bending Moment Diagram (1.35DL+1.5LL)

7.3. Utilization ratio check

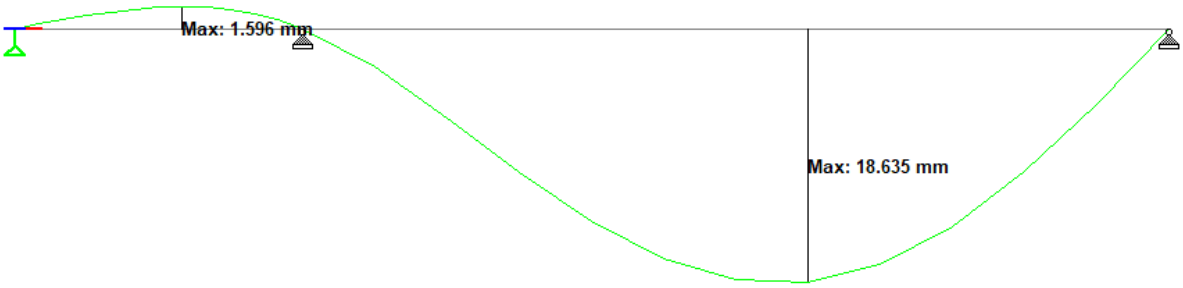


Utility ratio of Beam B1

Above Figure shows member utilization ratio. Failed members (i.e., members having utility ratio more than 1) will be highlighted with red colors. It can be seen from image that all members are green. Hence, all members have passed in design.

7.4. Deflection check

Below image shows displacement diagram of member having maximum vertical deflection for serviceability load combinations.



Deflection diagram of beam B1 (DL+LL)

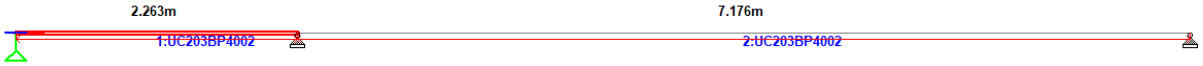
Maximum vertical displacement of beam in Y direction= 18.635 mm

Permissible vertical deflection = Span / 360 = 7176 /360 = 19.93 mm

Actual maximum vertical deflection of beam = 18.635 mm < 19.93 mm (Hence, OK)

7.5. STAAD design output results

STAAD output results for BEAM B1 Member 1 (2.26m):

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=========================================================================


     1 ST   UC203BP4002 (UPT)
                         PASS     EC-6.2.5           0.083         3
                      0.00            0.00         -232.19        2.35
=========================================================================
  MATERIAL DATA
     Grade of steel           =  S 355
     Modulus of elasticity    =  205 kN/mm2
     Design Strength  (py)    =  355  N/mm2

  SECTION PROPERTIES (units - cm)
     Member Length =    235.20
     Gross Area =  190.00          Net Area =  190.00

                                    z-axis          y-axis
     Moment of inertia        :    16300.001       13800.001
     Plastic modulus          :     7879.602       10714.416
     Elastic modulus          :     1346.551         690.173
     Shear Area               :        0.000           0.000
     Radius of gyration       :        9.262           8.522
     Effective Length         :      235.200         235.200

  DESIGN DATA (units - kN,m)   EUROCODE NO.3 /2005
     Section Class            :   CLASS 1
     Squash Load              :   6745.00
     Axial force/Squash load  :     0.000
     GM0 :  1.00          GM1 :  1.00          GM2 :  1.25

                                   z-axis          y-axis
     Slenderness ratio (KL/r) :       25.4            27.6
     Compression Capacity     :     4496.2          4179.2
     Tension Capacity         :     6703.2          6703.2
     Moment Capacity          :     2797.3          3803.6
     Reduced Moment Capacity  :     2797.3          3803.6
     Shear Capacity           :        0.0             0.0

  BUCKLING CALCULATIONS (units - kN,m)
     Lateral Torsional Buckling Moment       MB = 2797.3
     co-efficients C1 & K : C1 =1.000 K =1.0, Effective Length= 2.352
     Lateral Torsional Buckling Curve :
     Compression buckling curves:     z-z:           y-y:
     Critical Load For Torsional Buckling,          NcrT  = 56638.6
    STAAD SPACE                                          -- PAGE NO.     4

