

**TMK Consulting Engineers**

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Civil • Structural • Environmental  
Geotechnical • Mechanical • Electrical  
Fire • Hydraulics • Lifts • Green ESD

Berri Office: 25 Vaughan Terrace, Berri SA 5343

**STRUCTURAL CALCULATIONS AND  
DETAILS  
(SR1)**

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<b>Builder / Agent:</b>	BERT FARINA CONSTRUCTIONS	<b>Job Number:</b>	1806063
<b>Owner:</b>	CITIFY GROUP	<b>Date:</b>	21/05/2019
<b>Project:</b>	PROPOSED RESIDENTIAL APARTMENT DEVELOPMENT	<b>Order No.</b>	--
<b>Project Location:</b>	82 - 90 JOHNS ROAD, PROSPECT SA		

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The Calculations and Details enclosed give specific recommendations for the above mentioned building / structure. These must be read in conjunction with all listed attachments. Changes to the design or construction must not be made without further written advice from the Engineer. A full copy of this document is to be forwarded to all future owner(s).

This report is valid for a period of 24 months, based on current standards, regulations, etc.

**ATTACHMENTS:** CRCS, SDN, SC1, FC1-FC10, FC100-FC110, LS1-LS35, CC1-CC43, SS1-SS12, WC1-WC24, RC1-RC4, (A1 DRAWINGS C1/A, C2/A, S0/A, S1/A, S2/A, S3/A, S4/A, S5/A, S6/A, S7/A, S8/A, S9/A, S10/A, S11/A, S12/A, S13/A, S14/A, S15/A, S16/A, S100/A, S101/A)

**SITE INSPECTIONS:**

1. As otherwise required by the Engineer or requested by the client / contractor.

**NOTE:** 1. These inspections will incur additional fees.  
2. We require 24 hours notice when booking inspections.

**ADDITIONAL NOTES/REQUIREMENTS:**

1. Refer to A1 Drawings for all details.
2. The design gust wind speed for this site has been calculated to be in the order of 40m/s (ultimate limit state).

For and on behalf of  
**TMK Consulting Engineers**

**ANDREW MARTIN**  
Senior Associate / Team Leader

**TMK Consulting Engineers**

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**CONDITIONS FOR THE USE OF STRUCTURAL  
CALCULATIONS AND DETAILS  
(CRCS)****1. GENERAL**

- 1.1 These Structural Calculations and Details (hereinafter named the "Report") give specific recommendations for the particular building described in this report. This Report must be read in conjunction with all listed attachments. Changes to the design or construction must not be made without further written advice from the Engineer.
- 1.2 The Owner and all contractors will comply in all respects and at all times with all terms, conditions and recommendations contained in, or attached to, this Report.
- 1.2.1 It is essential that the Owner reads the entire report carefully as it contains important information, relating not only to the construction, but also to obligations and liabilities.
- 1.2.2 If the Owner requires different details to that recommended, our office must be notified prior to the commencement of construction, and advice will be given accordingly.
- 1.2.3 If there are any aspects of the Report that are not understood, please contact the Engineer.
- 1.3 The Engineer may (and the Owner hereby authorizes the Engineer to):
- 1.3.1 Issue instructions (including an instruction to cease construction) on behalf of the Owner to any person engaged in the construction of the building, or any part thereof, to ensure construction of the building in accordance with this Report and any modification thereof. If any modification as aforesaid may be likely to result in additional construction costs exceeding \$3,500.00 (plus GST), the Engineer may issue an instruction to cease construction in order to obtain the approval of the Owner for such modification.
- 1.3.2 Make such modifications to the Report as the Engineer may deem necessary during the course of construction.
- 1.4 The Owner shall be responsible for, and indemnify the Engineer against, all and any costs and charges and all claims and demands made for any additional costs incurred by reason of any act, requirement or instruction of the Engineer made or given pursuant to Clause 1.3.
- 1.5 The Engineer shall not be liable for any defect in or damage to the building / construction caused by or contributed to by any breach of the terms, conditions and recommendations committed, permitted or allowed by the Owner.
- 1.6 Where more than one person is named as the Owner, all these terms, conditions and recommendations shall bind all such persons jointly and each such person severally, and any instruction or information given to the Engineer by any one such person shall be deemed to be given by all other such persons.

**2. TERMS OF ENGAGEMENT**

- 2.1 All work will be carried out in accordance with TMK's standard '*Terms and Conditions of Engagement for Consulting Services*'.



## **1. GENERAL**

- 1.1 These notes shall be read in conjunction with the architectural drawings, the specifications and the Engineer's Report, etc.
- 1.2 All dimensions and levels shall be confirmed with the architectural drawings and / or checked on site.
- 1.3 Engineer's drawings must not be scaled.
- 1.4 The builder and / or agent shall be responsible for maintaining the stability of all structures and any elements until their completion and shall ensure that no part of structures or any elements are overstressed by excessive loading.
- 1.5 The specifications below shall apply unless noted otherwise.
- 1.6 Requests for information will generally be responded to by the engineer within 5 working days, whilst reviews of shop drawings generally within 10 working days.

## **2. CONCRETE**

- 2.1 Concrete construction to comply with AS 3600 *Concrete structures*.
- 2.2 Concrete shall be as follows:
  - Grade N20 (i.e. 20 MPa) to slab on ground, footings protected by vapour barrier and residential strip / pad footings.
  - Grade N25 to suspended slabs, beams, columns and non residential footings unprotected by vapour barrier.
  - Grade N32 to members exposed to exterior environments or where concrete is to have a polished finish.
  - Maximum aggregate 20 mm.
  - Slump to be nominal 100 mm unless noted otherwise.
- 2.2.1 For sites within 1 km of the shoreline of large expanses of salt water or heavy industrial areas where surfaces (e.g. verandahs, balconies, carports) are exposed, the surface shall be protected with suitable topping, sealer, tiles etc or the concrete grade shall be not less than N40.
- 2.2.2 For sites containing high sulphate or highly saline soils (or in heavy industrial areas), the concrete surface is to be protected from the aggressive soil by a 0.2 mm branded and certified vapour barrier. Alternatively, use a concrete grade of N40 or greater.
- 2.3 Construction joints to be thoroughly scabbled of all laitance and poorly compacted material. Vertical joints to be poured against shuttering (refer also BF062 *Specification for the construction of footings and slabs* (CRS) Clause 2.7.3).
- 2.4 All concrete to be properly cured by keeping all exposed surfaces in a moist, damp condition for at least the first 7 days after placing, or by spraying with an approved curing compound, subject to compatibility with proposed surface finishes.
- 2.5 Minimum stripping times\*:
  - Slab-soffit 14 days, props 21 days.
  - Beams-sides 3 days, soffit 21 days.
  - Columns and Walls - (unloaded) 3 days.

*\*Specific instructions on formwork stripping times / de-propping etc are required in the cases of multi-level work.*

The system of propping including any re-shoring or back-propping proposals is the responsibility of the builder / contractor and is subject to the approval of the Superintendent.

- 2.6 In accordance with AS/NZS 4671 *Steel reinforcing materials*, reinforcement designations are as follows:

• R: Plain round structural bar	• N: Hot rolled deformed bar
• F: Hard drawn wire fabric	• SL: Square ribbed fabric
• W: Hard drawn wire bar	• RL: Rectangular ribbed fabric
- 2.7 Provide 0.2 mm High Impact Resistance branded polythene membrane to AS 2870 *Residential slabs and footings* throughout underside of floor slabs on ground, all laps to be 300 mm and sealed with a 50 mm wide strip of pressure-sensitive waterproof tape.

2.8 All filling to be non-clay material compacted in 150 mm layers to 90% maximum dry density in accordance with AS 3798 *Guidelines on earthworks for commercial and residential developments*.

2.9 Where rod reinforcement is spliced, the minimum lap length shall be:

Bar Size	Lap Length (mm)	Bar Size	Lap Length (mm)
N12	500	N28	1800
N16	750	N32	2150
N20	1000	N36	2600
N24	1450		

2.10 Laps to slab mesh to be one (1) full mesh panel plus 25 mm.

2.11 Clear concrete cover to reinforcement, (including fitments and wire ties), shall be:

- Internal slab on fill: 30 mm bottom and sides, 20 mm top.
- Footings protected by vapour barrier: 40 mm bottom and sides, 20 mm top.
- Residential footings unprotected by vapour barrier: 40 mm top, 50 mm bottom and sides.
- Non-residential footings unprotected by damp-proof membrane: 50 mm top, bottom and sides.
- Suspended slabs, beams and columns: 20 mm internal, 40 mm external.
- Where concrete is exposed to aggressive soils: 65 mm general, 55 mm where protected by an approved membrane.

2.12 Concrete is to be separated from the supporting brick work by two (2) layers of 0.5 mm thick viscourse.

2.13 Walls must not be built on suspended concrete slabs or beams until form work and props supporting same have been removed.

2.14 Tension cracks may occur in slabs, apply suitable sealant for exposed surfaces to prevent possible moisture ingress.

2.15 Provide 10 mm isolation joints where concrete is adjacent steel work / masonry. Provide suitable filler and sealant.

### 3. **MASONRY**

3.1 Construction to comply with AS 3700 *Masonry structures*.

3.2 Minimum characteristic unconfined compressive strength of units to be as follows:

- Clay bricks: 40 MPa
- Concrete bricks: 10 MPa
- Concrete hollow blocks: 15 MPa

3.3 Mortar: Brick work: 1: 1 : 6 (Cement / Lime / Sand) Block work: 1: 1 : 6

3.4 Infill concrete grout to reinforced masonry to be Grade 15, slump 230 +/- 30, 10 mm aggregate.

3.5 For hollow block retaining walls, all cores are to be grouted.

3.6 Grouting to reinforced masonry shall be compacted by rodding with a plain round bar. All air pockets and bubbles must be displaced during compaction. However, care must be taken to avoid damaging or dislodging the masonry or reinforcement while compacting the grout.

### 4. **STEEL WORK**

4.1 All Hot Rolled Steel to comply with AS 4100 *Steel structures*, AS/NZS 4600 *Cold formed steel structures* and AS 2327.1 *Composite structures – Simply supported beams*.

4.2 All welding to comply with AS/NZS 1554 *Structural steel welding*, Parts 1, 2 & 3.

4.3 All fillet welds to be 6 mm (category SP unless noted otherwise) extending the full length of the edges in contact, except where plate thicknesses are less than 6 mm, use a weld size to match.

4.4 The steel worker shall supply all HD bolts, nuts and all other bolts and washers required for the erection of the steel work, holes for HD bolts to be 3 mm oversize, holes for other bolts to be no more than 2 mm oversize. Minimum connection: 10 mm plate with 2 M16 8.8/S bolts unless otherwise noted.

4.5 Where HSFG bolts are required bolting shall comply with AS 4100.

- 4.7 All base plates, HD bolts and columns in concrete which is in contact with ground to have concrete cover of 75 mm minimum.
- 4.8 Minimum edge distance taken from centre of fastener (*Where 'D' is the nominal diameter of the fastener*) shall be:
- Sheared or hand flame cut edge: 1.75D
  - Rolled plate, machine flame cut sawn or planed edge: 1.50D
  - Rolled edge of a rolled section: 1.25D
- 4.8 Steel work to be concrete encased must first be wrapped with RF41 mesh. The reinforcement is to be placed 25 mm from the steel work.
- 4.9 Provide a 10 mm clearance between vertical faces of steel work and adjacent masonry walls. Provide W6 ties between steel work and masonry at 600 centres (max).
- 4.10 All steel work to be adequately propped and braced during construction until all permanent bracing, masonry and cladding has been erected.
- 4.11 All cold formed sections are to be constructed in accordance with the manufacturer's specifications. Trimming members the same size as the adjoining member shall be provided at no additional cost, to support all edges of sheeting at an angle other than 90 degrees to purlin / girt (refer to purlin manufacturer for details).
- 4.12 Steel work Protective coatings to be:
- Exposed external steel work within 1 km from breaking surf or within 100 m of salt water not subject to breaking surf, or heaving industrial areas, or corrosive water: Hot-Dip Galvanized, and painted.
  - Exposed external steel work (not exposed to corrosive environment): Hot-Dip Galvanized, 'Dimet' treated or one coat sprayed Inorganic zinc silicate paint over class 2.5 abrasive blast surface.
  - Steel work acting as downpipe or gutter: Hot-Dip Galvanized.
  - Internal steel work (not exposed to moisture or corrosive environment): Red oxide zinc chromate primer (Rozc) over wire brush surface.
- Note: All steelwork in contact with the ground, paving or soil etc, shall, in addition to the protection required above, be either wrapped with "Denso" tape or encased with concrete a minimum 75 mm thick.*
- 4.13 Two (2) copies of shop detail drawings are to be submitted to the engineer and review of the same obtained before commencing fabrication. Review will not cover dimensions. Shop drawings will generally be reviewed by the engineers within 10 working days.

## **5. TIMBER**

- 5.1 All to comply with AS 1720.1 *Timber structures – Design methods* and AS 1684 *Residential timber framed construction*.
- 5.2 All MGP10 grade timber must exclude "heart in" material to give the timber a minimum joint group strength of JD4, in accordance with AS 1720.

## **6. EARTHWORKS**

All to comply with AS 3798 *Guidelines on earthworks for commercial and residential developments*.

## **7. SITE INSPECTIONS**

Must be carried out at the following stages (Refer to *Construction Report and Footing Recommendations (CR1)* for engineer recommendations):

- After site preparation and trenching for the footing beams.
- After the preparation of reinforcement, prior to the placement of any concrete.



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Additional inspections may be carried out at the discretion of the Engineer and / or as requested by the Owner / Agent<sup>1</sup>:

- At the concrete pour.
- After completion of the masonry prior to construction of the roof to ensure correct placement of control joints.
- Upon completion of the installation of paving, stormwater drains, pipes and structures.

#### **8. SURFACE PROTECTIVE COATINGS**

All structural members and surfaces, i.e. beams, columns, walls, floors, ceilings, roofs and the like both internally and externally shall be coated with an approved protective coating to suit their intended use / exposure environment, which is to be applied in strict accordance with the manufacturer's recommendations and specifications (see also Clause 4.12).

#### **9. RETAINING WALLS**

Refer to sheet BF063 *General notes for retaining wall construction (RWN)*.

#### **10. TERMITE PROTECTION**

Termite protection system shall be in accordance with AS 3660.1 *Termite management – New building work*.

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<sup>1</sup> Agent refers to architect, builder, project manager, contractor, supervisor or any other such person that has authority to act on the Owner's behalf.

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**STRUCTURAL CALCULATIONS  
(SC1)**

<b>Builder / Agent:</b>	BERT FARINA CONSTRUCTIONS	<b>Job Number:</b>	1806063
<b>Owner:</b>	CITIFY GROUP	<b>Date:</b>	21/05/2019
<b>Project:</b>	PROPOSED RESIDENTIAL APARTMENT DEVELOPMENT		
<b>Project Location:</b>	82 - 90 JOHNS ROAD, PROSPECT SA		

**GENERAL NOTES:**

- These calculations are to be read in conjunction with the associated Architectural Drawings, Footing Construction Report, Structural Drawings and / or Details.
- All work to comply with relevant Australian Standards including but not limited to:
 

AS/NZ 1170	- Structural design actions
AS 1554	- Structural steel welding
AS 1684	- Residential timber framed construction
AS 1720	- Timber structures
AS 3600	- Concrete structures
AS 3610	- Formwork for concrete
AS 3700	- Masonry structures
AS 4100	- Steel structures
AS 1163	- Structural steel hollow sections
AS/NZS 2312	- Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS 3850	- Tilt up concrete construction
AS 4678	- Earth retaining structures

**STRUCTURAL CALCULATIONS INDEX**

Footings	FC1-FC10, FC100-FC110
Lateral Stability	LS1-LS35
Concrete Columns	CC1-CC43
Suspended Slabs	SS1-SS12
Walls	WC1-WC24
Roof	RC1-RC4

## Footings Design

- Model Footings in ETABS structural package. Proposed system comprises pads to columns & shaft, strip footings to wall panels and strip tie footings between pads.
- Soil Subgrade reaction ( $k_s$ ) of 15,000 kPa/m used in model based on medium bearing clays.

## Layout

- Refer to structural drawings for layout & sizing.

## Serviceability Design

- Refer to ETABS extract; maximum settlement expected under serviceability loading is less than 10mm and also negligible settlement between adjacent footings.

$\Rightarrow$  serviceability OK

## Main Shaft Pad PF3 (PF5 similar)

$$M_x^* = -150 \text{ kNm/m}, +300 \text{ kNm/m}$$

$$M_y^* = -180 \text{ kNm/m}, +225 \text{ kNm/m}$$

$$A_{s \min} = 0.002 \times 1000 \times 930$$

$$= 1860 \text{ mm}^2/\text{m}$$

$$d_{ef} = 1000 - 40 - 20 - 20/2$$

$$= 930 \text{ mm}$$

$$A_{st} = 300 \times 10^6 / (0.8 + 500 \times 930 + 0.9)$$

$$= 896 \text{ mm}^2/\text{m}$$

$\Rightarrow$  minimum steel governs  $\Rightarrow$  N20 @ 150% each way T & B

Bearing: refer ETABS output:

- max bearing pressure under ultimate loading  
= 160 kPa

$\Rightarrow$  as ultimate bearing consider OK.

$\Rightarrow$  1000 thick Shaft Pad OK.

## Strip Footings

- \* Pad footing settlements & bearing pressures controlled without strip footings (from ETABS model).
- $\Rightarrow$  nominally adopt strip tie footings to match pad footing depth - 600w + 800D.

Checked : .....

Date : .....

### Pads to double columns (PF2)

- modelled as 800 thick in ETABS

$$M_x^* = -20 \text{ kNm/m}, \quad M_y^* = -200 \text{ kNm/m}$$

$$\Rightarrow A_{stmin} = \frac{0.002 \times 1000 \times 730}{1460 \text{ mm}^2/\text{m}}$$

$$d = 800 - 20 - \frac{20}{2} - 40 = 730 \text{ mm}$$

$$A_{st} = \frac{250 \times 10^6}{0.8 \times 500 + 730 \times 0.9} = 151 \text{ mm}^2/\text{m} \rightarrow \text{min steel governs.}$$

$\Rightarrow N20 @ 200\text{c}$  each way T & B

Bearing: refer to ETABS output:

max bearing pressure under ultimate loading  $\approx 130 \text{ kPa} \rightarrow$  for ultimate loading consider ok.

$\Rightarrow$  800 thick PF2 pads ok.

### Pads to single columns (PF1)

- modelled as 800 thick in ETABS

$M^* = +270 \text{ kNm/m}$  from ETABS output

$\Rightarrow$  adopt  $N20 @ 200\text{c}$  each way bottom (based on PF2, same moment, same thickness)

Bearing: Refer Etabs output;

max bearing pressure under ultimate loading  $\approx 160 \text{ kPa}$

$\Rightarrow$  for ultimate loading consider ok.

$\Rightarrow$  adopt 800 thick pads for PF1

### Pad Footing PF4

• Modelled as 800 thick in Etabs.

•  $M_x^* \approx 80 \text{ kNm/m}$ ,  $M_y^* \approx 80 \text{ kNm/m}$

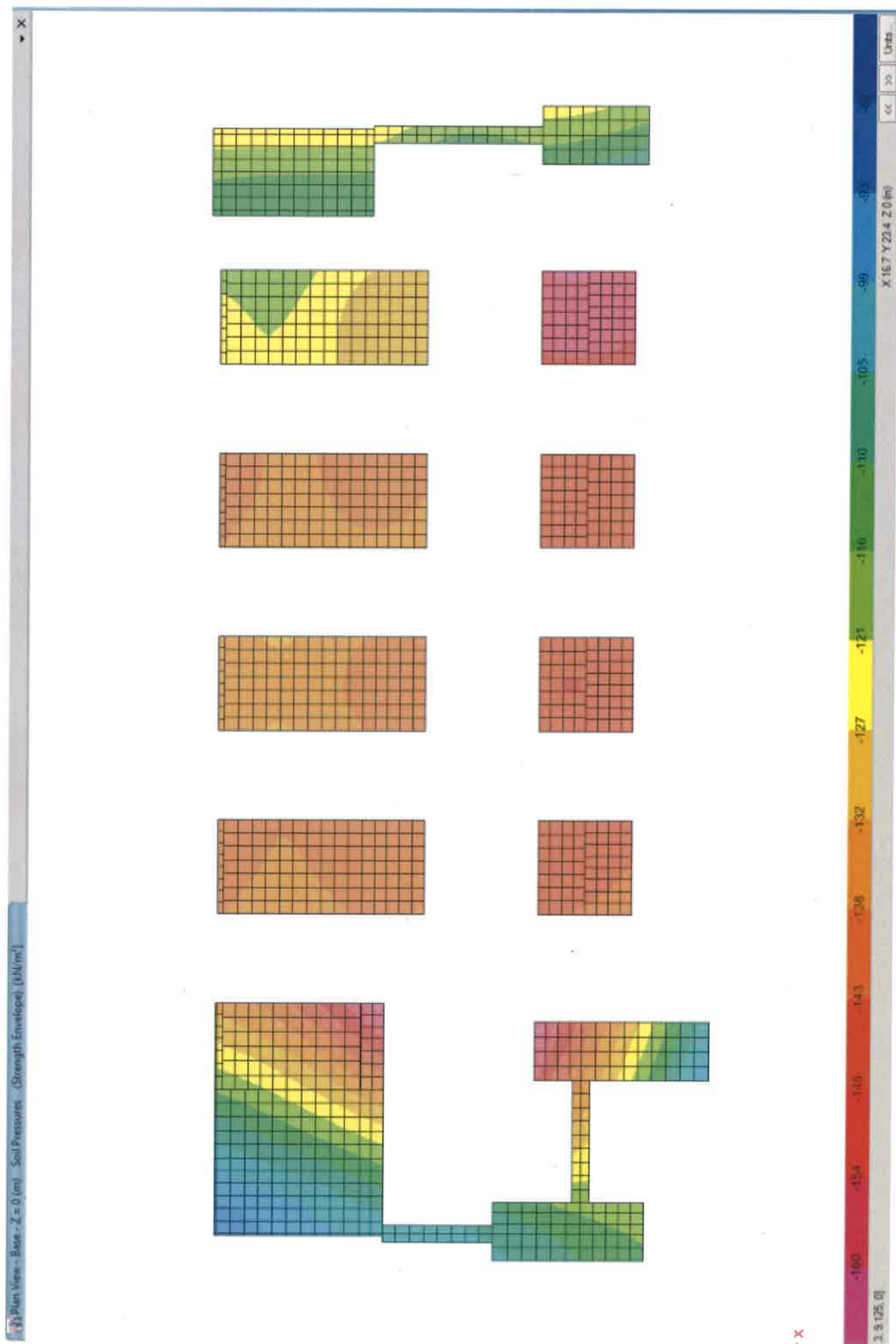
$\Rightarrow$  adopt  $N20 @ 200\text{c}$  each way bottom. (based on PF2, PF1, same depth, less moment)

• Bearing under ultimate loading  $\approx 160 \text{ kPa}$

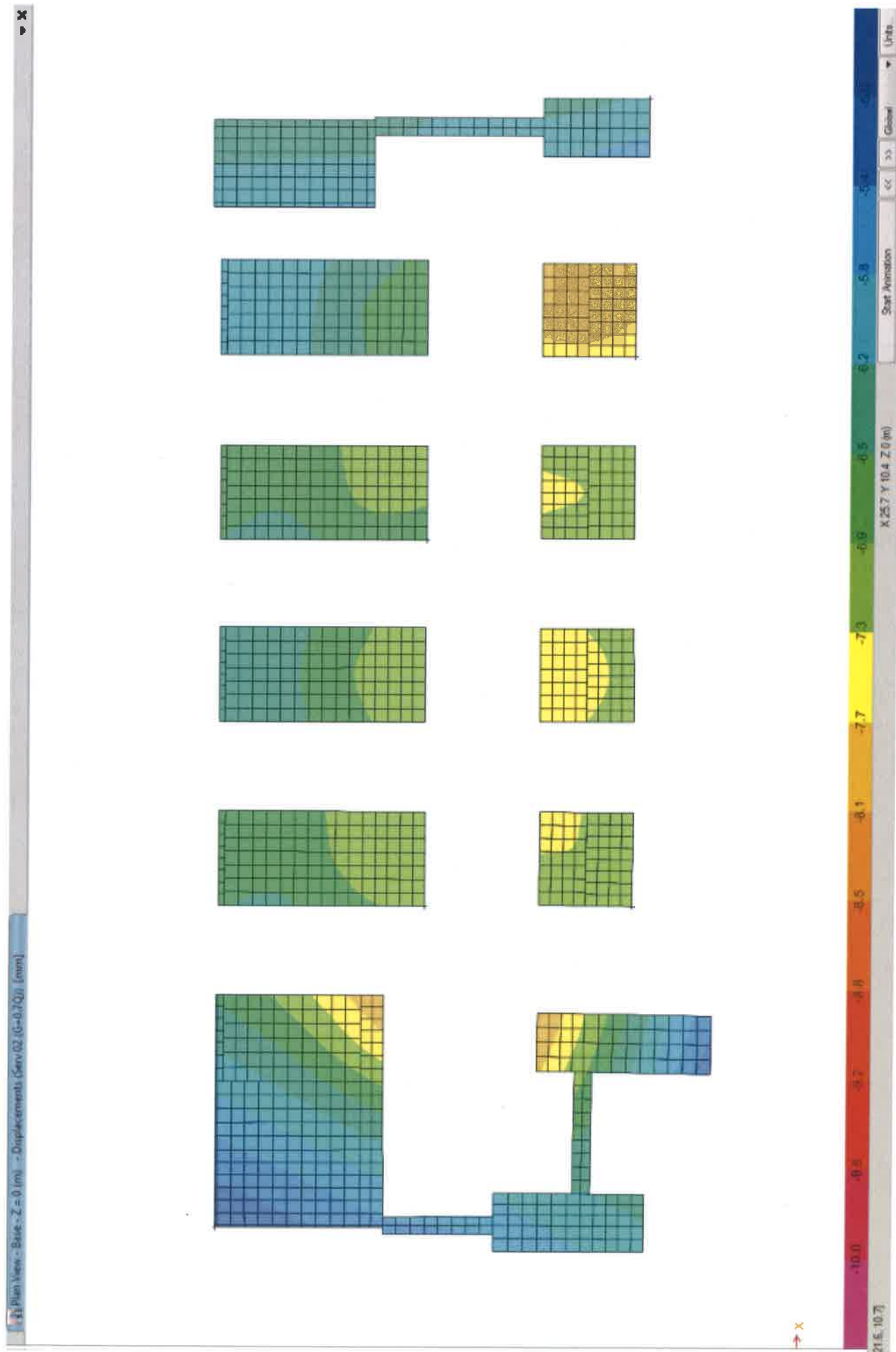
$\Rightarrow$  800 thick Pad Footing ok for PF4

Checked : .....

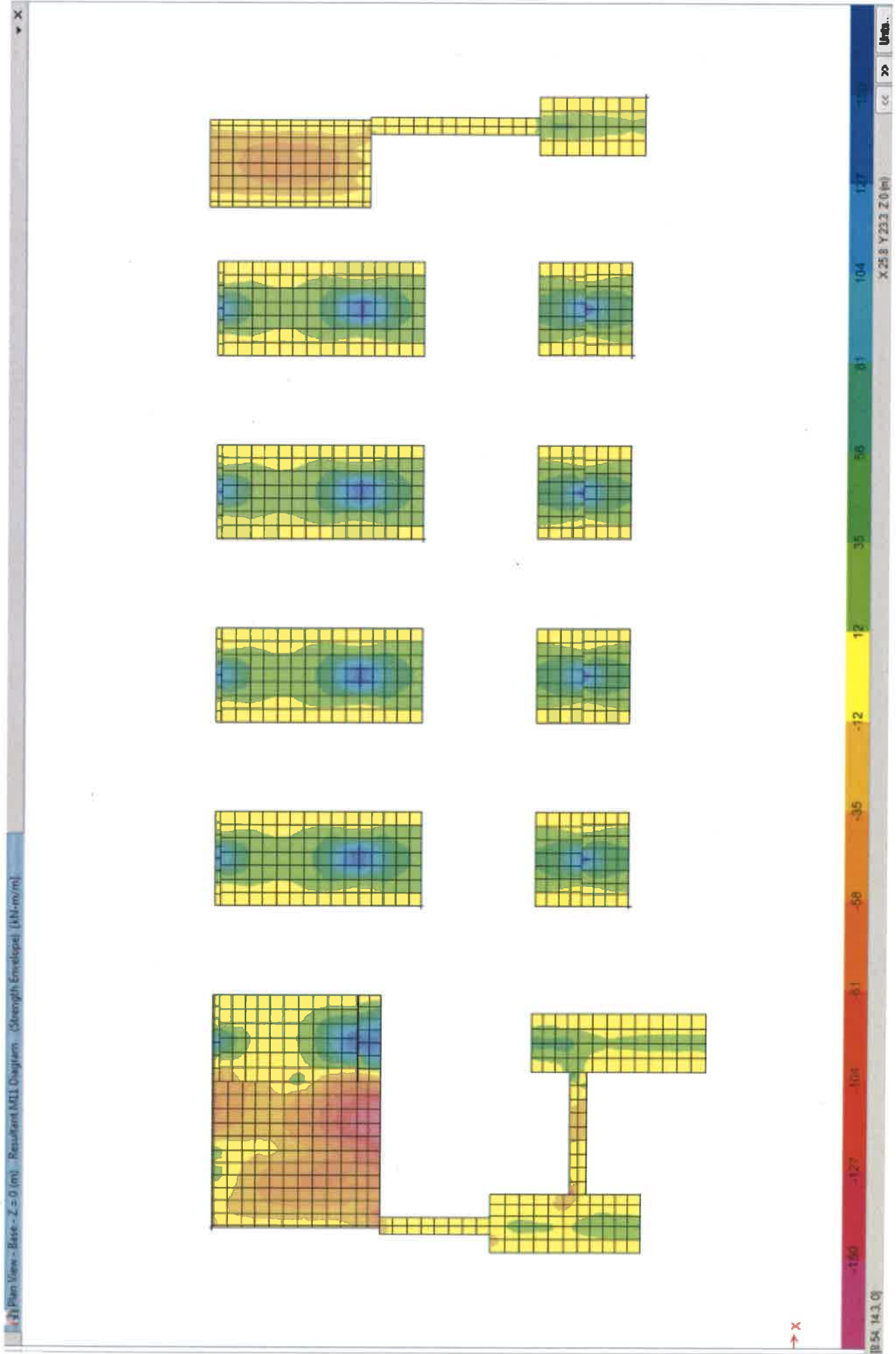
Date : .../.../...



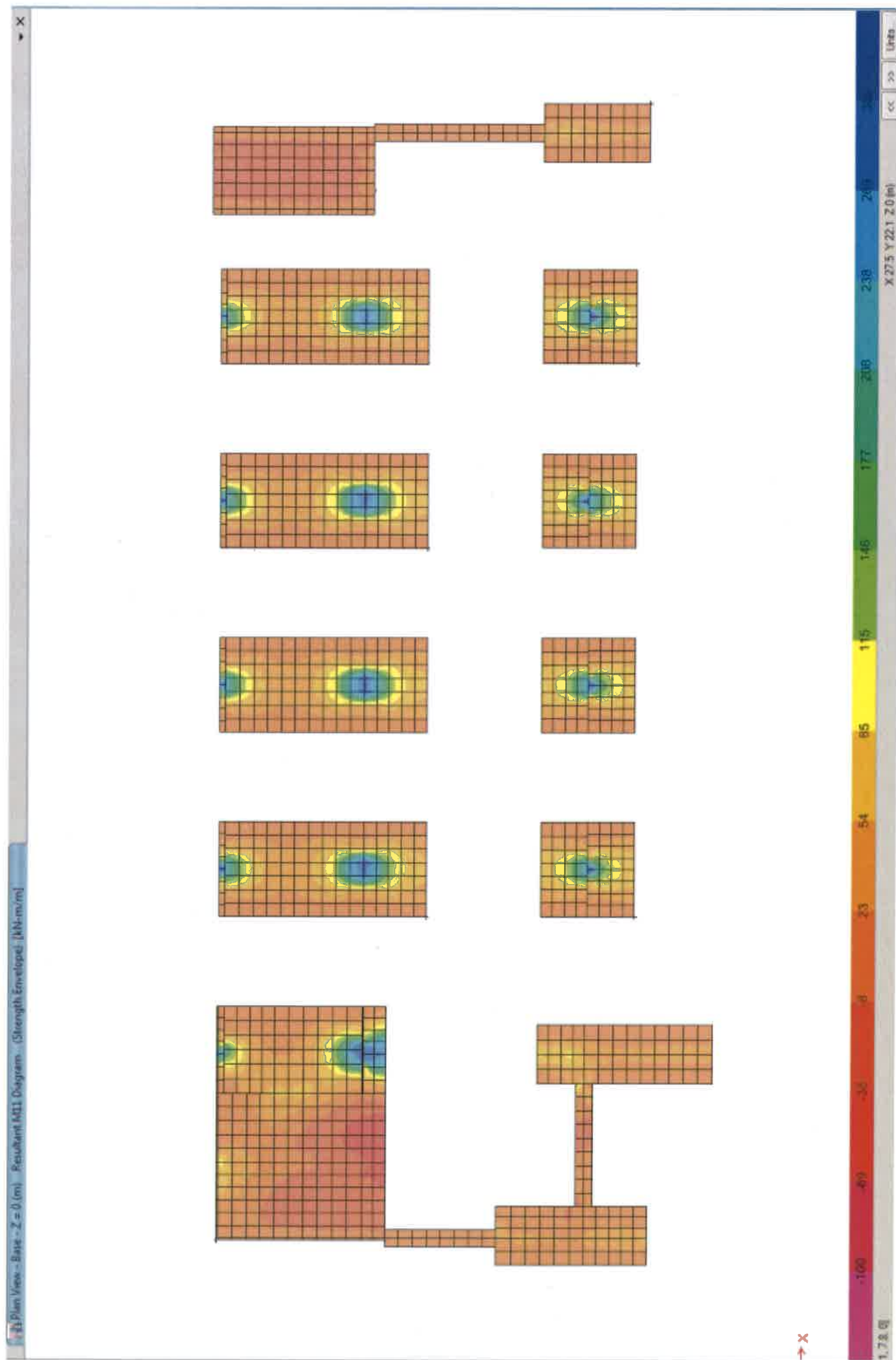
ETABS Model - Ultimate Soil Pressures (kPa)



