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THE WALLOWS INDUSTRIAL ESTATE,
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DY5 1QA.

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Ref	: 19827-G1
Rev.	:
Sheet No.	: 1
Calcs By	: Pp
Date	: 18-08-2020

Structural Calculations to B.S 5950 - 1:2000

Customer	:	G.Parry Consulting Ltd
Site	:	City College - Plymouth
Structure Type	:	Platform Floor
Structure Usage	:	Class Room

Design Loadings

Imposed Load	:	5.000 kN/m2
Dead Load	:	0.600 kN/m2

Loading Factors

Imposed Load	:	1.6	{Table 2}
Dead Load	:	1.4	{Table 2}

Material Specification

Mainbeam Material	:	S355 to BSEN 10025
Columns Material	:	S235 to BSEN 10025
Deckbeam Material	:	Z28

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Ref : 19827-G1
Rev. :
Sheet No.: 2
Calcs By : Pp
Date : 18-08-2020

Mainbeam Design **{Ref : BS5950:Part 1}**

Mainbeam Details

Description	: 457 x 152 x 67.0 UB	
Span	: 7.750 Metres	
Centres	: 5.465 Metres	
Grade of steel	: S355	
Mark Number	: 1	
Py	: 355 mm2	{Table 9}
Factored Load	: 8.840 kN	

Section Classification

b/T	: 5.060	
D/t	: 44.700	
Classification	: Plastic	{Table 11}
Factored U.D.L	: 374.407 kN	
Design Moment {M}	: 362.707 kNm	
Shear Force {Fv}	: 187.204 kN	
Av	: 4160.520 mm2	{4.2.3}
Shear Capacity	: 886.191 kN	
Moment Capacity	: 511.200 kNm	{4.2.5}
1.2PyZ	: 532.500 kNm	

Deflection

Allowable Deflection	: 21.528 mm	{Table 8}
Actual Deflection	: 21.371 mm	

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Ref : 19827-G1
Rev. :
Sheet No.: 3
Calcs By : Pp
Date : 18-08-2020

Mainbeam Design **{Ref : BS5950:Part 1}**

Mainbeam Details

Description	: 305 x 102 x 25.0 UB	
Span	: 3.875 Metres	
Centres	: 4.870 Metres	
Grade of steel	: S355	
Mark Number	: 2	
Py	: 355 mm2	{Table 9}
Factored Load	: 8.840 kN	

Section Classification

b/T	: 7.470	
D/t	: 47.600	
Classification	: Plastic	{Table 11}
Factored U.D.L	: 166.822 kN	
Design Moment {M}	: 80.804 kNm	
Shear Force {Fv}	: 83.411 kN	
Av	: 1767.840 mm2	{4.2.3}
Shear Capacity	: 376.550 kN	
Moment Capacity	: 119.990 kNm	{4.2.5}
1.2PyZ	: 122.688 kNm	

Deflection

Allowable Deflection	: 10.764 mm	{Table 8}
Actual Deflection	: 7.754 mm	

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Ref : 19827-G1
Rev. :
Sheet No.: 4
Calcs By : Pp
Date : 18-08-2020

Mainbeam Design **{Ref : BS5950:Part 1}**

Mainbeam Details

Description	: 457 x 152 x 52.0 UB	
Span	: 7.750 Metres	
Centres	: 3.093 Metres	
Grade of steel	: S355	
Mark Number	: 3	
Py	: 355 mm2	{Table 9}
Factored Load	: 8.840 kN	

Section Classification

b/T	: 6.990	
D/t	: 53.600	
Classification	: Plastic	{Table 11}
Factored U.D.L	: 211.901 kN	
Design Moment {M}	: 205.280 kNm	
Shear Force {Fv}	: 105.951 kN	
Av	: 3418.480 mm2	{4.2.3}
Shear Capacity	: 728.136 kN	
Moment Capacity	: 386.950 kNm	{4.2.5}
1.2PyZ	: 404.274 kNm	

Deflection

Allowable Deflection	: 21.528 mm	{Table 8}
Actual Deflection	: 16.240 mm	

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Ref : 19827-G1
Rev. :
Sheet No.: 5
Calcs By : Pp
Date : 18-08-2020

Mainbeam Design **{Ref : BS5950:Part 1}**

Mainbeam Details

Description	: 356 x 171 x 45.0 UB	
Span	: 6.939 Metres	
Centres	: 3.093 Metres	
Grade of steel	: S355	
Mark Number	: 4	
Py	: 355 mm2	{Table 9}
Factored Load	: 8.840 kN	

Section Classification

b/T	: 8.810	
D/t	: 45.300	
Classification	: Compact	{Table 11}
Factored U.D.L	: 189.727 kN	
Design Moment {M}	: 164.564 kNm	
Shear Force {Fv}	: 94.863 kN	
Av	: 2428.800 mm2	{4.2.3}
Shear Capacity	: 517.334 kN	
Moment Capacity	: 274.770 kNm	{4.2.5}
1.2PyZ	: 292.662 kNm	