  CRITICAL LOADS FOR EACH CLAUSE CHECK (units- kN,m):
   CLAUSE        RATIO  LOAD     FX       VY      VZ      MZ      MY
  EC-6.2.5       0.083     3     0.0    112.6     0.0  -232.2     0.0
  EC-6.3.2 LTB   0.083     3     0.0    112.6     0.0  -232.2     0.0
```

STAAD output results for BEAM B1 Member 2 (7.176m):


```
MEMBER     TABLE       RESULT/   CRITICAL COND/     RATIO/     LOADING/
                         FX            MY             MZ       LOCATION
=========================================================================


     2 ST   UC203BP4002 (UPT)
                       PASS     EC-6.2.5           0.083         3
                     0.00            0.00         232.19        0.00
=========================================================================
  MATERIAL DATA
     Grade of steel           =  S 355
     Modulus of elasticity    =  205 kN/mm2
     Design Strength  (py)    =  355  N/mm2

  SECTION PROPERTIES (units - cm)
     Member Length =    708.70
     Gross Area =  190.00          Net Area =  190.00
    STAAD SPACE                                          -- PAGE NO.    5


                                    z-axis          y-axis
     Moment of inertia        :    16300.001       13800.001
     Plastic modulus          :     7879.602       10714.416
     Elastic modulus          :     1346.551         690.173
     Shear Area               :        0.000           0.000
     Radius of gyration       :        9.262           8.522
     Effective Length         :      708.700         708.700

  DESIGN DATA (units - kN,m)   EUROCODE NO.3 /2005
     Section Class            :   CLASS 1
     Squash Load              :   6745.00
     Axial force/Squash load  :     0.000
     GM0 :  1.00          GM1 :  1.00          GM2 :  1.25

                                    z-axis          y-axis
     Slenderness ratio (KL/r) :        76.5            83.2
     Compression Capacity     :      1469.6          1332.9
     Tension Capacity         :      6703.2          6703.2
     Moment Capacity          :      2797.3          3803.6
     Reduced Moment Capacity  :      2797.3          3803.6
     Shear Capacity           :         0.0             0.0


    BUCKLING CALCULATIONS (units - kN,m)
       Lateral Torsional Buckling Moment       MB = 2797.3
       co-efficients C1 & K : C1 =1.000 K =1.0, Effective Length= 7.087
       Lateral Torsional Buckling Curve :
       Compression buckling curves:     z-z:           y-y:
       Critical Load For Torsional Buckling,          NcrT  = 15095.9
    CRITICAL LOADS FOR EACH CLAUSE CHECK (units- kN,m):
     CLAUSE        RATIO  LOAD     FX       VY      VZ      MZ      MY
    EC-6.2.5       0.083     3     0.0    204.8     0.0   232.2     0.0
    EC-6.3.2 LTB   0.083     3     0.0    204.8     0.0   232.2     0.0
      STAAD SPACE                                            -- PAGE NO.    6

     Torsion has not been considered in the design.
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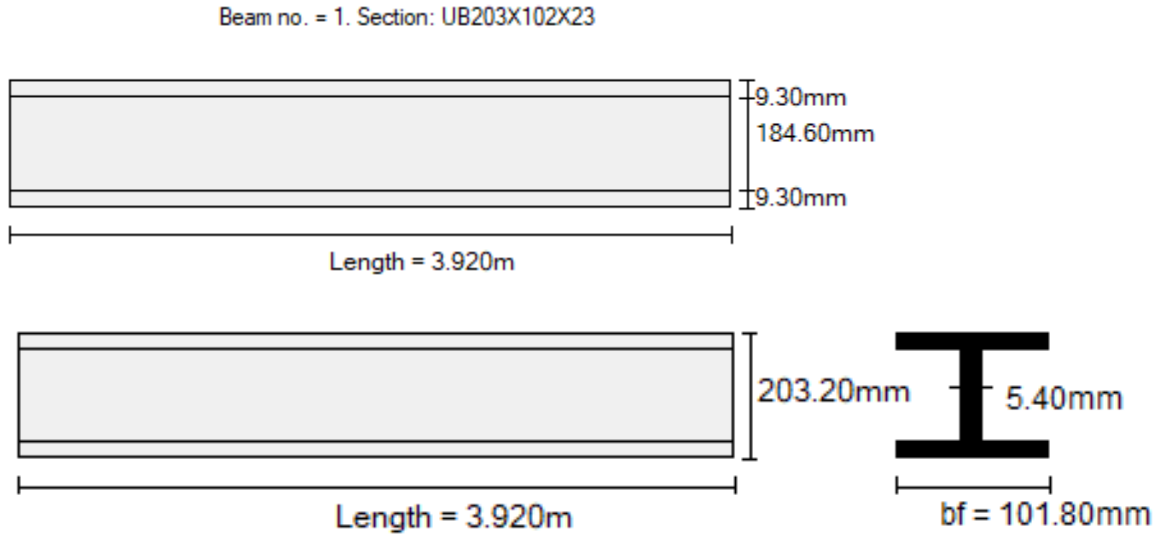
8. ANALYSIS AND DESIGN OF BEAM B2:

Refer below image showing view of beam B2 modeled in STAADPro:

Beam B2 Dimensions

8.1. Member Property



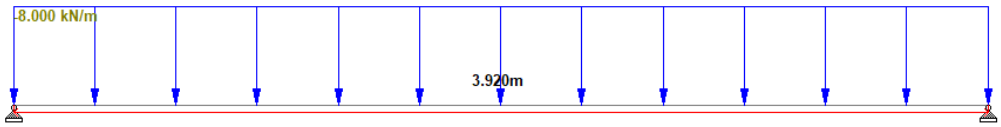
8.2. Load calculation of beam B2

Calculation of Dead and Live load on Beam B2:

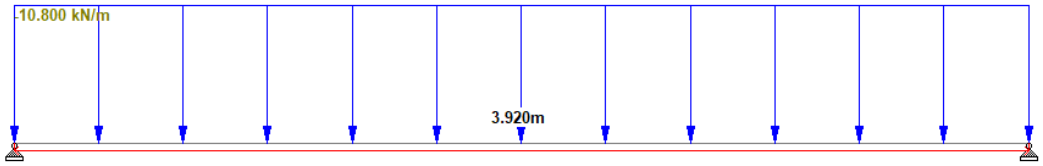
Span of loading as shown in above Figure,

Dead Load

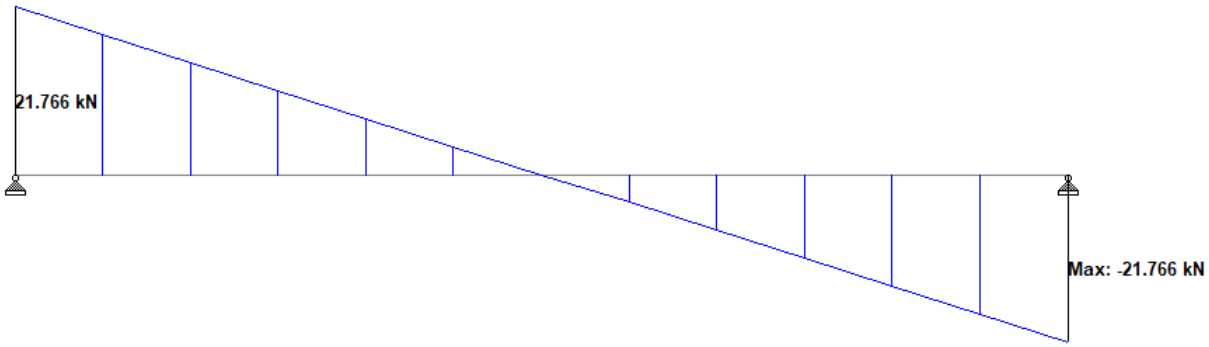
S.W of steel beam	Program Calculated as per section property
External wall build up wall load on beam ($4kN/m^2$ x 2m triangle tributary height)=	8 kN/m



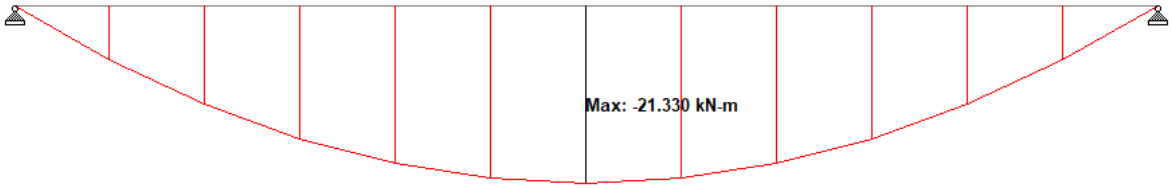
Dead load on beam B2



Loading Diagram (1.35DL+1.5LL)



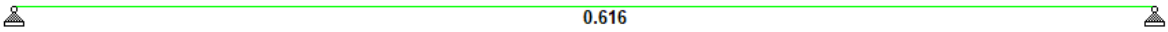
Shear force diagram (1.35DL+1.5LL)



Bending Moment Diagram (1.35DL+1.5LL)

..