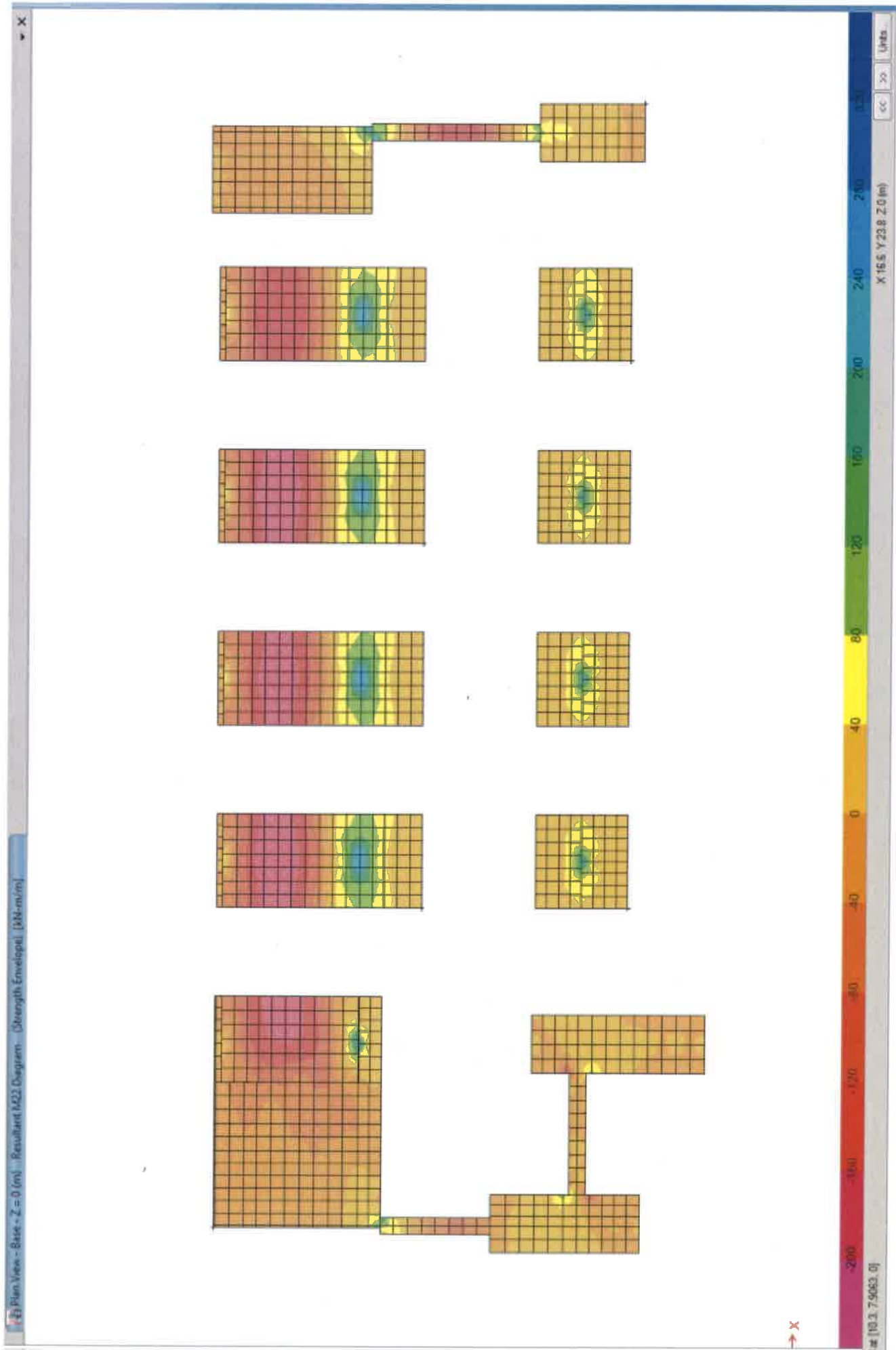
Etabs Model – Expected Soil Settlements (mm) under load case (DL + 0.7LL)

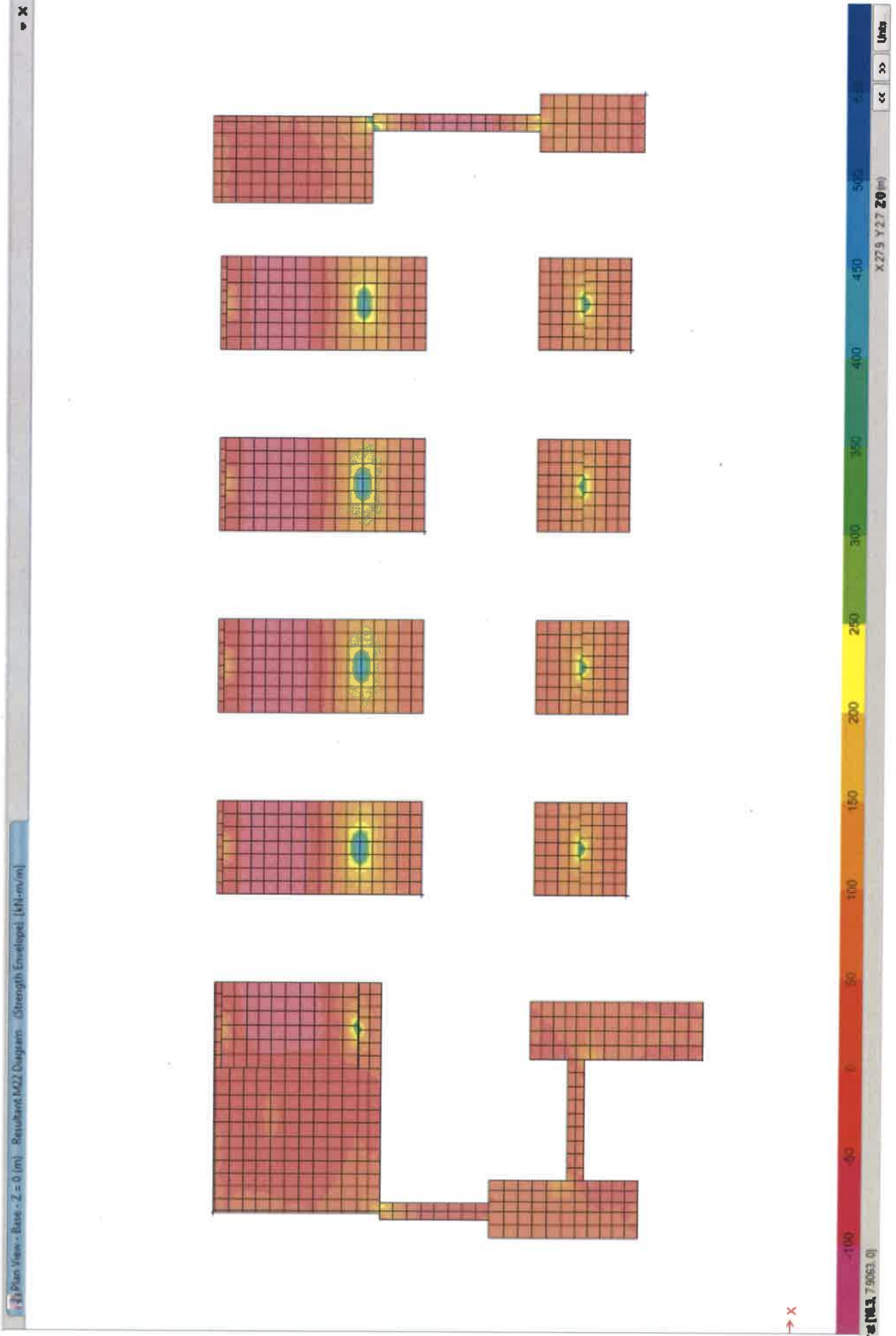


Etabs Model – Footing Ultimate Bending Moments X-Dir. (kN.m/m) Abs. Min.



Etabs Model – Footing Ultimate Bending Moments X-Dir. (kN.m/m) Abs. Max.





Etabs Model – Footing Ultimate Bending Moments Y-Dir. (kN.m/m) Abs. Max.



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 Date: 29-Nov-18  
 Design: FK  
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## REACTIVE SOIL MOVEMENT CALCULATIONS

Sub-number :

These calculations comply with the requirements of AS 2870—2011 and "Special Provisions for the Design of Residential Slabs and Footings for South Australian Conditions", February 2013.

Boreholes : 1 to 4

The values of the Differential Mound Movement  $y_m$  for the Centre Heave (C/H) and Edge Heave (E/H) conditions are intended for use in the Walsh Method of Analysis and comply with Clause F2 of AS 2870—2011.

Depth of Design Suction Change : 4.0 metres Table 2.4  
 Depth of the Cracked Zone : 3.0 metres Clause 2.3.2  
 Include the effects of trees : N (Y=Yes, N=No)

### Summary of soil profile parameters used in calculations

	HOLE 1		HOLE 2		HOLE 3		HOLE 4	
Fill < 5 yrs **	metres		metres		metres		metres	
Cut < 2 yrs **	metres		metres		metres		metres	
Bedrock **	metres		metres		metres		metres	
Water Table **	metres		metres		metres		metres	
Horizons	Depth	lps	Depth	lps	Depth	lps	Depth	lps
1	0.30	0.002	0.20	0.002	0.30	0.002	0.30	0.002
2	0.40	0.005	0.30	0.005	0.70	0.030	0.40	0.005
3	0.75	0.030	0.70	0.030	1.30	0.020	0.80	0.030
4	1.40	0.020	1.20	0.020	1.80	0.015	1.60	0.020
5	2.00	0.015	2.00	0.015	2.00	0.025	2.20	0.015
6	2.40	0.025	2.40	0.025	2.50	0.035	2.50	0.025
7	4.00	0.035	4.00	0.035	4.00	0.050	4.00	0.035

\*\* Leave blank if this parameter does not influence the design

### Summary of tree effect parameters (to AS 2870—2011 Appendix H)

This design EXCLUDES TREE EFFECTS		
HT =	n/a	Design height of row of trees (m)
D <sub>t</sub> =	n/a	Distance to row of trees (m)
D <sub>t</sub> / HT =	n/a	Tree Factor Appendix H
S <sub>v</sub> =	n/a	Surface Value of $\Delta pF$ Table 2.4
$\Delta u_{base}$ =	n/a	due the effect of the row of trees
and H <sub>t</sub> =	n/a	metres Appendix H

### Summary of calculated surface movement values

	HOLE 1	HOLE 2	HOLE 3	HOLE 4
Characteristic Surface Movement, $y_s$ (mm)	50.2	52.0	61.3	49.9
Surface Movement due to the Effects of Trees, $y_t$ (mm)	n/a	n/a	n/a	n/a

The maximum value of  $y_s$  is 61 mm Site Classification : H2-D (Table 2.3)

=>For design, use: C/H:  $y_m$  = 43 mm Appendix F2

E/H:  $y_m$  = 31 mm Appendix F2

=>For design, use:  $y_t$  = n/a mm Appendix H

### Notes / Comments :

In the case where trees have been found on the site or tree planting is planned in the vicinity of the proposed works, this design attempts to account for their effects by allowing for a vertical soil movement greater than would be expected to occur as a result of normal seasonal moisture movements beneath and adjacent to the footing. However, due to the complexity of tree root geometry, variable moisture extraction by the tree and the difficulty in predicting future tree growth, a precise design for the effects of trees is outside current knowledge.

The Owner must understand that, although appropriate precautions have been taken in this design for the effects of trees, some tree-induced movement in the structure must be accepted.



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## REACTIVE SOIL MOVEMENT CALCULATIONS

Sub-number :

Boreholes :

These calculations comply with the requirements of AS 2870—2011 and "Special Provisions for the Design of Residential Slabs and Footings for South Australian Conditions", February 2013.

The values of the Differential Mound Movement  $y_m$  for the Centre Heave (C/H) and Edge Heave (E/H) conditions are intended for use in the Walsh Method of Analysis and comply with Clause F2 of AS 2870—2011.

Depth of Design Suction Change : 4.0 metres Table 2.4  
 Depth of the Cracked Zone : 3.0 metres Clause 2.3.2  
 Include the effects of trees : N (Y=Yes, N=No)

### Summary of soil profile parameters used in calculations

	HOLE 5		HOLE 6		HOLE 7		HOLE 8	
Fill < 5 yrs **	metres		metres		metres		metres	
Cut < 2 yrs **	metres		metres		metres		metres	
Bedrock **	metres		metres		metres		metres	
Water Table **	metres		metres		metres		metres	
Horizons	Depth	lps	Depth	lps	Depth	lps	Depth	lps
1	0.45	0.005	0.40	0.005				
2	1.00	0.030	0.80	0.030				
3	1.60	0.020	1.40	0.020				
4	2.00	0.015	1.90	0.015				
5	2.20	0.025	2.40	0.025				
6	3.00	0.035	3.00	0.035				
7	4.00	0.050	4.00	0.050				

\*\* Leave blank if this parameter does not influence the design

### Summary of tree effect parameters (to AS 2870—2011 Appendix H)

This design EXCLUDES TREE EFFECTS		
HT =	n/a	Design height of row of trees (m)
$D_t$ =	n/a	Distance to row of trees (m)
$D_t$ / HT =	n/a	Tree Factor Appendix H
$S_v$ =	n/a	Surface Value of $\Delta pF$ Table 2.4
$\Delta u_{base}$ =	n/a	due the effect of the row of trees
and $H_t$ =	n/a	metres Appendix H

### Summary of calculated surface movement values

	HOLE 5	HOLE 6	HOLE 7	HOLE 8
Characteristic Surface Movement, $y_s$ (mm)	57.0	55.4	n/a	n/a
Surface Movement due to the Effects of Trees, $y_t$ (mm)	n/a	n/a	n/a	n/a

The maximum value of  $y_s$  is 57 mm Site Classification : H1-D (Table 2.3)

=>For design, use: C/H:  $y_m$  = 40 mm Appendix F2

E/H:  $y_m$  = 29 mm Appendix F2

=>For design, use:  $y_t$  = n/a mm Appendix H

### Notes / Comments :

In the case where trees have been found on the site or tree planting is planned in the vicinity of the proposed works, this design attempts to account for their effects by allowing for a vertical soil movement greater than would be expected to occur as a result of normal seasonal moisture movements beneath and adjacent to the footing. However, due to the complexity of tree root geometry, variable moisture extraction by the tree and the difficulty in predicting future tree growth, a precise design for the effects of trees is outside current knowledge.

The Owner must understand that, although appropriate precautions have been taken in this design for the effects of trees, some tree-induced movement in the structure must be accepted.



Town houses

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## REACTIVE SOIL MOVEMENT CALCULATIONS

Sub-number :

Boreholes : 1 to 4

These calculations comply with the requirements of AS 2870—2011 and "Special Provisions for the Design of Residential Slabs and Footings for South Australian Conditions", February 2013.  
The values of the Differential Mound Movement  $y_m$  for the Centre Heave (C/H) and Edge Heave (E/H) conditions are intended for use in the Walsh Method of Analysis and comply with Clause F2 of AS 2870—2011.

Depth of Design Suction Change : 4.0 metres Table 2.4  
Depth of the Cracked Zone : 3.0 metres Clause 2.3.2  
Include the effects of trees : N (Y=Yes, N=No)

### Summary of soil profile parameters used in calculations

	HOLE 1		HOLE 2		HOLE 3		HOLE 4	
Fill < 5 yrs **	metres		metres		metres		metres	
Cut < 2 yrs **	metres		metres		metres		metres	
Bedrock **	metres		metres		metres		metres	
Water Table **	metres		metres		metres		metres	
Horizons	Depth	lps	Depth	lps	Depth	lps	Depth	lps
1	0.40	0.005	0.30	0.005	0.30	0.002	0.40	0.005
2	0.75	0.030	0.70	0.030	0.70	0.030	0.80	0.030
3	1.40	0.020	1.20	0.020	1.30	0.020	1.60	0.020
4	2.00	0.015	2.00	0.015	1.80	0.015	2.20	0.015
5	2.40	0.025	2.40	0.025	2.00	0.025	2.50	0.025
6	3.00	0.035	3.00	0.035	2.50	0.035	3.00	0.035
7	4.00	0.055	4.00	0.055	4.00	0.055	4.00	0.055

\*\* Leave blank if this parameter does not influence the design

### Summary of tree effect parameters (to AS 2870—2011 Appendix H)

This design EXCLUDES TREE EFFECTS		
HT =	n/a	Design height of row of trees (m)
$D_t$ =	n/a	Distance to row of trees (m)
$D_t$ / HT =	n/a	Tree Factor Appendix H
$S_v$ =	n/a	Surface Value of $\Delta pF$ Table 2.4
$\Delta U_{base}$ =	n/a	due the effect of the row of trees
and $H_t$ =	n/a	metres Appendix H

### Summary of calculated surface movement values

	HOLE 1	HOLE 2	HOLE 3	HOLE 4
Characteristic Surface Movement, $y_s$ (mm)	55.3	56.7	63.3	54.9
Surface Movement due to the Effects of Trees, $y_t$ (mm)	n/a	n/a	n/a	n/a

The maximum value of  $y_s$  is 63 mm Site Classification : H2-D (Table 2.3)

=>For design, use: C/H:  $y_m$  = 44 mm Appendix F2  
E/H:  $y_m$  = 32 mm Appendix F2  
=>For design, use:  $y_t$  = n/a mm Appendix H

### Notes / Comments :

In the case where trees have been found on the site or tree planting is planned in the vicinity of the proposed works, this design attempts to account for their effects by allowing for a vertical soil movement greater than would be expected to occur as a result of normal seasonal moisture movements beneath and adjacent to the footing. However, due to the complexity of tree root geometry, variable moisture extraction by the tree and the difficulty in predicting future tree growth, a precise design for the effects of trees is outside current knowledge.

The Owner must understand that, although appropriate precautions have been taken in this design for the effects of trees, some tree-induced movement in the structure must be accepted.



Front 3 off

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## RESIDENTIAL FOOTING CALCULATIONS - SUMMARY SHEET

Sub-number :

The calculations are in accordance with AS 2870—2011 Residential slabs and footings

Site Address/Location : 82 - 90 JOHNS ROAD (TOWNHOUSE FRONT 3 OFF)  
PROSPECT SA

### STRUCTURE AND LOAD TYPES

Structure Type : Veneer  
Articulation : True

Construction : Two Storeys  
Roof : Steel Sheeting

### WALSH DESIGN PARAMETERS

Depth of Design Suction Change :	4.0 metres	Soil Profile Type :	Class D
Characteristic Movement - $y_s$ :	63 mm	Default Centre Heave Stiffness :	1000 kPa/m
Centre Heave - $y_m^*$ :	44 mm	Default Edge Heave Stiffness :	1500 kPa/m
Edge Heave - $y_m^*$ :	32 mm	Hard:Soft Mound Stiffness Ratio :	5
Design Surface Movement - $y_t^{**}$ :	0 mm	Design Deflection Ratio :	400
Design is for Tree Removal :	N	Differential Deflection Limit :	30 mm

\* The calculated heave values are in accordance with AS 2870—2011, Appendix F2 (Walsh method).

\*\* The calculated design movement due to trees is in accordance with AS 2870—2011, Appendix H.

### BEAM & SLAB DESIGN DETAILS

Slab Thickness :	100 mm	Top Face Bar Diameter :	16 mm
Top Face Fabric :	SL72	Bottom Face Bar Diameter :	16 mm
Area of Fabric Reinforcement :	179 mm <sup>2</sup> /m	Cover to Top Reinforcement :	20 mm
Reinforcement $f_{sy}$ :	500 MPa	Cover to Bottom Reinforcement :	30 mm
Reinforcement Modulus :	200E+3 MPa	Effective Beam Depth (C/H) :	810 mm
		Effective Beam Depth (E/H) :	800 mm
Internal Beam Width :	350 mm	<b>Internal Beams</b>	
External Beam Width :	350 mm	No. of Top Face Bars :	4
Overall Beam Depth :	850 mm	No. of Bottom Face Bars :	4
Concrete $f'_c$ :	20 MPa	<b>External Beams</b>	
Concrete Modulus :	15E+3 MPa	No. of Top Face Bars :	4
		No. of Bottom Face Bars :	4

### DESIGN SUMMARY

\*\*\* DESIGN IS SATISFACTORY - Refer to Calculation Sheets for Details.

#### CONSTRUCTION TYPE

Articulated Masonry Veneer

#### SLAB

Thickness 100 mm  
Fabric Reinforcement SL72

#### BEAMS

Beam Type	Depth x Width (mm) (mm)		Bar reinforcement	
			Top	Bottom
External	850	350	4.N16	4.N16
Internal	850	350	4.N16	4.N16

#### General Notes

Concrete  $f'_c$  20 MPa at 28 days  
Cover - Top 20 mm  
- Bottom 30 mm



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### DESIGN ASSUMPTIONS

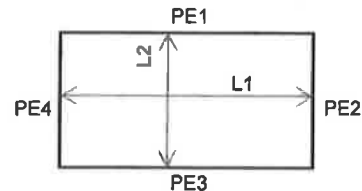
No. of rectangles in this design: 1

1. Building Construction : Double Storey ▼ Walls: Art. Masonry Veneer ▼ Roof: Steel Sheetting ▼

2. Max. Differential  $\Delta_{\text{allowable}}$  :  $L/400 \leq 30\text{mm}$

### DESIGN RECTANGLE 1

Design Rectangle Length (L1) : 17.500 m  
Design Rectangle Width (L2) : 15.000 m  
No. of Beams Parallel to L1 : 5  
No. of Beams Parallel to L2 : 7  
Section Area of Beams : 0.30 m<sup>2</sup>  
Trial Internal Beam Size : 350 x 850 ▼



∴ Soft Swell Stiffness of 100q ≈ 1950 kPa/m

### LOADS

#### Uniform Slab Loading

Footing Slab	2.40 kPa
Live Load	1.50 kPa
Finishes, Partitions	1.00 kPa
Internal Footings	3.06 kPa
Other Uniform Slab Loadings	5.60 kPa
<b>Total</b>	<b>13.56 kPa</b>

#### Footing Edge Loading

<b>PE1</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	Art. Masonry Veneer	2.70 x 2.4 kPa	6.48 kN/m
	Roof:	Steel Sheetting	1.50 x 0.40 kPa	0.60 kN/m
	Floor:	Timber	0.00 x 1.55 kPa	0.00 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>21.66 kN/m</b>
<b>PE2</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	Art. Masonry Veneer	2.70 x 2.4 kPa	6.48 kN/m
	Roof	Steel Sheetting	3.00 x 0.40 kPa	1.20 kN/m
	Floor	Timber	3.00 x 1.55 kPa	4.65 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>26.91 kN/m</b>
<b>PE3</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	Art. Masonry Veneer	2.70 x 2.4 kPa	6.48 kN/m
	Roof	Steel Sheetting	1.50 x 0.40 kPa	0.60 kN/m
	Floor	Timber	0.00 x 1.55 kPa	0.00 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>21.66 kN/m</b>
<b>PE4</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	Art. Masonry Veneer	2.70 x 2.4 kPa	6.48 kN/m
	Roof	Steel Sheetting	3.00 x 0.40 kPa	1.20 kN/m
	Floor	Timber	3.00 x 1.55 kPa	4.65 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>26.91 kN/m</b>



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## RESIDENTIAL FOOTING CALCULATIONS RECTANGLE 1 - BEAMS PARALLEL TO L1

The calculations are in accordance with AS 2870—2011 Residential slabs and footings

STRUCTURE AND LOAD DETAILS		Structure Type : Veneer	Articulation : True	Number of Beam Elements: 100	
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Rectangle Length :	17.500 metres	Equivalent Uniform Load :	16.45 kPa	Soil Profile Type :	Class D
Rectangle Width :	15.000 metres	Centre Line Load :	0.00 kN/m	Ys :	63 mm
Slab Thickness :	100 mm	Edge Line Load :	26.91 kN/m	Yt :	0 mm
Total No. of Beams :	5	Concrete f <sub>c</sub> :	20 MPa	Concrete Modulus :	15E+3 kPa

BEAM DETAILS		Internal Beams		External Beams	
Overall Beam Depth :	850 mm	Beam Width :	350 mm	Beam Width :	350 mm
Fabric Reinforcement		Top Face Bar Diameter :	16 mm	Top Face Bar Diameter :	16 mm
Top Face Fabric :	SL72	No. of Top Face Bars :	4	No. of Top Face Bars :	4
Area of Fabric Reinforcement :	179 mm <sup>2</sup> /m	Cover to Top Reinforcement :	20 mm	Cover to Top Reinforcement :	20 mm
F <sub>sy</sub> :	500 MPa	Bottom Face Bar Diameter :	16 mm	Bottom Face Bar Diameter :	16 mm
Steel Modulus :	200E+3 MPa	No. of Bottom Face Bars :	4	No. of Bottom Face Bars :	4
		Cover to Bottom Reinforcement :	30 mm	Cover to Bottom Reinforcement :	30 mm

WALSH DESIGN METHOD		Internal Beams		External Beams	
Centre Heave		Effective Beam Depth :	810 mm	Effective Beam Depth :	810 mm
Y <sub>m</sub> :	44 mm	Effective Flange Width :	2350 mm	Effective Flange Width :	1350 mm
Soft Swell Stiffness :	1950 kPa/m	Top Face Ast :	1221 mm <sup>2</sup>	Top Face Ast :	1042 mm <sup>2</sup>
Mound Edge distance, e :	1.722 m	Required Beam Capacity :	176.02 kNm/beam	Required Beam Capacity :	88.01 kNm/beam
Walsh Factor C1 :	0.95	Required Beam Stiffness :	4.31 E+9 mm <sup>4</sup>	Required Beam Stiffness :	2.15 E+9 mm <sup>4</sup>
Walsh Factor C2 :	0.97	Steel Ratio :	0.0043	Steel Ratio :	0.0037
Max BM :	46.94 kNm/m	Bending Capacity :	369.9 kNm	Bending Capacity :	318.9 kNm
Max Shear Force :	35.17 kN/m	I-Gross :	34.90 E+9 mm <sup>4</sup>	I-Gross :	28.52 E+9 mm <sup>4</sup>
Calc. I-required :	1.15 E+9 mm <sup>4</sup> /m	I-Cracked :	6.89 E+9 mm <sup>4</sup>	I-Cracked :	6.08 E+9 mm <sup>4</sup>
Calc. Span/Deflection Ratio :	588	Cracking Moment :	229.0 kNm	Cracking Moment :	155.3 kNm
Calc. Delta/Ym Ratio :	0.68	I-Effective :	34.90 E+9 mm <sup>4</sup>	I-Effective :	28.52 E+9 mm <sup>4</sup>

Internal - Bending : Provided Capacity of 369.9 kNm > Required Capacity of 176 kNm : OK  
Stiffness : Provided Stiffness of 34.9E+9 mm<sup>4</sup> > Required Stiffness of 4.31E+9 mm<sup>4</sup> : OK

WALSH DESIGN METHOD		Internal Beams		External Beams	
Edge Heave		Effective Beam Depth :	800 mm	Effective Beam Depth :	800 mm
Y <sub>m</sub> :	32 mm	Effective Flange Width :	3750 mm	Effective Flange Width :	1875 mm
Soft Swell Stiffness :	1950 kPa/m	Bottom Face Ast :	800 mm <sup>2</sup>	Bottom Face Ast :	800 mm <sup>2</sup>
Mound Edge distance, e :	1.880 m	Required Beam Capacity :	11.98 kNm/beam	Required Beam Capacity :	5.99 kNm/beam
Mound Shape Factor, W <sub>f</sub> :	0.00	Required Beam Stiffness :	0.11 E+9 mm <sup>4</sup>	Required Beam Stiffness :	0.06 E+9 mm <sup>4</sup>
Walsh Factor C1 :	0.99	Steel Ratio :	0.0003	Steel Ratio :	0.0005
Walsh Factor C2 :	1.00	Bending Capacity :	255.0 kNm	Bending Capacity :	254.0 kNm
Max BM :	3.20 kNm/m	I-Gross :	40.51 E+9 mm <sup>4</sup>	I-Gross :	32.22 E+9 mm <sup>4</sup>
Max Shear Force :	20.76 kN/m	I-Cracked :	6.11 E+9 mm <sup>4</sup>	I-Cracked :	5.83 E+9 mm <sup>4</sup>
Calc. I-required :	0.03 E+9 mm <sup>4</sup> /m	Cracking Moment :	175.0 kNm	Cracking Moment :	157.6 kNm
Calc. Span/Deflection Ratio :	3136	I-Effective :	40.51 E+9 mm <sup>4</sup>	I-Effective :	32.22 E+9 mm <sup>4</sup>
Calc. Delta/Ym Ratio :	0.17				

Internal - Bending : Provided Capacity of 255 kNm > Required Capacity of 12 kNm : OK  
Stiffness : Provided Stiffness of 40.51E+9 mm<sup>4</sup> > Required Stiffness of 0.11E+9 mm<sup>4</sup> : OK



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**RESIDENTIAL FOOTING CALCULATIONS**  
**RECTANGLE 1 - BEAMS PARALLEL TO L2**

The calculations are in accordance with AS 2870—2011 Residential slabs and footings

**STRUCTURE AND LOAD DETAILS**

Structure Type : Veneer		Articulation : True		Number of Beam Elements: 100	
Rectangle Length	15,000 metres	Equivalent Uniform Load	16.64 kPa	Soil Profile Type	Class D
Rectangle Width	17,500 metres	Centre Line Load	0.00 kN/m	Ys	63 mm
Slab Thickness	100 mm	Edge Line Load	21.66 kN/m	Yt	0 mm
No. of Beams	7	Concrete f <sub>c</sub>	20 MPa	Concrete Modulus	15E+3 kPa

**BEAM DETAILS**

Internal Beams		External Beams	
Overall Beam Depth	850 mm	Beam Width	350 mm
Fabric Reinforcement		Top Face Bar Diameter	16 mm
Top Face Fabric	SL72	No. of Top Face Bars	4
Area of Fabric Reinforcement	179 mm <sup>2</sup> /m	Cover to Top Reinforcement	20 mm
F <sub>sy</sub>	500 MPa	Bottom Face Bar Diameter	16 mm
Steel Modulus	200E+3 MPa	No. of Bottom Face Bars	4
		Cover to Bottom Reinforcement	30 mm

**WALSH DESIGN METHOD**

Internal Beams		External Beams	
Centre Heave	44 mm	Effective Beam Depth	810 mm
Y <sub>m</sub>	44 mm	Effective Flange Width	1350 mm
Soft Swell Stiffness	1950 kPa/m	Top Face Ast	1042 mm <sup>2</sup>
Mound Edge distance, e	1,722 m	Required Beam Capacity	55.75 kNm/beam
Walsh Factor C1	0.94	Required Beam Stiffness	1.20 E+9 mm <sup>4</sup>
Walsh Factor C2	0.96	Steel Ratio	0.0037
Max BM	38.23 kNm/m	Bending Capacity	318.9 kNm
Max Shear Force	30.03 kN/m	I-Gross	28.52 E+9 mm <sup>4</sup>
Calc. I-required	0.82 E+9 mm <sup>4</sup> /m	I-Cracked	6.08 E+9 mm <sup>4</sup>
Calc. Span/Deflection Ratio	504	Cracking Moment	155.3 kNm
Calc. Delta/Y <sub>m</sub> Ratio	0.68	I-Effective	28.52 E+9 mm <sup>4</sup>

Internal - Bending : Provided Capacity of 369.9 kNm > Required Capacity of 111.5 kNm : OK

Stiffness : Provided Stiffness of 34.9E+9 mm<sup>4</sup> > Required Stiffness of 2.4E+9 mm<sup>4</sup> : OK

External - Bending : Provided Capacity of 318.9 kNm > Required Capacity of 55.8 kNm : OK

Stiffness : Provided Stiffness of 28.52E+9 mm<sup>4</sup> > Required Stiffness of 1.2E+9 mm<sup>4</sup> : OK

**WALSH DESIGN METHOD**

Internal Beams		External Beams	
Edge Heave	32 mm	Effective Beam Depth	800 mm
Y <sub>m</sub>	32 mm	Effective Flange Width	1458 mm
Soft Swell Stiffness	1950 kPa/m	Bottom Face Ast	800 mm <sup>2</sup>
Mound Edge distance, e	1,880 m	Required Beam Capacity	5.00 kNm/beam
Mound Shape Factor, W <sub>f</sub>	0.00	Required Beam Stiffness	0.04 E+9 mm <sup>4</sup>
Walsh Factor C1	0.99	Steel Ratio	0.0007
Walsh Factor C2	1.00	Bending Capacity	253.4 kNm
Max BM	3.43 kNm/m	I-Gross	29.36 E+9 mm <sup>4</sup>
Max Shear Force	20.28 kN/m	I-Cracked	5.71 E+9 mm <sup>4</sup>
Calc. I-required	0.03 E+9 mm <sup>4</sup> /m	Cracking Moment	150.5 kNm
Calc. Span/Deflection Ratio	1804	I-Effective	29.36 E+9 mm <sup>4</sup>
Calc. Delta/Y <sub>m</sub> Ratio	0.26		

Internal - Bending : Provided Capacity of 254.7 kNm > Required Capacity of 10 kNm : OK

Stiffness : Provided Stiffness of 37.5E+9 mm<sup>4</sup> > Required Stiffness of 0.09E+9 mm<sup>4</sup> : OK

External - Bending : Provided Capacity of 253.4 kNm > Required Capacity of 5 kNm : OK

Stiffness : Provided Stiffness of 29.36E+9 mm<sup>4</sup> > Required Stiffness of 0.04E+9 mm<sup>4</sup> : OK



Rear 13 off

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## RESIDENTIAL FOOTING CALCULATIONS - SUMMARY SHEET

Sub-number :

The calculations are in accordance with AS 2870—2011 Residential slabs and footings

Site Address/Location : 82 - 90 JOHNS ROAD (TOWNHOUSE REAR 13 OFF)  
PROSPECT SA

### STRUCTURE AND LOAD TYPES

Structure Type : Veneer  
Articulation : True

Construction : Two Storeys  
Roof : Steel Sheetting

### WALSH DESIGN PARAMETERS

Depth of Design Suction Change :	4.0 metres	Soil Profile Type :	Class D
Characteristic Movement - $y_s$ :	63 mm	Default Centre Heave Stiffness :	1000 kPa/m
Centre Heave - $y_m^*$ :	44 mm	Default Edge Heave Stiffness :	1500 kPa/m
Edge Heave - $y_m^*$ :	32 mm	Hard:Soft Mound Stiffness Ratio :	5
Design Surface Movement - $y_t^{**}$ :	0 mm	Design Deflection Ratio :	400
Design is for Tree Removal :	N	Differential Deflection Limit :	30 mm

\* The calculated heave values are in accordance with AS 2870—2011, Appendix F2 (Walsh method).

\*\* The calculated design movement due to trees is in accordance with AS 2870—2011, Appendix H.

### BEAM & SLAB DESIGN DETAILS

Slab Thickness :	100 mm	Top Face Bar Diameter :	16 mm
Top Face Fabric :	SL72	Bottom Face Bar Diameter :	16 mm
Area of Fabric Reinforcement :	179 mm <sup>2</sup> /m	Cover to Top Reinforcement :	20 mm
Reinforcement $f_{sy}$ :	500 MPa	Cover to Bottom Reinforcement :	30 mm
Reinforcement Modulus :	200E+3 MPa	Effective Beam Depth (C/H) :	810 mm
		Effective Beam Depth (E/H) :	800 mm
Internal Beam Width :	350 mm	<b>Internal Beams</b>	
External Beam Width :	350 mm	No. of Top Face Bars :	4
Overall Beam Depth :	850 mm	No. of Bottom Face Bars :	4
Concrete $f_c$ :	20 MPa	<b>External Beams</b>	
Concrete Modulus :	15E+3 MPa	No. of Top Face Bars :	4
		No. of Bottom Face Bars :	4

### DESIGN SUMMARY

\*\*\* DESIGN IS SATISFACTORY - Refer to Calculation Sheets for Details.