Deflection

Allowable Deflection	: 19.275 mm	{Table 8}
Actual Deflection	: 18.373 mm	

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Ref : 19827-G1
Rev. :
Sheet No.: 6
Calcs By : Pp
Date : 18-08-2020

Mainbeam Design **{Ref : BS5950:Part 1}**

Mainbeam Details

Description	: 305 x 102 x 25.0 UB	
Span	: 3.875 Metres	
Centres	: 2.963 Metres	
Grade of steel	: S355	
Mark Number	: 5	
Py	: 355 mm2	{Table 9}
Factored Load	: 8.840 kN	

Section Classification

b/T	: 7.470	
D/t	: 47.600	
Classification	: Plastic	{Table 11}
Factored U.D.L	: 101.498 kN	
Design Moment {M}	: 49.163 kNm	
Shear Force {Fv}	: 50.749 kN	
Av	: 1767.840 mm2	{4.2.3}
Shear Capacity	: 376.550 kN	
Moment Capacity	: 119.990 kNm	{4.2.5}
1.2PyZ	: 122.688 kNm	

Deflection

Allowable Deflection	: 10.764 mm	{Table 8}
Actual Deflection	: 4.718 mm	

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Ref : 19827-G1
Rev. :
Sheet No.: 7
Calcs By : Pp
Date : 18-08-2020

Mainbeam Design {Ref : BS5950:Part 1}

Mainbeam Details

Description	: 305 x 102 x 25.0 UB	
Span	: 5.465 Metres	
Grade of steel	: 50	
Mark Number	: 6	
Py	: 355 mm2	{Table 6}
Reaction A	: 16.011 kN	
Reaction B	: 6.500 kN	

Section Classification

b/T	: 7.470	
D/t	: 47.600	
Classification	: Plastic	{Table 7}
Design Moment {M}	: 25.265 kNm	
Shear Force {Fv}	: 50.749 kN	
Av	: 1767.840 mm2	{4.2.3}
Shear Capacity	: 376.550 kN	
Moment Capacity	: 119.990 kNm	{4.2.5}
1.2PyZ	: 122.688 kNm	

Deflection

Allowable Deflection	: 15.181 mm	{Table 5}
Actual Deflection	: 3.616 mm	

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Ref	: 19827-G1
Rev.	:
Sheet No.	: 8
Calcs By	: Pp
Date	: 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 23.0 UC	
Mark Number	: 7	
Height	: 3.861 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 118.59 kN {187.20 kN}	
Loading X2	: 118.59 kN {187.20 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 237.18 kN {Factored 374.41 kN}	
Moment x-x	: 0.00 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 3.861 Metres	{Table 24}
Slenderness Ratio	: 104.92	{4.7.3.1}
Pc	: 131.163 n/mm2	{Table 27a}
Mb	: 44.096 kNm	{4.3.7.1}
Overall Buckling Check	: 0.958 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.354 < 1.00	{4.8.3.2}

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Ref	: 19827-G1
Rev.	:
Sheet No.	: 9
Calcs By	: Pp
Date	: 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 30.0 UC	
Mark Number	: 8	
Height	: 3.939 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 118.59 kN {187.20 kN}	
Loading X2	: 52.84 kN {83.41 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 171.43 kN {Factored 270.61 kN}	
Moment x-x	: 18.58 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 3.939 Metres	{Table 24}
Slenderness Ratio	: 103.12	{4.7.3.1}
Pc	: 134.327 n/mm2	{Table 27a}
Mb	: 66.370 kNm	{4.3.7.1}
Overall Buckling Check	: 0.807 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.411 < 1.00	{4.8.3.2}

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Ref : 19827-G1
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Sheet No.: 10
Calcs By : Pp
Date : 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 23.0 UC	
Mark Number	: 9	
Height	: 2.961 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 112.78 kN {178.03 kN}	
Loading X2	: 8.48 kN {13.39 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 121.26 kN {Factored 191.42 kN}	
Moment x-x	: 28.98 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 2.961 Metres	{Table 24}
Slenderness Ratio	: 80.46	{4.7.3.1}
Pc	: 186.845 n/mm2	{Table 27a}
Mb	: 51.164 kNm	{4.3.7.1}
Overall Buckling Check	: 0.910 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.673 < 1.00	{4.8.3.2}