8.3. Utilization ratio check

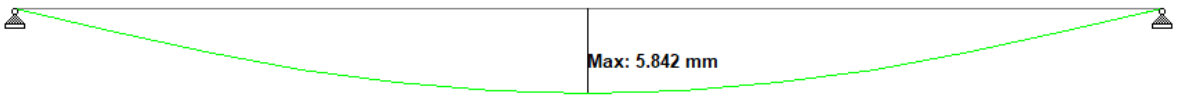


Utilization ratio of Beam B2

Above Figure 12 shows member utilization ratio. Failed members (i.e., members having utility ratio more than 1) will be highlighted with red colors. It can be seen from image that all members are green. Hence, all members have passed in design.

8.4. Deflection check

Below figure shows displacement diagram of member having maximum vertical deflection for serviceability load combinations.



Deflection diagram of beam B2 (DL+LL)

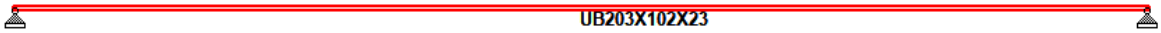
Maximum vertical displacement of beam in Y direction= 5.842 mm

Permissible vertical deflection = Span / 360 = 3920/360 = 10.888 mm

Actual maximum vertical deflection of beam = 5.842 mm < 10.88 mm (Hence, OK)

8.5. STAAD design output results

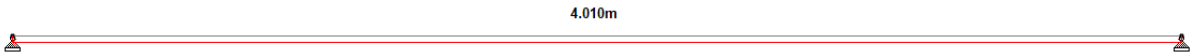
STAAD output results for BEAM B2 Member 1:




```
MEMBER     TABLE       RESULT/   CRITICAL COND/     RATIO/     LOADING/
                         FX           MY             MZ       LOCATION
=========================================================================


     1 ST  UB203X102X23 (BRITISH SECTIONS)
                          PASS     EC-6.3.2 LTB       0.616         3
                        0.00           0.00          -21.33        1.96
=========================================================================
  MATERIAL DATA
     Grade of steel           =  S 355
     Modulus of elasticity    =  205 kN/mm2
     Design Strength  (py)    =  355  N/mm2

  SECTION PROPERTIES (units - cm)
     Member Length =    392.00
     Gross Area =   29.40          Net Area =   29.40

                                    z-axis          y-axis
     Moment of inertia        :     2100.000         164.000
     Plastic modulus          :      234.000          49.700
     Elastic modulus          :      206.693          32.220
     Shear Area               :       17.041          12.381
     Radius of gyration       :        8.452           2.362
     Effective Length         :      392.000         392.000

  DESIGN DATA (units - kN,m)   EUROCODE NO.3 /2005
     Section Class            :   CLASS 1
     Squash Load              :   1043.70
     Axial force/Squash load  :     0.000
     GM0 :  1.00          GM1 :  1.00          GM2 :  1.25

                                    z-axis          y-axis
     Slenderness ratio (KL/r) :         46.4          166.0
     Compression Capacity     :        926.1          188.5
     Tension Capacity         :       1037.2         1037.2
     Moment Capacity          :         83.1           17.6
     Reduced Moment Capacity  :         83.1           17.6
     Shear Capacity           :        349.3          253.8

BUCKLING CALCULATIONS (units - kN,m)
   Lateral Torsional Buckling Moment       MB =   34.6
   co-efficients C1 & K : C1 =1.132 K =1.0, Effective Length= 3.920
   Lateral Torsional Buckling Curve : CURVE b
   Elastic Critical Moment for LTB,              Mcr   =    35.7
   Compression buckling curves:     z-z:  Curve a   y-y:  Curve b
   Critical Load For Torsional Buckling,         NcrT  =   982.3
   Critical Load For Torsional-Flexural Buckling, NcrTF =   982.3

  STAAD SPACE                                              -- PAGE NO.    4

CRITICAL LOADS FOR EACH CLAUSE CHECK (units- kN,m):
 CLAUSE        RATIO  LOAD     FX       VY      VZ      MZ      MY
EC-6.2.5       0.257     3     0.0      0.0     0.0   -21.3     0.0
EC-6.2.6-(Y)   0.086     3     0.0     21.8     0.0     0.0     0.0
EC-6.3.2 LTB   0.616     3     0.0      0.0     0.0   -21.3     0.0
 Torsion has not been considered in the design.
```