#### CONSTRUCTION TYPE

Articulated Masonry Veneer

#### SLAB

Thickness 100 mm  
Fabric Reinforcement SL72

#### BEAMS

Beam Type	Depth x Width		Bar reinforcement	
	(mm)	(mm)	Top	Bottom
External	850	350	4.N16	4.N16
Internal	850	350	4.N16	4.N16

#### General Notes

Concrete  $f_c$  20 MPa at 28 days  
Cover - Top 20 mm  
- Bottom 30 mm



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### DESIGN ASSUMPTIONS

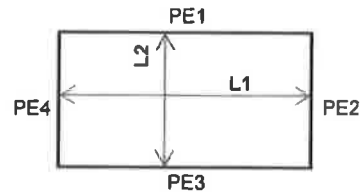
No. of rectangles in this design: 1

1. Building Construction : Double Storey ▼ Walls: Art. Masonry Veneer ▼ Roof: Steel Sheeting ▼

2. Max. Differential  $\Delta_{\text{allowable}}$  :  $L/400 \leq 30\text{mm}$

### DESIGN RECTANGLE 1

Design Rectangle Length (L1) : 58.000 m  
Design Rectangle Width (L2) : 14.000 m  
No. of Beams Parallel to L1 : 5  
No. of Beams Parallel to L2 : 14  
Section Area of Beams : 0.30 m<sup>2</sup>  
Trial Internal Beam Size : 350 x 850 ▼



Soft Swell Stiffness of 100q ≈ 1960 kPa/m

### LOADS

#### Uniform Slab Loading

Footing Slab	2.40 kPa
Live Load	1.50 kPa
Finishes, Partitions	1.00 kPa
Internal Footings	2.65 kPa
Other Uniform Slab Loadings	8.00 kPa
<b>Total</b>	<b>15.55 kPa</b>

#### Footing Edge Loading

<b>PE1</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	clad frame	3.60 x 2.0 kPa	7.20 kN/m
	Roof:	Steel Sheeting	1.50 x 0.40 kPa	0.60 kN/m
	Floor:	Timber	0.00 x 1.55 kPa	0.00 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>22.38 kN/m</b>
<b>PE2</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	clad frame	3.60 x 2.0 kPa	7.20 kN/m
	Roof	Steel Sheeting	3.00 x 0.40 kPa	1.20 kN/m
	Floor	Timber	2.50 x 1.55 kPa	3.88 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>26.86 kN/m</b>
<b>PE3</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	clad frame	3.60 x 2.0 kPa	7.20 kN/m
	Roof	Steel Sheeting	1.50 x 0.40 kPa	0.60 kN/m
	Floor	Timber	0.00 x 1.55 kPa	0.00 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>22.38 kN/m</b>
<b>PE4</b>	Lower External Wall:	Art. Masonry Veneer	3.10 x 2.4 kPa	7.44 kN/m
	Upper External Wall:	clad frame	3.60 x 2.0 kPa	7.20 kN/m
	Roof	Steel Sheeting	3.00 x 0.40 kPa	1.20 kN/m
	Floor	Timber	2.50 x 1.55 kPa	3.88 kN/m
	Footing Self Weight			7.14 kN/m
<b>Total</b>				<b>26.86 kN/m</b>



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**RESIDENTIAL FOOTING CALCULATIONS**  
**RECTANGLE 1 - BEAMS PARALLEL TO L1**

**STRUCTURE AND LOAD DETAILS**

The calculations are in accordance with AS 2870—2011 Residential slabs and footings

Structure Type : Veneer		Articulation : True		Number of Beam Elements: 100	
Rectangle Length	58.000 metres	Equivalent Uniform Load	18.75 kPa	Soil Profile Type	Class D
Rectangle Width	14.000 metres	Centre Line Load	0.00 kN/m	Ys	63 mm
Slab Thickness	100 mm	Edge Line Load	26.86 kN/m	Yt	0 mm
Total No. of Beams	5	Concrete f <sub>c</sub>	20 MPa	Concrete Modulus	15E+3 kPa

**BEAM DETAILS**

Internal Beams		External Beams	
Overall Beam Depth	850 mm	Beam Width	350 mm
Fabric Reinforcement	SL72	Top Face Bar Diameter	16 mm
Area of Fabric Reinforcement	179 mm <sup>2</sup> /m	No. of Top Face Bars	4
F <sub>sy</sub>	500 MPa	Cover to Top Reinforcement	20 mm
Steel Modulus	200E+3 MPa	Bottom Face Bar Diameter	16 mm
		No. of Bottom Face Bars	4
		Cover to Bottom Reinforcement	30 mm

**WALSH DESIGN METHOD**

Centre Heave		Internal Beams		External Beams	
Y <sub>m</sub>	44 mm	Effective Beam Depth	810 mm	Effective Beam Depth	810 mm
Soft Swell Stiffness	1960 kPa/m	Effective Flange Width	2350 mm	Effective Flange Width	1350 mm
Mound Edge distance, e	1.722 m	Top Face Ast	1221 mm <sup>2</sup>	Top Face Ast	1042 mm <sup>2</sup>
Walsh Factor C1	0.99	Required Beam Capacity	168.45 kNm/beam	Required Beam Capacity	84.23 kNm/beam
Walsh Factor C2	1.00	Required Beam Stiffness	4.16 E+9 mm <sup>4</sup>	Required Beam Stiffness	2.08 E+9 mm <sup>4</sup>
Max BM	48.13 kNm/m	Steel Ratio	0.0043	Steel Ratio	0.0037
Max Shear Force	37.97 kN/m	Bending Capacity	369.9 kNm	Bending Capacity	318.9 kNm
Calc. I-required	1.19 E+9 mm <sup>4</sup> /m	I-Gross	34.90 E+9 mm <sup>4</sup>	I-Gross	28.52 E+9 mm <sup>4</sup>
Calc. Span/Deflection Ratio	1949	I-Cracked	6.89 E+9 mm <sup>4</sup>	I-Cracked	6.08 E+9 mm <sup>4</sup>
Calc. Delta/Y <sub>m</sub> Ratio	0.68	Cracking Moment	229.0 kNm	Cracking Moment	155.3 kNm
		I-Effective	34.90 E+9 mm <sup>4</sup>	I-Effective	28.52 E+9 mm <sup>4</sup>

Internal - Bending : Provided Capacity of 369.9 kNm > Required Capacity of 168.5 kNm : OK  
Stiffness : Provided Stiffness of 34.9E+9 mm<sup>4</sup> > Required Stiffness of 4.16E+9 mm<sup>4</sup> : OK

**WALSH DESIGN METHOD**

Edge Heave		Internal Beams		External Beams	
Y <sub>m</sub>	32 mm	Effective Beam Depth	800 mm	Effective Beam Depth	800 mm
Soft Swell Stiffness	1960 kPa/m	Effective Flange Width	3500 mm	Effective Flange Width	1750 mm
Mound Edge distance, e	1.880 m	Bottom Face Ast	800 mm <sup>2</sup>	Bottom Face Ast	800 mm <sup>2</sup>
Mound Shape Factor, Wf	0.00	Required Beam Capacity	12.65 kNm/beam	Required Beam Capacity	6.33 kNm/beam
Walsh Factor C1	1.00	Required Beam Stiffness	0.24 E+9 mm <sup>4</sup>	Required Beam Stiffness	0.12 E+9 mm <sup>4</sup>
Walsh Factor C2	1.00	Steel Ratio	0.0003	Steel Ratio	0.0006
Max BM	3.62 kNm/m	Bending Capacity	254.9 kNm	Bending Capacity	253.8 kNm
Max Shear Force	20.80 kN/m	I-Gross	39.69 E+9 mm <sup>4</sup>	I-Gross	31.42 E+9 mm <sup>4</sup>
Calc. I-required	0.07 E+9 mm <sup>4</sup> /m	I-Cracked	6.08 E+9 mm <sup>4</sup>	I-Cracked	5.80 E+9 mm <sup>4</sup>
Calc. Span/Deflection Ratio	10329	Cracking Moment	173.4 kNm	Cracking Moment	155.6 kNm
Calc. Delta/Y <sub>m</sub> Ratio	0.18	I-Effective	39.69 E+9 mm <sup>4</sup>	I-Effective	31.42 E+9 mm <sup>4</sup>

Internal - Bending : Provided Capacity of 254.9 kNm > Required Capacity of 12.7 kNm : OK  
Stiffness : Provided Stiffness of 39.69E+9 mm<sup>4</sup> > Required Stiffness of 0.24E+9 mm<sup>4</sup> : OK

External - Bending : Provided Capacity of 253.8 kNm > Required Capacity of 6.3 kNm : OK  
Stiffness : Provided Stiffness of 31.42E+9 mm<sup>4</sup> > Required Stiffness of 0.12E+9 mm<sup>4</sup> : OK



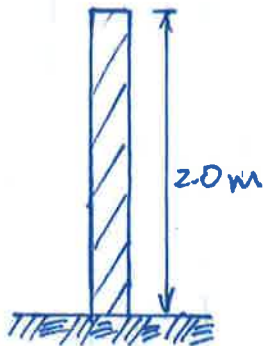
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## RESIDENTIAL FOOTING CALCULATIONS RECTANGLE 1 - BEAMS PARALLEL TO L2

The calculations are in accordance with AS 2870—2011 Residential slabs and footings

STRUCTURE AND LOAD DETAILS				Structure Type : Veneer		Articulation : True		Number of Beam Elements: 100	
Rectangle Length	14.000 metres	Equivalent Uniform Load		16.48 kPa		Soil Profile Type		Class D	
Rectangle Width	58.000 metres	Centre Line Load		0.00 kN/m		Ys		63 mm	
Slab Thickness	100 mm	Edge Line Load		22.38 kN/m		Yt		0 mm	
No. of Beams	14	Concrete f'c		20 MPa		Concrete Modulus		15E+3 kPa	
BEAM DETAILS									
Overall Beam Depth		850 mm		Internal Beams			External Beams		
Fabric Reinforcement		SL72		Top Face Bar Diameter		350 mm		Beam Width	
Area of Fabric Reinforcement		179 mm <sup>2</sup> /m		No. of Top Face Bars		16 mm		Top Face Bar Diameter	
Fsy		500 MPa		Cover to Top Reinforcement		4		No. of Top Face Bars	
Steel Modulus		200E+3 MPa		Bottom Face Bar Diameter		20 mm		Cover to Top Reinforcement	
				No. of Bottom Face Bars		16 mm		Bottom Face Bar Diameter	
				Cover to Bottom Reinforcement		4		No. of Bottom Face Bars	
						30 mm		Cover to Bottom Reinforcement	
WALSH DESIGN METHOD									
Centre Heave		44 mm		Internal Beams			External Beams		
Ym		44 mm		Effective Beam Depth		810 mm		Effective Beam Depth	
Soft Swell Stiffness		1960 kPa/m		Effective Flange Width		2350 mm		Effective Flange Width	
Mound Edge distance, e		1.722 m		Top Face Ast		1221 mm <sup>2</sup>		Top Face Ast	
Walsh Factor C1		0.93		Required Beam Capacity		179.95 kNm/beam		Required Beam Capacity	
Walsh Factor C2		0.95		Required Beam Stiffness		4.31 E+9 mm <sup>4</sup>		Required Beam Stiffness	
Max BM		40.33 kNm/m		Steel Ratio		0.0043		Steel Ratio	
Max Shear Force		30.98 kN/m		Bending Capacity		369.9 kNm		Bending Capacity	
Calc. I-required		0.97 E+9 mm <sup>4</sup> /m		I-Gross		34.90 E+9 mm <sup>4</sup>		I-Gross	
Calc. Span/Deflection Ratio		471		I-Cracked		6.89 E+9 mm <sup>4</sup>		I-Cracked	
Calc. Delta/Ym Ratio		0.68		Cracking Moment		229.0 kNm		Cracking Moment	
				I-Effective		34.90 E+9 mm <sup>4</sup>		I-Effective	
Internal - Bending : Provided Capacity of 369.9 kNm > Required Capacity of 180 kNm : OK									
Stiffness : Provided Stiffness of 34.9E+9 mm <sup>4</sup> > Required Stiffness of 4.31E+9 mm <sup>4</sup> : OK									
WALSH DESIGN METHOD									
Edge Heave		32 mm		Internal Beams			External Beams		
Ym		32 mm		Effective Beam Depth		800 mm		Effective Beam Depth	
Soft Swell Stiffness		1960 kPa/m		Effective Flange Width		3150 mm		Effective Flange Width	
Mound Edge distance, e		1.880 m		Bottom Face Ast		800 mm <sup>2</sup>		Bottom Face Ast	
Mound Shape Factor, Wf		0.00		Required Beam Capacity		14.83 kNm/beam		Required Beam Capacity	
Walsh Factor C1		0.99		Required Beam Stiffness		0.13 E+9 mm <sup>4</sup>		Required Beam Stiffness	
Walsh Factor C2		1.00		Steel Ratio		0.0003		Steel Ratio	
Max BM		3.32 kNm/m		Bending Capacity		254.8 kNm		Bending Capacity	
Max Shear Force		20.87 kN/m		I-Gross		38.43 E+9 mm <sup>4</sup>		I-Gross	
Calc. I-required		0.03 E+9 mm <sup>4</sup> /m		I-Cracked		6.04 E+9 mm <sup>4</sup>		I-Cracked	
Calc. Span/Deflection Ratio		1750		Cracking Moment		171.0 kNm		Cracking Moment	
Calc. Delta/Ym Ratio		0.25		I-Effective		38.43 E+9 mm <sup>4</sup>		I-Effective	
Internal - Bending : Provided Capacity of 254.8 kNm > Required Capacity of 14.8 kNm : OK									
Stiffness : Provided Stiffness of 38.43E+9 mm <sup>4</sup> > Required Stiffness of 0.13E+9 mm <sup>4</sup> : OK									
Internal - Bending : Provided Capacity of 318.9 kNm > Required Capacity of 90 kNm : OK									
Stiffness : Provided Stiffness of 28.52E+9 mm <sup>4</sup> > Required Stiffness of 2.15E+9 mm <sup>4</sup> : OK									

## BLOCKWORK FENCE



Wind speed = N1.

Ultimate  $q_u = 0.68 \text{ kpa}$

Serviceability  $q_s = 0.46 \text{ kpa}$

$$C_{tq} = C_{pn} K_p$$

$$K_p = 1.0$$

$$C_{pn} = 1.3 + 0.5 \times (0.3 + \log_{10}(11)) (0.8 - 1) \\ = 1.27$$

$$\therefore W L = 0.68 \text{ kpa} \times 1.27 = 0.86 \text{ kpa}$$

$$M^* = \frac{0.86 \times 2^2}{2} = 1.72 \text{ kNm/m}$$

check reinforcement in pier

$$\text{Try } 1-\text{M}6 @ 2000 \text{ c/c} \Rightarrow A_{st} = 200 \text{ mm}^2 / 2 \text{ m}$$

$$\phi M_{cap} = \phi f_{cy} A_{st} d \left[ 1 - \frac{0.6 f_{cr} A_{st} d}{(1.3 f_{cr}) b d} \right]$$

$$= 0.75 \times 500 \times 200 \times 190/2 \left[ 1 - \frac{0.6 \times 500 \times 200}{(1.3 \times 6.06) (2000 \times 190/2)} \right] / 106 \\ = 6.91 \text{ kNm/2m}$$

$$M^* = 1.72 \times 2 = 3.44 \text{ kNm/2m} < \phi M \text{ O.K.}$$

check overturning

$$D \geq \sqrt[3]{\frac{3.44 \times 10}{18 \times 3}} = 0.86 \text{ m}$$

Adopt 300x600 deep footing with 1000 long x 1000 deep trench

Pier @ 2000 c/c MAX. Provide 6-M12 (3T, 3B) reinforcement

Provide Brick pier with 1-M6 VERTICAL REQ @

2000 C/C MAX. EMBED ROD 500 INTO FOOTING CONCRETE

Checked : .....

Date : .....



*trench pier for return  
walls*

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## PAD & PIER FOOTING DESIGN FOR BUILDING STRUCTURES

Type of Footing =	R	S=Square, R=Rectangular, B=Bored Pier
Footing Length (B) =	1000	mm
Footing Width =	300	mm
Footing Depth =	1000	mm
Footing Concrete $f'_c$ =	20	MPa
Vertical Load =	4.800	kN
Horizontal Load =	4.000	kN
Applied Moment =	4.000	kNm

Auto Size Calculation  
Specific Size Calculation

Overturning Loads Permanent? N Y=Yes, N=No

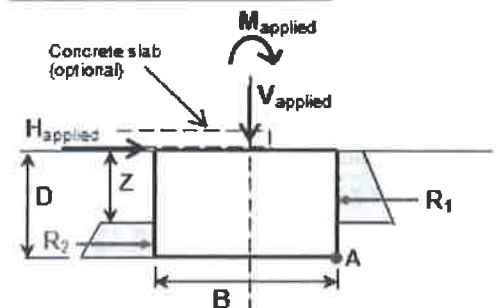
Soil Type = Firm clay of medium to high plasticity, silty clay, sandy clay ▼ (AS 4678-2002 Table D4)

Cohesion =	5	kPa	Concrete Slab ?	N	Y=Yes, N=No
Friction Angle =	27	degrees			
Density =	18.0	kN/m <sup>3</sup>			
Bearing Capacity =	360	kPa			

### RESISTANCE AGAINST UPLIFT

Footing weight =	7.20	kN
Interacting soil weight =	16.82	kN
Cohesion force on vertical faces =	6.50	kN
Contributing slab weight =	0.00	kN
0.9*Total load resisting uplift =	21.61	kN
Ratio 0.9*Resistance:Uplift =	N/A	∴OK

**NOTE:**  $\phi_{\text{uplift}} = 0.9$   
 $\phi_{\text{overturning}} = 0.8$   
 $\phi_{\text{bearing}} = 0.5$

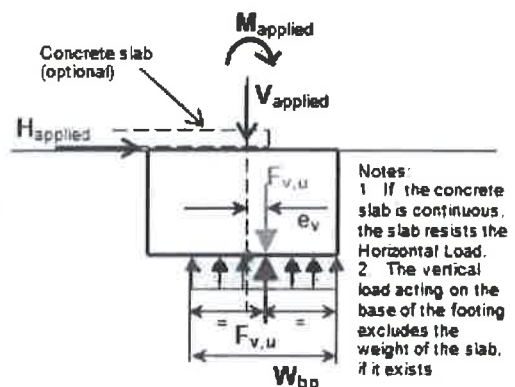


**Forces Acting on Footing**

Showing Soil Passive Pressure Distribution

### RESISTANCE TO OVERTURNING

Disturbing Moment at point 'A' on base =	8.00	kNm
Passive pressure strength at surface =	16.32	kPa
Passive pressure strength at base =	64.25	kPa
Depth, Z, to passive pressure switch =	678	mm
Passive pressure strength at depth Z =	48.82	kPa
Total passive soil force (Upper zone, $R_1$ ) =	7.64	kN
Total passive soil force (Lower zone, $R_2$ ) =	1.76	kN
M.R. due to passive soil forces $R_1$ & $R_2$ =	3.17	kNm
M.R. due to cohesion on vertical faces =	3.25	kNm
M.R. due to friction on vertical faces =	1.43	kNm
M.R. due to gravity & applied vert. loads =	6.00	kNm
0.8* $\Sigma$ M.R. (Due to all effects) =	11.07	kNm
Ratio (0.8* $\Sigma$ M.R. : O.T. about point 'A') =	1.384	> 1.00 ∴OK



**Forces Acting on Footing**

Showing Vertical Bearing Pressure Distribution

### BEARING PRESSURE

Moment at centreline of base of footing =	4.00	kNm
Net Vertical Force at base of footing, $F_{v,u}$ =	13.44	kN
Effective eccentricity of vertical load, $e_v$ =	298	mm
Width of bearing pressure block, $W_{bp}$ =	405	mm
Maximum soil bearing capacity =	21.9	kN

> 13.44 kN ∴OK

=> ADOPT 1000 mm x 300 mm x 1000 mm deep concrete pad.

(NOTE: No concrete slab has been allowed for in the design.)

The concrete footing is unreinforced.

End of calculation

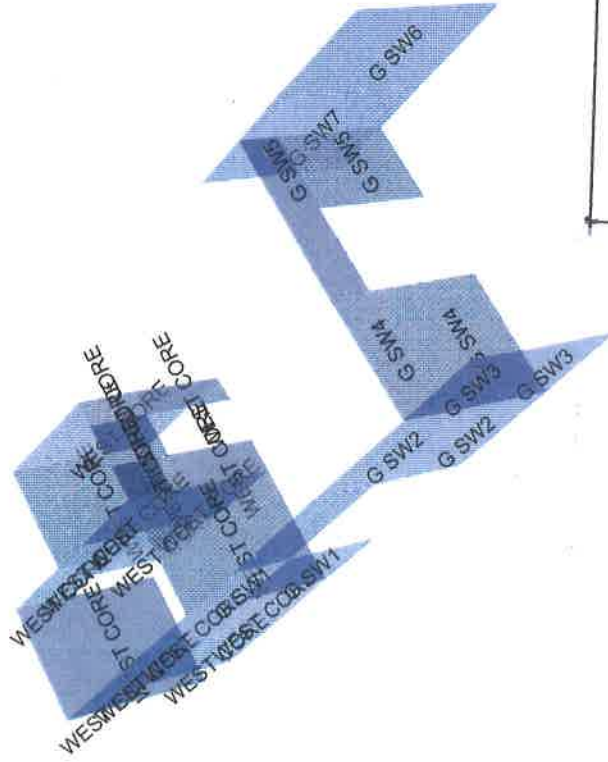
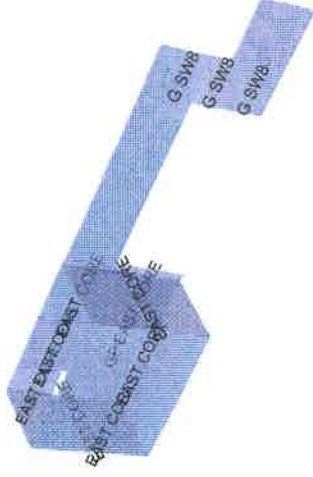
## Wall Panel Design

- Analyse wall panels in Etabs.
- Propose ground floor loadbearing panels & shaft walls to be 175mm thick.
- Propose level 1 & above loadbearing wall panels to be 150mm thick, including shafts.
- Refer Etabs wall panel design summary on sheet WC6-WC8, walls all working at minimum steel requirements including shafts;

	Vertical steel	horizontal steel
150mm thick	225mm <sup>2</sup>	375mm <sup>2</sup>
150mm thick shafts	570mm <sup>2</sup>	375 mm <sup>2</sup>
175mm thick	630mm <sup>2</sup>	438 mm <sup>2</sup>

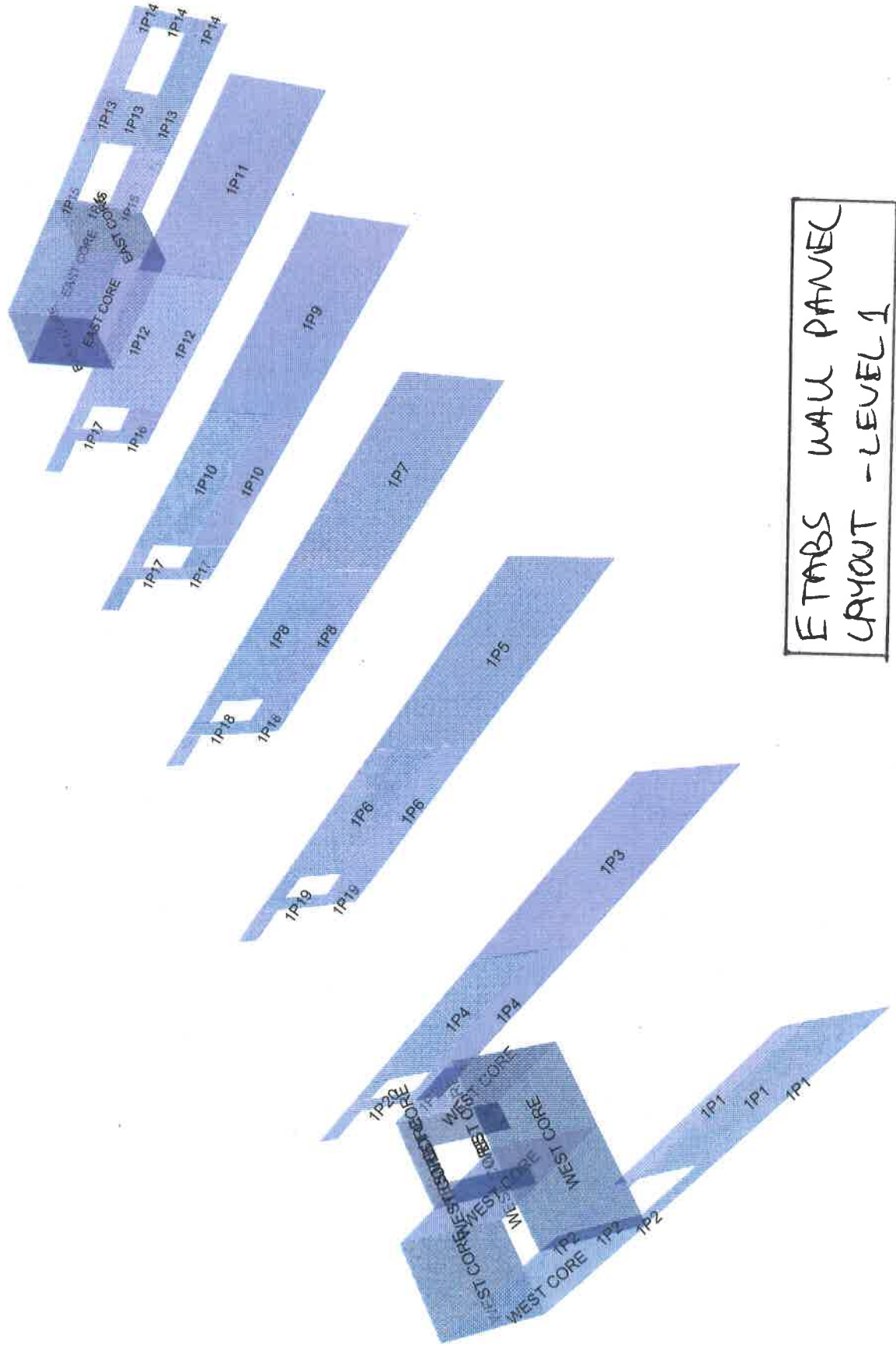
⇒ Adopt the following reinforcement:

- 150 thick L/B walls - SLS1 mesh central
- 150 thick shaft walls from L1 & above  
- SLS1 central + N12 @ 600% vertical central
- 175 panels - SLS1 central + N12 @ 400% central vertical



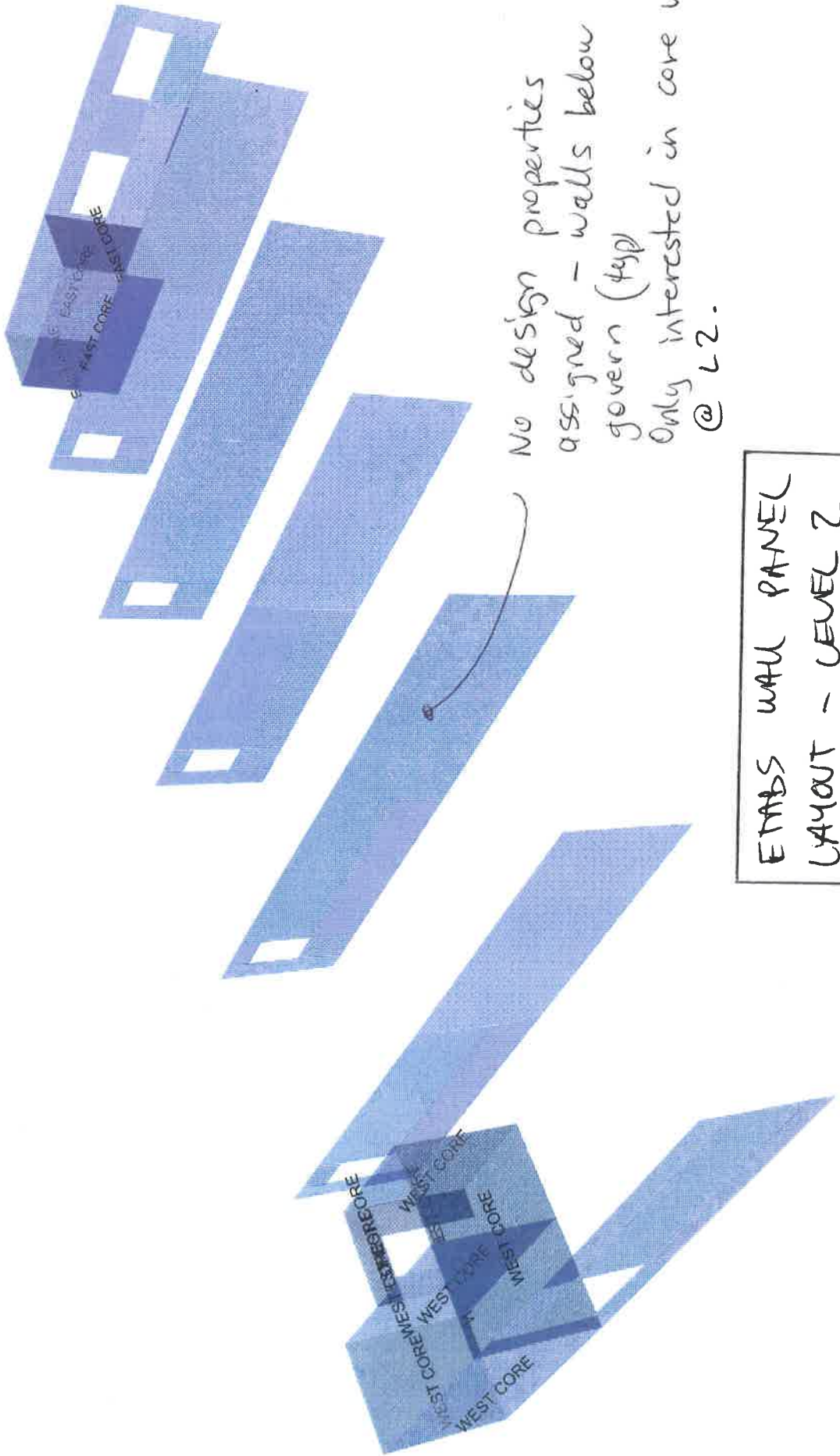
ETABS WALL PANEL  
LAYOUT - GROUND FLOOR

WCZ



WC3

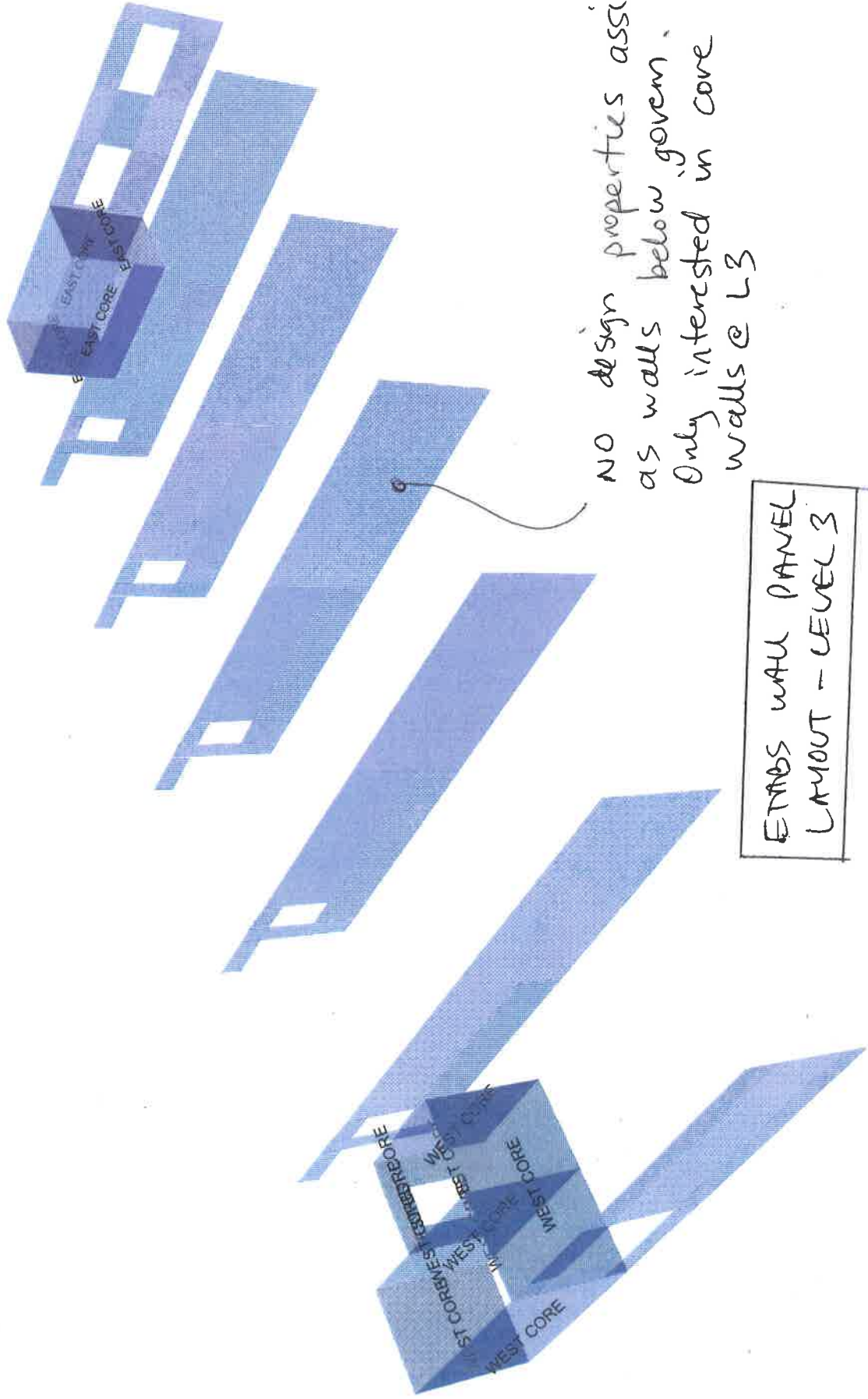
ETABS WALL PANEL  
LAYOUT - LEVEL 1



No design properties assigned - walls below govern (typ)  
Only interested in core walls @ L2.

