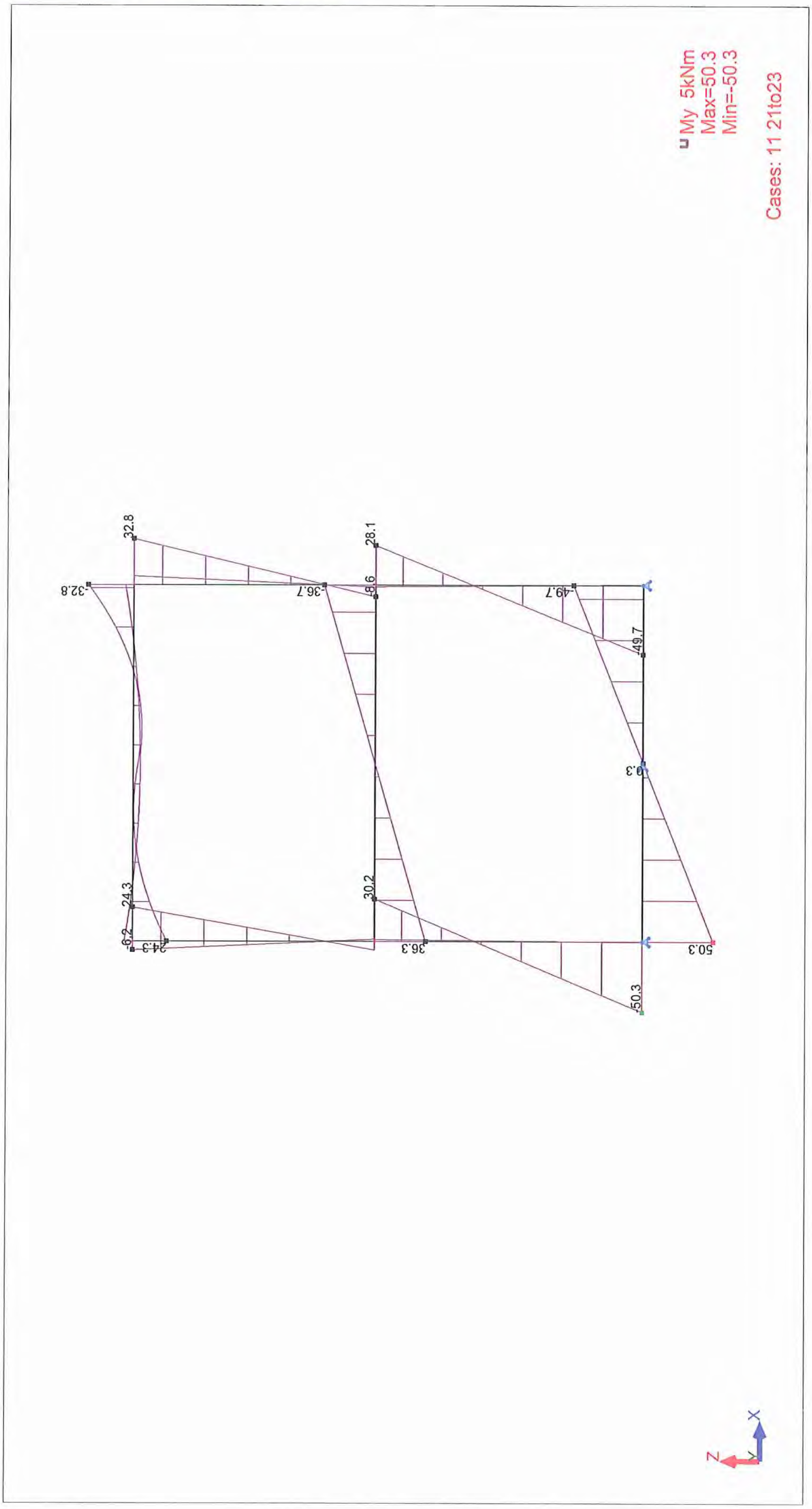
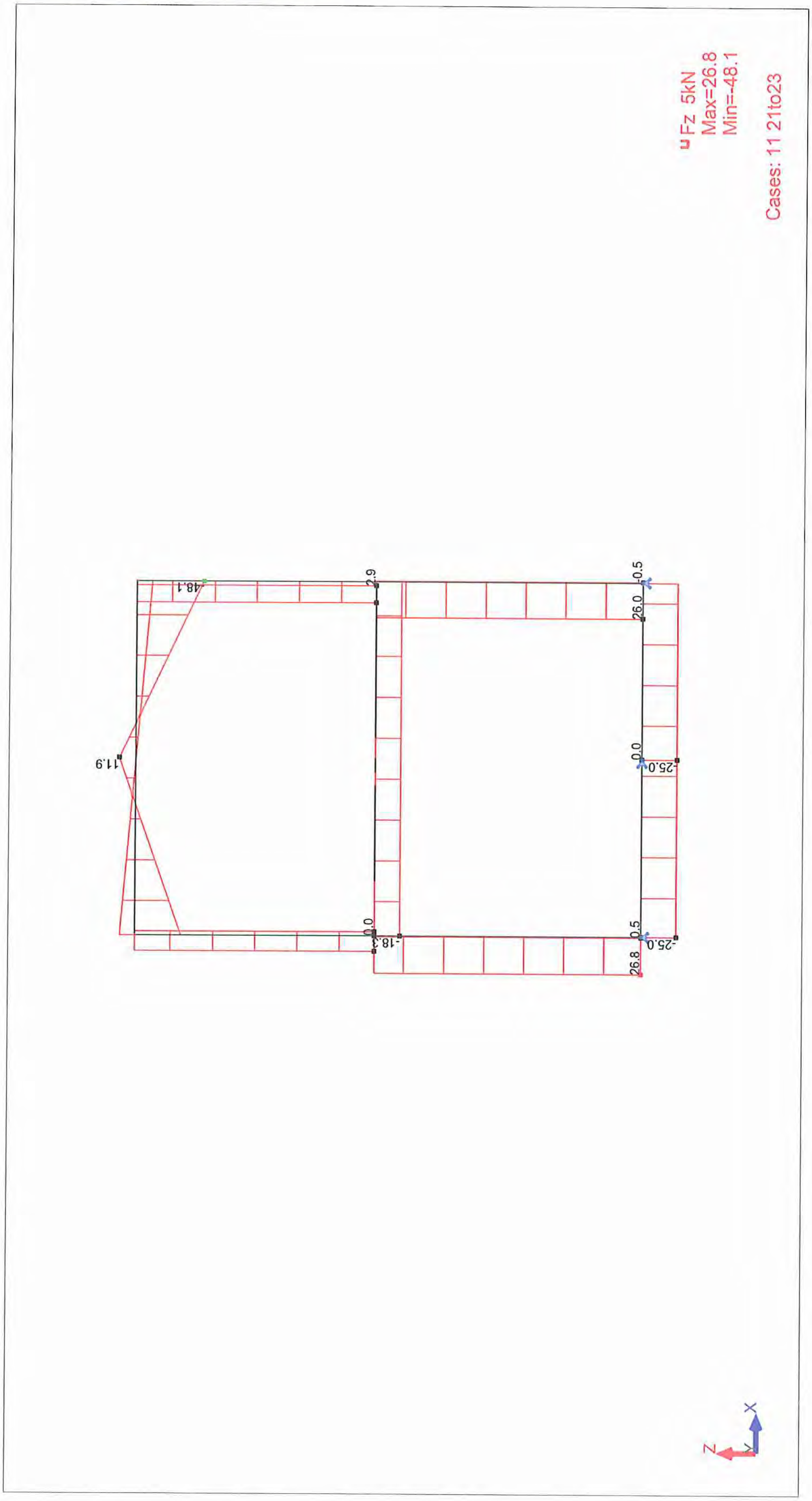
View - MY, Cases: 11 21to23