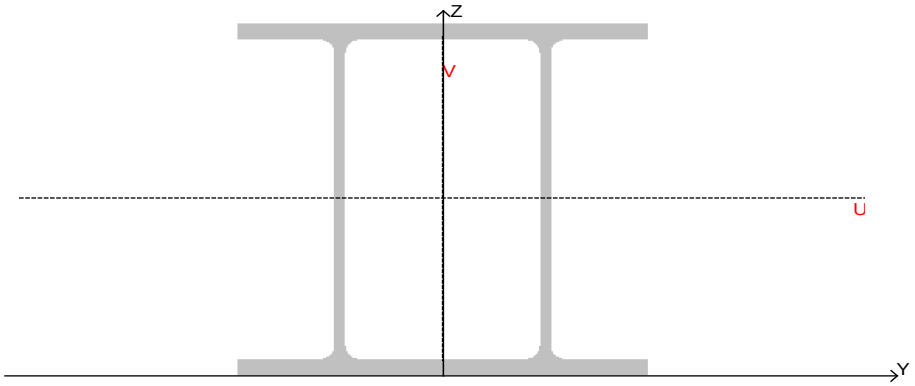
9. ANALYSIS AND DESIGN OF BEAM B3:

Refer below image showing view of beam B3 modeled in STAADPro:



Beam B3 Dimensions

9.1. Member Property



Section element	Rotation angle	Mirror	Material	E (kN/mm^2)
Universal Beams 203x102x23			Steel	205.0
Universal Beams 203x102x23			Steel	205.0

The overall dimensions of the section are 204 x 203 mm

Basic geometry of the section

	Parameter	Value	
A	Cross sectional area	5879.8	mm^2
a	Angle between Y-Z and U-V axes	-0.0	deg
I_y	Moment of inertia about axis parallel to Y passing through centroid	42097868.57	mm^4
I_z	Moment of inertia about axis parallel to Z passing through centroid	18510848.38	mm^4
I_t	Torsional moment of inertia (St. Venant)	140388.92	mm^4
i_y	Radius of gyration about axis parallel to Y passing through centroid	84.62	mm
i_z	Radius of gyration about axis parallel to Z passing through centroid	56.11	mm
W_{u+}	Elastic modulus about U-axis (+ve extreme)	414349.11	mm^3
W_{u-}	Elastic modulus about U-axis (-ve extreme)	414349.11	mm^3
W_{v+}	Elastic modulus about V-axis (+ve extreme)	181835.44	mm^3
W_{v-}	Elastic modulus about V-axis (-ve extreme)	181835.44	mm^3

9.2. Load calculation of beam B3

Calculation of Dead and Live load on Beam:
Span of loading as shown in above image,

Self-weightconsidered for 150mm Hollow core slab =	3	kN/m^2
Weight considered for Laminate flooring (25kN/m2 x 0.075m)=	1.875	kN/m^2
Live load on floor (As per Category A of BS EN 1991-1-1:2002)=	2	kN/m^2
Live load on roof (As per Category H of BS EN 1991-1-1:2002)=	1	kN/m^3
Weight considered for 350mm external wall build up =	4	kN/m^2
Weight considered roofing material =	0.35	kN/m^2
Weight considered for roof finishes =	0.2	kN/m^2

Loading between node 1-2

Dead Load

S.W of steel beam	Program Calculated	
External wall build-up load on lintel beam(4 kN/m^2 x 0.742m tributary height)=	2.968	kN/m
Roofing material load on beam(0.35 kN/m^{2}x 2.765 m tributary roof span)=	0.9677	kN/m
Roof finishes load on beam(0.2 kN/m^{2}x 2.765m tributary roof span)=	0.553	kN/m
Total Dead load on beam=	4.4887	kN/m

Live load

Live load on Roof = (1 kN/m^{2}x 2.765m tributary roof span)=	2.765	kN/m
Total live load on beam=	2.765	kN/m