ETABS WALL PANEL LAYOUT - LEVEL 2

WC4



WCS

TABLE: Shear Wall Pier Summary - AS 3600-09

Story	Pier Label	Station	Design Type	Required Reinf	Pier Leg	Leg X1	Leg Y1	Leg X2	Leg Y2	Shear Rebar	Compressive Stress Left	Compressive Stress Right	Compressive Stress Limit Left	Compressive Stress Limit Right	Warnings	Errors
Roof	EAST CORE	Top	Uniform	0.15	Top Leg 1	40200	15075	42800	15075	375	0	0.03518	0	8	No Message	No Message
Roof	EAST CORE	Top	Uniform	0.15	Top Leg 2	42800	15075	42800	20000	375	0.00489	0.004388	8	8	No Message	No Message
Roof	EAST CORE	Top	Uniform	0.15	Top Leg 3	40200	20000	42800	20000	375	0	0.009064	0	8	No Message	No Message
Roof	EAST CORE	Top	Uniform	0.15	Top Leg 4	40200	15075	40200	20000	375	0.01233	0	8	0	No Message	No Message
Roof	EAST CORE	Bottom	Uniform	0.38	Bottom Leg 1	40200	15075	42800	15075	375	0.3	0.4	8	8	No Message	No Message
Roof	EAST CORE	Bottom	Uniform	0.38	Bottom Leg 2	42800	15075	42800	20000	375	0.2	0.1	8	8	No Message	No Message
Roof	EAST CORE	Bottom	Uniform	0.38	Bottom Leg 3	40200	20000	42800	20000	375	0.1	0.4	8	8	No Message	No Message
Roof	EAST CORE	Bottom	Uniform	0.38	Bottom Leg 4	40200	15075	40200	20000	375	0.2	0.1	8	8	No Message	No Message
Third Floor	EAST CORE	Top	Uniform	0.15	Top Leg 1	40200	15075	42800	15075	375	0.2	0.2	8	8	No Message	No Message
Third Floor	EAST CORE	Top	Uniform	0.15	Top Leg 2	42800	15075	42800	20000	375	0.2	0.1	8	8	No Message	No Message
Third Floor	EAST CORE	Top	Uniform	0.15	Top Leg 3	40200	20000	42800	20000	375	0.3	0.6	8	8	No Message	No Message
Third Floor	EAST CORE	Top	Uniform	0.15	Top Leg 4	40200	15075	40200	20000	375	0.2	0.2	8	8	No Message	No Message
Third Floor	EAST CORE	Bottom	Uniform	0.22	Bottom Leg 1	40200	15075	42800	15075	375	1.2	0.5	8	8	No Message	No Message
Third Floor	EAST CORE	Bottom	Uniform	0.22	Bottom Leg 2	42800	15075	42800	20000	375	0.6	0.6	8	8	No Message	No Message
Third Floor	EAST CORE	Bottom	Uniform	0.22	Bottom Leg 3	40200	20000	42800	20000	375	0.4	0.9	8	8	No Message	No Message
Third Floor	EAST CORE	Bottom	Uniform	0.22	Bottom Leg 4	40200	15075	40200	20000	375	0.7	0.3	8	8	No Message	No Message
Second Floor	EAST CORE	Top	Uniform	0.15	Top Leg 1	40200	15075	42800	15075	375	0.4	0.4	8	8	No Message	No Message
Second Floor	EAST CORE	Top	Uniform	0.15	Top Leg 2	42800	15075	42800	20000	375	0.6	0.6	8	8	No Message	No Message
Second Floor	EAST CORE	Top	Uniform	0.15	Top Leg 3	40200	20000	42800	20000	375	0.4	0.4	8	8	No Message	No Message
Second Floor	EAST CORE	Top	Uniform	0.15	Top Leg 4	40200	15075	40200	20000	375	0.7	0.3	8	8	No Message	No Message
Second Floor	EAST CORE	Bottom	Uniform	0.23	Bottom Leg 1	40200	15075	42800	15075	375	3.4	1.1	8	8	No Message	No Message
Second Floor	EAST CORE	Bottom	Uniform	0.23	Bottom Leg 2	42800	15075	42800	20000	375	1.4	1.5	8	8	No Message	No Message
Second Floor	EAST CORE	Bottom	Uniform	0.23	Bottom Leg 3	40200	20000	42800	20000	375	1.1	2.5	8	8	No Message	No Message
Second Floor	EAST CORE	Bottom	Uniform	0.23	Bottom Leg 4	40200	15075	40200	20000	375	1.9	1.8	8	8	No Message	No Message
First Floor	EAST CORE	Top	Uniform	0.15	Top Leg 1	40200	15075	40200	20000	437.5	1.1	0.6	8	8	No Message	No Message
First Floor	EAST CORE	Top	Uniform	0.15	Top Leg 2	40200	15075	42800	15075	437.5	0.9	0.7	8	8	No Message	No Message
First Floor	EAST CORE	Top	Uniform	0.15	Top Leg 3	42800	15075	42800	20000	437.5	0.9	0.9	8	8	No Message	No Message
First Floor	EAST CORE	Top	Uniform	0.15	Top Leg 4	40200	20000	42800	20000	437.5	1.3	1.2	8	8	No Message	No Message
First Floor	EAST CORE	Bottom	Uniform	0.36	Bottom Leg 1	42800	15075	42800	19000	437.5	0.3	3.4	8	8	No Message	No Message
First Floor	EAST CORE	Bottom	Uniform	0.36	Bottom Leg 2	40200	15075	42800	15075	437.5	5.1	1.4	8	8	No Message	No Message
First Floor	EAST CORE	Bottom	Uniform	0.36	Bottom Leg 3	40200	15075	42000	20000	437.5	2.2	1.8	8	8	No Message	No Message
First Floor	EAST CORE	Bottom	Uniform	0.36	Bottom Leg 4	40200	20000	42800	20000	437.5	0	5.8	0	8	No Message	No Message
Roof	WEST CORE	Top	Uniform	0.15	Top Leg 1	7600	18100	9950	18100	0	0	0	0	0	No Message	No Message
Roof	WEST CORE	Top	Uniform	0.15	Top Leg 2	9950	15100	9950	18100	375	0.01044	0.008979	8	8	No Message	No Message
Roof	WEST CORE	Top	Uniform	0.15	Top Leg 3	5000	15100	9950	15100	375	0.1	0.04884	8	8	No Message	No Message
Roof	WEST CORE	Top	Uniform	0.15	Top Leg 4	7600	15100	7600	20000	375	0.0401	0.03809	8	8	No Message	No Message
Roof	WEST CORE	Top	Uniform	0.15	Top Leg 5	5000	20000	7600	20000	375	0.006987	0.006449	8	8	No Message	No Message
Roof	WEST CORE	Top	Uniform	0.15	Top Leg 6	5000	15100	5000	20000	375	0.005248	0	8	0	No Message	No Message
Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 1	7600	18100	8175	18100	375	0.8	1.4	8	8	No Message	No Message
Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 2	9175	18100	9950	18100	375	0.5	0.9	8	8	No Message	No Message

governing case for upper shafts  
 $A_{st} = 0.0035 \times 150 \times 1000 = 570$

governing case for  
 175 Panels  $A_{st} = 0.0036 \times 175 \times 1000 = 630 \text{ mm}^2$

WLG

Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 3	9950	15100	9950	18100	375	0.3	0.3	8	8	No Message	No Message
Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 4	5000	15100	9950	15100	375	0.2	0.4	8	8	No Message	No Message
Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 5	7600	15100	7600	20000	375	0.2	0.2	8	8	No Message	No Message
Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 6	5000	20000	7600	20000	375	0.3	0.2	8	8	No Message	No Message
Roof	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 7	5000	15100	5000	20000	375	0.3	0.3	8	8	No Message	No Message
Third Floor	WEST CORE	Top	Uniform	0.15	Top Leg 1	7600	18100	9950	18100	0	0	0	0	0	No Message	No Message
Third Floor	WEST CORE	Top	Uniform	0.15	Top Leg 2	9950	15100	9950	18100	375	0.3	0.3	8	8	No Message	No Message
Third Floor	WEST CORE	Top	Uniform	0.15	Top Leg 3	5000	15100	9950	15100	375	0.2	0.3	8	8	No Message	No Message
Third Floor	WEST CORE	Top	Uniform	0.15	Top Leg 4	7600	15100	7600	20000	375	0.1	0.2	8	8	No Message	No Message
Third Floor	WEST CORE	Top	Uniform	0.15	Top Leg 5	5000	20000	7600	20000	375	0.3	0.9	8	8	No Message	No Message
Third Floor	WEST CORE	Top	Uniform	0.15	Top Leg 6	5000	15100	5000	20000	375	0.3	0.3	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 1	7600	18100	8175	18100	375	2	3.4	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 2	9175	18100	9950	18100	375	0.9	2.6	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 3	9950	15100	9950	18100	375	0.8	0.8	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 4	5000	15100	9950	15100	375	0.4	1.5	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 5	7600	15100	7600	20000	375	0.4	0.5	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 6	5000	20000	7600	20000	375	0.6	0.9	8	8	No Message	No Message
Third Floor	WEST CORE	Bottom	Uniform	0.15	Bottom Leg 7	5000	15100	5000	20000	375	0.9	0.3	8	8	No Message	No Message
Second Floor	WEST CORE	Top	Uniform	0.15	Top Leg 1	7600	18100	9950	18100	0	0	0	0	0	No Message	No Message
Second Floor	WEST CORE	Top	Uniform	0.15	Top Leg 2	9950	15100	9950	18100	375	0.8	0.8	8	8	No Message	No Message
Second Floor	WEST CORE	Top	Uniform	0.15	Top Leg 3	5000	15100	9950	15100	375	0.4	0.7	8	8	No Message	No Message
Second Floor	WEST CORE	Top	Uniform	0.15	Top Leg 4	7600	15100	7600	20000	375	0.4	0.3	8	8	No Message	No Message
Second Floor	WEST CORE	Top	Uniform	0.15	Top Leg 5	5000	20000	7600	20000	375	0.6	1	8	8	No Message	No Message
Second Floor	WEST CORE	Top	Uniform	0.15	Top Leg 6	5000	15100	5000	20000	375	0.9	0.3	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 1	7600	18100	8175	18100	375	4	6.5	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 2	9175	18100	9950	18100	375	1.8	4	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 3	9950	15100	9950	18100	375	1.7	1.6	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 4	5000	15100	9950	15100	375	1	3	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 5	7600	15100	7600	20000	375	0.4	1.1	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 6	5000	20000	7600	20000	375	1.1	2.3	8	8	No Message	No Message
Second Floor	WEST CORE	Bottom	Uniform	0.22	Bottom Leg 7	5000	15100	5000	20000	375	1.8	0.5	8	8	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 1	5000	15100	7600	15100	437.5	0.7	0.2	8	8	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 2	5000	15100	5000	20000	437.5	1.2	0.4	8	8	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 3	7600	18100	9950	18100	437.5	0.5	0.4	8	8	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 4	9950	15100	9950	18100	437.5	1.4	1.4	8	8	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 5	7600	15100	9950	15100	0	0	0	0	0	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 6	7600	15100	7600	20000	437.5	0.3	0.2	8	8	No Message	No Message
First Floor	WEST CORE	Top	Uniform	0.15	Top Leg 7	5000	20000	7600	20000	437.5	1.1	1.1	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 1	5000	15100	8375	15100	437.5	6.5	1.3	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 2	7600	15100	7600	19000	437.5	0.9	2.9	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 3	5000	15100	5000	19000	437.5	1.9	4	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 4	9375	15100	9950	15100	437.5	6.8	10.2	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 5	7600	18100	9950	18100	437.5	1.4	5.5	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 6	9950	15100	9950	18100	437.5	0	5	8	8	No Message	No Message
First Floor	WEST CORE	Bottom	Uniform	0.28	Bottom Leg 7	5000	20000	7600	20000	437.5	1.8	6.1	8	8	No Message	No Message

WCT

WC8

First Floor	G SW1	Top	Uniform	0.15	Top Leg 1	5000	13320	5000	15100	437.5	0.3	0.3	8	8	No Message	No Message
First Floor	G SW1	Bottom	Uniform	0.32	Bottom Leg 1	5000	13320	5000	15100	437.5	2.8	1.7	8	8	No Message	No Message
First Floor	G SW2	Top	Uniform	0.15	Top Leg 1	5000	7500	5000	10320	437.5	0.4	0.5	8	8	No Message	No Message
First Floor	G SW2	Bottom	Uniform	0.15	Bottom Leg 1	5000	7500	5000	10320	437.5	1.9	1.8	8	8	No Message	No Message
First Floor	G SW4	Top	Uniform	0.15	Top Leg 1	5000	7500	7675	7500	437.5	0.1	0.1	8	8	No Message	No Message
First Floor	G SW4	Bottom	Uniform	0.34	Bottom Leg 1	5000	7500	7675	7500	437.5	0.6	4.7	8	8	No Message	No Message
First Floor	G SW3	Top	Uniform	0.15	Top Leg 1	5000	5400	5000	7500	437.5	0	0.5	0	8	No Message	No Message
First Floor	G SW3	Bottom	Uniform	0.15	Bottom Leg 1	5000	5400	5000	7500	437.5	1.9	0	8	0	No Message	No Message
First Floor	G SW5	Top	Uniform	0.15	Top Leg 1	9575	7500	11300	7500	437.5	0	0	0	0	No Message	No Message
First Floor	G SW5	Bottom	Uniform	0.15	Bottom Leg 1	9575	7500	11300	7500	437.5	2.1	0	8	0	No Message	No Message
First Floor	G SW6	Top	Uniform	0.15	Top Leg 1	11300	3350	11300	6125	437.5	0	0.2	0	8	No Message	No Message
First Floor	G SW6	Bottom	Uniform	0.17	Bottom Leg 1	11300	3350	11300	6125	437.5	1.4	0.6	8	8	No Message	No Message
First Floor	G SW7	Top	Uniform	0.15	Top Leg 1	11300	6125	11300	8900	437.5	1.2	1.4	8	8	No Message	No Message
First Floor	G SW7	Bottom	Uniform	0.15	Bottom Leg 1	11300	6125	11300	8900	437.5	2.3	4.6	8	8	No Message	No Message
First Floor	G SW8	Top	Uniform	0.15	Top Leg 1	42800	7400	42800	9010	437.5	0	0.4	0	8	No Message	No Message
First Floor	G SW8	Bottom	Uniform	0.15	Bottom Leg 1	42800	7400	42800	9010	437.5	0	4.3	0	8	No Message	No Message
Second Floor	1P1	Top	Uniform	0.15	Top Leg 1	5000	5400	5000	11900	375	0.4	0.5	8	8	No Message	No Message
Second Floor	1P1	Bottom	Uniform	0.15	Bottom Leg 1	5000	5400	5000	11900	375	0.6	0.7	8	8	No Message	No Message
Second Floor	1P3	Top	Uniform	0.15	Top Leg 1	11300	5400	11300	12750	375	1.2	0	8	0	No Message	No Message
Second Floor	1P3	Bottom	Uniform	0.15	Bottom Leg 1	11300	5400	11300	12750	375	1.9	0	8	0	No Message	No Message
Second Floor	1P4	Top	Uniform	0.15	Top Leg 1	11300	12750	11300	18500	375	0.6	0.6	8	8	No Message	No Message
Second Floor	1P4	Bottom	Uniform	0.15	Bottom Leg 1	11300	12750	11300	18500	375	1.4	0	8	0	No Message	No Message
Second Floor	1P5	Top	Uniform	0.15	Top Leg 1	17600	5400	17600	12750	375	1	0	8	0	No Message	No Message
Second Floor	1P5	Bottom	Uniform	0.15	Bottom Leg 1	17600	5400	17600	12750	375	1.9	0	8	0	No Message	No Message
Second Floor	1P6	Top	Uniform	0.15	Top Leg 1	17600	12750	17600	18500	375	0.7	0.7	8	8	No Message	No Message
Second Floor	1P6	Bottom	Uniform	0.15	Bottom Leg 1	17600	12750	17600	18500	375	1.7	0	8	0	No Message	No Message
Second Floor	1P7	Top	Uniform	0.15	Top Leg 1	23900	5400	23900	12750	375	1	0	8	0	No Message	No Message
Second Floor	1P7	Bottom	Uniform	0.15	Bottom Leg 1	23900	5400	23900	12750	375	2	0	8	0	No Message	No Message
Second Floor	1P8	Top	Uniform	0.15	Top Leg 1	23900	12750	23900	18500	375	0.7	0	8	0	No Message	No Message
Second Floor	1P8	Bottom	Uniform	0.15	Bottom Leg 1	23900	12750	23900	18500	375	1.7	0	8	0	No Message	No Message
Second Floor	1P9	Top	Uniform	0.15	Top Leg 1	30200	5400	30200	12750	375	1	0	8	0	No Message	No Message
Second Floor	1P9	Bottom	Uniform	0.15	Bottom Leg 1	30200	5400	30200	12750	375	2	0	8	0	No Message	No Message
Second Floor	1P10	Top	Uniform	0.15	Top Leg 1	30200	12750	30200	18500	375	0.7	0.7	8	8	No Message	No Message
Second Floor	1P10	Bottom	Uniform	0.15	Bottom Leg 1	30200	12750	30200	18500	375	1.7	0	8	0	No Message	No Message
Second Floor	1P11	Top	Uniform	0.15	Top Leg 1	36500	5400	36500	12750	375	1.1	0	8	0	No Message	No Message
Second Floor	1P11	Bottom	Uniform	0.15	Bottom Leg 1	36500	5400	36500	12750	375	2.3	0	8	0	No Message	No Message
Second Floor	1P12	Top	Uniform	0.15	Top Leg 1	36500	12750	36500	18500	375	0.7	0.6	8	8	No Message	No Message
Second Floor	1P12	Bottom	Uniform	0.15	Bottom Leg 1	36500	12750	36500	18500	375	1.6	0	8	0	No Message	No Message
Second Floor	1P13	Top	Uniform	0.15	Top Leg 1	42800	10400	42800	12500	375	0.4	0	8	0	No Message	No Message
Second Floor	1P13	Bottom	Uniform	0.15	Bottom Leg 1	42800	10400	42800	12500	375	0.2	0.2	8	8	No Message	No Message
Second Floor	1P16	Top	Uniform	0.15	Top Leg 1	36500	19500	36500	20100	375	0	6	0	8	No Message	No Message
Second Floor	1P16	Bottom	Uniform	0.15	Bottom Leg 1	36500	19500	36500	20100	375	0	0	0	0	No Message	No Message
Second Floor	1P17	Top	Uniform	0.15	Top Leg 1	36500	19500	36500	20100	0	0	0	0	0	No Message	No Message
Second Floor	1P17	Bottom	Uniform	0.15	Bottom Leg 1	36500	19500	36500	20100	375	2.5	0	8	0	No Message	No Message
Second Floor	1P17	Top	Uniform	0.15	Top Leg 2	30200	19500	30200	20100	0	0	0	0	0	No Message	No Message
Second Floor	1P17	Bottom	Uniform	0.15	Bottom Leg 1	30200	19500	30200	20100	0	0	0	0	0	No Message	No Message

typical 150 loadbearing wall ~0.015x150x1000 = 225 mm<sup>3</sup>

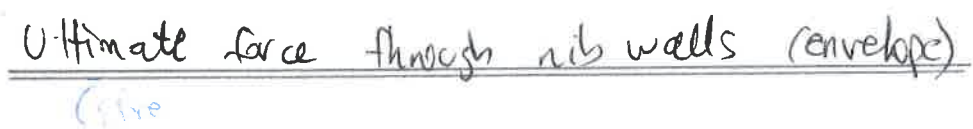
### Nib walls near grid 2

- wall length  $\sim 700\text{mm}$
- panel thickness  $150\text{mm}$
- Total load on nib  
 $\sim 0.70\text{m} \times 805\text{ kN/m} = 563\text{ kN}$  (from EMBS)

$$\Rightarrow M_x = 563 \times 0.7\text{m} \times 0.05 = 19.7\text{ kNm}$$

- Analyse nib wall in RAPT.

$\Rightarrow$  from RAPT design adopt  $150 \times 700$  Nib, 4 Nib vertical bars + N20 edge bars, N10 wgs @  $150\%$ .



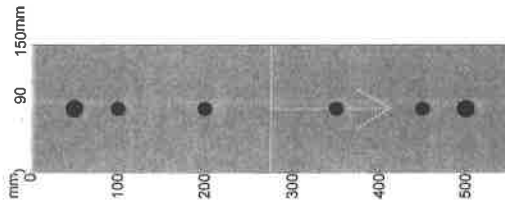
Project Name: Johns Road Prospect  
Project Number: 1806063  
Description: Nib Column  
Designer: FK

K:\2018\06\1806063\Structural Drawings and Calcs\Design Calculations and Details\FKNib Column.rpo

RAPT - Version: 6.5.16.0

Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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Licensee  
TMK Consulting Engineers  
Level 6  
100 Pirie Street  
Adelaide SA 5000  
11169065160718WPN3



Input

General		FK	
Designer	A	Johns Road Prospect	
Project Name	A	1806063	
Project Number	A	Nib Column	
Description	A	Australia - AS3600-2009- <b>SAVED</b>	
Design Code	List	Australia - Australian Materials - 2009- <b>SAVED</b>	
Material	List	Standard Concrete - Australia	
Concrete Type	List	40MPa	
Concrete Strength	List	0	
Rotation	##	N	
Tension Curve	Y/N	N	

Rectangle

#	Solid/Void	X	Y	Width	Depth
1	Solid	0	0	150	550

Reinforcement Bar

Reinforcement Bar Type		Reinforcement Bar Size		Number of bundled bars		X		Y		Distance		Tendon Force	
#	List	List	List	List	List	mm	mm	mm	mm	mm	mm	kN	kN
1	N, Deformed, 500MPa	20, 20mm, 314mm <sup>2</sup>	1	75	50	10000	0						

Design Data		##		List	
Capacity Reduction Factor in Flexure - Tension		##	0.8		
Capacity Reduction Factor in Flexure - Compression		##	0.6		
Capacity Reduction Factor in Shear		##	0.7		
Concrete Material Factor Flexure		##	1		
Concrete Material Factor Shear		##	1		
Reinforcement Material Factor		##	1		
Maximum Depth of Neutral Axis for Ductility		Y/N	0.4		
Shear Enhancement near Support		##	N		
Time of Loading in Days		##	28		
Concrete Strength at Time of Loading		MPa	40		
Design Period in Years		##	30		
Relative Humidity		%	50		
Average Temperature		C.	20		
Long Term Calculation Basis		List	Code Default		
Concrete Strength Gain Rate		List			

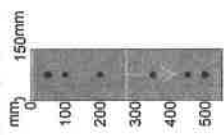
Design Points

Moment		Axial		Description	
#	kNm	kN	A		
-1	0	19.7	563		

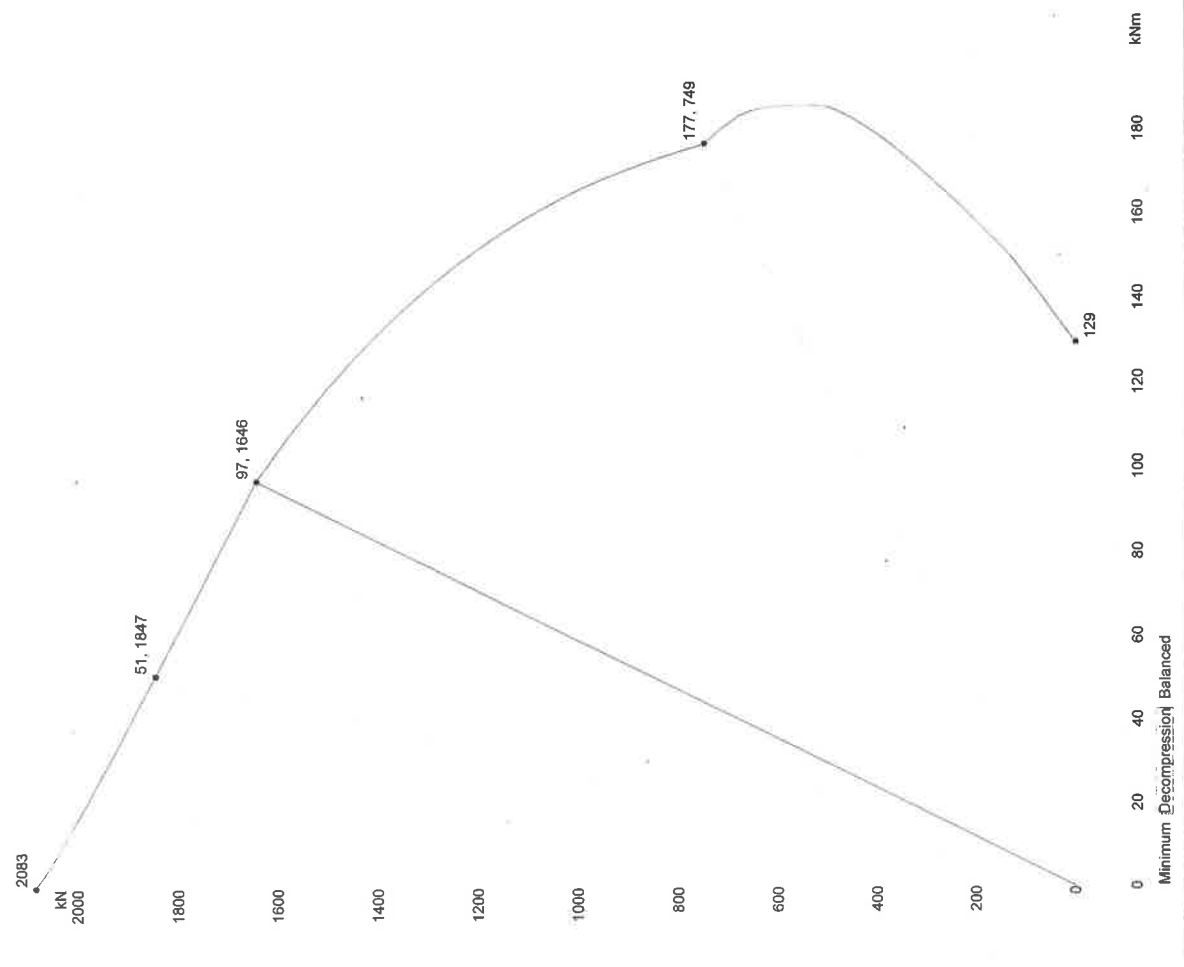
Slenderness

Length Unsupported		mm		3300	
Column Framing	List	List	Braced		
Effective Length Factor	##	##	1		
Moment Ratio for Creep	##	##	0.5		
Smaller End Moment M1	kNm	kNm	10		
Larger End Moment M2	kNm	kNm	19.7		
Applied Axial Load	kN	kN	563		

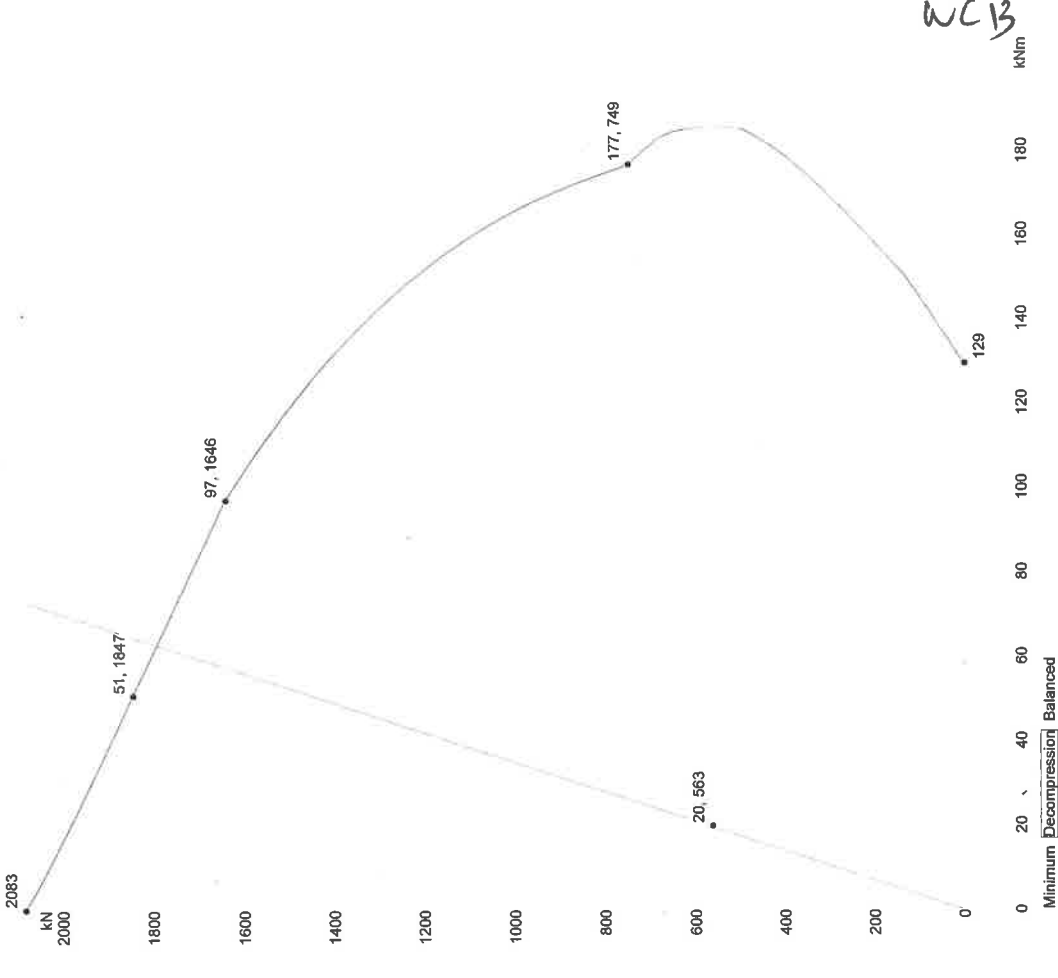
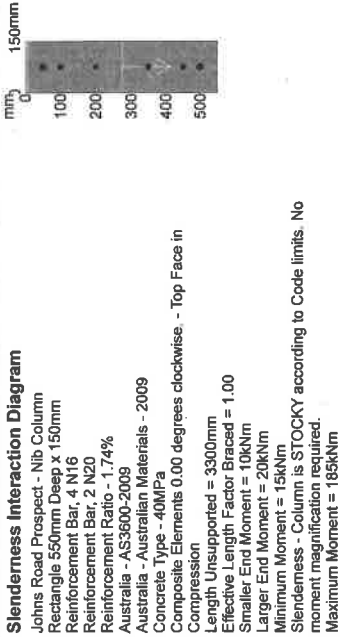
WC11



**General Interaction Diagram**  
Johns Road Prospect - Nib Column  
Rectangle 550mm Deep x 150mm  
Reinforcement Bar, 4 N16  
Reinforcement Bar, 2 N20  
Reinforcement Ratio - 1.74%  
Australia - Australian Materials - 2009  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression



Column Interaction Diagram										Ratio of Neutral Axis Depth				Neutral Axis depth				Compression Curvature				Remarks	
#	kNm	mm	mm	#	#	#	#	mm	mm	mm	mm	#	#	#	#	#	#	#	#	#	#		
Point/Moment	Axial	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth	Phi	Neutral Axis Depth		
1	0	2083.39	0.6	99999	99999	0.0025	0	0	0	0	0	0.0025	0.9478	5.6108	Pure Axial Nuo - dp = 275mm								
2	3.19	2065.03	0.6	7.3857	3692.9	0.0026	0.9478	5.6108	0.0027	1.8182	6.9674	0.0027	1.8182	6.9674									
3	7.6	2042.34	0.6	3.85	1925	0.0028	2.6203	8.7478	0.0029	3.3619	10.8629	0.0031	4.0496	13.1957									
4	13.8	2012.62	0.6	2.0821	1041.1	0.0032	4.889	15.7895	0.0033	5.2851	18.6676	0.0034	5.842	21.8611									
5	21.91	1975.23	0.6	1.7286	864.3	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
6	32.06	1929.53	0.6	1.4929	746.4	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
7	44.42	1874.76	0.6	1.3245	662.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
8	59.2	1809.97	0.6	1.1982	599.1	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
9	76.63	1734.05	0.6	1.1	550	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
10	97.01	1645.59	0.6	1.0548	527.4	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
11	108.04	1577.52	0.6	1.0132	506.6	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
12	117.36	1514.1	0.6	0.9747	487.3	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
13	125.39	1454.24	0.6	0.939	469.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
14	132.32	1397.74	0.6	0.9059	452.9	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
15	138.28	1344.5	0.6	0.875	437.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
16	143.49	1293.78	0.6	0.8462	423.1	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
17	148.04	1245.58	0.6	0.8191	409.6	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
18	152.02	1199.76	0.6	0.7938	396.9	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
19	155.51	1156.08	0.6	0.77	385	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
20	158.59	1114.37	0.6	0.7476	373.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
21	161.32	1074.44	0.6	0.7264	363.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
22	163.75	1036.16	0.6	0.7064	353.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
23	165.93	999.39	0.6	0.6875	343.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
24	167.83	963.31	0.6	0.6696	334.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
25	169.52	928.15	0.6	0.6525	326.3	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
26	171.05	894.15	0.6	0.6364	318.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
27	172.45	861.23	0.6	0.621	310.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
28	173.74	829.32	0.6	0.6063	303.1	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
29	174.92	798.34	0.6	0.6033	291.7	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
30	176.72	748.6	0.6	0.5833	277	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
31	180.5	711.25	0.6144	0.554	277	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
32	183.3	679.35	0.6261	0.531	265.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
33	184.65	651.01	0.6359	0.5099	255	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
34	185.27	624.5	0.6447	0.4904	245.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
35	185.64	598.58	0.6531	0.4724	236.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
36	185.82	573.25	0.661	0.4556	227.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
37	185.83	548.47	0.6685	0.44	220	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
38	185.71	524.23	0.6756	0.4254	212.7	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
39	185.47	500.5	0.6824	0.4118	205.9	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
40	184.61	480.5	0.6881	0.399	199.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
41	183.47	461.87	0.6932	0.3869	193.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
42	182.28	443.81	0.6981	0.3756	187.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
43	181.04	426.27	0.7028	0.3649	182.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
44	179.76	409.25	0.7072	0.3548	177.4	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
45	178.35	392.16	0.7117	0.3453	172.6	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
46	176.81	374.97	0.7161	0.3362	168.1	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
47	175.25	358.16	0.7203	0.3277	163.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
48	173.68	341.73	0.7244	0.3195	159.8	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
49	172.09	325.65	0.7283	0.3117	155.9	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
50	170.49	309.9	0.7321	0.3043	152.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
51	168.89	294.46	0.7359	0.2973	148.6	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
52	167.29	279.32	0.7394	0.2906	145.3	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
53	165.69	264.46	0.7429	0.2841	142.1	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
54	164.09	249.87	0.7463	0.2778	139	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
55	162.49	235.53	0.7496	0.2721	136	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
56	160.9	221.42	0.7529	0.2664	133.2	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
57	159.31	207.55	0.756	0.261	130.5	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
58	157.74	193.89	0.7591	0.2558	127.9	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
59	156.17	180.43	0.762	0.2508	125.4	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077	0.0035	6.3636	25.4077									
60	154.61	167.1																					



Point #	Moment kNm	Axial kN	Phi	Ratio of Neutral Axis Depth	Neutral Axis Depth mm	Face Strain	Compression Curvature	El x 10E12	Remarks
70	140.52	67.86	0.7862	0.2064	103.2	0.0035	33.9031	5.2713	A
71	139.23	59.78	0.7878	0.2032	101.6	0.0035	34.4546	5.1291	
72	137.95	51.84	0.7895	0.2	100	0.0035	35	4.9823	
73	136.64	43.75	0.7911	0.1969	98.5	0.0035	35.5455	4.8589	
74	135.34	35.78	0.7928	0.194	97	0.0035	36.0909	4.7304	
75	134.06	27.93	0.7944	0.1911	95.5	0.0035	36.6364	4.6065	
76	132.79	20.19	0.7959	0.1883	94.1	0.0035	37.1818	4.487	
77	131.53	12.56	0.7975	0.1855	92.8	0.0035	37.7273	4.3717	
78	129.44	0	0.8	0.1812	90.6	0.0035	38.6407	4.1874	

Pure Moment Muo - d = 500mm

Column Interaction Diagram

Point	Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Compression Face Strain	Curvature x 10E-6	EI x 10E12	Buckling Load	Magnified Moment
#	kNm	kN	#	#	mm	#	#	kNm/m2	kN	kNm
1	0	2083.39	0.6	99899	99899	0.0025	0	0	0	72.9
2	3.19	2065.03	0.6	73857	3692.9	0.0026	0.9478	5.6108	0	72.26
3	7.6	2042.34	0.6	3.85	1925	0.0027	1.8182	6.9874	0	71.45
4	13.8	2012.62	0.6	2.6714	1335.7	0.0028	2.6203	8.7799	0	70.42
5	21.91	1975.23	0.6	2.0821	1041.1	0.0029	3.3619	10.8629	0	69.12
6	32.06	1929.53	0.6	1.7286	864.3	0.0031	4.0496	13.1957	0	67.52
7	44.42	1874.76	0.6	1.4929	746.4	0.0032	4.689	15.7895	0	65.6
8	59.2	1809.97	0.6	1.3245	662.2	0.0033	5.2851	18.6676	0	63.33
9	76.63	1734.05	0.6	1.1982	599.1	0.0034	5.842	21.8611	0	60.68
10	97.01	1645.59	0.6	1.1	550	0.0035	6.3636	25.4077	0	57.58
11	108.04	1577.52	0.6	1.0648	527.4	0.0035	6.8364	27.1337	0	55.2
12	117.36	1514.1	0.6	1.0132	506.6	0.0035	7.3091	28.3101	0	52.98
13	125.39	1454.24	0.6	0.9747	487.3	0.0035	7.7818	29.0989	0	50.89
14	132.32	1397.74	0.6	0.939	469.5	0.0035	8.2545	29.5836	0	48.91
15	138.28	1344.5	0.6	0.9059	452.9	0.0035	8.7273	29.8244	0	47.05
16	143.49	1293.78	0.6	0.875	437.5	0.0035	9.2009	29.0745	0	45.27
17	148.04	1245.58	0.6	0.8462	423.1	0.0035	9.6736	28.7135	0	43.58
18	152.02	1199.78	0.6	0.8191	409.6	0.0035	10.1463	28.3215	0	41.98
19	155.51	1156.08	0.6	0.7938	396.9	0.0035	10.6190	27.9317	0	40.45
20	158.59	1114.37	0.6	0.77	385	0.0035	11.0917	27.5419	0	38.98
21	161.32	1074.44	0.6	0.7476	373.8	0.0035	11.5644	27.1513	0	37.6
22	163.75	1036.16	0.6	0.7264	363.2	0.0035	12.0371	26.7607	0	36.26
23	165.93	999.39	0.6	0.7064	353.2	0.0035	12.5098	26.3701	0	34.97
24	167.83	963.31	0.6	0.6875	343.8	0.0035	12.9825	25.9795	0	33.71
25	169.52	928.15	0.6	0.6696	334.8	0.0035	13.4552	25.5889	0	32.48
26	171.05	894.15	0.6	0.6525	326.3	0.0035	13.9279	25.1983	0	31.29
27	172.45	861.23	0.6	0.6364	318.2	0.0035	14.4006	24.8077	0	30.14
28	173.74	829.32	0.6	0.621	310.5	0.0035	14.8733	24.4171	0	29.02
29	174.92	798.34	0.6	0.6063	303.1	0.0035	15.3460	24.0265	0	27.93
30	176.72	748.6	0.6	0.5933	291.7	0.0035	15.8187	23.6359	0	26.19
31	180.5	711.25	0.6144	0.554	277	0.0035	16.2914	23.2454	0	24.89
32	183.3	679.35	0.6261	0.531	265.5	0.0035	16.7641	22.8549	0	23.77
33	184.65	651.01	0.6359	0.5099	255	0.0035	17.2368	22.4644	0	22.78
34	185.27	624.5	0.6447	0.4904	245.2	0.0035	17.7095	22.0739	0	21.85
35	185.64	598.58	0.6531	0.4724	236.2	0.0035	18.1822	21.6834	0	20.95
36	185.82	573.25	0.661	0.4556	227.8	0.0035	18.6549	21.2929	0	20.06
37	185.83	548.47	0.6685	0.44	220	0.0035	19.1276	20.9024	0	19.19
38	185.71	524.23	0.6756	0.4254	212.7	0.0035	19.6003	20.5119	0	18.34
39	185.47	500.5	0.6824	0.4118	205.9	0.0035	20.0730	20.1214	0	17.51
40	184.61	480.5	0.6881	0.399	199.5	0.0035	20.5457	19.7309	0	16.81
41	183.47	461.87	0.6932	0.3869	193.5	0.0035	21.0184	19.3404	0	16.16
42	182.28	443.81	0.6981	0.3756	187.8	0.0035	21.4911	18.9499	0	15.53
43	181.04	426.27	0.7028	0.3649	182.5	0.0035	21.9638	18.5594	0	14.92
44	179.76	409.25	0.7072	0.3548	177.4	0.0035	22.4365	18.1689	0	14.32
45	178.35	392.16	0.7117	0.3453	172.6	0.0035	22.9092	17.7784	0	13.72
46	176.81	374.97	0.7161	0.3362	168.1	0.0035	23.3819	17.3879	0	13.12
47	175.25	358.16	0.7203	0.3277	163.8	0.0035	23.8546	16.9974	0	12.53
48	173.68	341.73	0.7244	0.3195	159.8	0.0035	24.3273	16.6069	0	11.96
49	172.09	325.65	0.7283	0.3117	155.9	0.0035	24.8000	16.2164	0	11.39
50	170.49	309.9	0.7321	0.3043	152.2	0.0035	25.2727	15.8259	0	10.84
51	168.89	294.46	0.7359	0.2973	148.6	0.0035	25.7454	15.4354	0	10.3
52	167.29	279.32	0.7394	0.2906	145.3	0.0035	26.2181	15.0449	0	9.77
53	165.69	264.46	0.7429	0.2841	142.1	0.0035	26.6908	14.6544	0	9.25
54	164.09	249.87	0.7463	0.278	139	0.0035	27.1635	14.2639	0	8.74
55	162.49	235.53	0.7496	0.2721	136	0.0035	27.6362	13.8734	0	8.24
56	160.9	221.42	0.7529	0.2664	133.2	0.0035	28.1089	13.4829	0	7.75
57	159.31	207.55	0.756	0.261	130.5	0.0035	28.5816	13.0924	0	7.26
58	157.74	193.89	0.7591	0.2558	127.9	0.0035	29.0543	12.7019	0	6.78
59	156.17	180.43	0.762	0.2508	125.4	0.0035	29.5270	12.3114	0	6.31
60	154.61	167.17	0.765	0.246	123	0.0035	30.0000	11.9209	0	5.85
61	153.06	154.09	0.7678	0.2414	120.7	0.0035	30.4727	11.5304	0	5.39
62	151.52	141.19	0.7706	0.2369	118.5	0.0035	30.9454	11.1399	0	4.94
63	150.01	129.07	0.7733	0.2326	116.3	0.0035	31.4181	10.7494	0	4.51
64	148.6	119.73	0.7752	0.2285	114.2	0.0035	31.8908	10.3589	0	4.19
65	147.22	110.65	0.7772	0.2245	112.2	0.0035	32.3635	9.9684	0	3.87
66	145.85	101.75	0.7791	0.2206	110.3	0.0035	32.8362	9.5779	0	3.56
67	144.5	93.03	0.7809	0.2169	108.5	0.0035	33.3089	9.1874	0	3.28
68	143.16	84.48	0.7827	0.2133	106.6	0.0035	33.7816	8.7969	0	2.98
69	141.83	76.09	0.7845	0.2098	104.9	0.0035	34.2543	8.4064	0	2.66