View - FZ, Cases: 11 21to23



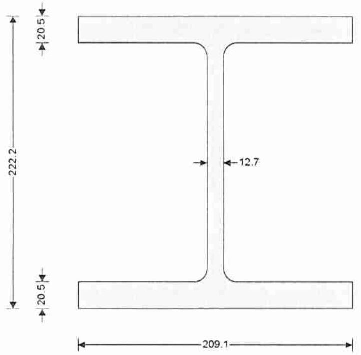
STEEL MEMBER DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05

Section details

Section type	**UC 203x203x86 (BS4-1)**
Steel grade	**S275**
From table 9: Design strength p_y	
Thickness of element	max(T, t) = **20.5** mm
Design strength	p_y = **265** N/mm^2
Modulus of elasticity	E = **205000** N/mm^2



Lateral restraint

Distance between major axis restraints	L_x = **3000** mm
Distance between minor axis restraints	L_y = **1000** mm

Effective length factors

Effective length factor in major axis	K_x = **1.50**
Effective length factor in minor axis	K_y = **1.00**
Effective length factor for lateral-torsional buckling	K_{LT} = **0.90**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]}$ = **1.02**

Internal compression parts - Table 11

Depth of section — d = **160.8** mm

Stress ratios — $r1 = \min(F_c / (d \times t \times p_{yw}), 1)$ = **0.118**

$r2 = F_c / (A \times p_{yw})$ = **0.022**

$d / t = 12.4 \times \varepsilon <= \max(80 \times \varepsilon / (1 + r1), 40 \times \varepsilon)$ Class 1 plastic

Outstand flanges - Table 11

Width of section — b = B / 2 = **104.6** mm

$b / T = 5.0 \times \varepsilon <= 9 \times \varepsilon$ Class 1 plastic

Section is class 1 plastic

Moment capacity - Section 4.2.5

Design bending moment — M = **50** kNm

Moment capacity low shear - cl.4.2.5.2 — $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **258.8** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling	$L_E = 0.9 \times L_y$ = **900** mm
Slenderness ratio	$\lambda = L_E / r_{yy}$ = **16.851**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter	u = **0.850**
Torsional index	x = **10.220**
Slenderness factor	$v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25}$ = **0.969**
Ratio - cl.4.3.6.9	β_W = **1.000**
Equivalent slenderness - cl.4.3.6.7	$\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]}$ = **13.874**
Limiting slenderness - Annex B.2.2	$\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **34.951**

$\lambda_{LT} < \lambda_{L0}$ - No allowance need be made for lateral-torsional buckling

Buckling resistance moment - Section 4.3.6.4

Bending strength	$p_b = p_y$ = **265** N/mm^2
Buckling resistance moment	$M_b = p_b \times S_{xx}$ = **258.8** kNm

PASS - Moment capacity exceeds design bending moment

Compression members - Section 4.7

Design compression force — F_c = **66** kN

Effective length for major (x-x) axis buckling - Section 4.7.3

Effective length for buckling	$L_{Ex} = L_x \times K_x$ = **4500** mm
Slenderness ratio - cl.4.7.2	$\lambda_x = L_{Ex} / r_{xx}$ = **48.473**

Compressive strength - Section 4.7.5

Limiting slenderness	$\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **17.476**
Strut curve - Table 23	b
Robertson constant	α_x = **3.5**
Perry factor	$\eta_x = \alpha_x \times (\lambda_x - \lambda_0) / 1000$ = **0.108**
Euler stress	$p_{Ex} = \pi^2 \times E / \lambda_x^2$ = **861.1** N/mm^2
	$\phi_x = (p_y + (\eta_x + 1) \times p_{Ex}) / 2$ = **609.8** N/mm^2
Compressive strength - Annex C.1	$p_{cx} = p_{Ex} \times p_y / (\phi_x + (\phi_x^2 - p_{Ex} \times p_y)^{0.5})$ = **230.8** N/mm^2