Loading between node 2-3

Dead Load

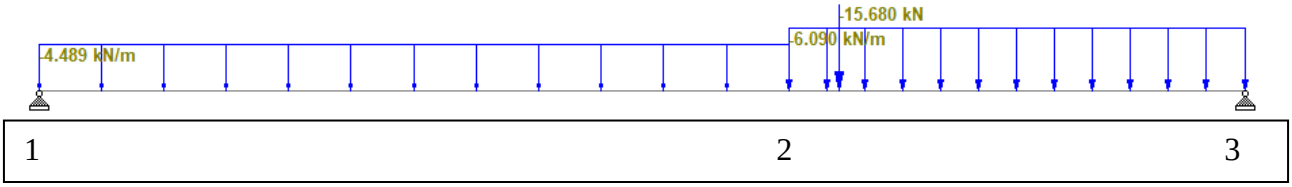
S.W of steel beam	Program Calculated as per section	
External wall buildup load on lintel beam(4 kN/m^2 x 0.742m tributary height)=	2.968	kN/m
Roofing material load on beam(0.35 kN/m^{2}x 5.67 m tributary roof span)=	1.9845	kN/m
Roof finishes load on beam(0.2 kN/m^{2}x 5.67m tributary roof span)=	1.134	kN/m
Total Dead load on beam=	6.0865	kN/m

Live load

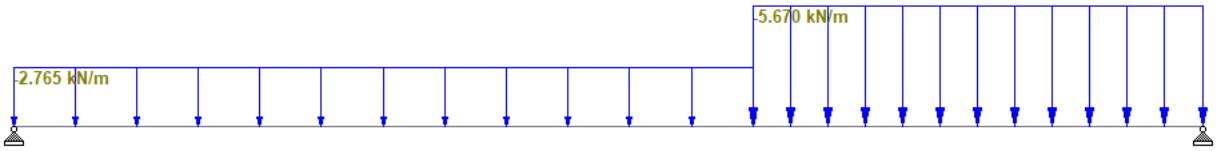
Live load on Roof = (1 kN/m^{2}x 2.765m tributary roof span)=	5.67	kN/m
Total live load on beam=	5.67	kN/m

Load from secondary beam

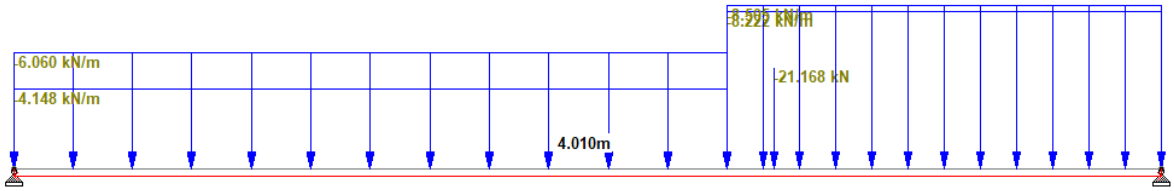
Concentrated load from Beam B2 on Beam B3=	15.68	kN



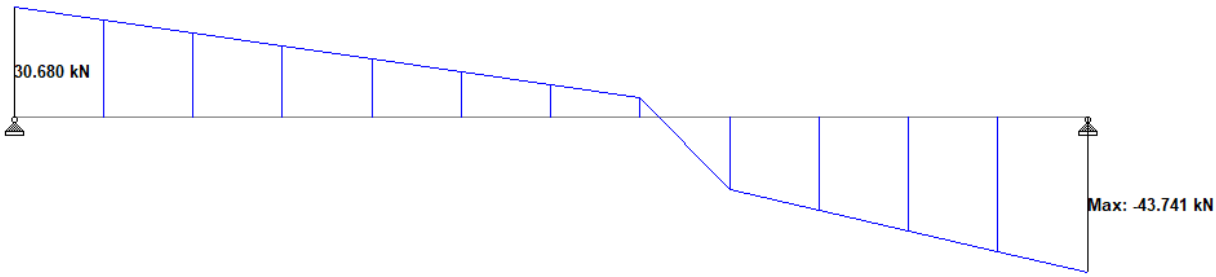
Dead load on beam B3



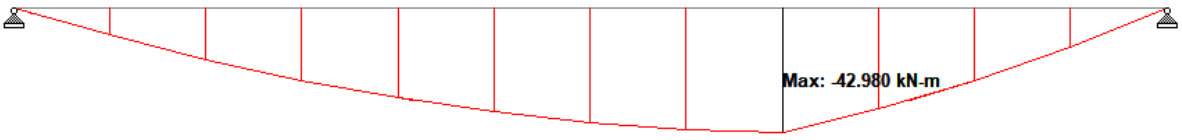
Live load on beam B3



Loading Diagram (1.35DL+1.5LL)