Remarks

A

Pure Axial Nuo - dp = 275mm

Decompression

Balanced Point

WC14

WC15

Remarks
A

Pure Moment Muo - d = 500mm

**Errors and Warnings**  
**Input**  
No errors or warnings were found.  
**Output**  
No errors or warnings were found.

K:\2018\061806063\Structural Drawings and Calcs\Design Calculations and Details\FK\blade cantilever option Designer: FK 2.rpf

RAPT - Version: 6.5.16.0 Reinforced And Post-Tensioned Concrete Analysis & Design Package Copyright(C) 1988 - 2018 PCDC Pty. Ltd. All Rights Reserved

Licensee  
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Input		General	
Design Code	List	Australia - AS3600-2009*SAVED*	Australia - Australian Materials - 2009*SAVED*
Material	List	Reinforced	Reinforced
Reinforcement Type	List	Beam	Beam
Member Type	List	Internal	Internal
Strip Type	List	One way - Nominal Width	One way - Nominal Width
Column Stiffness	List	Equivalent Column	Equivalent Column
Concrete Type	List	Standard Concrete - Australia	Standard Concrete - Australia
Concrete - Spanning Members	List	32MPa	32MPa
Concrete - Columns	List	40MPa	40MPa
Top Reinforcement Cover	mm	40	40
Bottom Reinforcement Cover	mm	40	40
Top Reinforcement Axis Depth Limit	mm	30	30
Bottom Reinforcement Axis Depth Limit	mm	30	30
Concrete Unit Weight	kn/m3	25	25
Self Weight Definition	List	Program Calculated	Program Calculated
Pattern Live Load	Y/N	Y	Y
Earthquake Design	List	None	None
Moment Redistribution	%	0	0
Design Surface Levels	List	Extreme Surfaces	Extreme Surfaces

Span		Span		Slab		Panel		Panel	
Length	Depth	Width	Width	Left	Right	Left	Right	Left	Right
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
LC	1500	185	6300	6300					
RE	2000	185	6300	6300					
		0							

Columns		Column		Support		Transverse	
Grid	Reference	Type	Spacing	Grid	Type	Spacing	Prestress (P/A)
A	1	List	mm	mm	mm	mm	MPa
1	1	Knife-Edge	6300				
2	2	Knife-Edge	6300				

Beams		Beam		Beam		Beam		Effective	
Number	Depth	Width	Width	Width	Width	Width	Width	Width	Width
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
LC	500	200	200	800					
1	3100	200	200	540					

## Load Cases

Case	Load Type	Load Definition	Live Load Description
1	Self Weight	Applied Loads	A
2	Extra Dead Load	Applied Loads	
3	Live Load	Applied Loads	Y

## 1. Self Weight - Line

Load Reference Column	Left end of load from reference column mm	Load at Right End left end reference column mm	Right end of load from reference column mm	Load at Description right end
#	mm	mm	mm	mm
1	0	0	30.71	1
2	1	0	43.71	2

## 2. Extra Dead Load - Panel

Load Reference Column	Left end of load from reference column mm	Load at Right End left end reference column mm	Right end of load from reference column mm	Load at Description right end
#	mm	mm	mm	mm
1	0	0	1	2

## 3. Live Load - Panel

Load Reference Column	Left end of load from reference column mm	Load at Right End left end reference column mm	Right end of load from reference column mm	Load at Description right end
#	mm	mm	mm	mm
1	0	0	4	2

## Load Combinations : Ultimate

Load Combination	Description	1. Self Weight	2. Extra Dead Load	3. Live Load
1	Live Load	1.2	1.2	1.5
2	Live Load	0.9	0.9	1.5
3	Dead Load	1.35	1.35	0

## Load Combinations : Short Term Service

Load Combination	Description	1. Self Weight	2. Extra Dead Load	3. Live Load
1	Live Load	1	1	0.7

## Load Combinations : Permanent Service

Load Combination	Description	1. Self Weight	2. Extra Dead Load	3. Live Load
1	Live Load	1	1	0.4

## Load Combinations : Deflection

Load Combination	Description	1. Self Weight	2. Extra Dead Load	3. Live Load
1	Short Term - Deflection	1	1	0.7
2	Permanent - Deflection	1	1	0.4
3	Initial - Deflection	1	0	0

Blade Cantilever  
at Balconies

WCLB

Design Zones : Top

Layer	Steel	Left End	Distance to	Bar stagger	Top Cover	Right End	Distance to Bar stagger	Top Cover	Maximum	Minimum	Preferred
Number	type	Reference	left end of	length at left	at left end	bar	right end of	length at	Bar Size	Bar Size	Bar Size
List	#	Column	mm	mm	mm	mm	mm	mm	mm	mm	List
1	Bar	1	-1500	0	40	2	0	0	36	16	28

Layer	Minimum	Maximum	Minimum	% in
Number	Bars	Bars	mm	%
List	#	mm	mm	%
1	0	0	0	0

Design Zones : Bottom

Layer	Steel	Left End	Distance to	Bar stagger	Bottom	Right End	Distance to Bar stagger	Bottom	Maximum	Minimum
Number	type	Reference	left end of	length at left	at left end	bar	right end of	length at	Bar Size	Bar Size
List	#	Column	mm	mm	mm	mm	mm	mm	mm	List
1	Bar	1	-1500	0	40	2	0	0	40	36

Layer	Preferred	Minimum	Maximum	% in
Number	bar size	Bars	mm	%
List	#	mm	mm	%
1	28	0	0	0

User Defined : Top

Layer	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Top Cover mm	% Development of Bar in Tension	% Development of Bar in Compression	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Top Cover mm
1	N 500MPa	0	0	0	40	100	100	1	2000	0	40

Layer	% Development of Right End of Bar in Tension	% Development of Right End of Bar in Compression	Bar Number	% in Flange	Layer attached after the PreExisting Load
	%	%	List #	mm %	Case Y/N
	100	100	28	2 0	0 N

Reinforcement Design Zones



Reinforcement Design Zones User Defined



Design Data

Capacity Reduction factor (phi) for Flexure	##	0.8
Capacity Reduction factor (phi) for Shear	##	0.7

Load Combinations : Transfer Prestress

Load Combination	Description	1. Self	2. Extra	3. Live
A	Weight Dead Load	##	##	##
1	Transfer	1	0	0

Load Combinations : Pre Existing

Load Combination	Description	1. Self	2. Extra	3. Live
A	Weight Dead Load	##	##	##
1	Pre Existing	1	0	0

Load Combinations : Construction

Load Combination	Description	1. Self	2. Extra	3. Live
A	Weight Dead Load	##	##	##
1	Construction	1	0	0

Load Case 1 : 1. Self Weight



Load Case 2 : 2. Extra Dead Load



Load Case 3 : 3. Live Load



Reinforcement

Reinforcement Use	Type	Reinforcement Preferred	Number
List	List	Bar Size	#
Flexural Bar	N 500MPa		
Flexural Mesh	F 450MPa		
Shear Option 1	N 500MPa	10	2
Shear Option 2	N 500MPa	12	2
Shear Option 3	N 500MPa	12	6
Punching Shear	N 500MPa	12	1

Reinforcement

Reinforcement	Maximum	Minimum	Minimum	Minimum	Span	Span	Span	Span	Span	Span
Bar	Spacing	Bar	Spacing	Bar	Spacing	Bar	Spacing	Bar	Spacing	Bar
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
Support Reinforcement	300	60	0	0	0	0	0	0	0	0
Span Reinforcement	300	60	0	0	0	0	0	0	0	0

Designation	Type	Yield Stress Modulus	Elastic Stress	Ductility Strain Limit	Peak Stress	Design Strain Limit	Material Factor	Material Capacity Reduction Factor - Shear	Material Capacity Reduction Factor - Flexure	Include as Flexural Reinforcement for Shear
N	Deformed	500	2e5	N	0.05	540	90	-1	-1	Y

Reinforcement Bar

Description

Nominal Bar Size	Bar Diameter A	Bar Area mm2	Bar Inertia mm4	Bar Weight kg/m	Stock Length mm
10	10	78.5	491.07	0.62	12000
12	12	113	1018.29	0.89	12000
16	16	201	3218.29	1.58	12000
20	20	314	7857.14	2.47	12000
24	24	452	16292.6	3.55	12000
28	28	616	30184	4.83	12000
32	32	804	51492.6	6.31	12000
36	36	1020	82481.1	7.99	12000
40	40	1260	1.257e5	9.86	12000

Elevation view

mm	0	1	2
-800			
-1600			
-2400			
-3200			
1500			3500mm
mm	-2000	1	2
0			
2000			

Plan view

**Warnings**  
**Input**  
No errors or warnings were found.  
**Output**  
No errors or warnings were found.

Bending Moments Load Cases

Col No. 1	Self Weight	Extra Load	Dead Load	Live Load
Moment Above	kNm	-0	-0	-0
Moment Below	kNm	-0	-0	-0
Reaction	kN	107.06	19.28	77.18
Elastic Rotation	##	0	0	0
Elastic Axial Shortening	mm	0	0	0

Material Factor for Concrete in Flexure	##	1
Material Factor for Concrete in Shear	##	1
Material Factor for Reinforcement	##	0.4
Maximum Ratio of Neutral Axis Depth for Ductility	##	0
Ductility Limit - Strain	Y/N	Y
Ductility Check at Left End Column	Y/N	Y
Ductility Check at Right End Column	Y/N	Y
Minimum Reinforcement Strength Limit - ### x M*	##	0
Flexural Critical Section - Consider Transverse Beams	Y/N	Y
Flexural Critical Section - Distance from centre of Support	##	-1
Beam Left Sideface Cover (Internal)	mm	25
Beam Right Sideface cover	mm	40
Prestress Minimum Reinforcement Basis	List	Program Default
Shear Enhancement at Supports	Y/N	N
Ast Value in Shear Calculations	List	Calculated
Limit Reinforcement Strain	Y/N	Y
Include Strain Hardening of Reinforcement	Y/N	N
Beam Shear Critical Section Location	List	Code Critical Section

Maximum Service Stress Change - Prestressed Sections	MPa	0
Maximum Service Stress Change - Reinforced Sections	MPa	0
Relative Humidity	%	50
Average Temperature	C	20
Prestress Losses Calculations based on	List	Program Default
Crack Width Calculations	List	Code default
AS3600 Shrinkage and Temperature Reinforcement	List	Moderate
Degree of Restraint in Primary Direction	%	0
Degree of Restraint in Secondary Direction	%	0
Concrete Strength Gain Rate	List	N

Concrete Tensile Strength for Deflection Calculations- ### x (F <sub>ck</sub> )	##	-1
Maximum Value of left/gross for Deflection Calculations	##	0.6
Total Deflection Warning Limit - Maximum Span/Deflection	##	250
Total Deflection Warning Limit - Maximum Deflection	##	25
Incremental Deflection Warning Limit - Maximum Span/Deflection	##	250
Incremental Deflection Warning Limit - Maximum Deflection	##	25
Initial Time for Shrinkage	List	Full Shrinkage
Time of Loading in days	##	10
Age Adjustment Factor	##	0.78
Concrete Strength at Time of Loading	MPa	27.04
Loaded Period in years	##	30
Tension stiffening Approach	List	Modified Concrete Tensile Modulus Method

Live Load Pattern Factor	##	1
Pattern Live Load for Ultimate Strength	Y/N	Y
Pattern Live Load for Crack Control	Y/N	Y
Pattern Live Load For Deflections	Y/N	Y
Pattern Live Load for Deflection Permanent Load Combination	Y/N	N

Material Properties

Concrete - Standard Concrete - Australia : Concrete Strength Basis - Cylinder

Description	A	32MPa	40MPa
Characteristic Compressive Strength	MPa	32	40
Mean Compressive Strength	MPa	39.29	48.51
Lower Characteristic Tensile Strength	MPa	3.39	3.79
Upper Characteristic Tensile Strength	MPa	6.11	6.83
Concrete Density	kg/m3	2447	2447
Design Concrete Modulus	MPa	27932.9	31956.2
Mean Concrete Modulus	MPa	30949.7	33721.2
Basic Shrinkage Strain	mm/mm	1000	1000
Shrinkage Multiplier	##	1	1
Basic Creep Factor	##	3.4	2.8
Creep Multiplier	##	1	1
Concrete Strain at Peak Stress	##	0.002	0.002
Squash Load Factor	##	0.9	0.9
Concrete Strain Limit	##	0.004	0.004
Strength Gain Rate	List	Normal	Normal

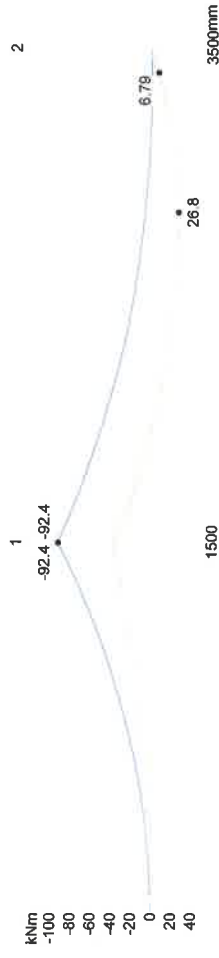
Col No. 2		Self Weight	Extra Load	Dead Load	Live Load
Moment Above	kNm	-0	-0	-0	-0
Moment Below	kNm	-0	-0	-0	-0
Reaction	kN	26.44	2.76	11.03	
Elastic Rotation	##	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0

## Load Combinations Column Actions

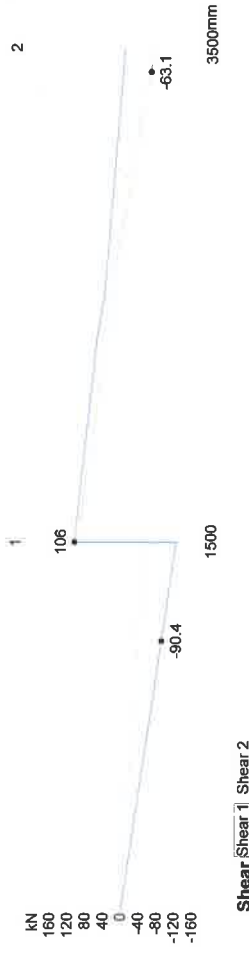
Col No. 1	Characteristic Service	Characteristic Service (Reversal)	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0
Reaction	kN	203.53	180.37	267.38	267.38	151.52	267.38
Elastic Rotation	°	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0

Col No. 2	Characteristic Service	Characteristic Service (Reversal)	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above							
Moment Below							
Reaction							
Elastic Rotation	40.22	40.22	36.91	51.57	51.57	5.01	72.83
Elastic Axial Shortening	##						
	mm						

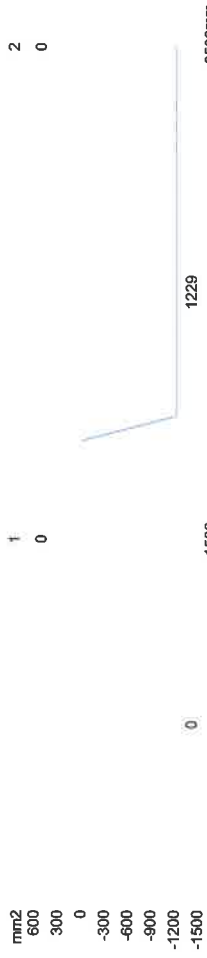
## Ultimate Flexure



Moment Moment 1 Moment 2



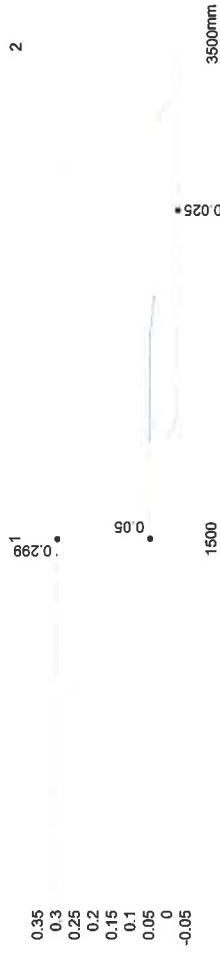
## Flexural Design Ultimate



**Reinforcement**      **Top Total**      **Bottom Total**      **Top Ultimate**      **Bottom Ultimate**      **Min Top**      **Min Bot**



Capacity	Minimum	Ultimate Design	Initial	Final
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## Neutral Axis Depth Initial Final

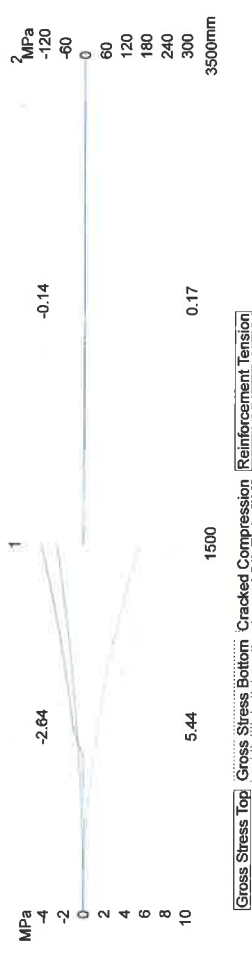
## Span 1

**Design Comments:-**

- As there is no area of steel in the tension zone (any prestressing tendons are in the compression zone) we are now adding an area of steel, equivalent to that required for minimum reinforcement, to the design tension layer. This is then assumed to be the initial design reinforcement setup. More reinforcement will be added as required to achieve the applied moments. Add added = 1229.22mm<sup>2</sup> @ 2000mm

## Service

## Maximum Moment Condition



Gross Stress Top	Gross Stress Bottom	Cracked Compression	Reinforcement Tension
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wc1a

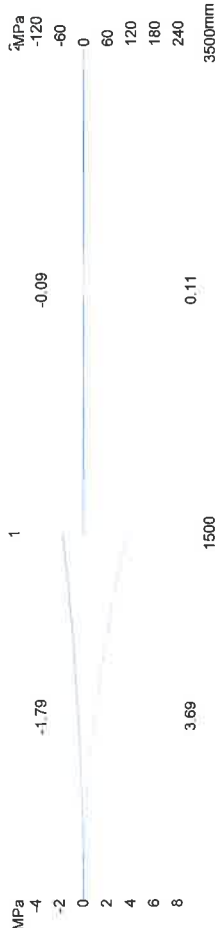
Reversal Moment Condition



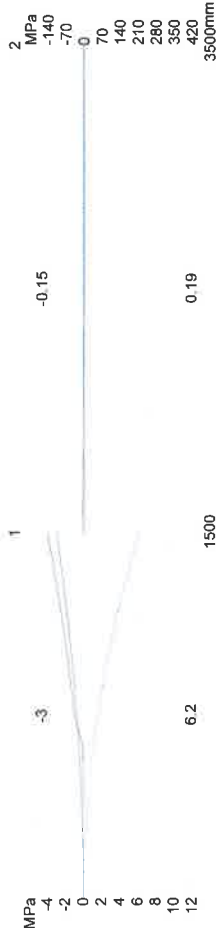
Permanent Maximum Moment Condition



Reversal Moment Condition



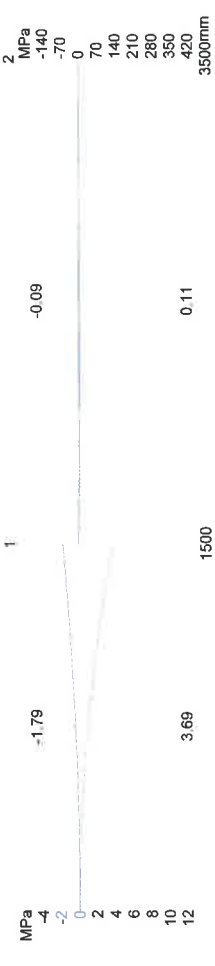
Characteristic Service Maximum Moment Condition



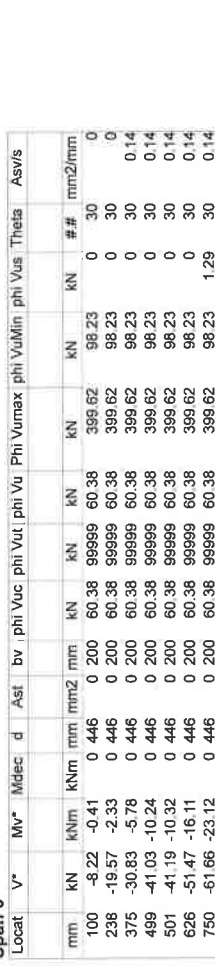
Reversal Moment Condition



Reversal Moment Condition



Permanent Maximum Moment Condition



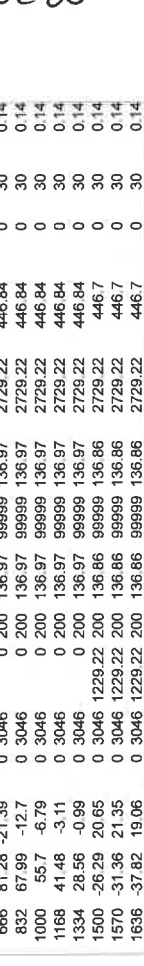
Reversal Moment Condition



Characteristic Service Maximum Moment Condition



Reversal Moment Condition



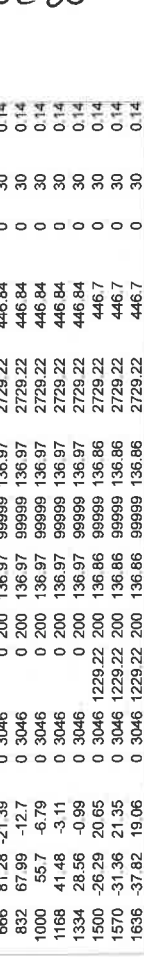
Span 0		Locat	V*	Mv*	Mdec	d	Ast	bv	phi	Vuc	phi	Vut	phi	Vu	Phi	Vumax	phi	VuMin	phi	Vus	Theta	Asvs
		mm	kN	kNm	kNm	mm	mm	mm	mm	kN	kN	kN	kN	kN	kN	kN	kN	kN	kN	kN	#	mm2/mm
		100	-8.22	-0.41	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	30	0	0	0	0	0	0	0
		238	-19.57	-2.33	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	30	0	0	0	0	0	0	0
		375	-30.83	-5.78	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	30	0	0	0	0	0	0	0
		499	-41.03	-10.24	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	30	0	0	0	0	0	0	0
		501	-41.19	-10.32	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	30	0	0	0	0	0	0	0
		626	-51.47	-16.11	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	30	0	0	0	0	0	0	0
		750	-61.66	-23.12	0	446	0	200	60.38	99999	60.38	399.62	98.23	1.29	30	0	0	0	0	0	0	0
		868	-71.36	-30.97	0	446	0	200	60.38	99999	60.38	399.62	98.23	10.99	30	0	0	0	0	0	0	0
		984	-80.9	-39.8	0	446	0	200	60.38	99999	60.38	399.62	98.23	20.52	30	0	0	0	0	0	0	0
		1100	-90.44	-49.74	0	446	0	200	60.38	99999	60.38	399.62	98.23	30.06	30	0	0	0	0	0	0	0
		1499	-123.24	-92.37	0	446	0	200	60.38	99999	60.38	399.62	98.23	0	0	0	0	0	0	0	0	0

Spacing of Sets		Minimum Legs		Shear Comments	
2 legs	2 legs	6 legs	Min legs		
N10	N12	N12	N10	#	A
0	0	0	0	0	No shear steel
0	0	0	0	0	No shear steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
375	375	375	375	2	Minimum Steel
0	0	0	0	0	Minimum Steel

Span 1

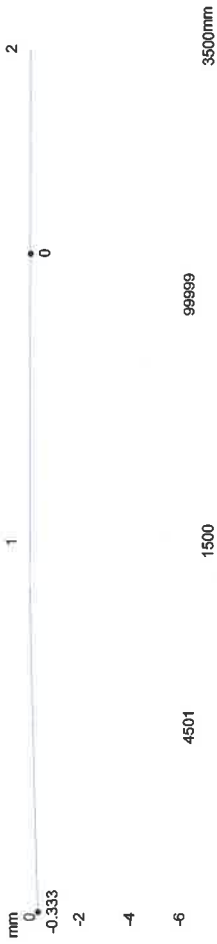
Locat	V*	Mv*	Mdec	d	Ast	bv	phi	Vuc	phi	Vut	phi	Vu	Phi	Vumax	phi	VuMin	phi	Vus	Theta	Asvs
mm	kN	kNm	kNm	mm	mm	mm	mm	mm	mm	kN	kN	kN	kN	kN	kN	kN	kN	kN	#	mm2/mm
1	143.96	-92.35	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
67	137.51	-83.06	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
133	131.05	-74.2	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
199	124.6	-65.76	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
265	118.73	-58.78	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
331	112.27	-51.15	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
400	105.53	-43.84	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
500	97.52	-36.23	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
666	81.28	-21.39	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
832	67.99	-12.7	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
1000	55.7	-6.79	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
1168	41.48	-3.11	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
1334	28.56	-0.99	0	3046	0	200	136.97	99999	136.97	2729.22	446.84	0	30	0	0	0	0	0	0	0
1500	-26.29	20.65	0	3046	1229.22	200	136.86	99999	136.86	2729.22	446.7	0	30	0	0	0	0	0	0	0
1570	-31.36	21.35	0	3046	1229.22	200	136.86	99999	136.86	2729.22	446.7	0	30	0	0	0	0	0	0	0
1636	-37.82	19.06	0	3046	1229.22	200	136.86	99999	136.86	2729.22	446.7	0	30	0	0	0	0	0	0	0

Reversal Moment Condition

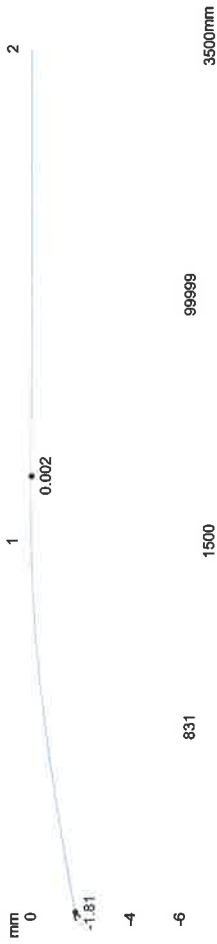




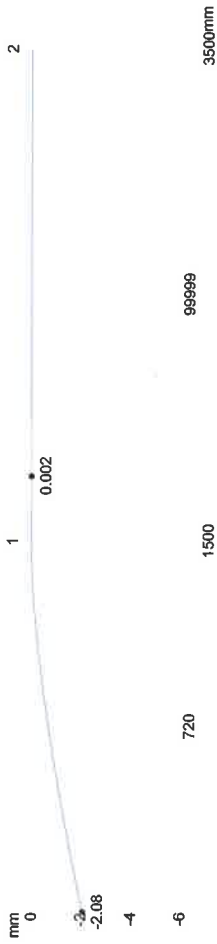
Short Term



Incremental



Total Long Term

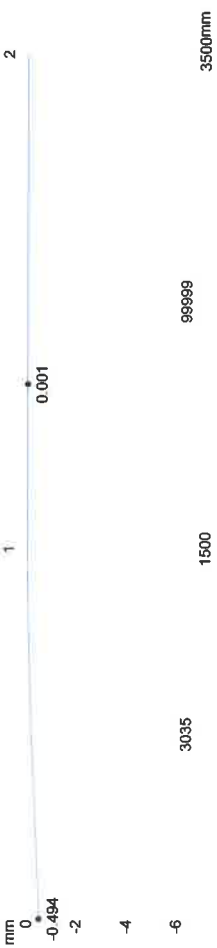


Detailed Reinforcement

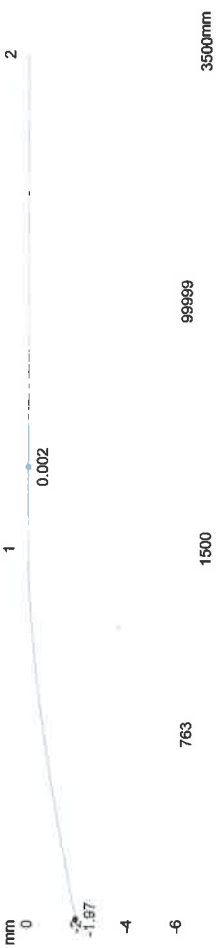
Span 0										Bottom Reinforcement									
Top Reinforcement					Bottom Reinforcement					Top Reinforcement					Bottom Reinforcement				
Locat	Max	Max	Area	Depth	Rebar	Max	Max	Area	Depth	Rebar	Max	Max	Area	Depth	Rebar	Max	Max	Area	Depth
mm	mm	mm	mm2	mm	Reqd	mm	mm	mm2	mm	Reqd	mm	mm	mm2	mm	Reqd	mm	mm	mm2	mm
100	40	300	0	54	800	0	0	0	0	446	200	0	0	0	446	200	0	0	446
238	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
375	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
499	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
501	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
626	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
750	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
968	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
984	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1100	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1125	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1177	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1223	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1269	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1315	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1361	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1407	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1453	40	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel
1499	36	300	0	54	800	No Steel	Added	0	0	No Steel	Added	0	0	0	No Steel	Added	0	0	No Steel

WC22

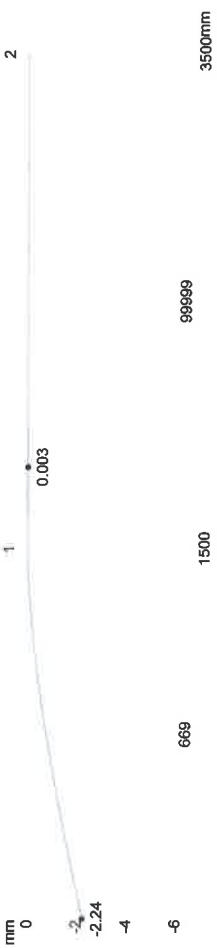
Short Term



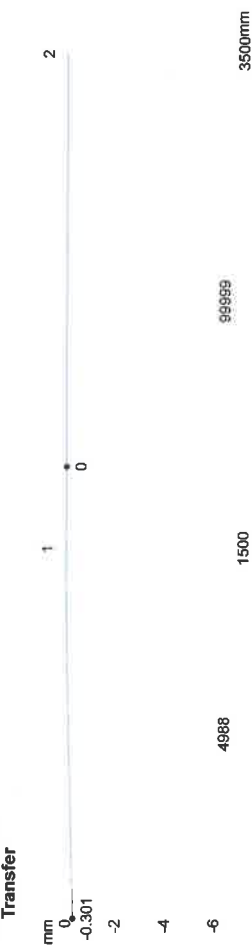
Incremental



Total Long Term



Odd Spans Loaded Transfer

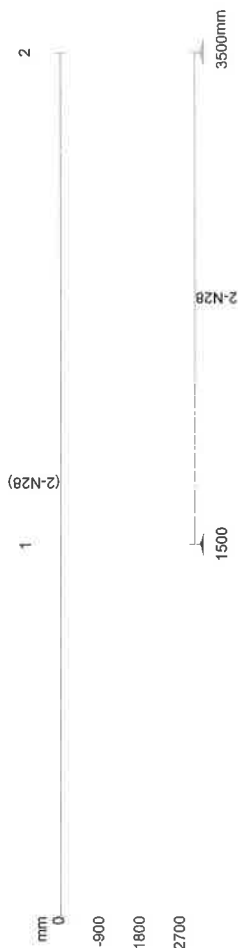


[illegible]

**Design Comments:-**

- Design Comments -
- - Column Grid 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.
- - Column Grid 2 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.

## Reinforcement Layout



- Column Grid 1 - Required Bar Size: Maintaining the same cover will require slightly less reinforcement than calculated.
- Span 0 - Required Bar Size: Maintaining the same cover will require slightly less reinforcement than calculated.

- Column Grid 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.
- Column Grid 2 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.

WC23

[illegible]

**Design Comments:-**

Design Comments -

- Column Grid 1 - Required Bar Size: Maintaining the same cover will require slightly less reinforcement than calculated
- Span 0 - Required Bar Size: Maintaining the same cover will require slightly less reinforcement than calculated

**Span 1**

Span	Top Reinforcement						Bottom Reinforcement					
	Local Size mm	Max Size mm	Area mm <sup>2</sup>	Depth mm	Section Width mm	Rebar Req'd A	Max Size mm	Area mm <sup>2</sup>	Depth mm	Section Width mm	Rebar Req'd A	
10	1	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	67	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	133	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	199	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	265	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	331	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	397	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	463	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	529	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	595	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	661	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	727	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	793	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	859	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	925	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added
	991	40	300	0	54	540	No Steel Added	0	0	3046	200	No Steel Added

## Shear Reinforcement

[illegible]

### Screen wall

- Design Height 1800 high
- Use 190 series blockwork Core filled & reinforced.