Compression resistance - Section 4.7.4

Compression resistance - cl.4.7.4 — $P_{cx} = A \times p_{cx}$ = **2530.3** kN

PASS - Compression resistance exceeds design compression force

Effective length for minor (y-y) axis buckling - Section 4.7.3

Effective length for buckling	$L_{Ey} = L_y \times K_y$ = **1000** mm
Slenderness ratio - cl.4.7.2	$\lambda_y = L_{Ey} / r_{yy}$ = **18.723**

Compressive strength - Section 4.7.5

Limiting slenderness	$\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **17.476**
Strut curve - Table 23	c
Robertson constant	α_y = **5.5**
Perry factor	$\eta_y = \alpha_y \times (\lambda_y - \lambda_0) / 1000$ = **0.007**
Euler stress	$p_{Ey} = \pi^2 \times E / \lambda_y^2$ = **5771.5** N/mm^2
	$\phi_y = (p_y + (\eta_y + 1) \times p_{Ey}) / 2$ = **3038.1** N/mm^2
Compressive strength - Annex C.1	$p_{cy} = p_{Ey} \times p_y / (\phi_y + (\phi_y^2 - p_{Ey} \times p_y)^{0.5})$ = **263.1** N/mm^2

Compression resistance - Section 4.7.4

Compression resistance - cl.4.7.4 $P_{cy} = A \times p_{cy} =$ **2884.6** kN

PASS - Compression resistance exceeds design compression force

Compression members with moments - Section 4.8.3

Comb.compression & bending check - cl.4.8.3.2 $F_c / (A \times p_y) + M / M_c =$ **0.216**

PASS - Combined bending and compression check is satisfied

Member buckling resistance - Section 4.8.3.3

Max major axis moment governing M_b $M_{LT} = M_x =$ **50.00** kNm

Equivalent uniform moment factor for major axis flexural buckling

$m_x =$ **1.000**

$m_y =$ **1.000**

Buckling resistance checks - cl.4.8.3.3.2 $F_c / P_{cx} + m_x \times M / M_c \times (1 + 0.5 \times F_c / P_{cx}) =$ **0.222**

$F_c / P_{cy} + m_{LT} \times M_{LT} / M_b =$ **0.216**

PASS - Member buckling resistance checks are satisfied

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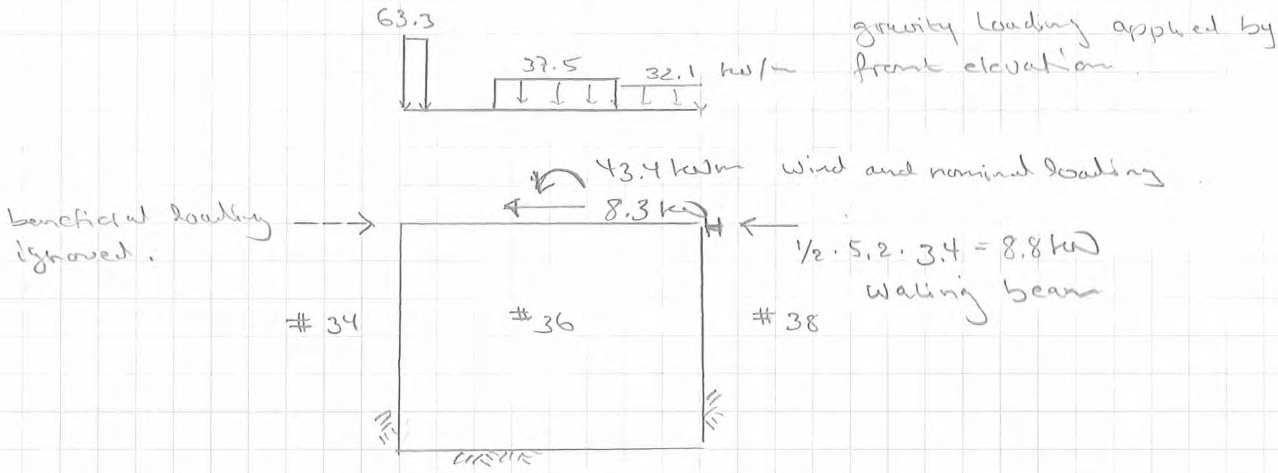
Job No	Sheet No.	Rev
4266		