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Ref	: 19827-G1
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Sheet No.	: 11
Calcs By	: Pp
Date	: 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 23.0 UC	
Mark Number	: 10	
Height	: 3.939 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 52.84 kN {83.41 kN}	
Loading X2	: 4.09 kN {6.46 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 56.93 kN {Factored 89.87 kN}	
Moment x-x	: 13.54 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 3.939 Metres	{Table 24}
Slenderness Ratio	: 107.04	{4.7.3.1}
Pc	: 126.924 n/mm2	{Table 27a}
Mb	: 43.498 kNm	{4.3.7.1}
Overall Buckling Check	: 0.549 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.315 < 1.00	{4.8.3.2}

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Ref	: 19827-G1
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Sheet No.	: 12
Calcs By	: Pp
Date	: 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 23.0 UC	
Mark Number	: 11	
Height	: 3.861 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 67.11 kN {105.94 kN}	
Loading X2	: 67.11 kN {105.94 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 134.22 kN {Factored 211.88 kN}	
Moment x-x	: 0.00 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 3.861 Metres	{Table 24}
Slenderness Ratio	: 104.92	{4.7.3.1}
Pc	: 131.163 n/mm2	{Table 27a}
Mb	: 44.096 kNm	{4.3.7.1}
Overall Buckling Check	: 0.542 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.200 < 1.00	{4.8.3.2}

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Sheet No.: 13
Calcs By : Pp
Date : 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 23.0 UC	
Mark Number	: 12	
Height	: 3.939 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 63.83 kN {100.76 kN}	
Loading X2	: 4.78 kN {7.55 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 68.61 kN {Factored 108.31 kN}	
Moment x-x	: 16.41 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 3.939 Metres	{Table 24}
Slenderness Ratio	: 107.04	{4.7.3.1}
Pc	: 126.924 n/mm2	{Table 27a}
Mb	: 43.498 kNm	{4.3.7.1}
Overall Buckling Check	: 0.664 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.381 < 1.00	{4.8.3.2}

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Sheet No.: 14
Calcs By : Pp
Date : 18-08-2020

Column Design {Ref : BS5950:Part 1}

Column Details

Description	: 152 x 152 x 23.0 UC	
Mark Number	: 13	
Height	: 3.939 Metres	

Unfactored Loads, {Factored Loads}

Loading X1	: 32.15 kN {50.75 kN}	
Loading X2	: 2.49 kN {3.93 kN}	
Loading Y1	: 0.00 kN {0.00 kN}	
Loading Y2	: 0.00 kN {0.00 kN}	
Classification	: Plastic	
Total Vertical Load	: 34.64 kN {Factored 54.68 kN}	
Moment x-x	: 8.24 kNm	{4.7.6}
Moment y-y	: 0.00 kNm	
Effective Height	: 3.939 Metres	{Table 24}
Slenderness Ratio	: 107.04	{4.7.3.1}
Pc	: 126.924 n/mm2	{Table 27a}
Mb	: 43.498 kNm	{4.3.7.1}
Overall Buckling Check	: 0.334 < 1.00	{4.8.3.3.1}
Local Capacity Check	: 0.192 < 1.00	{4.8.3.2}

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Sheet No.: 15

Calcs By : Pp

Date : 18-08-2020

Base Plate Design

ALL BASE PLATES 250 x 250 x 10THK ON FOUNDATION DESIGN BY OTHERS.

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Calcs By	: Pp
Date	: 18-08-2020

Cross Brace Design

Cross Brace Details

Description	: 50 x 50 x 6.0 RSA
Bolting	: 2/M16 {Grade 8.8} Per End
Floor Area	: 491.580 m2
Total No. of Panels	: 2
Panel Width	: 3.625 Metres
Panel Height	: 3.785 Metres
Total Horiz'l Load	: 98.316 kN
Max Load Per Panel	: 49.158 kN
Increased Axial	: 51.328 kN
Tension Capacity	: 71.071 kN

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Ref	: 19827-G1
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Calcs By	: Pp
Date	: 18-08-2020

Steel Staircase Design

Staircase Details

Height	: 2.064 Metres	
Angle	: 36.0 Degrees	
Width	: 1.016 Metres	

Stringer Material

Description	: 180 x 10.0 Thick Flat	
Stringer Zxx	: 54.000 cm3	
Factored U.D.L	: 10.044 kN	
Design Moment {M}	: 3.567 kNm	
Shear Force {Fv}	: 5.022 kN	
Av	: 1800.000 mm2	{4.2.3}
Shear Capacity	: 297.000 kN	
Moment Capacity	: 14.850 kNm	{4.2.5}
1.2PyZ	: 17.820 kNm	

Deflection

Allowable Deflection	: 7.891 mm	{Table 5}
Actual Deflection	: 1.689 mm	

Tread Details

Material	: 4.5mm Thick Durbar Pattern Chequerplate
Profile	: 50mm Downturn To Front, 50mm Upturn To Rear
Size	: 1.016 Metres x 0.279 Metres
Fixing To Stringer	: 2/M12 Diameter Bolts Via Welded Cleats