### Loads

$$w = 0.96 \text{ kPa} \times 1.2 = 1.15 \text{ kPa}$$

### Strength Design

$$M^*_{\text{wall}} = 1.15 \text{ kPa} \times 1.8^2 / 2 = 1.86 \text{ kNm/m}$$

$$\Rightarrow A_{st} > \frac{1.86 \times 10^6}{0.75 \times 500 \text{ MPa} \times \frac{190}{2} \times 0.9}$$

$$= 58 \text{ mm}^2/\text{m}$$

$$A_{st(\text{min})} \approx 0.0025 \times 1000 \times 95$$

$$= 237.5 \text{ mm}^2/\text{m}$$

$\Rightarrow$  nominally adopt  $M20 @ 200 \text{ mm}$  vertical

### Footing Design

- Use continuously trenchled footings to stabilise for overturning.

$$M^* = 1.86 \text{ kNm/m}$$

$$D = \left( \frac{1.86 \times 10}{3.0 \times 17} \right)^{1/3}$$

$$= 714 \text{ mm} \Rightarrow \text{continuously trench } 750 \text{ mm into natural ground.}$$



REF: 1806063  
DATE: May-19  
SHEET: 2/1  
DESIGN: RGC

## Purlins

P1

span	6.2 m	single span
spacing	1.2 m	
live load	0.36 kPa	
wind pressure	0.96 kPa	(Ultimate)
Cpn	1.2	
roof weight	0.4 kPa	(sheet + ceiling)

### LOADS

DL		
roof	0.48 kN/m	
self wt.	0.06 kN/m	
	0.54 kN/m	total

LL		
roof	0.43 kN/m	
	0.43 kN/m	total

WL	1.38 kN/m	(ultimate)
----	-----------	------------

### STRENGTH DESIGN

$w^* = 1.2DL + 1.5LL$	=	1.30 kN/m
$w^* = 0.9DL + WL(ult)$	=	-0.90 kN/m

### SERVICABILITY DESIGN

$w$ (serv)	=	0.84 kN/m
------------	---	-----------

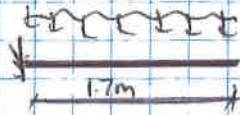
Win =	2.04 kN/m	from lysaght tables
Wout =	1.8 kN/m	from lysaght tables
$w$ for $\Delta = L/150$	1.42 kN/m	from lysaght tables
$\Delta_{serv} =$	25 mm	L/ 252
$\Delta_{dl} =$	16 mm	L/ 394

**Adopt Z20015 @ 1200c/c, 1 Row of Bridging**

## Roof Beam RB2

RLW = 6.3m

### Layout



### Loads

$$\text{Roof DL} = 0.40 \text{ kPa} \times 6.3 \text{ m} =$$

$$2.52 \text{ kN/m} \downarrow$$

$$\text{Roof UL} = (1.5 / 1.7 \times 6.3 + 0.12) \times 6.3 \text{ m} =$$

$$1.81 \text{ kN/m} \downarrow$$

$$\text{Roof WL} = 0.96 \text{ kPa} \times 1.2 \times 6.3 \text{ m} =$$

$$7.26 \text{ kN/m} \uparrow$$

$$\text{Beam SW} =$$

$$0.35 \text{ kN/m} \downarrow$$

### Serviceability Design

$$\Delta_{\text{lim}} = 1/180 (\text{DL}) = 9.4 \text{ mm}$$

$$W_{\text{DL}} = 2.87 \text{ kN/m} \downarrow$$

$$I_{\text{req}} = \frac{1}{8} \times \frac{2.87 \times 1700^4}{2 \times 10^5 + 9.4}$$

$$= 12.8 \times 10^6 \text{ mm}^4$$

→ require

180 PFC for deflection  
( $I_x = 14.1 \times 10^6 \text{ mm}^4$ )

### Strength Design

$$W = 6.16 \text{ kN/m} \downarrow, \quad 4.7 \text{ kN/m} \uparrow$$

$$\Rightarrow M^+ = -8.90 \text{ kNm}, \quad + 6.80 \text{ kNm}$$

$$L_c = 1700 \text{ mm}$$

→ require 125 PFC for strength, ( $P_{\text{Mb}} \sim 15 \text{ kNm}$ )

→ adapt 200 PFC for RB2

## Roof Beam RB1

$$\text{span } 1700 \text{ mm}, \quad L_c = 1700 \text{ mm}$$

$$\text{RLW} = 3.15 \text{ m}$$

$$\Rightarrow I_{\text{req}} = 6.4 \times 10^6 \text{ mm}^4$$

$$M^+ = 4.45 \text{ kNm}$$

} Adapt 150 PFC for RB1  
 $I_x = 8.34 \times 10^6 \text{ mm}^4$   
 $P_{\text{Mb}} = 27 \text{ kNm}$

Checked : .....

Date : .../.../...

# Tie Beam Design (TB1)

$$\text{SPAN} = 6.3 \text{ m}$$

$$W = 0.96 \times 2 \times (0.7 + 0.3) = 1.92 \text{ kN/m}$$

$$w = 1.28 \text{ kN/m}$$

$$M^* = \frac{1.92 \times 6.3^2}{8} = 9.5 \text{ kNm}$$

$$A_{\text{req}} = \frac{M}{\sigma_s} = 25 \text{ cm}^2 \text{ say } 20 \text{ cm}^2$$

$$I_{\text{req}} = \frac{5 \times 1.28 \times 6.3^4}{384 \times 200 \times 10^3} = 6.56 \times 10^6 \text{ mm}^4$$

$$\text{ISOPFC } \phi M_b (L_e = 7 \text{ m}) = 11.4 \text{ kNm} \text{ ok}$$

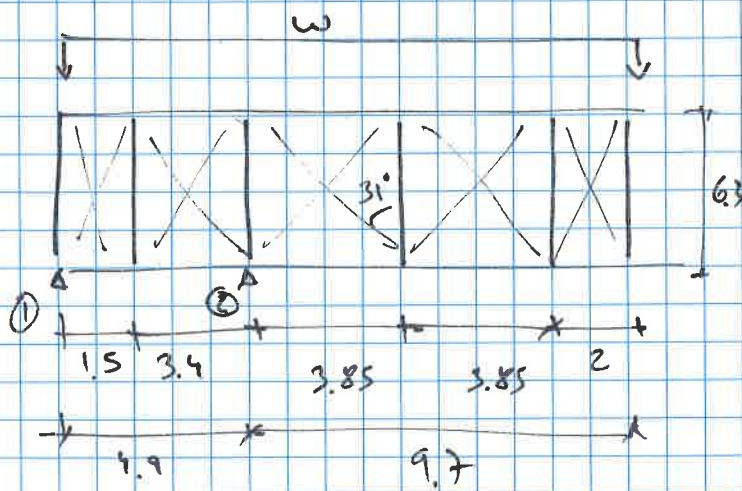
$$I_x = 8.34 \times 10^6 \text{ mm}^4 \text{ ok}$$

ADOPT 150 PFC

## Roof BRACING

$$W_{1,2} \rightarrow 40^2 \times 0.5 \times 1.2 = 0.96 \text{ kPa}$$

$$W^* = 0.8 \times 2 \times (0.4 + 0.5) = 2.3 \text{ kN/m}$$



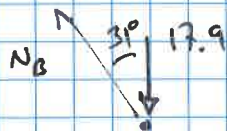
$R_2 = \text{MAX STWT comp.}$

$$R_2 = \frac{w}{2L} \cdot (L+a)^2 = \underline{50 \text{ kN}}$$

Bracing force at 3rd story =  $2.78 \times 2.3 = 17.9 \text{ kN}$

$$\sum F_y = 0 \rightarrow 17.9 - N_B \cdot \cos 31^\circ = 0$$

$$N_B = \underline{20.9 \text{ kN}}$$



TRY 65 x 65 x 5.0 EA  $\phi N_t = 136 \text{ kN}$  ok

TRY 89 x 3.5 SHS  $\phi N_c (l_c = 6.3 \text{ m}) = 57.4 \text{ kN}$  ok

## Lateral Stability Assessment

- Building analysed for lateral stability using ETABS structural design package
  - Refer to ETABS lateral stability report for seismic design and wind design parameters used in the analysis. (See sheets LS6-LS9)
  - The proposed mechanism for lateral stability is via the precast walls & core walls in the North-South direction and via the core walls in the East-West direction.
  - Refer to sheet LS35 - structural mass participation ratio above 40% in both x & y directions satisfying AS1170.4 Cl 7.4.2.
  - Refer to sheet LS22 for critical lateral displacements. At roof level maximum lateral deflection is 4mm in both directions; well within the requirements of AS1170.4 Cl 5.4.2 (max. storey drift 1.5% of storey height)  $\Rightarrow$  OK.
- $\Rightarrow$  New structure is considered adequate for lateral loading. Also refer to individual design sections for wall panels, concrete columns & floor beams



Ref.: 1806063

Date: 30-Nov-18

Design: FK

Page: LS2

## WIND SPEED CALCULATION

These calculations comply with the requirements of AS/NZS 1170.2:2011 - Wind Actions (Amendments 1 & 2) and the Building Code of Australia (BCA Volume 1).

Site : 90, Johns Rd Prospect

Description : 4 storey residential

### DESIGN WIND SPEEDS

Importance Level :	2	▼	BCA Vol.1 - 2013 Table B1.2a
$R_{\text{strength}}$ :	500 years		BCA Vol.1 - 2013 Table B1.2b
$R_{\text{serviceability}}$ :	20 years		
Wind region :	A	▼	Figure 3.1
Terrain category :	3	▼	Clause 4.2.1
Reference height, $z$ :	15 metres		
Terrain/height, $M_{z,\text{cat}}$ :	0.89		Table 4.1
Direction, $M_d$ :	1.00		Table 3.2
Shielding, $M_s$ :	1.00		Clause 4.3
Topography, $M_t$ :	1.00		Clause 4.4
$V_{R,\text{strength}}$ :	45 m/s		Table 3.1
$V_{R,\text{serviceability}}$ :	37 m/s		
$\Rightarrow V_{\text{des},\text{strength}}$ :	40.0 m/s		Clause 2.3
$\Rightarrow V_{\text{des},\text{serviceability}}$ :	32.9 m/s		

→ For Designs to AS 4055-2012 Wind loads for housing (Table 2.2) use Wind Class N2

### Notes on comparing results from AS/NZS 1170.2:2011 with AS 4055 - 2012 (Refer to Appendix A3 of AS 4055 - 2012)

**AS 4055 - 2012 Wind Classifications** were derived from a range of design scenarios evaluated using AS/NZS 1170.2:2011 - Wind Actions (incl. Amendments 1 & 2), in which the following criteria were applied:

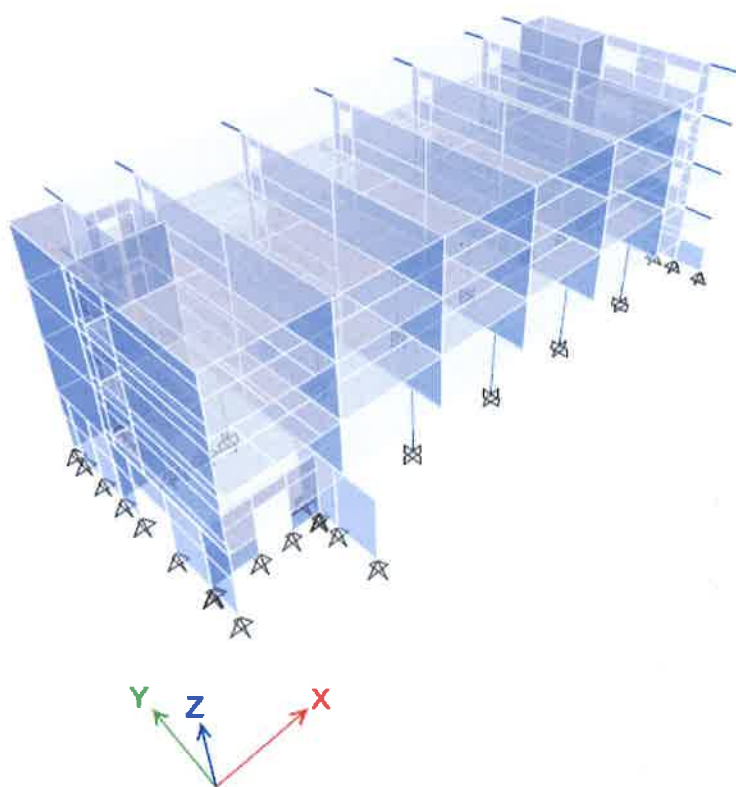
1. The annual probability of exceedance - 1/500 (approximately equivalent to  $R_{\text{strength}} = 500$  years);
2. A factor of 0.95 on (strength) wind speed accounted for various effects unique to housing;
3. A 5% margin was allowed on the wind speed for assigning N and C classes;
4. Average roof height was taken as 6.5 metres;
5. In AS 4055 - 2012,  $M_{z,\text{cat}}$  was derived from AS/NZS 1170.2:2011 using a reference height of 6.5 metres;
6. The topographic multiplier,  $M_t$ , was derived from the hill shape multiplier defined in Table A2 of AS 4055 - 2012, except that the **separation zone at the crest** (AS/NZS 1170.2:2011, Figure 4.4) was not included in AS 4055 - 2012.

Consequently, although the **Design Gust Speeds**  $V_{h,u}$  and  $V_{h,s}$  for **N and C class sites for housing** do not exactly correspond to the values of  $V_{\text{des},\text{strength}}$  and  $V_{\text{des},\text{serviceability}}$  from AS/NZS 1170.2:2011, the correlation shown above between the **Design Wind Speeds** determined from AS/NZS 1170.2:2011 and the **N and C Wind Classifications** determined from AS 4055 - 2012 is acceptable for design purposes.

# ETABS<sup>®</sup> version 17

Integrated Building Design Software

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## Lateral Stability Report

### Proposed Apartments

Model File: Model 01, Revision 0

17/05/2019

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## 1 Loads

This chapter provides loading information as applied to the model.

### 1.1 Load Patterns

Table 1.1 - Load Patterns

Name	Type	Self Weight Multiplier	Auto Load
Dead	Dead	1	
Live	Live	0	
SDead	Superimposed Dead	0	
Wind	Wind	0	AS/NZS 1170.2:2011
EQ	Seismic	0	AS 1170 2007

### 1.2 Auto Wind Loading

Table 1.2 - Auto Wind - AS/NZS 1170.2:2011 (Part 1 of 2)

Load Pattern	Loading Method	Exposure Width Type	Angle deg	e	Cp,wind	Cp,lee	Ka	Kc	Kl	Kp
Wind(1/8)	Diaphragms	From Diaphragms	0	0.2	0.8	0.5	1	1	1	1
Wind(2/8)	Diaphragms	From Diaphragms	45	0.2	0.8	0.5	1	1	1	1
Wind(3/8)	Diaphragms	From Diaphragms	90	0.2	0.8	0.5	1	1	1	1
Wind(4/8)	Diaphragms	From Diaphragms	135	0.2	0.8	0.5	1	1	1	1
Wind(5/8)	Diaphragms	From Diaphragms	180	0.2	0.8	0.5	1	1	1	1
Wind(6/8)	Diaphragms	From Diaphragms	225	0.2	0.8	0.5	1	1	1	1
Wind(7/8)	Diaphragms	From Diaphragms	270	0.2	0.8	0.5	1	1	1	1
Wind(8/8)	Diaphragms	From Diaphragms	315	0.2	0.8	0.5	1	1	1	1

Table 1.2 - Auto Wind - AS/NZS 1170.2:2011 (Part 2 of 2)

Top Story	Bottom Story	Include Parapet	Vr meter/sec	Terrain Category	Md	Ms	Mt	Cdyn
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1
Roof	Base	No	50	3	1	1	1	1

### 1.3 Auto Seismic Loading

Table 1.3 - Auto Seismic - AS 1170:2007 (Part 1 of 2)

Load Pattern	Type	Direction	Eccentricity %	Ecc. Overridden	Period Method	kt	Top Story	Bottom Story	Site Class
EQ	Seismic	X		No	Program Calculated	0.075	Roof	Base	C
EQ	Seismic	Y		No	Program Calculated	0.075	Roof	Base	C
EQ	Seismic	X + Ecc. Y	10	No	Program Calculated	0.075	Roof	Base	C
EQ	Seismic	Y + Ecc. X	10	No	Program Calculated	0.075	Roof	Base	C
EQ	Seismic	X - Ecc. Y	10	No	Program Calculated	0.075	Roof	Base	C
EQ	Seismic	Y - Ecc. X	10	No	Program Calculated	0.075	Roof	Base	C

Table 1.3 - Auto Seismic - AS 1170:2007 (Part 2 of 2)

kp	Z	Sp	$\mu$	Period Used sec	Coeff Used	Weight Used kN	Base Shear kN
1	0.1	0.77	2	0.248	0.14168	16845.9	2386.7
1	0.1	0.77	2	0.142	0.14168	16845.9	2386.7
1	0.1	0.77	2	0.248	0.14168	16845.9	2386.7
1	0.1	0.77	2	0.142	0.14168	16845.9	2386.7
1	0.1	0.77	2	0.248	0.14168	16845.9	2386.7
1	0.1	0.77	2	0.142	0.14168	16845.9	2386.7

## AS 1170 2007 Auto Seismic Load Calculation

This calculation presents the automatically generated lateral seismic loads for load pattern EQ according to AS 1170 2007, as calculated by ETABS.

### Direction and Eccentricity

Direction = Multiple

Eccentricity Ratio = 10% for all diaphragms

### Structural Period

Period Calculation Method = Program Calculated

Coefficient,  $k_t$  [AS 6.2.3]

$$k_t = 0.075m$$

Structure Height Above Base,  $h_n$

$$h_n = 14 \text{ m}$$

### Factors and Coefficients

Probability Factor,  $k_p$  [AS Table 3.1]

$$k_p = 1$$

Hazard Factor,  $Z$  [AS Table 3.2]

$$Z = 0.1$$

Structural Performance Factor,  $S_p$  [AS Table 6.5(A)]

$$S_p = 0.77$$

Structural Ductility Factor,  $\mu$  [AS Table 6.5(A)]

$$\mu = 2$$

Site Sub-soil Class [AS 4.1.1] = Ce - Shallow Soil

### Equivalent Lateral Forces

Seismic Design Action Coefficient,  $C_{d(T)}$  [AS 6.2.1]

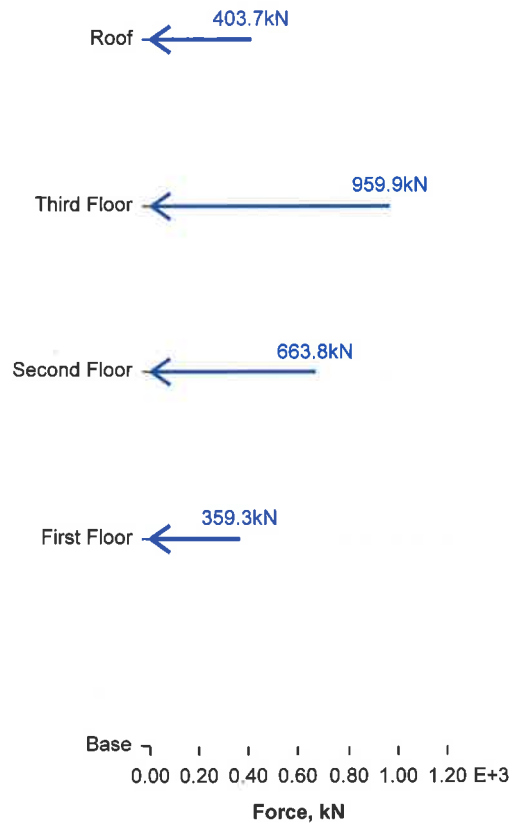
$$C_{d(T)} = \frac{k_p Z C_h(T_i) S_p}{\mu}$$

### Calculated Base Shear

Direction	Period Used (sec)	$C_{d(T)}$	W (kN)	V (kN)
X	0.248	0.14168	16845.8959	2386.7
Y	0.142	0.14168	16845.8959	2386.7
X + Ecc. Y	0.248	0.14168	16845.8959	2386.7
Y + Ecc. X	0.142	0.14168	16845.8959	2386.7
X - Ecc. Y	0.248	0.14168	16845.8959	2386.7
Y - Ecc. X	0.142	0.14168	16845.8959	2386.7

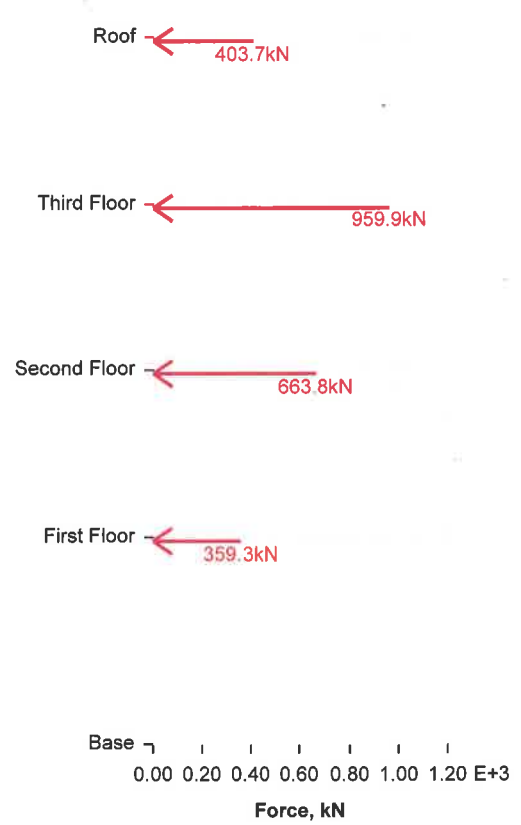
### Applied Story Forces

**Lateral Load to Stories - X**



Story	Elevation m	X-Dir kN	Y-Dir kN
Roof	14	403.7	0
Third Floor	10.7	959.9	0
Second Floor	7.4	663.8	0
First Floor	4.1	359.3	0
Base	0	0	0

**Lateral Load to Stories - Y**



Story	Elevation m	X-Dir kN	Y-Dir kN
Roof	14	0	403.7
Third Floor	10.7	0	959.9
Second Floor	7.4	0	663.8
First Floor	4.1	0	359.3
Base	0	0	0

## 1.4 Load Cases

**Table 1.5 - Load Cases - Summary**

Name	Type
Modal	Modal - Ritz
Dead	Linear Static
Live	Linear Static
SDead	Linear Static
Wind	Linear Static
EQ	Linear Static
-EQ	Linear Static

**Table 1.6 - Load Cases - Static - Linear**

Name	Stiffness From	Mass Source	Load Type	Load Name	Scale Factor	Design Load Type
Dead	Preset P-delta	MsSrc1	Load Pattern	Dead	1	Program Determined
Live	Preset P-delta	MsSrc1	Load Pattern	Live	1	Program Determined
SDead	Preset P-delta	MsSrc1	Load Pattern	SDead	1	Program Determined
Wind	Preset P-delta	MsSrc1	Load Pattern	Wind	1	Program Determined
EQ	Preset P-delta	MsSrc1	Load Pattern	EQ	1	Program Determined
-EQ	Preset P-delta	MsSrc1	Load Pattern	EQ	-1	Program Determined

**Table 1.7 - Load Cases - Modal - Ritz**

Name	Stiffness From	Mass Source	Load Type	Load Name	Max Cycles	Target Participation %	Max Number Modes	Min Number Modes	Design Load Type
Modal	Preset P-delta	MsSrc1	Acceleration	UX	0	99	40	1	Program Determined
Modal			Acceleration	UY	0	99			

**Table 1.8 - P-delta Options**

Automation Method	Load Pattern	Scale Factor	Convergence Tolerance
Iterative - Loads	Dead	1	1E-07
	Live	0.5	
	SDead	1	

## 1.5 Load Combinations

**Table 1.9 - Load Combinations**

Name	Load Case/Combo	Scale Factor	Type	Auto
Serv 01 (G)	Dead	1	Linear Add	No
Serv 01 (G)	SDead	1		No
Serv 02 (G+0.7Q)	Dead	1	Linear Add	No
Serv 02 (G+0.7Q)	SDead	1		No
Serv 02 (G+0.7Q)	Live	0.7		No
Serv 03 (G+Wind)	Dead	1	Linear Add	No
Serv 03 (G+Wind)	SDead	1		No
Serv 03 (G+Wind)	Wind	0.67		No
Ult 01 (1.35G)	Dead	1.35	Linear Add	No
Ult 01 (1.35G)	SDead	1.35		No
Ult 02 (1.2G+1.5Q)	Dead	1.2	Linear Add	No
Ult 02 (1.2G+1.5Q)	SDead	1.2		No
Ult 02 (1.2G+1.5Q)	Live	1.5		No

Table 1.9 - Load Combinations (continued)

Name	Load Case/Combo	Scale Factor	Type	Auto
Ult 03 (1.2G+Wind+0.4Q)	Dead	1.2	Linear Add	No
Ult 03 (1.2G+Wind+0.4Q)	SDead	1.2		No
Ult 03 (1.2G+Wind+0.4Q)	Live	0.4		No
Ult 03 (1.2G+Wind+0.4Q)	Wind	1		No
Ult 04 (0.9G+Wind)	Dead	0.9	Linear Add	No
Ult 04 (0.9G+Wind)	SDead	0.9		No
Ult 04 (0.9G+Wind)	Wind	1		No
Ult 05 (G+EQ+0.3Q)	Dead	1	Linear Add	No
Ult 05 (G+EQ+0.3Q)	SDead	1		No
Ult 05 (G+EQ+0.3Q)	Live	0.3		No
Ult 05 (G+EQ+0.3Q)	EQ	1		No
Ult 06 (G-EQ+0.3Q)	Dead	1	Linear Add	No
Ult 06 (G-EQ+0.3Q)	SDead	1		No
Ult 06 (G-EQ+0.3Q)	Live	0.3		No
Ult 06 (G-EQ+0.3Q)	-EQ	1		No

## 2 Analysis Results

This chapter provides analysis results.

### 2.1 Story Results

Table 2.1 - Story Max/Avg Displacements

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Roof	Modal 1	X	0.04319	0.04116	1.049
Third Floor	Modal 1	X	0.03427	0.0321	1.068
Second Floor	Modal 1	X	0.02182	0.02044	1.067
First Floor	Modal 1	X	0.00885	0.00816	1.085
Roof	Modal 2	Y	0.04493	0.03244	1.385
Third Floor	Modal 2	Y	0.0363	0.02589	1.402
Second Floor	Modal 2	Y	0.02719	0.01869	1.455
First Floor	Modal 2	Y	0.02058	0.01205	1.708
Roof	Modal 3	Y	0.1	0.005962	10.709
Third Floor	Modal 3	X	0.02277	0.001597	14.256
Third Floor	Modal 3	Y	0.1	0.004071	12.365
Second Floor	Modal 3	X	0.01578	0.001657	9.522
Second Floor	Modal 3	Y	0.03327	0.002899	11.476
First Floor	Modal 3	X	0.007616	0.001604	4.749
First Floor	Modal 3	Y	0.01436	0.001032	13.906
Roof	Modal 4	X	0.00676	0.004994	1.354
Roof	Modal 4	Y	0.005456	0.00124	4.4
Third Floor	Modal 4	X	0.004944	0.003336	1.482
Third Floor	Modal 4	Y	0.004326	0.001104	3.918
Second Floor	Modal 4	X	0.002104	0.000289	7.278
Second Floor	Modal 4	Y	0.003214	0.0008449	3.804
First Floor	Modal 4	X	0.003009	0.001465	2.053
First Floor	Modal 4	Y	0.001509	0.0003891	3.878
Roof	Modal 5	X	0.009052	0.006695	1.352
Third Floor	Modal 5	X	0.006949	0.004868	1.428
Second Floor	Modal 5	X	0.002422	0.0007112	3.406
Second Floor	Modal 5	Y	0.003665	0.0004328	8.468
First Floor	Modal 5	X	0.003263	0.002213	1.474
First Floor	Modal 5	Y	0.001726	0.0002713	6.363
Roof	Modal 6	X	0.0205	0.01913	1.072
Third Floor	Modal 6	X	0.009793	0.007677	1.276
Second Floor	Modal 6	X	0.01927	0.01374	1.403
First Floor	Modal 6	X	0.02338	0.01721	1.358
Roof	Modal 7	X	0.02343	0.02171	1.079
Third Floor	Modal 7	X	0.01085	0.008339	1.301
Second Floor	Modal 7	X	0.02433	0.01719	1.415
First Floor	Modal 7	X	0.02062	0.0164	1.258
Roof	Modal 8	X	0.005327	0.004057	1.313
Roof	Modal 8	Y	0.001918	0.0008468	2.265
Third Floor	Modal 8	X	0.003632	0.001724	2.107
Third Floor	Modal 8	Y	0.001552	0.0005101	3.043
Second Floor	Modal 8	X	0.00347	0.001877	1.848
Second Floor	Modal 8	Y	0.001769	0.0005299	3.338
First Floor	Modal 8	X	0.002503	0.001615	1.55
Roof	Modal 9	X	0.008589	0.007821	1.098

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Third Floor	Modal 9	X	0.006871	0.004696	1.463
Second Floor	Modal 9	X	0.00664	0.004387	1.514
First Floor	Modal 9	X	0.005851	0.003786	1.545
Roof	Modal 10	X	0.004433	0.004104	1.08
Roof	Modal 10	Y	0.001892	0.00168	1.126
Third Floor	Modal 10	X	0.002222	0.001539	1.444
Third Floor	Modal 10	Y	0.001412	0.001081	1.306
Second Floor	Modal 10	X	0.007753	0.004933	1.572
Second Floor	Modal 10	Y	0.00212	0.0005332	3.976
First Floor	Modal 10	X	0.01049	0.004492	2.335
Roof	Modal 11	X	0.01245	0.008153	1.527
Roof	Modal 11	Y	0.03285	0.02669	1.231
Third Floor	Modal 11	X	0.007107	0.002022	3.515
Third Floor	Modal 11	Y	0.0222	0.01534	1.448
Second Floor	Modal 11	X	0.03427	0.01658	2.067
Second Floor	Modal 11	Y	0.02211	0.004331	5.105
First Floor	Modal 11	X	0.04342	0.02277	1.907
First Floor	Modal 11	Y	0.03804	0.01743	2.182
Roof	Modal 12	X	0.01207	0.009495	1.271
Roof	Modal 12	Y	0.02297	0.02116	1.085
Third Floor	Modal 12	X	0.007071	0.003109	2.274
Third Floor	Modal 12	Y	0.01557	0.01128	1.381
Second Floor	Modal 12	X	0.03763	0.02021	1.862
Second Floor	Modal 12	Y	0.01848	0.003801	4.862
First Floor	Modal 12	X	0.04019	0.02173	1.85
First Floor	Modal 12	Y	0.03011	0.01269	2.373
Roof	Modal 13	X	0.004124	0.002907	1.419
Roof	Modal 13	Y	0.00572	0.003639	1.572
Third Floor	Modal 13	X	0.001538	0.0005909	2.603
Third Floor	Modal 13	Y	0.003548	0.002185	1.624
Second Floor	Modal 13	X	0.009579	0.004895	1.957
First Floor	Modal 13	X	0.01091	0.007107	1.535
First Floor	Modal 13	Y	0.005017	0.002382	2.107
Roof	Modal 14	X	0.007478	0.006588	1.135
Third Floor	Modal 14	X	0.009263	0.004093	2.263
Third Floor	Modal 14	Y	0.002914	0.0006534	4.461
Second Floor	Modal 14	X	0.007376	0.003417	2.159
Second Floor	Modal 14	Y	0.004121	0.0007808	5.278
First Floor	Modal 14	X	0.003339	0.001658	2.014
Roof	Modal 15	X	0.003096	0.001426	2.172
Third Floor	Modal 15	X	0.002382	0.0009142	2.606
Second Floor	Modal 15	X	0.002851	0.0003442	8.282
Second Floor	Modal 15	Y	0.0009678	0.0004413	2.193
First Floor	Modal 15	X	0.001642	0.0004246	3.867
First Floor	Modal 15	Y	0.001041	0.0004642	2.242
Roof	Modal 16	X	0.01354	0.007336	1.846
Third Floor	Modal 16	X	0.0173	0.002776	6.231
Third Floor	Modal 16	Y	0.009902	0.0005895	16.795
Second Floor	Modal 16	X	0.01447	0.005126	2.822

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Second Floor	Modal 16	Y	0.00812	0.002804	2.895
First Floor	Modal 16	X	0.004521	0.002389	1.893
First Floor	Modal 16	Y	0.006224	0.003927	1.585
Roof	Modal 17	X	0.007567	0.00289	2.618
Roof	Modal 17	Y	0.005889	0.0008378	7.029
Third Floor	Modal 17	X	0.01467	0.004755	3.085
Second Floor	Modal 17	X	0.009491	0.002061	4.605
Second Floor	Modal 17	Y	0.007667	0.003282	2.336
First Floor	Modal 17	X	0.005902	0.002417	2.442
First Floor	Modal 17	Y	0.006644	0.004063	1.635
Roof	Modal 18	X	0.03247	0.02344	1.385
Third Floor	Modal 18	X	0.03321	0.01525	2.178
Third Floor	Modal 18	Y	0.01403	0.002146	6.536
Second Floor	Modal 18	X	0.01771	0.008537	2.075
Second Floor	Modal 18	Y	0.00997	0.003343	2.983
First Floor	Modal 18	X	0.00609	0.003347	1.819
First Floor	Modal 18	Y	0.005951	0.004401	1.352
Roof	Modal 19	X	0.03	0.02394	1.253
Third Floor	Modal 19	X	0.03071	0.01349	2.277
Third Floor	Modal 19	Y	0.01437	0.002541	5.656
Second Floor	Modal 19	X	0.01946	0.008317	2.34
Second Floor	Modal 19	Y	0.01417	0.005805	2.442
First Floor	Modal 19	X	0.006272	0.003616	1.734
First Floor	Modal 19	Y	0.008343	0.005457	1.529
Roof	Modal 20	X	0.008816	0.00251	3.512
Roof	Modal 20	Y	0.01455	0.000352	41.347
Third Floor	Modal 20	X	0.01007	0.006095	1.653
Second Floor	Modal 20	X	0.01743	0.009392	1.856
Second Floor	Modal 20	Y	0.00916	0.001313	6.979
First Floor	Modal 20	X	0.01142	0.00331	3.449
First Floor	Modal 20	Y	0.01339	0.002725	4.913
Roof	Modal 21	X	0.008776	0.001266	6.932
Roof	Modal 21	Y	0.007117	0.000368	19.34
Third Floor	Modal 21	X	0.01117	0.0006092	18.339
Third Floor	Modal 21	Y	0.01158	0.0008531	13.574
Second Floor	Modal 21	X	0.008168	0.000601	13.591
Second Floor	Modal 21	Y	0.0114	0.003014	3.782
First Floor	Modal 21	Y	0.0081	0.004779	1.695
Roof	Modal 22	X	0.01661	0.007291	2.279
Roof	Modal 22	Y	0.01926	0.006266	3.074
Third Floor	Modal 22	X	0.01733	0.004175	4.15
Third Floor	Modal 22	Y	0.01968	0.003944	4.989
Second Floor	Modal 22	X	0.01646	0.003803	4.329
Second Floor	Modal 22	Y	0.02171	0.006286	3.454
First Floor	Modal 22	X	0.009778	0.001954	5.004
First Floor	Modal 22	Y	0.0184	0.006615	2.782
Roof	Modal 23	X	0.016	0.0008875	18.033
Roof	Modal 23	Y	0.02641	0.007462	3.539
Third Floor	Modal 23	X	0.02124	0.002033	10.447