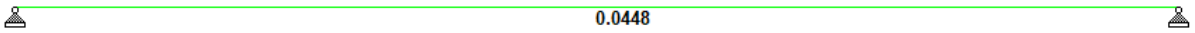


Shear force diagram (1.35DL+1.5LL)



Bending Moment Diagram (1.35DL+1.5LL)

9.3. Utilization ratio check

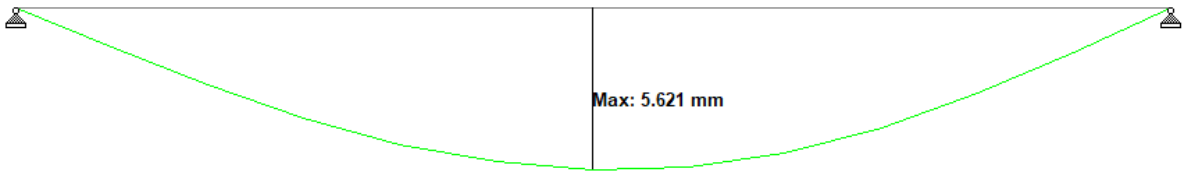


Utilization ratio of Beam B2

Above shows that failed members (i.e., members having utility ratio more than 1) will be highlighted with red colors. It can be seen from image that all members are green. Hence, all members have passed in design.

9.4. Deflection check

Below image shows displacement diagram of member having maximum vertical deflection for serviceability load combinations.



Deflection diagram of beam B2 (DL+LL)

Maximum vertical displacement of beam in Y direction= 5.621 mm

Permissible vertical deflection = Span / 360 = 4010/360 = 11.138 mm

Actual maximum vertical deflection of beam = 5.621 mm <11.138 mm (Hence, OK)

9.5. STAAD design output results

STAAD output results for BEAM B3 Member 1:

```
MEMBER     TABLE       RESULT/   CRITICAL COND/     RATIO/     LOADING/
                         FX           MY             MZ       LOCATION
=========================================================================


     1 ST   4UB203      (UPT)
                         PASS     EC-6.2.5          0.045         3
                       0.00           0.00         -42.98        2.67
=========================================================================
  MATERIAL DATA
     Grade of steel           =  S 355
     Modulus of elasticity    =  205 kN/mm2
     Design Strength  (py)    =  355  N/mm2

  SECTION PROPERTIES (units - cm)
     Member Length =    401.00
     Gross Area =   58.80          Net Area =   58.80

                                    z-axis          y-axis
     Moment of inertia        :     4209.791        1851.080
     Plastic modulus          :     2703.191        2345.716
     Elastic modulus          :      414.758         183.275
     Shear Area               :        0.000           0.000
     Radius of gyration       :        8.462           5.611
     Effective Length         :      401.000         401.000

  DESIGN DATA (units - kN,m)   EUROCODE NO.3 /2005
     Section Class            :   CLASS 1
     Squash Load              :   2087.33
     Axial force/Squash load  :     0.000
     GM0 :  1.00          GM1 :  1.00          GM2 :  1.25

                                    z-axis          y-axis
     Slenderness ratio (KL/r) :         47.4            71.5
     Compression Capacity     :        769.1           491.9
     Tension Capacity         :       2074.4          2074.4
     Moment Capacity          :        959.6           832.7
     Reduced Moment Capacity  :        959.6           832.7
     Shear Capacity           :          0.0             0.0


   BUCKLING CALCULATIONS (units - kN,m)
      Lateral Torsional Buckling Moment       MB =  959.6
      co-efficients C1 & K : C1 =1.000 K =1.0, Effective Length= 4.010
      Lateral Torsional Buckling Curve :
      Compression buckling curves:     z-z:            y-y:
      Critical Load For Torsional Buckling,          NcrT  =  3401.7
     STAAD SPACE                                              -- PAGE NO.    4

   CRITICAL LOADS FOR EACH CLAUSE CHECK (units- kN,m):
    CLAUSE        RATIO  LOAD     FX       VY      VZ      MZ      MY
  EC-6.2.5       0.045     3     0.0    -20.6     0.0   -43.0     0.0
  EC-6.3.2 LTB   0.045     3     0.0    -20.6     0.0   -43.0     0.0
    Torsion has not been considered in the design.
                        ____________________
```

10. ANALYSIS AND SPECIFICATION OF Lintel beam B4:

10.1. Load calculation of Lintel beam B4

Dead Load

S.W of lintel beam

External wall build up wall load on lintel beam(4 kN/m^{2}x0.62m tributary height) = 2.48 kN/m