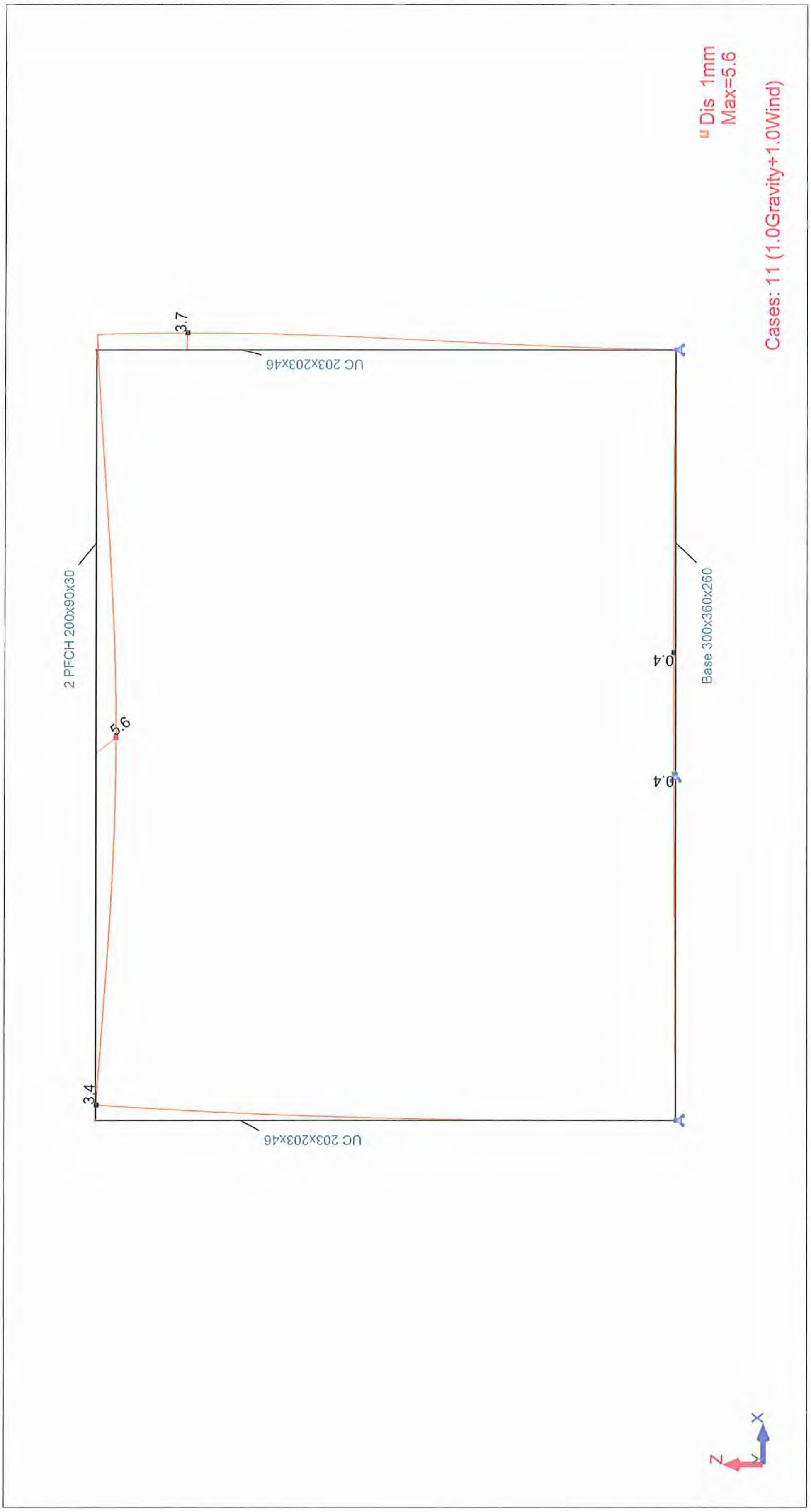
Made By	Dates	Chkd
JF	11/11/15	

36 Flask Walk

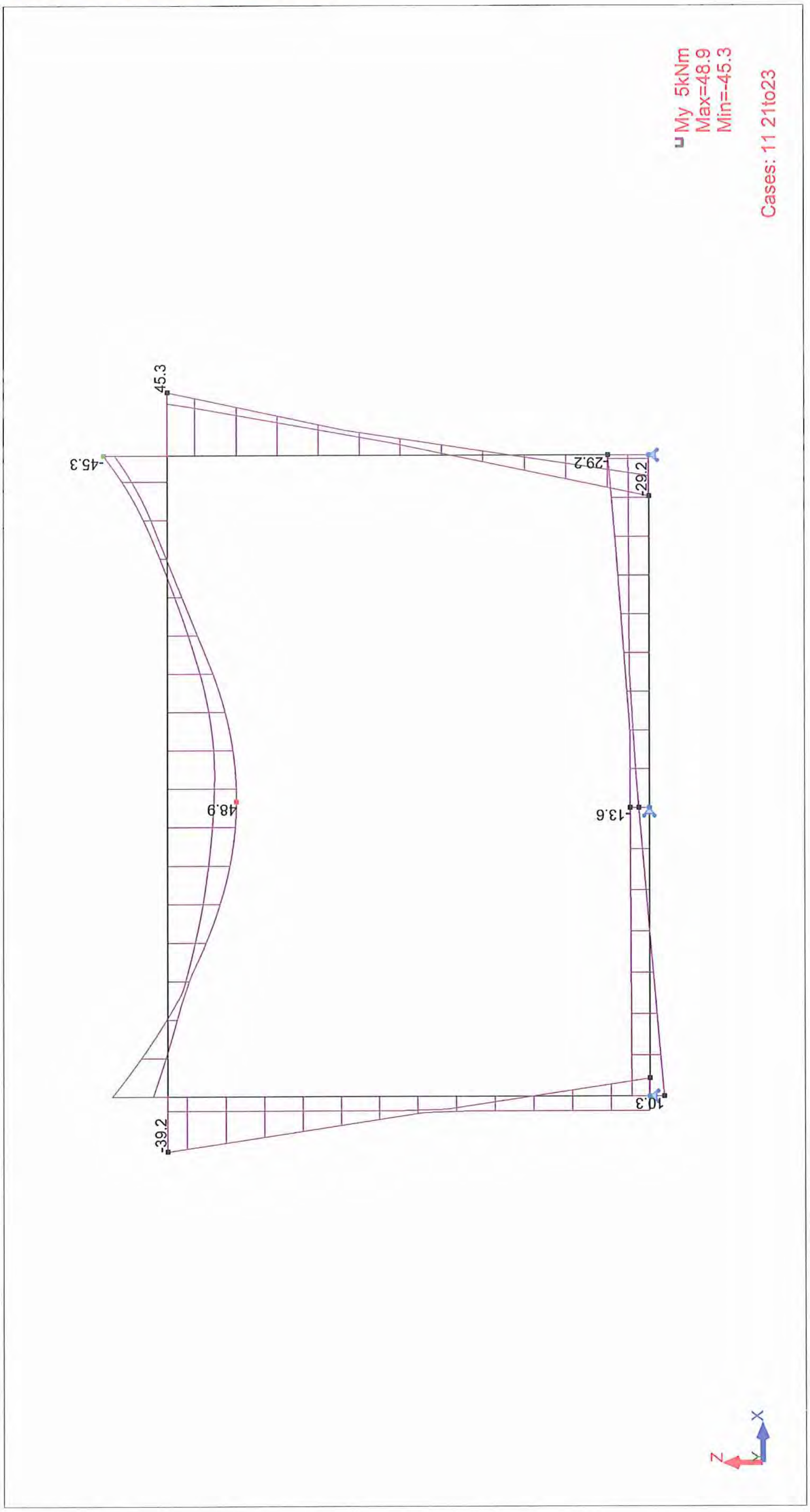
BOX FRAME SUPPORTING FRONT ELEVATION



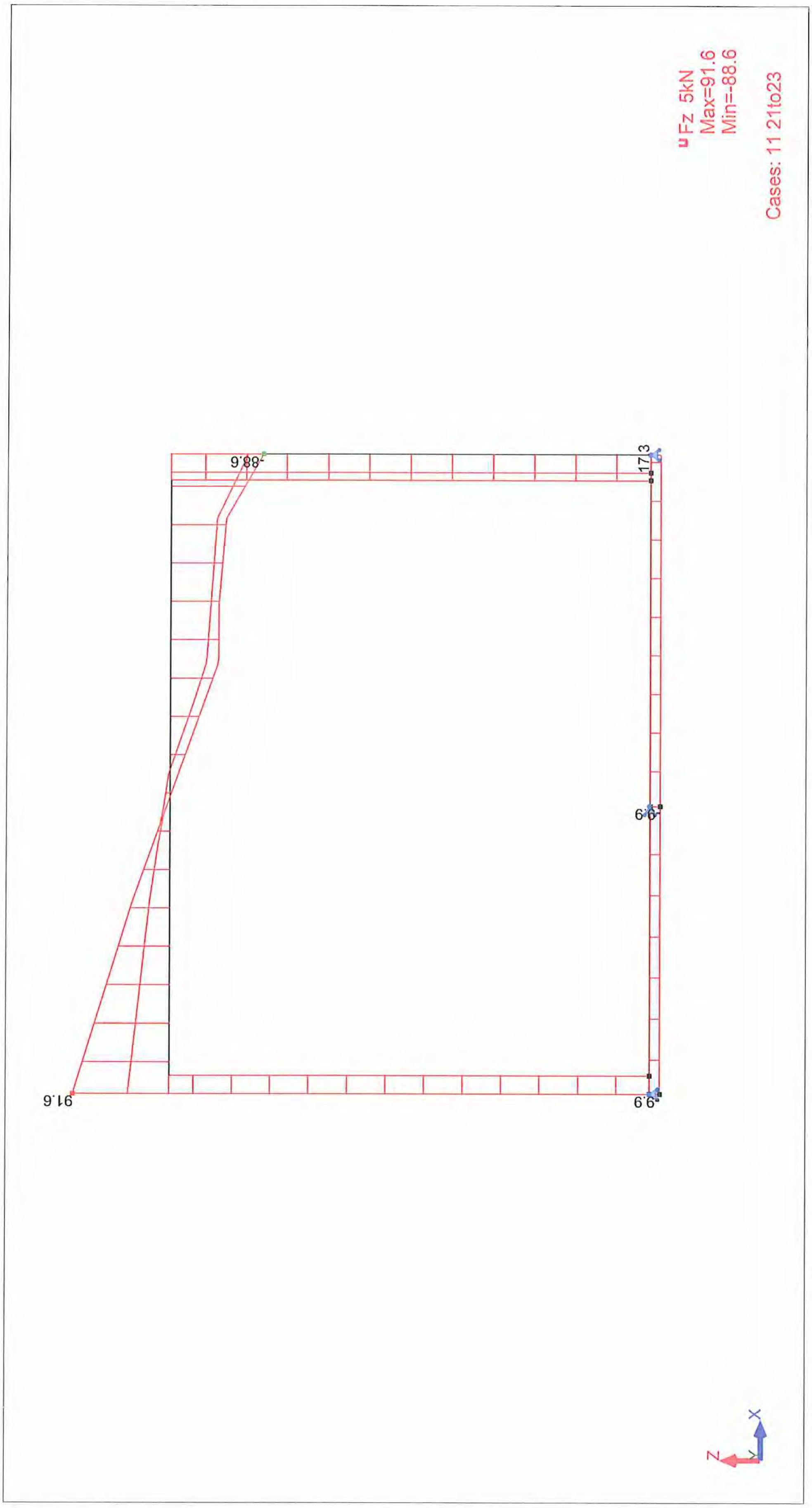
View - Exact deformation(s), Cases: 11 (1.0Gravity+1.0Wind) 1



View - MY, Cases: 11 21to23



View - FZ, Cases: 11 21to23



STEEL MEMBER DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05

Section details

Section type: **UKPFC 200x90x30 (Corus Advance)**

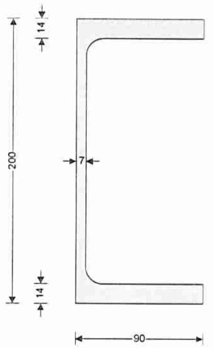
Steel grade: **S275**

From table 9: Design strength p_y

Thickness of element: max(T, t) = **14.0** mm

Design strength: p_y = **275** N/mm^2

Modulus of elasticity: E = **205000** N/mm^2



Lateral restraint

Distance between major axis restraints: L_x = **4200** mm

Distance between minor axis restraints: L_y = **4200** mm

Effective length factors

Effective length factor in major axis: K_x = **1.00**

Effective length factor in minor axis: K_y = **1.00**

Effective length factor for lateral-torsional buckling: K_{LT} = **1.20**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]}$ = **1.00**