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Third Floor	Modal 23	Y	0.02578	0.001062	24.264
Second Floor	Modal 23	X	0.01598	0.001512	10.571
Second Floor	Modal 23	Y	0.02774	0.009039	3.069
First Floor	Modal 23	X	0.009237	0.001851	4.99
First Floor	Modal 23	Y	0.02052	0.008813	2.329
Roof	Modal 24	X	0.01516	0.005766	2.629
Roof	Modal 24	Y	0.01867	0.006654	2.806
Third Floor	Modal 24	X	0.01473	8.305E-05	177.374
Third Floor	Modal 24	Y	0.01704	0.0002743	62.103
Second Floor	Modal 24	X	0.02291	0.009845	2.327
Second Floor	Modal 24	Y	0.0186	0.004464	4.166
First Floor	Modal 24	X	0.01047	0.005304	1.974
First Floor	Modal 24	Y	0.008198	0.005132	1.598
Roof	Modal 25	X	0.02719	0.01271	2.14
Roof	Modal 25	Y	0.0317	0.01139	2.785
Third Floor	Modal 25	X	0.02795	0.005374	5.202
Third Floor	Modal 25	Y	0.03259	0.003222	10.114
Second Floor	Modal 25	X	0.01611	0.001334	12.072
Second Floor	Modal 25	Y	0.02755	0.00566	4.867
First Floor	Modal 25	Y	0.02088	0.006622	3.152
Roof	Modal 26	X	0.01893	0.0163	1.161
Third Floor	Modal 26	X	0.006044	0.000661	9.144
Third Floor	Modal 26	Y	0.004315	0.0003351	12.876
Second Floor	Modal 26	X	0.004159	0.0005107	8.143
Second Floor	Modal 26	Y	0.004245	0.0005926	7.164
First Floor	Modal 26	X	0.0113	8.641E-05	130.802
First Floor	Modal 26	Y	0.005756	0.0002044	28.16
Roof	Modal 27	X	0.01179	0.008673	1.359
Roof	Modal 27	Y	0.009748	0.005006	1.947
Third Floor	Modal 27	X	0.005758	0.001265	4.551
Third Floor	Modal 27	Y	0.009159	0.00331	2.768
Second Floor	Modal 27	X	0.01276	0.002485	5.135
Second Floor	Modal 27	Y	0.01529	0.009308	1.643
First Floor	Modal 27	X	0.01654	0.001822	9.078
First Floor	Modal 27	Y	0.01524	0.001379	11.048
Roof	Modal 28	X	0.01587	0.004813	3.297
Roof	Modal 28	Y	0.04051	0.02959	1.369
Third Floor	Modal 28	X	0.02305	0.002775	8.306
Third Floor	Modal 28	Y	0.02418	0.002051	11.793
Second Floor	Modal 28	X	0.03159	0.002805	11.26
Second Floor	Modal 28	Y	0.03961	0.0212	1.869
First Floor	Modal 28	X	0.03554	0.00524	6.783
First Floor	Modal 28	Y	0.04281	0.006168	6.941
Roof	Modal 29	X	0.01648	0.006613	2.492
Roof	Modal 29	Y	0.02835	0.0178	1.593
Third Floor	Modal 29	X	0.03724	0.003345	11.133
Third Floor	Modal 29	Y	0.03578	0.007544	4.742
Second Floor	Modal 29	X	0.03423	0.0009714	35.242
Second Floor	Modal 29	Y	0.03688	0.0003104	118.815

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
First Floor	Modal 29	X	0.0138	0.001657	8.33
First Floor	Modal 29	Y	0.02947	0.01395	2.113
Roof	Modal 30	X	0.03344	0.01677	1.994
Roof	Modal 30	Y	0.01555	0.001934	8.042
Third Floor	Modal 30	X	0.02232	0.001847	12.086
Third Floor	Modal 30	Y	0.01545	0.002842	5.436
Second Floor	Modal 30	X	0.02921	0.00279	10.47
Second Floor	Modal 30	Y	0.04098	0.01344	3.05
First Floor	Modal 30	X	0.04863	0.006993	6.954
First Floor	Modal 30	Y	0.02826	0.01126	2.51
Roof	Modal 31	X	0.01514	0.000914	16.565
Roof	Modal 31	Y	0.02263	0.00631	3.587
Third Floor	Modal 31	X	0.01865	0.002144	8.701
Third Floor	Modal 31	Y	0.01702	0.005993	2.84
Second Floor	Modal 31	X	0.03048	0.004475	6.81
Second Floor	Modal 31	Y	0.01695	0.00537	3.157
First Floor	Modal 31	X	0.03381	0.005512	6.134
First Floor	Modal 31	Y	0.0245	0.009005	2.721
Roof	Modal 32	X	0.02174	0.009096	2.39
Roof	Modal 32	Y	0.02085	0.005169	4.033
Third Floor	Modal 32	X	0.01898	0.002435	7.798
Third Floor	Modal 32	Y	0.02257	0.00387	5.833
Second Floor	Modal 32	X	0.04693	0.004523	10.376
Second Floor	Modal 32	Y	0.03407	0.007834	4.349
First Floor	Modal 32	X	0.1	0.0101	5.147
First Floor	Modal 32	Y	0.1	0.01714	3.117
Roof	Modal 33	X	0.008438	0.00293	2.88
Roof	Modal 33	Y	0.01086	0.003586	3.027
Third Floor	Modal 33	X	0.01361	0.0002827	48.138
Third Floor	Modal 33	Y	0.02035	0.002173	9.366
Second Floor	Modal 33	X	0.04828	0.01228	3.932
Second Floor	Modal 33	Y	0.03159	0.00242	13.055
First Floor	Modal 33	Y	0.1	0.02928	2.573
Roof	Modal 34	X	0.01018	0.00208	4.894
Roof	Modal 34	Y	0.01147	0.002434	4.712
Third Floor	Modal 34	X	0.01574	0.00387	4.067
Third Floor	Modal 34	Y	0.01711	0.005849	2.926
Second Floor	Modal 34	X	0.02181	0.001384	15.764
Second Floor	Modal 34	Y	0.02778	0.008184	3.394
First Floor	Modal 34	X	0.03141	0.005642	5.568
First Floor	Modal 34	Y	0.03878	0.005109	7.591
Roof	Modal 35	X	0.01477	0.003419	4.319
Roof	Modal 35	Y	0.03002	0.01175	2.554
Third Floor	Modal 35	X	0.0161	0.002136	7.536
Third Floor	Modal 35	Y	0.02138	0.0017	12.577
Second Floor	Modal 35	X	0.01886	0.0002898	65.08
Second Floor	Modal 35	Y	0.03471	0.002046	16.969
First Floor	Modal 35	X	0.04642	0.004275	10.86
First Floor	Modal 35	Y	0.1	0.01949	3.82

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Roof	Modal 36	X	0.01609	0.004882	3.295
Roof	Modal 36	Y	0.0219	0.008015	2.732
Third Floor	Modal 36	X	0.008581	0.0006705	12.798
Third Floor	Modal 36	Y	0.01444	0.001195	12.085
Second Floor	Modal 36	X	0.03101	0.003642	8.514
Second Floor	Modal 36	Y	0.02896	0.008797	3.292
First Floor	Modal 36	X	0.1	0.008417	6.618
First Floor	Modal 36	Y	0.03518	0.001081	32.543
Roof	Modal 37	X	0.01321	0.002962	4.46
Roof	Modal 37	Y	0.02152	0.007508	2.867
Third Floor	Modal 37	X	0.01627	0.003245	5.014
Third Floor	Modal 37	Y	0.02292	0.005908	3.879
Second Floor	Modal 37	X	0.02314	0.003326	6.957
Second Floor	Modal 37	Y	0.02817	0.004296	6.559
First Floor	Modal 37	X	0.1	0.01584	3.618
First Floor	Modal 37	Y	0.1	0.01668	4.563
Roof	Modal 38	X	0.01394	0.002563	5.44
Roof	Modal 38	Y	0.01827	0.00336	5.439
Third Floor	Modal 38	X	0.02012	0.006515	3.089
Third Floor	Modal 38	Y	0.01887	0.005745	3.285
Second Floor	Modal 38	X	0.02924	0.005065	5.774
Second Floor	Modal 38	Y	0.01448	0.003768	3.843
First Floor	Modal 38	X	0.1	0.02613	3.35
First Floor	Modal 38	Y	0.1	0.01869	3.596
Roof	Modal 39	X	0.009172	0.001458	6.291
Roof	Modal 39	Y	0.009457	0.003208	2.948
Third Floor	Modal 39	X	0.009326	0.002112	4.416
Third Floor	Modal 39	Y	0.01024	0.002318	4.418
Second Floor	Modal 39	Y	0.01821	0.004179	4.357
First Floor	Modal 39	X	0.03871	0.01182	3.274
Roof	Modal 40	X	0.008708	0.00167	5.213
Roof	Modal 40	Y	0.01208	0.004507	2.68
Third Floor	Modal 40	X	0.00696	0.001063	6.544
Third Floor	Modal 40	Y	0.008956	0.002023	4.426
Second Floor	Modal 40	X	0.01472	0.002259	6.515
Second Floor	Modal 40	Y	0.02668	0.006045	4.414
First Floor	Modal 40	X	0.02942	0.008899	3.307
First Floor	Modal 40	Y	0.03619	0.01056	3.428
Roof	Dead	X	0.1	0.01718	3.605
Roof	Dead	Y	0.1	0.01205	9.982
Third Floor	Dead	X	0.1	0.0216	2.454
Third Floor	Dead	Y	0.1	0.01865	5.098
Second Floor	Dead	X	0.03976	0.02148	1.851
Second Floor	Dead	Y	0.1	0.02154	3.214
First Floor	Dead	X	0.04064	0.02303	1.765
First Floor	Dead	Y	0.1	0.03834	1.934
Roof	Live	X	0.01874	0.004067	4.607
Roof	Live	Y	0.1	0.02812	2.205
Third Floor	Live	X	0.01885	0.007394	2.549

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Third Floor	Live	Y	0.1	0.02448	2.067
Second Floor	Live	X	0.01327	0.006509	2.038
Second Floor	Live	Y	0.03466	0.01806	1.919
First Floor	Live	X	0.01031	0.006888	1.496
First Floor	Live	Y	0.01831	0.01122	1.632
Roof	SDead	X	0.02595	0.01531	1.695
Third Floor	SDead	X	0.01335	0.006268	2.13
Third Floor	SDead	Y	0.01889	0.00202	9.35
Second Floor	SDead	X	0.00603	0.001755	3.436
Second Floor	SDead	Y	0.01333	0.003116	4.277
First Floor	SDead	X	0.006611	0.003487	1.896
First Floor	SDead	Y	0.01333	0.006632	2.011
Roof	Wind 1	X	0.4	0.4	1.04
Third Floor	Wind 1	X	0.3	0.3	1.064
Second Floor	Wind 1	X	0.2	0.2	1.089
First Floor	Wind 1	X	0.1	0.1	1.091
Roof	Wind 2	X	0.8	0.7	1.152
Roof	Wind 2	Y	0.5	0.2	2.252
Third Floor	Wind 2	X	0.6	0.5	1.192
Third Floor	Wind 2	Y	0.4	0.2	2.293
Second Floor	Wind 2	X	0.4	0.4	1.228
Second Floor	Wind 2	Y	0.3	0.1	2.306
First Floor	Wind 2	X	0.2	0.2	1.293
First Floor	Wind 2	Y	0.1	0.1	2.192
Roof	Wind 3	X	0.1	0.1	2.482
Roof	Wind 3	Y	0.5	0.3	1.764
Third Floor	Wind 3	X	0.1	0.03882	3.167
Third Floor	Wind 3	Y	0.4	0.2	1.782
Second Floor	Wind 3	X	0.1	0.02719	3.653
Second Floor	Wind 3	Y	0.3	0.2	1.793
First Floor	Wind 3	X	0.1	0.01648	4.049
First Floor	Wind 3	Y	0.2	0.1	1.893
Roof	Wind 4	X	0.7	0.6	1.073
Roof	Wind 4	Y	0.3	0.2	1.607
Third Floor	Wind 4	X	0.5	0.5	1.087
Third Floor	Wind 4	Y	0.2	0.1	1.595
Second Floor	Wind 4	X	0.3	0.3	1.114
Second Floor	Wind 4	Y	0.2	0.1	1.601
First Floor	Wind 4	X	0.2	0.1	1.37
First Floor	Wind 4	Y	0.1	0.1	1.833
Roof	Wind 5	X	0.4	0.4	1.029
Third Floor	Wind 5	X	0.3	0.3	1.049
Second Floor	Wind 5	X	0.2	0.2	1.072
First Floor	Wind 5	X	0.1	0.1	1.17
Roof	Wind 6	X	0.6	0.6	1.035
Roof	Wind 6	Y	0.2	0.2	1.277
Third Floor	Wind 6	X	0.5	0.5	1.072
Third Floor	Wind 6	Y	0.2	0.1	1.33
Second Floor	Wind 6	X	0.4	0.3	1.109

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Second Floor	Wind 6	Y	0.2	0.1	1.401
First Floor	Wind 6	X	0.2	0.1	1.22
First Floor	Wind 6	Y	0.1	0.1	1.56
Roof	Wind 7	X	0.1	0.02703	2.641
Roof	Wind 7	Y	0.3	0.2	1.469
Third Floor	Wind 7	Y	0.3	0.2	1.485
Second Floor	Wind 7	Y	0.2	0.1	1.525
First Floor	Wind 7	Y	0.2	0.1	1.643
Roof	Wind 8	X	0.8	0.7	1.113
Roof	Wind 8	Y	0.3	0.1	2.241
Third Floor	Wind 8	X	0.6	0.5	1.132
Third Floor	Wind 8	Y	0.3	0.1	2.212
Second Floor	Wind 8	X	0.4	0.3	1.148
Second Floor	Wind 8	Y	0.2	0.1	2.164
First Floor	Wind 8	X	0.2	0.2	1.198
First Floor	Wind 8	Y	0.1	0.04702	2.064
Roof	EQ 1	X	4.1	3.9	1.041
Third Floor	EQ 1	X	3.2	3	1.058
Second Floor	EQ 1	X	2.1	2	1.059
First Floor	EQ 1	X	0.9	0.8	1.086
Roof	EQ 2	Y	1.2	1	1.167
Third Floor	EQ 2	Y	1	0.8	1.195
Second Floor	EQ 2	Y	0.8	0.6	1.285
First Floor	EQ 2	Y	0.6	0.4	1.597
Roof	EQ 3	X	4	3.9	1.033
Third Floor	EQ 3	X	3.2	3	1.048
Second Floor	EQ 3	X	2	1.9	1.049
First Floor	EQ 3	X	0.9	0.8	1.085
Roof	EQ 4	X	0.3	0.1	2.434
Roof	EQ 4	Y	1.4	1.1	1.354
Third Floor	EQ 4	X	0.3	0.1	3.281
Third Floor	EQ 4	Y	1.2	0.8	1.385
Second Floor	EQ 4	X	0.3	0.1	3.813
Second Floor	EQ 4	Y	0.8	0.6	1.426
First Floor	EQ 4	X	0.2	0.1	3.889
First Floor	EQ 4	Y	0.6	0.4	1.681
Roof	EQ 5	X	4.1	3.9	1.049
Third Floor	EQ 5	X	3.3	3.1	1.068
Second Floor	EQ 5	X	2.1	2	1.07
First Floor	EQ 5	X	0.9	0.8	1.088
Roof	EQ 6	Y	1.1	1	1.045
Third Floor	EQ 6	Y	0.9	0.8	1.111
Second Floor	EQ 6	Y	0.8	0.6	1.196
First Floor	EQ 6	Y	0.6	0.4	1.521
Roof	-EQ 1	X	4.1	3.9	1.041
Third Floor	-EQ 1	X	3.2	3	1.058
Second Floor	-EQ 1	X	2.1	2	1.059
First Floor	-EQ 1	X	0.9	0.8	1.086
Roof	-EQ 2	Y	1.2	1	1.167

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Third Floor	-EQ 2	Y	1	0.8	1.195
Second Floor	-EQ 2	Y	0.8	0.6	1.285
First Floor	-EQ 2	Y	0.6	0.4	1.597
Roof	-EQ 3	X	4	3.9	1.033
Third Floor	-EQ 3	X	3.2	3	1.048
Second Floor	-EQ 3	X	2	1.9	1.049
First Floor	-EQ 3	X	0.9	0.8	1.085
Roof	-EQ 4	X	0.3	0.1	2.434
Roof	-EQ 4	Y	1.4	1.1	1.354
Third Floor	-EQ 4	X	0.3	0.1	3.281
Third Floor	-EQ 4	Y	1.2	0.8	1.385
Second Floor	-EQ 4	X	0.3	0.1	3.813
Second Floor	-EQ 4	Y	0.8	0.6	1.426
First Floor	-EQ 4	X	0.2	0.1	3.889
First Floor	-EQ 4	Y	0.6	0.4	1.681
Roof	-EQ 5	X	4.1	3.9	1.049
Third Floor	-EQ 5	X	3.3	3.1	1.068
Second Floor	-EQ 5	X	2.1	2	1.07
First Floor	-EQ 5	X	0.9	0.8	1.088
Roof	-EQ 6	Y	1.1	1	1.045
Third Floor	-EQ 6	Y	0.9	0.8	1.111
Second Floor	-EQ 6	Y	0.8	0.6	1.196
First Floor	-EQ 6	Y	0.6	0.4	1.521
Roof	Serv 01 (G)	X	0.1	0.001866	30.691
Roof	Serv 01 (G)	Y	0.1	0.01281	11.353
Third Floor	Serv 01 (G)	X	0.1	0.01534	3.511
Third Floor	Serv 01 (G)	Y	0.1	0.02067	5.513
Second Floor	Serv 01 (G)	X	0.04228	0.01973	2.143
Second Floor	Serv 01 (G)	Y	0.1	0.02466	3.348
First Floor	Serv 01 (G)	X	0.04725	0.02662	1.775
First Floor	Serv 01 (G)	Y	0.1	0.04497	1.945
Roof	Serv 02 (G+0.7Q)	X	0.1	0.004626	15.175
Roof	Serv 02 (G+0.7Q)	Y	0.2	0.03239	5.825
Third Floor	Serv 02 (G+0.7Q)	X	0.1	0.02071	3.236
Third Floor	Serv 02 (G+0.7Q)	Y	0.1	0.03654	4.008
Second Floor	Serv 02 (G+0.7Q)	X	0.04919	0.0231	2.13
Second Floor	Serv 02 (G+0.7Q)	Y	0.1	0.03572	2.902
First Floor	Serv 02 (G+0.7Q)	X	0.1	0.03156	1.718
First Floor	Serv 02 (G+0.7Q)	Y	0.1	0.1	1.899
Roof	Serv 03 (G+Wind) Max	X	0.5	0.5	1.046
Roof	Serv 03 (G+Wind) Max	Y	0.2	0.2	1.103
Third Floor	Serv 03 (G+Wind) Max	X	0.4	0.4	1.079
Third Floor	Serv 03 (G+Wind) Max	Y	0.2	0.2	1.19
Second Floor	Serv 03 (G+Wind) Max	X	0.3	0.3	1.115
Second Floor	Serv 03 (G+Wind) Max	Y	0.2	0.1	1.324
First Floor	Serv 03 (G+Wind) Max	X	0.2	0.1	1.223
First Floor	Serv 03 (G+Wind) Max	Y	0.2	0.1	1.607
Roof	Serv 03 (G+Wind) Min	X	0.5	0.4	1.097
Roof	Serv 03 (G+Wind) Min	Y	0.2	0.1	1.441

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Third Floor	Serv 03 (G+Wind) Min	X	0.3	0.3	1.098
Third Floor	Serv 03 (G+Wind) Min	Y	0.1	0.1	1.343
Second Floor	Serv 03 (G+Wind) Min	X	0.2	0.2	1.112
Second Floor	Serv 03 (G+Wind) Min	Y	0.1	0.1	1.449
First Floor	Serv 03 (G+Wind) Min	X	0.1	0.1	1.218
First Floor	Serv 03 (G+Wind) Min	Y	0.1	0.01178	7.368
Roof	Ult 01 (1.35G)	X	0.1	0.002518	30.691
Roof	Ult 01 (1.35G)	Y	0.2	0.0173	11.353
Third Floor	Ult 01 (1.35G)	X	0.1	0.0207	3.511
Third Floor	Ult 01 (1.35G)	Y	0.2	0.0279	5.513
Second Floor	Ult 01 (1.35G)	X	0.1	0.02664	2.143
Second Floor	Ult 01 (1.35G)	Y	0.1	0.03329	3.348
First Floor	Ult 01 (1.35G)	X	0.1	0.03593	1.775
First Floor	Ult 01 (1.35G)	Y	0.1	0.1	1.945
Roof	Ult 02 (1.2G+1.5Q)	X	0.1	0.008154	11.827
Roof	Ult 02 (1.2G+1.5Q)	Y	0.3	0.1	4.66
Third Floor	Ult 02 (1.2G+1.5Q)	X	0.1	0.02993	3.104
Third Floor	Ult 02 (1.2G+1.5Q)	Y	0.2	0.1	3.509
Second Floor	Ult 02 (1.2G+1.5Q)	X	0.1	0.03117	2.121
Second Floor	Ult 02 (1.2G+1.5Q)	Y	0.1	0.1	2.708
First Floor	Ult 02 (1.2G+1.5Q)	X	0.1	0.04254	1.685
First Floor	Ult 02 (1.2G+1.5Q)	Y	0.1	0.1	1.871
Roof	Ult 03 (1.2G+Wind+0.4Q) Max	X	0.8	0.7	1.057
Roof	Ult 03 (1.2G+Wind+0.4Q) Max	Y	0.4	0.3	1.147
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Max	X	0.6	0.6	1.084
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Max	Y	0.3	0.3	1.231
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Max	X	0.4	0.4	1.116
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Max	Y	0.3	0.2	1.355
First Floor	Ult 03 (1.2G+Wind+0.4Q) Max	X	0.2	0.2	1.215
First Floor	Ult 03 (1.2G+Wind+0.4Q) Max	Y	0.2	0.2	1.614
Roof	Ult 03 (1.2G+Wind+0.4Q) Min	X	0.7	0.6	1.083
Roof	Ult 03 (1.2G+Wind+0.4Q) Min	Y	0.3	0.2	1.333
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Min	X	0.5	0.5	1.085
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Min	Y	0.2	0.2	1.259
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Min	X	0.3	0.3	1.097
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Min	Y	0.2	0.1	1.368
First Floor	Ult 03 (1.2G+Wind+0.4Q) Min	X	0.2	0.1	1.198
First Floor	Ult 03 (1.2G+Wind+0.4Q) Min	Y	0.1	0.02832	4.689
Roof	Ult 04 (0.9G+Wind) Max	X	0.8	0.7	1.082
Roof	Ult 04 (0.9G+Wind) Max	Y	0.4	0.3	1.319
Third Floor	Ult 04 (0.9G+Wind) Max	X	0.6	0.6	1.107
Third Floor	Ult 04 (0.9G+Wind) Max	Y	0.3	0.2	1.369
Second Floor	Ult 04 (0.9G+Wind) Max	X	0.4	0.4	1.136
Second Floor	Ult 04 (0.9G+Wind) Max	Y	0.3	0.2	1.455
First Floor	Ult 04 (0.9G+Wind) Max	X	0.2	0.2	1.204
First Floor	Ult 04 (0.9G+Wind) Max	Y	0.2	0.1	1.66
Roof	Ult 04 (0.9G+Wind) Min	X	0.7	0.6	1.049
Roof	Ult 04 (0.9G+Wind) Min	Y	0.2	0.2	1.085
Third Floor	Ult 04 (0.9G+Wind) Min	X	0.5	0.5	1.063

Table 2.1 - Story Max/Avg Displacements (continued)

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Third Floor	Ult 04 (0.9G+Wind) Min	Y	0.2	0.2	1.156
Second Floor	Ult 04 (0.9G+Wind) Min	X	0.3	0.3	1.074
Second Floor	Ult 04 (0.9G+Wind) Min	Y	0.2	0.1	1.352
First Floor	Ult 04 (0.9G+Wind) Min	X	0.2	0.1	1.159
First Floor	Ult 04 (0.9G+Wind) Min	Y	0.1	0.04957	2.859
Roof	Ult 05 (G+EQ+0.3Q) Max	X	4.1	3.9	1.033
Roof	Ult 05 (G+EQ+0.3Q) Max	Y	1.3	1.2	1.085
Third Floor	Ult 05 (G+EQ+0.3Q) Max	X	3.3	3.1	1.054
Third Floor	Ult 05 (G+EQ+0.3Q) Max	Y	1.1	1	1.086
Second Floor	Ult 05 (G+EQ+0.3Q) Max	X	2.1	2	1.059
Second Floor	Ult 05 (G+EQ+0.3Q) Max	Y	0.8	0.7	1.153
First Floor	Ult 05 (G+EQ+0.3Q) Max	X	0.9	0.8	1.109
First Floor	Ult 05 (G+EQ+0.3Q) Max	Y	0.6	0.4	1.47
Roof	Ult 05 (G+EQ+0.3Q) Min	X	0.1	0.01344	5.972
Roof	Ult 05 (G+EQ+0.3Q) Min	Y	0.2	0.009326	23.099
Third Floor	Ult 05 (G+EQ+0.3Q) Min	X	0.1	0.01977	5.279
Third Floor	Ult 05 (G+EQ+0.3Q) Min	Y	0.2	0.01925	12.173
Second Floor	Ult 05 (G+EQ+0.3Q) Min	X	0.1	0.001639	58.168
Second Floor	Ult 05 (G+EQ+0.3Q) Min	Y	0.2	0.0084	19.893
First Floor	Ult 05 (G+EQ+0.3Q) Min	X	0.2	0.03675	4.935
First Floor	Ult 05 (G+EQ+0.3Q) Min	Y	0.2	0.1	2.756
Roof	Ult 06 (G-EQ+0.3Q) Max	X	0.1	0.03109	3.186
Roof	Ult 06 (G-EQ+0.3Q) Max	Y	0.5	0.1	10.625
Third Floor	Ult 06 (G-EQ+0.3Q) Max	X	0.2	0.1	3.107
Third Floor	Ult 06 (G-EQ+0.3Q) Max	Y	0.5	0.1	6.483
Second Floor	Ult 06 (G-EQ+0.3Q) Max	X	0.2	0.04417	3.754
Second Floor	Ult 06 (G-EQ+0.3Q) Max	Y	0.3	0.1	5.188
First Floor	Ult 06 (G-EQ+0.3Q) Max	X	0.2	0.03388	6.019
First Floor	Ult 06 (G-EQ+0.3Q) Max	Y	0.1	0.04043	3.427
Roof	Ult 06 (G-EQ+0.3Q) Min	X	4.2	3.9	1.061
Roof	Ult 06 (G-EQ+0.3Q) Min	Y	1.5	1.2	1.276
Third Floor	Ult 06 (G-EQ+0.3Q) Min	X	3.3	3.1	1.076
Third Floor	Ult 06 (G-EQ+0.3Q) Min	Y	1.2	1	1.28
Second Floor	Ult 06 (G-EQ+0.3Q) Min	X	2.1	2	1.075
Second Floor	Ult 06 (G-EQ+0.3Q) Min	Y	0.8	0.6	1.306
First Floor	Ult 06 (G-EQ+0.3Q) Min	X	0.8	0.8	1.08
First Floor	Ult 06 (G-EQ+0.3Q) Min	Y	0.6	0.4	1.64

max Δ<sub>n</sub>  
at roof  
level.

Table 2.2 - Story Drifts

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Roof	Modal 1	X	3.008E-06	26	42.8	20	14
Roof	Modal 2	Y	3.151E-06	26	42.8	20	14
Roof	Modal 3	X	1.684E-06	16	5	5.4	14
Roof	Modal 3	Y	4.35E-06	18	5	20	14
Roof	Modal 4	X	1.37E-06	26	42.8	20	14
Roof	Modal 5	X	1.51E-06	18	5	20	14
Roof	Modal 6	X	4.229E-06	225	42.8	15.065	14
Roof	Modal 7	X	4.951E-06	225	42.8	15.065	14

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Roof	Modal 8	X	1.266E-06	26	42.8	20	14
Roof	Modal 9	X	1.781E-06	18	5	20	14
Roof	Modal 10	X	1.043E-06	25	42.8	15.075	14
Roof	Modal 10	Y	2.542E-07	38	23.9	5.4	14
Roof	Modal 11	X	3.631E-06	16	5	5.4	14
Roof	Modal 11	Y	4.737E-06	38	23.9	5.4	14
Roof	Modal 12	X	3.268E-06	24	42.8	5.4	14
Roof	Modal 12	Y	3.785E-06	38	23.9	5.4	14
Roof	Modal 13	X	1.033E-06	16	5	5.4	14
Roof	Modal 13	Y	7.888E-07	27	40.2	20	14
Roof	Modal 14	X	5.052E-06	24	42.8	5.4	14
Roof	Modal 15	X	1.243E-06	16	5	5.4	14
Roof	Modal 15	Y	5.103E-07	24	42.8	5.4	14
Roof	Modal 16	X	6.294E-06	24	42.8	5.4	14
Roof	Modal 16	Y	2.461E-06	24	42.8	5.4	14
Roof	Modal 17	X	3.903E-06	16	5	5.4	14
Roof	Modal 17	Y	1.157E-06	16	5	5.4	14
Roof	Modal 18	X	1.715E-05	24	42.8	5.4	14
Roof	Modal 18	Y	3.989E-06	157	42.8	10.4	14
Roof	Modal 19	X	1.576E-05	16	5	5.4	14
Roof	Modal 19	Y	3.667E-06	16	5	5.4	14
Roof	Modal 20	X	4.74E-06	16	5	5.4	14
Roof	Modal 21	X	1.489E-06	195	36.5	18.5	14
Roof	Modal 21	Y	1.795E-06	24	42.8	5.4	14
Roof	Modal 22	X	4.749E-06	50	36.5	20.1	14
Roof	Modal 23	X	5.223E-06	24	42.8	5.4	14
Roof	Modal 23	Y	5.063E-06	24	42.8	5.4	14
Roof	Modal 24	X	4.739E-06	16	5	5.4	14
Roof	Modal 24	Y	3.539E-06	48	23.9	20.1	14
Roof	Modal 25	X	8.837E-06	24	42.8	5.4	14
Roof	Modal 25	Y	5.799E-06	48	23.9	20.1	14
Roof	Modal 26	X	6.883E-06	16	5	5.4	14
Roof	Modal 27	X	4.234E-06	45	11.3	5.4	14
Roof	Modal 27	Y	3.104E-06	16	5	5.4	14
Roof	Modal 28	X	4.93E-06	40	30.2	5.4	14
Roof	Modal 28	Y	1.411E-05	47	17.6	20.1	14
Roof	Modal 29	Y	1.339E-05	49	30.2	20.1	14
Roof	Modal 30	X	1.034E-05	45	11.3	5.4	14
Roof	Modal 30	Y	8.903E-06	49	30.2	20.1	14
Roof	Modal 31	X	9.566E-06	16	5	5.4	14
Roof	Modal 31	Y	8.69E-06	49	30.2	20.1	14
Roof	Modal 32	X	6.514E-06	38	23.9	5.4	14
Roof	Modal 32	Y	1.158E-05	47	17.6	20.1	14
Roof	Modal 33	X	4.701E-06	38	23.9	5.4	14
Roof	Modal 33	Y	4.94E-06	49	30.2	20.1	14
Roof	Modal 34	X	5.487E-06	25	42.8	15.075	14
Roof	Modal 34	Y	3.687E-06	46	11.3	20.1	14
Roof	Modal 35	X	5.449E-06	18	5	20	14
Roof	Modal 35	Y	1.372E-05	26	42.8	20	14

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Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Roof	Modal 36	X	4.484E-06	26	42.8	20	14
Roof	Modal 36	Y	9.785E-06	26	42.8	20	14
Roof	Modal 37	X	7.162E-06	26	42.8	20	14
Roof	Modal 37	Y	5.527E-06	157	42.8	10.4	14
Roof	Modal 38	X	5.982E-06	25	42.8	15.075	14
Roof	Modal 38	Y	3.644E-06	25	42.8	15.075	14
Roof	Modal 39	X	2.91E-06	50	36.5	20.1	14
Roof	Modal 39	Y	5.776E-06	18	5	20	14
Roof	Modal 40	Y	7.161E-06	26	42.8	20	14
Roof	Dead	X	6.21E-06	24	42.8	5.4	14
Roof	Dead	Y	1.249E-05	158	42.8	8	14
Roof	Live	X	2.08E-06	42	36.5	5.4	14
Roof	Live	Y	5.834E-06	16	5	5.4	14
Roof	SDead	X	4.045E-06	42	36.5	5.4	14
Roof	SDead	Y	2.925E-06	158	42.8	8	14
Roof	Wind 1	X	3.052E-05	26	42.8	20	14
Roof	Wind 2	X	5.521E-05	24	42.8	5.4	14
Roof	Wind 2	Y	3.083E-05	26	42.8	20	14
Roof	Wind 3	X	1.164E-05	24	42.8	5.4	14
Roof	Wind 3	Y	3.317E-05	26	42.8	20	14
Roof	Wind 4	X	4.985E-05	26	42.8	20	14
Roof	Wind 4	Y	2.131E-05	26	42.8	20	14
Roof	Wind 5	X	2.997E-05	23	7.6	15.1	14
Roof	Wind 6	X	4.889E-05	23	7.6	15.1	14
Roof	Wind 6	Y	1.728E-05	149	5	14.3	14
Roof	Wind 7	X	9.023E-06	16	5	5.4	14
Roof	Wind 7	Y	2.41E-05	18	5	20	14
Roof	Wind 8	X	5.414E-05	16	5	5.4	14
Roof	Wind 8	Y	2.094E-05	22	7.6	18.1	14
Roof	EQ 1	X	0.0002843	26	42.8	20	14
Roof	EQ 2	Y	8.438E-05	26	42.8	20	14
Roof	EQ 3	X	0.0002843	26	42.8	20	14
Roof	EQ 4	Y	9.99E-05	26	42.8	20	14
Roof	EQ 5	X	0.0002843	26	42.8	20	14
Roof	EQ 6	Y	7.154E-05	18	5	20	14
Roof	-EQ 1	X	0.0002843	26	42.8	20	14
Roof	-EQ 2	Y	8.438E-05	26	42.8	20	14
Roof	-EQ 3	X	0.0002843	26	42.8	20	14
Roof	-EQ 4	Y	9.99E-05	26	42.8	20	14
Roof	-EQ 5	X	0.0002843	26	42.8	20	14
Roof	-EQ 6	Y	7.154E-05	18	5	20	14
Roof	Serv 01 (G)	X	1.025E-05	24	42.8	5.4	14
Roof	Serv 01 (G)	Y	1.541E-05	158	42.8	8	14
Roof	Serv 02 (G+0.7Q)	X	1.167E-05	42	36.5	5.4	14
Roof	Serv 03 (G+Wind) Max	X	3.516E-05	27	40.2	20	14
Roof	Serv 03 (G+Wind) Max	Y	1.48E-05	16	5	5.4	14
Roof	Serv 03 (G+Wind) Min	X	4.042E-05	24	42.8	5.4	14
Roof	Serv 03 (G+Wind) Min	Y	2.049E-05	158	42.8	8	14
Roof	Ult 01 (1.35G)	X	1.384E-05	24	42.8	5.4	14