Span of lintel beam B4 = 3.2 m

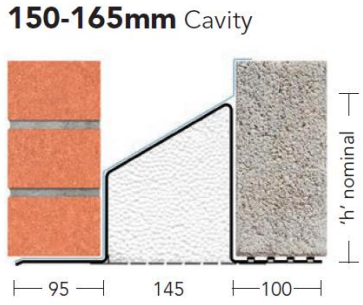
Total UDL load on B4 = 2.48kN/m x 3.2m = 8 kN

10.2. Lintel specification from manfacturer

Keystone lintel: HD/K-150 for length 3150-3600

HD/K-150 (For cavity widths 150-165mm)

Manufactured length 150mm increments	600-1500	1650-2100	2250-3000	3150-3600	3750-4000
Height 'h'	125	160	180	180	200
Thickness	2.9	2.9	3.2	3.2	3.2
Total UDL kN 3:1	30	30	35	30	30
Total UDL kN 19:1	20	22	30	25	26

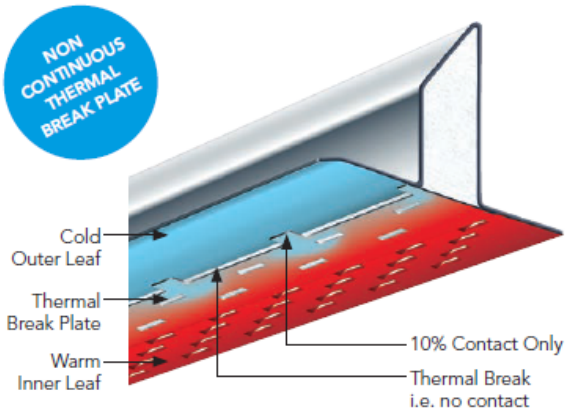


Keystone lintel illustration & specification

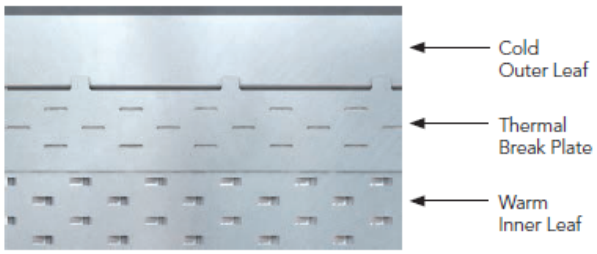
Actual capacity of lintel HD/K-150 = 25kN > 8kN (Actual Loading)

STANDARD KEYSTONE LINTEL

with patented Thermal Break Plate



Standard Keystone Lintel with patented non continuous Thermal Break Plate



GALVANISED STEEL

Keystone's standard range of lintels are manufactured from high quality grade pre-galvanised mild steel to BS EN 10346:2009 DX51D plus Z600 or grade Z275 to BS EN10025-2:2004 with minimised spangle finish and a minimum yield stress of 250N/mm².

STAINLESS STEEL

Please refer to page 53 for details.

STRUCTURAL PERFORMANCE

The Keystone Lintel range has safe working loads as detailed in each applicable loading table in our Lintel Range and Loading tables, pages 11-53. The structural performance figures within each table have been ascertained by testing in accordance with the requirements of standards BS 5977 Part 2: 1983 and BS EN 845-2:2003.

The figures take into account the different loading arrangements which are common to traditional cavity wall construction.

Differential Total UDL kN 3:1
Up to 75% loading on the inner leaf.

Differential Total UDL kN 19:1
Up to 95% loading on the inner leaf.

LINTEL LOAD TABLES

For full details of load tables specific to your lintel type please see Lintel Range & Loading Tables pages 11-53.

Differential Load 3:1 ratio, 75% load on inner leaf.
Differential Load 19:1 ratio, 95% load on inner leaf.

Lintel types: HD/K, S/K-50 (215WIL), S/K-70 (215WIL), S/K-90 (215WIL),S/K-110, S/K-130, S/K-150, SB/K, T/K, SL/K, RB/K, TJ/K, TW/K, INT/K, SW/K, IB/K, EL/K-50, EL/K-90, CFS/K, X/K have been tested as a composite unit with surrounding masonry, built in accordance with BS EN 1996-2:2006. These composite units have been tested in accordance with the requirements of BS5977: part 2: 1983 (BS EN 845-2:2003).