Internal compression parts - Table 11

Depth of section: d = **148** mm

$d / t = 21.1 \times \varepsilon <= 80 \times \varepsilon$ — Class 1 plastic

Outstand flanges - Table 11

Width of section: b = B = **90** mm

$b / T = 6.4 \times \varepsilon <= 9 \times \varepsilon$ — Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force: $F_{y,v}$ = **46** kN

$d / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area: $A_v = t \times D$ = **1400** mm^2

Design shear resistance: $P_{y,v} = 0.6 \times p_y \times A_v$ = **231** kN

PASS - Design shear resistance exceeds design shear force

Shear capacity - Section 4.2.3

Design shear force: $F_{x,v}$ = **0** kN

Moment capacity - Section 4.2.5

Design bending moment: M = **25** kNm

Moment capacity low shear - cl.4.2.5.2: $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **80.1** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling: $L_E = 1.2 \times L_y$ = **5040** mm

Slenderness ratio: $\lambda = L_E / r_{yy}$ = **175.051**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter: u = **0.953**

Torsional index: x = **12.979**

Slenderness factor: $v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25}$ = **0.561**

Ratio - cl.4.3.6.9: β_W = **1.000**

Equivalent slenderness - cl.4.3.6.7: $\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]}$ = **93.578**

Limiting slenderness - Annex B.2.2: $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **34.310**

$\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant: α_{LT} = **7.0**

Perry factor: $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0)$ = **0.415**

Euler stress: $p_E = \pi^2 \times E / \lambda_{LT}^2$ = **231.1** N/mm^2

$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2$ = **301** N/mm^2

Bending strength - Annex B.2.1: $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5})$ = **136.5** N/mm^2

Equivalent uniform moment factor - Section 4.3.6.6

Equivalent uniform moment factor for LTB: m_{LT} = **1.000**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment: $M_b = p_b \times S_{xx}$ = **39.8** kNm

M_b / m_{LT} = **39.8** kNm

PASS - Buckling resistance moment exceeds design bending moment

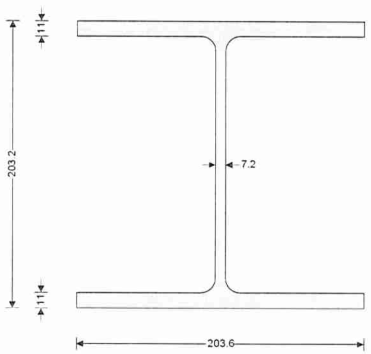
STEEL MEMBER DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05

Section details

Section type	**UC 203x203x46 (BS4-1)**
Steel grade	**S275**
From table 9: Design strength p_y	
Thickness of element	max(T, t) = **11.0** mm
Design strength	p_y = **275** N/mm²
Modulus of elasticity	E = **205000** N/mm²



Lateral restraint

Distance between major axis restraints	L_x = **3000** mm
Distance between minor axis restraints	L_y = **1000** mm

Effective length factors

Effective length factor in major axis	K_x = **1.50**
Effective length factor in minor axis	K_y = **1.00**
Effective length factor for lateral-torsional buckling	K_{LT} = **0.90**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]}$ = **1.00**

Internal compression parts - Table 11

Depth of section	d = **160.8** mm	
Stress ratios	$r1 = \min(F_c / (d \times t \times p_{yw}), 1)$ = **0.289**	
	$r2 = F_c / (A \times p_{yw})$ = **0.057**	
	$d / t = 22.3 \times \varepsilon <= \max(80 \times \varepsilon / (1 + r1), 40 \times \varepsilon)$	Class 1 plastic

Outstand flanges - Table 11

Width of section	b = B / 2 = **101.8** mm	
	$b / T = 9.3 \times \varepsilon <= 10 \times \varepsilon$	Class 2 compact

Section is class 2 compact

Moment capacity - Section 4.2.5

Design bending moment	M = **45** kNm

Moment capacity low shear - cl.4.2.5.2	$M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **136.8** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling	$L_E = 0.9 \times L_y$ = **900** mm
Slenderness ratio	$\lambda = L_E / r_{yy}$ = **17.529**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter	u = **0.847**
Torsional index	x = **17.713**
Slenderness factor	$v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25}$ = **0.988**
Ratio - cl.4.3.6.9	β_W = **1.000**
Equivalent slenderness - cl.4.3.6.7	$\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]}$ = **14.662**
Limiting slenderness - Annex B.2.2	$\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **34.310**

$\lambda_{LT} < \lambda_{L0}$ - No allowance need be made for lateral-torsional buckling

Buckling resistance moment - Section 4.3.6.4

Bending strength	$p_b = p_y$ = **275** N/mm²
Buckling resistance moment	$M_b = p_b \times S_{xx}$ = **136.8** kNm

PASS - Moment capacity exceeds design bending moment

Compression members - Section 4.7

Design compression force	F_c = **92** kN

Effective length for major (x-x) axis buckling - Section 4.7.3

Effective length for buckling	$L_{Ex} = L_x \times K_x$ = **4500** mm
Slenderness ratio - cl.4.7.2	$\lambda_x = L_{Ex} / r_{xx}$ = **51.026**

Compressive strength - Section 4.7.5

Limiting slenderness	$\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **17.155**
Strut curve - Table 23	b
Robertson constant	α_x = **3.5**
Perry factor	$\eta_x = \alpha_x \times (\lambda_x - \lambda_0) / 1000$ = **0.119**
Euler stress	$p_{Ex} = \pi^2 \times E / \lambda_x^2$ = **777.1** N/mm²
	$\phi_x = (p_y + (\eta_x + 1) \times p_{Ex}) / 2$ = **572.1** N/mm²
Compressive strength - Annex C.1	$p_{cx} = p_{Ex} \times p_y / (\phi_x + (\phi_x^2 - p_{Ex} \times p_y)^{0.5})$ = **235.1** N/mm²

Compression resistance - Section 4.7.4

Compression resistance - cl.4.7.4	$P_{cx} = A \times p_{cx}$ = **1380.5** kN

PASS - Compression resistance exceeds design compression force

Effective length for minor (y-y) axis buckling - Section 4.7.3

Effective length for buckling	$L_{Ey} = L_y \times K_y$ = **1000** mm
Slenderness ratio - cl.4.7.2	$\lambda_y = L_{Ey} / r_{yy}$ = **19.477**

Compressive strength - Section 4.7.5

Limiting slenderness	$\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **17.155**
Strut curve - Table 23	c
Robertson constant	α_y = **5.5**
Perry factor	$\eta_y = \alpha_y \times (\lambda_y - \lambda_0) / 1000$ = **0.013**
Euler stress	$p_{Ey} = \pi^2 \times E / \lambda_y^2$ = **5333.5** N/mm²
	$\phi_y = (p_y + (\eta_y + 1) \times p_{Ey}) / 2$ = **2838.3** N/mm²
Compressive strength - Annex C.1	$p_{cy} = p_{Ey} \times p_y / (\phi_y + (\phi_y^2 - p_{Ey} \times p_y)^{0.5})$ = **271.3** N/mm²

Compression resistance - Section 4.7.4

Compression resistance - cl.4.7.4 $P_{cy} = A \times p_{cy} =$ **1593.7** kN

PASS - Compression resistance exceeds design compression force

Compression members with moments - Section 4.8.3

Comb.compression & bending check - cl.4.8.3.2 $F_c / (A \times p_y) + M / M_c =$ **0.386**

PASS - Combined bending and compression check is satisfied

Member buckling resistance - Section 4.8.3.3

Max major axis moment governing M_b $M_{LT} = M_x =$ **45.00** kNm

Equivalent uniform moment factor for major axis flexural buckling

$m_x =$ **1.000**

$m_y =$ **1.000**

Buckling resistance checks - cl.4.8.3.3.2 $F_c / P_{cx} + m_x \times M / M_c \times (1 + 0.5 \times F_c / P_{cx}) =$ **0.407**

$F_c / P_{cy} + m_{LT} \times M_{LT} / M_b =$ **0.387**

PASS - Member buckling resistance checks are satisfied

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Job No	Sheet No.	Rev
4266		

Made By	Dates	Chkd
[illegible]	15/12/15	

36 Flask Walk

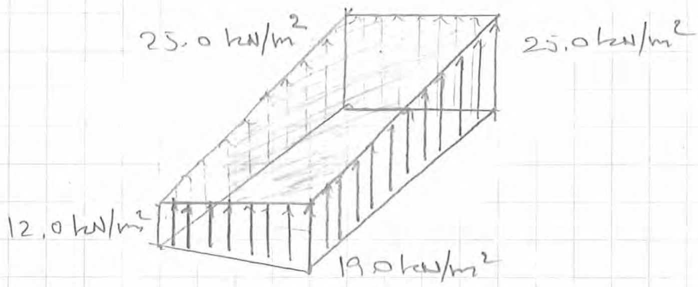
FLOTATION / HEAVE

Approximate volume of excavation: $V = 4.5 \cdot 13.2 \cdot 2.3 = 136.6\,m^3$

Upward pressure caused by residual heave:

$p = 0.5 \cdot 2.3 \cdot 20 = 23.0\,kN/m^2$

Worst credible water pressure applied at underside of RC slab.



* When assuming thickness of slab + finishes equal to 0.2 m.

Boyancy force: $P = 4.5 \cdot 13.2 \cdot (\frac{1}{2}(25.0+19.0) + \frac{1}{2}(25.0+12.0))/2$

$= 1203\,kN$

Restoring force: $P = 4.2 \cdot 130.8 + 7.8 \cdot 123.2 + 1.2 \cdot 23.8$

$+ 4.0 \cdot 23.8 + 4.0 \cdot 30.0 + 4.0 \cdot 23.8$

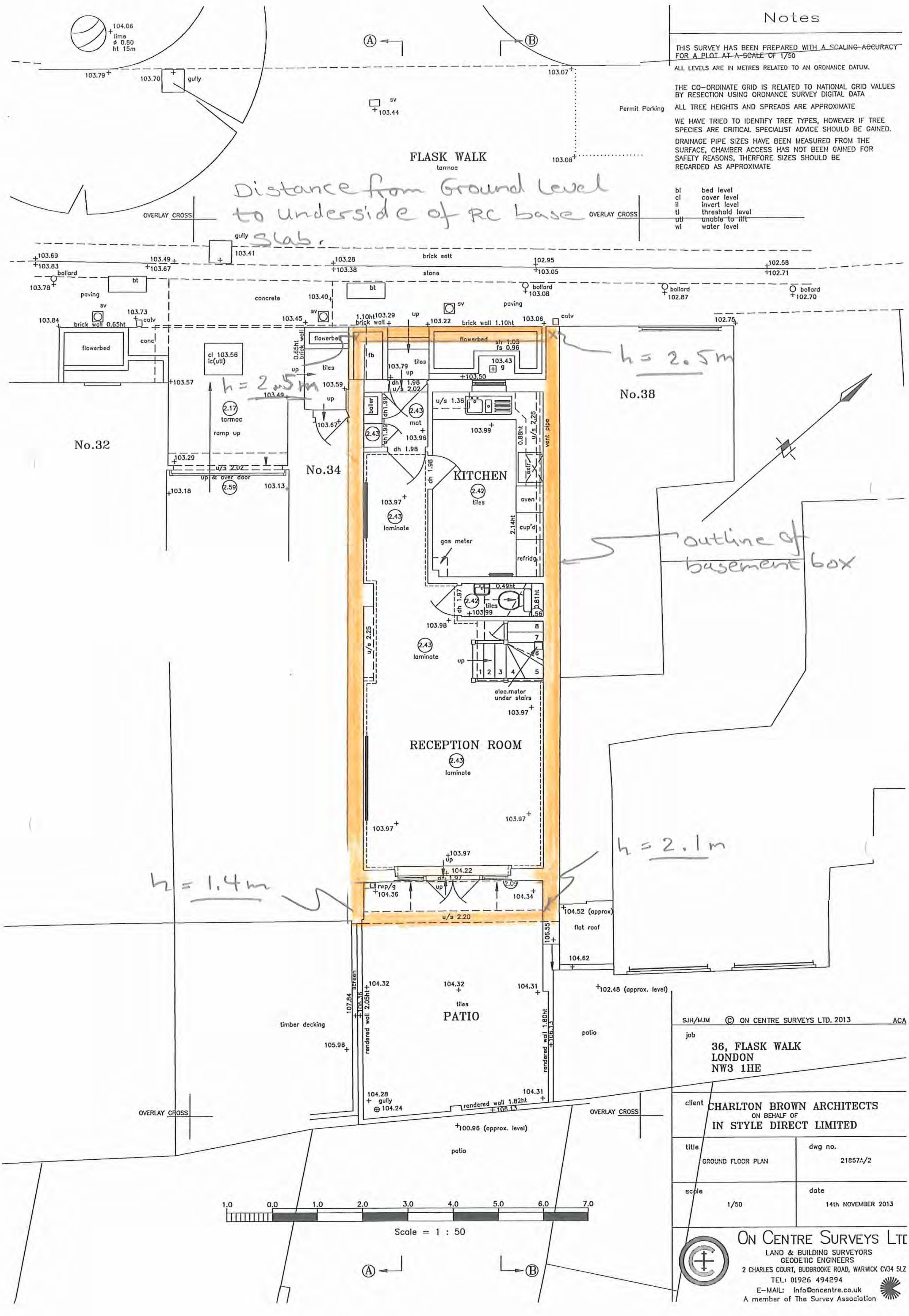
$+ 4.2 \cdot 126.2 + 9.0 \cdot 118.6$

$+ 4.0 \cdot 12.7 \cdot 9.2$

$= 3914\,kN$ (DL+LL)

$P \approx 2/3 \cdot 3914 = 2609\,kN$ for DL only

∴ PASS



Notes

THIS SURVEY HAS BEEN PREPARED ~~WITH A SCALING ACCURACY FOR A PLOT AT A SCALE OF 1/50~~

ALL LEVELS ARE IN METRES RELATED TO AN ORDNANCE DATUM.

THE CO-ORDINATE GRID IS RELATED TO NATIONAL GRID VALUES BY RESECTION USING ORDNANCE SURVEY DIGITAL DATA

ALL TREE HEIGHTS AND SPREADS ARE APPROXIMATE

WE HAVE TRIED TO IDENTIFY TREE TYPES, HOWEVER IF TREE SPECIES ARE CRITICAL SPECIALIST ADVICE SHOULD BE GAINED.

DRAINAGE PIPE SIZES HAVE BEEN MEASURED FROM THE SURFACE, CHAMBER ACCESS HAS NOT BEEN GAINED FOR SAFETY REASONS, THERFORE SIZES SHOULD BE REGARDED AS APPROXIMATE

bl	bed level
cl	cover level
il	invert level
tl	threshold level
utl	~~unable to lift~~
wl	water level

job: 36, FLASK WALK, LONDON, NW3 1HE

client: CHARLTON BROWN ARCHITECTS ON BEHALF OF IN STYLE DIRECT LIMITED

title	dwg no.
GROUND FLOOR PLAN	21857A/2
scale	**date**
1/50	14th NOVEMBER 2013

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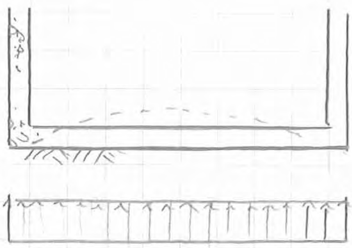
Job No	Sheet No.	Rev
4266		

Made By	Dates	Chkd
[initials]	15/12/15	

36 Flask Walk

RC BASE SLAB.

Water pressure will not be additional to any soil heave pressures. Water pressure at front governs the design of the RC slab...



$p = 25.0\ kN/m^2$ (sls)
water

Max hogging moment $M \approx 1/8 \cdot (1.2 \cdot 25.0) \cdot 4.0^2$
$= \underline{60.0}\ kNm/m$

∴ 250 mm thick RC slab adequate.

TP01

ELEMENT DESIGN to BS 8110:1997

SOLID SLABS

Originated from RCC11.xls v2.1

REINFORCED CONCRETE COUNCIL dti

INPUT Location	Base slab - hogging			
Design moment, M	60.0 kNm/m	fcu 35 N/mm²		γc = 1.50
ßb	1.00	fy 460 N/mm²		γs = 1.05
span	4000 mm			
Height, h	250 mm	Section location	SIMPLY SUPPORTED SP/	
Bar Ø	16 mm	Compression steel	NONE	
cover	30 mm to these bars		(deflection control only)	

OUTPUT Base slab - hogging Compression steel = NONE

d = 250 - 30 - 16/2 = 212.0 mm

(3.4.4.4) K' = 0.156 > K = 0.038 ok

(3.4.4.4) z = 212.0 [0.5 + (0.25 - 0.038 /0.893)]^½ = 202.6 > 0.95d = 201.4 mm

(3.4.4.1) As = 60.00E6 /460 /201.4 x 1.05 = 680 > min As = 325 mm²/m

PROVIDE T16 @ 300 = 670 mm²/m

(Eqn 8) fs = 2/3 x 460 x 680 /670 /1.00 = 311.2 N/mm²

(Eqn 7) Tens mod factor = 0.55 + (477 - 311.2) /120 /(0.9 + 1.335) = 1.168

(3.4.6.3) Permissible L/d = 20.0 x 1.168 = 23.367

Actual L/d = 4000 /212.0 = 18.868 ok