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Roof	Ult 01 (1.35G)	Y	2.081E-05	158	42.8	8	14
Roof	Ult 02 (1.2G+1.5Q)	X	1.538E-05	42	36.5	5.4	14
Roof	Ult 02 (1.2G+1.5Q)	Y	2.271E-05	16	5	5.4	14
Roof	Ult 03 (1.2G+Wind+0.4Q) Max	X	5.218E-05	26	42.8	20	14
Roof	Ult 03 (1.2G+Wind+0.4Q) Max	Y	2.102E-05	16	5	5.4	14
Roof	Ult 03 (1.2G+Wind+0.4Q) Min	X	5.813E-05	24	42.8	5.4	14
Roof	Ult 03 (1.2G+Wind+0.4Q) Min	Y	2.663E-05	158	42.8	8	14
Roof	Ult 04 (0.9G+Wind) Max	X	5.108E-05	26	42.8	20	14
Roof	Ult 04 (0.9G+Wind) Max	Y	2.097E-05	26	42.8	20	14
Roof	Ult 04 (0.9G+Wind) Min	X	5.425E-05	24	42.8	5.4	14
Roof	Ult 04 (0.9G+Wind) Min	Y	2.146E-05	158	42.8	8	14
Roof	Ult 05 (G+EQ+0.3Q) Max	X	0.0002869	26	42.8	20	14
Roof	Ult 05 (G+EQ+0.3Q) Max	Y	8.605E-05	26	42.8	20	14
Roof	Ult 05 (G+EQ+0.3Q) Min	X	1.944E-05	16	5	5.4	14
Roof	Ult 06 (G-EQ+0.3Q) Max	X	3.189E-05	24	42.8	5.4	14
Roof	Ult 06 (G-EQ+0.3Q) Max	Y	3.596E-05	27	40.2	20	14
Roof	Ult 06 (G-EQ+0.3Q) Min	X	0.0002825	17	5	15.1	14
Roof	Ult 06 (G-EQ+0.3Q) Min	Y	0.0001137	26	42.8	20	14
Third Floor	Modal 1	X	3.786E-06	24	42.8	5.4	10.7
Third Floor	Modal 2	Y	3.459E-06	156	42.8	12.5	10.7
Third Floor	Modal 3	Y	5.462E-06	16	5	5.4	10.7
Third Floor	Modal 4	X	1.442E-06	41	30.2	21.6	10.7
Third Floor	Modal 5	X	1.879E-06	39	23.9	21.6	10.7
Third Floor	Modal 6	X	9.087E-06	24	42.8	5.4	10.7
Third Floor	Modal 7	X	1.102E-05	24	42.8	5.4	10.7
Third Floor	Modal 8	X	1.953E-06	24	42.8	5.4	10.7
Third Floor	Modal 8	Y	4.47E-07	156	42.8	12.5	10.7
Third Floor	Modal 9	X	4.083E-06	24	42.8	5.4	10.7
Third Floor	Modal 10	X	3E-06	24	42.8	5.4	10.7
Third Floor	Modal 11	X	9.757E-06	16	5	5.4	10.7
Third Floor	Modal 11	Y	9.48E-06	39	23.9	21.6	10.7
Third Floor	Modal 12	X	1.212E-05	24	42.8	5.4	10.7
Third Floor	Modal 12	Y	7.88E-06	39	23.9	21.6	10.7
Third Floor	Modal 13	X	2.994E-06	16	5	5.4	10.7
Third Floor	Modal 13	Y	1.601E-06	156	42.8	12.5	10.7
Third Floor	Modal 14	X	5.294E-06	24	42.8	5.4	10.7
Third Floor	Modal 15	X	1.212E-06	24	42.8	5.4	10.7
Third Floor	Modal 15	Y	4.803E-07	24	42.8	5.4	10.7
Third Floor	Modal 16	X	4.377E-06	24	42.8	5.4	10.7
Third Floor	Modal 16	Y	2.474E-06	39	23.9	21.6	10.7
Third Floor	Modal 17	X	2.818E-06	16	5	5.4	10.7
Third Floor	Modal 17	Y	2.195E-06	48	23.9	20.1	10.7
Third Floor	Modal 18	X	1.084E-05	24	42.8	5.4	10.7
Third Floor	Modal 19	X	9.933E-06	24	42.8	5.4	10.7
Third Floor	Modal 19	Y	4.385E-06	157	42.8	10.4	10.7
Third Floor	Modal 20	X	8.335E-06	39	23.9	21.6	10.7
Third Floor	Modal 20	Y	4.256E-06	24	42.8	5.4	10.7
Third Floor	Modal 21	X	1.421E-06	16	5	5.4	10.7
Third Floor	Modal 21	Y	1.61E-06	48	23.9	20.1	10.7

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Third Floor	Modal 22	X	5.096E-06	38	23.9	5.4	10.7
Third Floor	Modal 22	Y	5.391E-06	24	42.8	5.4	10.7
Third Floor	Modal 23	X	3.603E-06	16	5	5.4	10.7
Third Floor	Modal 23	Y	6.122E-06	41	30.2	21.6	10.7
Third Floor	Modal 24	X	3.665E-06	24	42.8	5.4	10.7
Third Floor	Modal 24	Y	2.397E-06	24	42.8	5.4	10.7
Third Floor	Modal 25	X	5.447E-06	41	30.2	21.6	10.7
Third Floor	Modal 25	Y	7.972E-06	24	42.8	5.4	10.7
Third Floor	Modal 26	X	2.514E-06	16	5	5.4	10.7
Third Floor	Modal 26	Y	2.583E-06	47	17.6	20.1	10.7
Third Floor	Modal 27	X	4.986E-06	16	5	5.4	10.7
Third Floor	Modal 27	Y	7.409E-06	37	17.6	21.6	10.7
Third Floor	Modal 28	Y	1.806E-05	24	42.8	5.4	10.7
Third Floor	Modal 29	X	1.904E-05	16	5	5.4	10.7
Third Floor	Modal 29	Y	1.892E-05	41	30.2	21.6	10.7
Third Floor	Modal 30	X	7.054E-06	16	5	5.4	10.7
Third Floor	Modal 30	Y	7.738E-06	41	30.2	21.6	10.7
Third Floor	Modal 31	X	1.336E-05	24	42.8	5.4	10.7
Third Floor	Modal 32	X	1.723E-05	16	5	5.4	10.7
Third Floor	Modal 32	Y	7.905E-06	16	5	5.4	10.7
Third Floor	Modal 33	X	1.308E-05	37	17.6	21.6	10.7
Third Floor	Modal 33	Y	1.075E-05	24	42.8	5.4	10.7
Third Floor	Modal 34	X	7.047E-06	43	36.5	21.6	10.7
Third Floor	Modal 34	Y	9.661E-06	37	17.6	21.6	10.7
Third Floor	Modal 35	X	6.473E-06	40	30.2	5.4	10.7
Third Floor	Modal 35	Y	6.905E-06	37	17.6	21.6	10.7
Third Floor	Modal 36	X	8.671E-06	26	42.8	20	10.7
Third Floor	Modal 36	Y	6.184E-06	33	7.6	21.6	10.7
Third Floor	Modal 37	X	9.601E-06	26	42.8	20	10.7
Third Floor	Modal 37	Y	1.972E-05	26	42.8	20	10.7
Third Floor	Modal 38	X	1.042E-05	18	5	20	10.7
Third Floor	Modal 38	Y	1.041E-05	26	42.8	20	10.7
Third Floor	Modal 39	X	1.327E-05	18	5	20	10.7
Third Floor	Modal 39	Y	5.467E-06	26	42.8	20	10.7
Third Floor	Modal 40	X	8.687E-06	26	42.8	20	10.7
Third Floor	Modal 40	Y	1.148E-05	26	42.8	20	10.7
Third Floor	Dead	X	5.315E-06	16	5	5.4	10.7
Third Floor	Dead	Y	1.114E-05	158	42.8	8	10.7
Third Floor	Live	Y	5.507E-06	16	5	5.4	10.7
Third Floor	SDead	X	2.471E-06	16	5	5.4	10.7
Third Floor	SDead	Y	2.6E-06	158	42.8	8	10.7
Third Floor	Wind 1	X	3.473E-05	158	42.8	8	10.7
Third Floor	Wind 2	X	6.597E-05	24	42.8	5.4	10.7
Third Floor	Wind 2	Y	3.357E-05	156	42.8	12.5	10.7
Third Floor	Wind 3	X	1.377E-05	24	42.8	5.4	10.7
Third Floor	Wind 3	Y	3.582E-05	26	42.8	20	10.7
Third Floor	Wind 4	X	5.406E-05	43	36.5	21.6	10.7
Third Floor	Wind 4	Y	2.208E-05	26	42.8	20	10.7
Third Floor	Wind 5	X	3.302E-05	34	40.2	21.6	10.7

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Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Third Floor	Wind 6	X	5.216E-05	33	7.6	21.6	10.7
Third Floor	Wind 6	Y	1.79E-05	18	5	20	10.7
Third Floor	Wind 7	X	8.677E-06	16	5	5.4	10.7
Third Floor	Wind 7	Y	2.625E-05	149	5	14.3	10.7
Third Floor	Wind 8	X	6.222E-05	16	5	5.4	10.7
Third Floor	Wind 8	Y	2.519E-05	16	5	5.4	10.7
Third Floor	EQ 1	X	0.0003478	24	42.8	5.4	10.7
Third Floor	EQ 2	Y	9.236E-05	156	42.8	12.5	10.7
Third Floor	EQ 3	X	0.0003422	16	5	5.4	10.7
Third Floor	EQ 4	X	3.2E-05	24	42.8	5.4	10.7
Third Floor	EQ 4	Y	0.0001116	156	42.8	12.5	10.7
Third Floor	EQ 5	X	0.0003537	24	42.8	5.4	10.7
Third Floor	EQ 6	Y	8.619E-05	16	5	5.4	10.7
Third Floor	-EQ 1	X	0.0003478	24	42.8	5.4	10.7
Third Floor	-EQ 2	Y	9.236E-05	156	42.8	12.5	10.7
Third Floor	-EQ 3	X	0.0003422	16	5	5.4	10.7
Third Floor	-EQ 4	X	3.2E-05	24	42.8	5.4	10.7
Third Floor	-EQ 4	Y	0.0001116	156	42.8	12.5	10.7
Third Floor	-EQ 5	X	0.0003537	24	42.8	5.4	10.7
Third Floor	-EQ 6	Y	8.619E-05	16	5	5.4	10.7
Third Floor	Serv 01 (G)	X	7.786E-06	16	5	5.4	10.7
Third Floor	Serv 01 (G)	Y	1.374E-05	158	42.8	8	10.7
Third Floor	Serv 02 (G+0.7Q)	X	8.728E-06	16	5	5.4	10.7
Third Floor	Serv 02 (G+0.7Q)	Y	1.643E-05	16	5	5.4	10.7
Third Floor	Serv 03 (G+Wind) Max	X	3.83E-05	34	40.2	21.6	10.7
Third Floor	Serv 03 (G+Wind) Max	Y	1.628E-05	16	5	5.4	10.7
Third Floor	Serv 03 (G+Wind) Min	X	4.061E-05	24	42.8	5.4	10.7
Third Floor	Serv 03 (G+Wind) Min	Y	1.946E-05	158	42.8	8	10.7
Third Floor	Ult 01 (1.35G)	X	1.051E-05	16	5	5.4	10.7
Third Floor	Ult 01 (1.35G)	Y	1.855E-05	158	42.8	8	10.7
Third Floor	Ult 02 (1.2G+1.5Q)	X	1.136E-05	16	5	5.4	10.7
Third Floor	Ult 02 (1.2G+1.5Q)	Y	2.335E-05	16	5	5.4	10.7
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Max	X	5.722E-05	24	42.8	5.4	10.7
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Max	Y	2.283E-05	16	5	5.4	10.7
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Min	X	5.907E-05	24	42.8	5.4	10.7
Third Floor	Ult 03 (1.2G+Wind+0.4Q) Min	Y	2.551E-05	158	42.8	8	10.7
Third Floor	Ult 04 (0.9G+Wind) Max	X	5.976E-05	24	42.8	5.4	10.7
Third Floor	Ult 04 (0.9G+Wind) Max	Y	2.44E-05	155	42.8	14.9	10.7
Third Floor	Ult 04 (0.9G+Wind) Min	X	5.653E-05	24	42.8	5.4	10.7
Third Floor	Ult 04 (0.9G+Wind) Min	Y	2.108E-05	26	42.8	20	10.7
Third Floor	Ult 05 (G+EQ+0.3Q) Max	X	0.0003464	24	42.8	5.4	10.7
Third Floor	Ult 05 (G+EQ+0.3Q) Max	Y	0.0001004	16	5	5.4	10.7
Third Floor	Ult 05 (G+EQ+0.3Q) Min	X	2.163E-05	16	5	5.4	10.7
Third Floor	Ult 05 (G+EQ+0.3Q) Min	Y	2.234E-05	150	5	11.9	10.7
Third Floor	Ult 06 (G-EQ+0.3Q) Max	X	1.77E-05	34	40.2	21.6	10.7
Third Floor	Ult 06 (G-EQ+0.3Q) Max	Y	4.875E-05	16	5	5.4	10.7
Third Floor	Ult 06 (G-EQ+0.3Q) Min	X	0.0003614	16	5	5.4	10.7
Third Floor	Ult 06 (G-EQ+0.3Q) Min	Y	0.0001249	158	42.8	8	10.7
Second Floor	Modal 1	X	4.306E-06	16	5	5.4	7.4

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Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Second Floor	Modal 2	Y	4.365E-06	157	42.8	10.4	7.4
Second Floor	Modal 3	X	3.162E-06	16	5	5.4	7.4
Second Floor	Modal 3	Y	6.602E-06	16	5	5.4	7.4
Second Floor	Modal 4	X	4.952E-07	37	17.6	21.6	7.4
Second Floor	Modal 4	Y	6.463E-07	16	5	5.4	7.4
Second Floor	Modal 5	X	7.44E-07	34	40.2	21.6	7.4
Second Floor	Modal 6	X	1.436E-06	156	42.8	12.5	7.4
Second Floor	Modal 6	Y	5.682E-07	16	5	5.4	7.4
Second Floor	Modal 7	X	1.67E-06	16	5	5.4	7.4
Second Floor	Modal 7	Y	9.292E-07	16	5	5.4	7.4
Second Floor	Modal 8	X	7.679E-07	26	42.8	20	7.4
Second Floor	Modal 8	Y	3.858E-07	16	5	5.4	7.4
Second Floor	Modal 9	X	4.833E-07	18	5	20	7.4
Second Floor	Modal 9	Y	4.574E-07	16	5	5.4	7.4
Second Floor	Modal 10	X	4.848E-06	45	11.3	5.4	7.4
Second Floor	Modal 11	X	1.676E-05	24	42.8	5.4	7.4
Second Floor	Modal 11	Y	5.701E-06	105	30.2	12.75	7.4
Second Floor	Modal 12	X	1.877E-05	24	42.8	5.4	7.4
Second Floor	Modal 12	Y	5.969E-06	156	42.8	12.5	7.4
Second Floor	Modal 13	X	5.281E-06	42	36.5	5.4	7.4
Second Floor	Modal 13	Y	1.198E-06	150	5	11.9	7.4
Second Floor	Modal 14	X	3.138E-06	24	42.8	5.4	7.4
Second Floor	Modal 14	Y	9.584E-07	156	42.8	12.5	7.4
Second Floor	Modal 15	X	6.793E-07	158	42.8	8	7.4
Second Floor	Modal 15	Y	2.198E-07	26	42.8	20	7.4
Second Floor	Modal 16	X	5.323E-06	16	5	5.4	7.4
Second Floor	Modal 17	X	3.82E-06	24	42.8	5.4	7.4
Second Floor	Modal 17	Y	1.827E-06	39	23.9	21.6	7.4
Second Floor	Modal 18	X	6.265E-06	16	5	5.4	7.4
Second Floor	Modal 19	X	6.981E-06	24	42.8	5.4	7.4
Second Floor	Modal 20	X	1.879E-06	38	23.9	5.4	7.4
Second Floor	Modal 20	Y	1.314E-06	24	42.8	5.4	7.4
Second Floor	Modal 21	X	1.865E-06	33	7.6	21.6	7.4
Second Floor	Modal 21	Y	2.279E-06	48	23.9	20.1	7.4
Second Floor	Modal 22	X	4.153E-06	24	42.8	5.4	7.4
Second Floor	Modal 23	X	4E-06	43	36.5	21.6	7.4
Second Floor	Modal 23	Y	3.712E-06	16	5	5.4	7.4
Second Floor	Modal 24	X	6.9E-06	16	5	5.4	7.4
Second Floor	Modal 24	Y	4.78E-06	39	23.9	21.6	7.4
Second Floor	Modal 25	X	5.602E-06	24	42.8	5.4	7.4
Second Floor	Modal 25	Y	5.444E-06	39	23.9	21.6	7.4
Second Floor	Modal 26	X	3.995E-06	24	42.8	5.4	7.4
Second Floor	Modal 26	Y	1.144E-06	43	36.5	21.6	7.4
Second Floor	Modal 27	X	8.879E-06	16	5	5.4	7.4
Second Floor	Modal 27	Y	9.324E-06	39	23.9	21.6	7.4
Second Floor	Modal 28	Y	1.119E-05	39	23.9	21.6	7.4
Second Floor	Modal 29	X	9.425E-06	37	17.6	21.6	7.4
Second Floor	Modal 29	Y	1.186E-05	39	23.9	21.6	7.4
Second Floor	Modal 30	X	1.605E-05	16	5	5.4	7.4

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Second Floor	Modal 30	Y	1.423E-05	41	30.2	21.6	7.4
Second Floor	Modal 31	X	1.221E-05	16	5	5.4	7.4
Second Floor	Modal 31	Y	9.047E-06	24	42.8	5.4	7.4
Second Floor	Modal 32	X	3.703E-05	24	42.8	5.4	7.4
Second Floor	Modal 32	Y	2.734E-05	24	42.8	5.4	7.4
Second Floor	Modal 33	X	2.092E-05	37	17.6	21.6	7.4
Second Floor	Modal 33	Y	2.399E-05	16	5	5.4	7.4
Second Floor	Modal 34	X	1.686E-05	39	23.9	21.6	7.4
Second Floor	Modal 34	Y	1.663E-05	16	5	5.4	7.4
Second Floor	Modal 35	X	1.675E-05	39	23.9	21.6	7.4
Second Floor	Modal 35	Y	3.184E-05	16	5	5.4	7.4
Second Floor	Modal 36	X	1.605E-05	33	7.6	21.6	7.4
Second Floor	Modal 36	Y	1.604E-05	37	17.6	21.6	7.4
Second Floor	Modal 37	X	2.484E-05	33	7.6	21.6	7.4
Second Floor	Modal 37	Y	2.933E-05	33	7.6	21.6	7.4
Second Floor	Modal 38	X	3.941E-05	26	42.8	20	7.4
Second Floor	Modal 38	Y	2.763E-05	33	7.6	21.6	7.4
Second Floor	Modal 39	X	1.443E-05	33	7.6	21.6	7.4
Second Floor	Modal 39	Y	1.185E-05	26	42.8	20	7.4
Second Floor	Modal 40	X	1.062E-05	43	36.5	21.6	7.4
Second Floor	Modal 40	Y	1.48E-05	26	42.8	20	7.4
Second Floor	Dead	X	1.289E-05	24	42.8	5.4	7.4
Second Floor	Dead	Y	2.638E-05	157	42.8	10.4	7.4
Second Floor	Live	X	3.353E-06	24	42.8	5.4	7.4
Second Floor	Live	Y	7.661E-06	37	17.6	21.6	7.4
Second Floor	SDead	X	3.97E-06	24	42.8	5.4	7.4
Second Floor	SDead	Y	5.501E-06	157	42.8	10.4	7.4
Second Floor	Wind 1	X	3.932E-05	16	5	5.4	7.4
Second Floor	Wind 2	X	7.457E-05	16	5	5.4	7.4
Second Floor	Wind 2	Y	4.033E-05	157	42.8	10.4	7.4
Second Floor	Wind 3	X	2.385E-05	24	42.8	5.4	7.4
Second Floor	Wind 3	Y	4.644E-05	157	42.8	10.4	7.4
Second Floor	Wind 4	X	5.733E-05	34	40.2	21.6	7.4
Second Floor	Wind 4	Y	2.861E-05	157	42.8	10.4	7.4
Second Floor	Wind 5	X	3.81E-05	16	5	5.4	7.4
Second Floor	Wind 6	X	5.761E-05	208	17.6	19.5	7.4
Second Floor	Wind 6	Y	1.937E-05	45	11.3	5.4	7.4
Second Floor	Wind 7	X	1.308E-05	16	5	5.4	7.4
Second Floor	Wind 7	Y	3.449E-05	16	5	5.4	7.4
Second Floor	Wind 8	X	7.721E-05	16	5	5.4	7.4
Second Floor	Wind 8	Y	3.588E-05	150	5	11.9	7.4
Second Floor	EQ 1	X	0.0004018	16	5	5.4	7.4
Second Floor	EQ 2	X	3.965E-05	24	42.8	5.4	7.4
Second Floor	EQ 2	Y	0.0001155	157	42.8	10.4	7.4
Second Floor	EQ 3	X	0.0003939	16	5	5.4	7.4
Second Floor	EQ 4	X	5.803E-05	24	42.8	5.4	7.4
Second Floor	EQ 4	Y	0.0001396	157	42.8	10.4	7.4
Second Floor	EQ 5	X	0.0004096	16	5	5.4	7.4
Second Floor	EQ 6	Y	0.0001086	16	5	5.4	7.4

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
Second Floor	-EQ 1	X	0.0004018	16	5	5.4	7.4
Second Floor	-EQ 2	X	3.965E-05	24	42.8	5.4	7.4
Second Floor	-EQ 2	Y	0.0001155	157	42.8	10.4	7.4
Second Floor	-EQ 3	X	0.0003939	16	5	5.4	7.4
Second Floor	-EQ 4	X	5.803E-05	24	42.8	5.4	7.4
Second Floor	-EQ 4	Y	0.0001396	157	42.8	10.4	7.4
Second Floor	-EQ 5	X	0.0004096	16	5	5.4	7.4
Second Floor	-EQ 6	Y	0.0001086	16	5	5.4	7.4
Second Floor	Serv 01 (G)	X	1.686E-05	24	42.8	5.4	7.4
Second Floor	Serv 01 (G)	Y	3.188E-05	157	42.8	10.4	7.4
Second Floor	Serv 02 (G+0.7Q)	X	1.921E-05	24	42.8	5.4	7.4
Second Floor	Serv 02 (G+0.7Q)	Y	3.526E-05	157	42.8	10.4	7.4
Second Floor	Serv 03 (G+Wind) Max	X	4.754E-05	16	5	5.4	7.4
Second Floor	Serv 03 (G+Wind) Max	Y	1.763E-05	150	5	11.9	7.4
Second Floor	Serv 03 (G+Wind) Min	X	5.347E-05	24	42.8	5.4	7.4
Second Floor	Serv 03 (G+Wind) Min	Y	3.983E-05	157	42.8	10.4	7.4
Second Floor	Ult 01 (1.35G)	X	2.277E-05	24	42.8	5.4	7.4
Second Floor	Ult 01 (1.35G)	Y	4.304E-05	157	42.8	10.4	7.4
Second Floor	Ult 02 (1.2G+1.5Q)	X	2.527E-05	24	42.8	5.4	7.4
Second Floor	Ult 02 (1.2G+1.5Q)	Y	4.549E-05	157	42.8	10.4	7.4
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Max	X	7.158E-05	16	5	5.4	7.4
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Max	Y	2.646E-05	25	42.8	15.075	7.4
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Min	X	7.621E-05	24	42.8	5.4	7.4
Second Floor	Ult 03 (1.2G+Wind+0.4Q) Min	Y	5.205E-05	157	42.8	10.4	7.4
Second Floor	Ult 04 (0.9G+Wind) Max	X	7.344E-05	16	5	5.4	7.4
Second Floor	Ult 04 (0.9G+Wind) Max	Y	2.989E-05	225	42.8	15.065	7.4
Second Floor	Ult 04 (0.9G+Wind) Min	X	6.981E-05	24	42.8	5.4	7.4
Second Floor	Ult 04 (0.9G+Wind) Min	Y	4.056E-05	157	42.8	10.4	7.4
Second Floor	Ult 05 (G+EQ+0.3Q) Max	X	0.0004049	16	5	5.4	7.4
Second Floor	Ult 05 (G+EQ+0.3Q) Max	Y	0.0001182	150	5	11.9	7.4
Second Floor	Ult 05 (G+EQ+0.3Q) Min	X	2.779E-05	45	11.3	5.4	7.4
Second Floor	Ult 05 (G+EQ+0.3Q) Min	Y	4.27E-05	16	5	5.4	7.4
Second Floor	Ult 06 (G-EQ+0.3Q) Max	X	3.915E-05	24	42.8	5.4	7.4
Second Floor	Ult 06 (G-EQ+0.3Q) Max	Y	6.695E-05	150	5	11.9	7.4
Second Floor	Ult 06 (G-EQ+0.3Q) Min	X	0.0004142	16	5	5.4	7.4
Second Floor	Ult 06 (G-EQ+0.3Q) Min	Y	0.0001729	157	42.8	10.4	7.4
First Floor	Modal 1	X	2.745E-06	130	5	17.05	4.1
First Floor	Modal 2	X	2.051E-06	29	11.3	3.35	4.1
First Floor	Modal 2	Y	4.889E-06	10	30.2	15.075	4.1
First Floor	Modal 3	X	5.939E-06	113	42.8	17.0375	4.1
First Floor	Modal 3	Y	3.964E-06	18	5	20	4.1
First Floor	Modal 4	X	8.582E-05	113	42.8	17.0375	4.1
First Floor	Modal 5	X	8.599E-05	130	5	17.05	4.1
First Floor	Modal 6	X	1.269E-05	29	11.3	3.35	4.1
First Floor	Modal 7	X	1.611E-05	29	11.3	3.35	4.1
First Floor	Modal 8	X	7.152E-05	113	42.8	17.0375	4.1
First Floor	Modal 9	X	7.069E-05	130	5	17.05	4.1
First Floor	Modal 10	X	0.0002051	29	11.3	3.35	4.1
First Floor	Modal 11	X	1.132E-05	24	42.8	5.4	4.1

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
First Floor	Modal 11	Y	9.25E-06	4	23.9	19.8	4.1
First Floor	Modal 12	X	2.445E-05	29	11.3	3.35	4.1
First Floor	Modal 12	Y	7.324E-06	4	23.9	19.8	4.1
First Floor	Modal 13	X	4.029E-06	29	11.3	3.35	4.1
First Floor	Modal 13	Y	1.219E-06	4	23.9	19.8	4.1
First Floor	Modal 14	X	1.966E-05	113	42.8	17.0375	4.1
First Floor	Modal 15	X	1.905E-05	130	5	17.05	4.1
First Floor	Modal 16	X	2.431E-06	29	11.3	3.35	4.1
First Floor	Modal 16	Y	1.512E-06	5	30.2	19.8	4.1
First Floor	Modal 17	X	4.294E-06	29	11.3	3.35	4.1
First Floor	Modal 17	Y	1.603E-06	14	30.2	7.425	4.1
First Floor	Modal 18	X	2.614E-06	61	5	19	4.1
First Floor	Modal 18	Y	1.468E-06	24	42.8	5.4	4.1
First Floor	Modal 19	X	1.613E-06	81	42.8	19	4.1
First Floor	Modal 19	Y	2.035E-06	15	36.5	7.425	4.1
First Floor	Modal 20	X	2.297E-05	29	11.3	3.35	4.1
First Floor	Modal 21	X	1.272E-05	29	11.3	3.35	4.1
First Floor	Modal 21	Y	1.976E-06	16	5	5.4	4.1
First Floor	Modal 22	X	7.668E-05	29	11.3	3.35	4.1
First Floor	Modal 23	X	5.913E-05	29	11.3	3.35	4.1
First Floor	Modal 24	X	4.698E-05	29	11.3	3.35	4.1
First Floor	Modal 25	X	1.393E-05	134	7.6	17.05	4.1
First Floor	Modal 25	Y	5.063E-06	2	11.3	19.8	4.1
First Floor	Modal 26	X	5.46E-05	29	11.3	3.35	4.1
First Floor	Modal 27	X	3.835E-05	29	11.3	3.35	4.1
First Floor	Modal 28	X	2.124E-05	81	42.8	19	4.1
First Floor	Modal 28	Y	1.068E-05	24	42.8	5.4	4.1
First Floor	Modal 29	X	1.968E-05	29	11.3	3.35	4.1
First Floor	Modal 29	Y	7.188E-06	16	5	5.4	4.1
First Floor	Modal 30	X	2.169E-05	130	5	17.05	4.1
First Floor	Modal 30	Y	7.02E-06	24	42.8	5.4	4.1
First Floor	Modal 31	X	6.151E-05	29	11.3	3.35	4.1
First Floor	Modal 32	X	3.568E-05	29	11.3	3.35	4.1
First Floor	Modal 32	Y	1.343E-05	24	42.8	5.4	4.1
First Floor	Modal 33	X	5.974E-05	29	11.3	3.35	4.1
First Floor	Modal 33	Y	1.838E-05	16	5	5.4	4.1
First Floor	Modal 34	X	8.646E-05	29	11.3	3.35	4.1
First Floor	Modal 35	X	2.945E-05	29	11.3	3.35	4.1
First Floor	Modal 35	Y	1.816E-05	16	5	5.4	4.1
First Floor	Modal 36	X	1.577E-05	81	42.8	19	4.1
First Floor	Modal 37	X	2.452E-05	29	11.3	3.35	4.1
First Floor	Modal 37	Y	2.907E-05	81	42.8	19	4.1
First Floor	Modal 38	X	3.171E-05	26	42.8	20	4.1
First Floor	Modal 38	Y	1.64E-05	19	7.6	20	4.1
First Floor	Modal 39	X	1.064E-05	29	11.3	3.35	4.1
First Floor	Modal 39	Y	4.881E-06	24	42.8	5.4	4.1
First Floor	Modal 40	X	7.502E-06	26	42.8	20	4.1
First Floor	Modal 40	Y	6.315E-06	16	5	5.4	4.1
First Floor	Dead	X	1.23E-05	24	42.8	5.4	4.1

Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
First Floor	Dead	Y	1.808E-05	53	42.8	9.01	4.1
First Floor	Live	X	2.72E-06	24	42.8	5.4	4.1
First Floor	Live	Y	4.466E-06	53	42.8	9.01	4.1
First Floor	SDead	X	2.076E-06	24	42.8	5.4	4.1
First Floor	SDead	Y	3.252E-06	53	42.8	9.01	4.1
First Floor	Wind 1	X	2.432E-05	77	5	13.32	4.1
First Floor	Wind 2	X	5.11E-05	29	11.3	3.35	4.1
First Floor	Wind 2	Y	3.69E-05	24	42.8	5.4	4.1
First Floor	Wind 3	X	1.881E-05	29	11.3	3.35	4.1
First Floor	Wind 3	Y	4.76E-05	14	30.2	7.425	4.1
First Floor	Wind 4	X	5.065E-05	24	42.8	5.4	4.1
First Floor	Wind 4	Y	3.003E-05	14	30.2	7.425	4.1
First Floor	Wind 5	X	2.664E-05	141	40.2	17.5375	4.1
First Floor	Wind 6	X	4.224E-05	6	36.5	19.8	4.1
First Floor	Wind 6	Y	2.652E-05	4	23.9	19.8	4.1
First Floor	Wind 7	Y	3.88E-05	3	17.6	19.8	4.1
First Floor	Wind 8	X	4.462E-05	24	42.8	5.4	4.1
First Floor	Wind 8	Y	2.472E-05	18	5	20	4.1
First Floor	EQ 1	X	0.0002805	130	5	17.05	4.1
First Floor	EQ 2	Y	0.0001412	9	23.9	15.075	4.1
First Floor	EQ 3	X	0.0002806	130	5	17.05	4.1
First Floor	EQ 4	X	5.696E-05	29	11.3	3.35	4.1
First Floor	EQ 4	Y	0.0001464	10	30.2	15.075	4.1
First Floor	EQ 5	X	0.0002804	130	5	17.05	4.1
First Floor	EQ 6	Y	0.000138	9	23.9	15.075	4.1
First Floor	-EQ 1	X	0.0002805	130	5	17.05	4.1
First Floor	-EQ 2	Y	0.0001412	9	23.9	15.075	4.1
First Floor	-EQ 3	X	0.0002806	130	5	17.05	4.1
First Floor	-EQ 4	X	5.696E-05	29	11.3	3.35	4.1
First Floor	-EQ 4	Y	0.0001464	10	30.2	15.075	4.1
First Floor	-EQ 5	X	0.0002804	130	5	17.05	4.1
First Floor	-EQ 6	Y	0.000138	9	23.9	15.075	4.1
First Floor	Serv 01 (G)	X	1.438E-05	24	42.8	5.4	4.1
First Floor	Serv 01 (G)	Y	2.133E-05	53	42.8	9.01	4.1
First Floor	Serv 02 (G+0.7Q)	X	1.628E-05	24	42.8	5.4	4.1
First Floor	Serv 02 (G+0.7Q)	Y	2.446E-05	53	42.8	9.01	4.1
First Floor	Serv 03 (G+Wind) Max	X	4.622E-05	24	42.8	5.4	4.1
First Floor	Serv 03 (G+Wind) Max	Y	4.265E-05	53	42.8	9.01	4.1
First Floor	Serv 03 (G+Wind) Min	X	2.29E-05	6	36.5	19.8	4.1
First Floor	Serv 03 (G+Wind) Min	Y	2.094E-05	4	23.9	19.8	4.1
First Floor	Ult 01 (1.35G)	X	1.941E-05	24	42.8	5.4	4.1
First Floor	Ult 01 (1.35G)	Y	2.88E-05	53	42.8	9.01	4.1
First Floor	Ult 02 (1.2G+1.5Q)	X	2.133E-05	24	42.8	5.4	4.1
First Floor	Ult 02 (1.2G+1.5Q)	Y	3.23E-05	53	42.8	9.01	4.1
First Floor	Ult 03 (1.2G+Wind+0.4Q) Max	X	6.586E-05	24	42.8	5.4	4.1
First Floor	Ult 03 (1.2G+Wind+0.4Q) Max	Y	5.92E-05	53	42.8	9.01	4.1
First Floor	Ult 03 (1.2G+Wind+0.4Q) Min	X	3.524E-05	6	36.5	19.8	4.1
First Floor	Ult 03 (1.2G+Wind+0.4Q) Min	Y	3.203E-05	4	23.9	19.8	4.1
First Floor	Ult 04 (0.9G+Wind) Max	X	6.046E-05	24	42.8	5.4	4.1

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Table 2.2 - Story Drifts (continued)

Story	Load Case/Combo	Direction	Drift	Label	X m	Y m	Z m
First Floor	Ult 04 (0.9G+Wind) Max	Y	5.214E-05	24	42.8	5.4	4.1
First Floor	Ult 04 (0.9G+Wind) Min	X	3.771E-05	24	42.8	5.4	4.1
First Floor	Ult 04 (0.9G+Wind) Min	Y	3.421E-05	4	23.9	19.8	4.1
First Floor	Ult 05 (G+EQ+0.3Q) Max	X	0.0002843	113	42.8	17.0375	4.1
First Floor	Ult 05 (G+EQ+0.3Q) Max	Y	0.0001512	10	30.2	15.075	4.1
First Floor	Ult 05 (G+EQ+0.3Q) Min	X	4.941E-05	29	11.3	3.35	4.1
First Floor	Ult 05 (G+EQ+0.3Q) Min	Y	3.963E-05	53	42.8	9.01	4.1
First Floor	Ult 06 (G-EQ+0.3Q) Max	X	5.89E-05	24	42.8	5.4	4.1
First Floor	Ult 06 (G-EQ+0.3Q) Max	Y	5.247E-05	18	5	20	4.1
First Floor	Ult 06 (G-EQ+0.3Q) Min	X	0.0002773	130	5	17.05	4.1
First Floor	Ult 06 (G-EQ+0.3Q) Min	Y	0.0001416	10	30.2	15.075	4.1

## 2.2 Modal Results

Table 2.3 - Modal Periods and Frequencies

Case	Mode	Period sec	Frequency cyc/sec	Circular Frequency rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
Modal	1	0.248	4.039	25.3755	643.9146
Modal	2	0.142	7.05	44.2934	1961.9026
Modal	3	0.105	9.542	59.9551	3594.6136
Modal	4	0.088	11.307	71.0431	5047.1156
Modal	5	0.087	11.436	71.8563	5163.3292
Modal	6	0.077	12.91	81.1134	6579.3787
Modal	7	0.074	13.435	84.4144	7125.7847
Modal	8	0.069	14.553	91.4415	8361.5535
Modal	9	0.068	14.728	92.54	8563.6584
Modal	10	0.064	15.685	98.5505	9712.2003
Modal	11	0.054	18.594	116.8323	13649.7875
Modal	12	0.053	18.934	118.9652	14152.7282
Modal	13	0.052	19.255	120.9823	14636.7272
Modal	14	0.047	21.178	133.0638	17705.988
Modal	15	0.047	21.432	134.6609	18133.5559
Modal	16	0.045	22.041	138.4851	19178.1132
Modal	17	0.045	22.073	138.6919	19235.4347
Modal	18	0.044	22.8	143.259	20523.1286
Modal	19	0.044	22.975	144.3591	20839.5542
Modal	20	0.042	24.016	150.8997	22770.7335
Modal	21	0.041	24.533	154.1463	23761.0815
Modal	22	0.039	25.664	161.2502	26001.639
Modal	23	0.039	25.934	162.9477	26551.9478
Modal	24	0.036	27.492	172.7344	29837.1725
Modal	25	0.036	27.944	175.5756	30826.8014
Modal	26	0.033	30.047	188.7931	35642.8187
Modal	27	0.032	31.515	198.0157	39210.226
Modal	28	0.028	35.18	221.0427	48859.8639
Modal	29	0.027	36.797	231.2046	53455.5622
Modal	30	0.025	40.542	254.7319	64888.3429
Modal	31	0.023	43.7	274.5753	75391.578
Modal	32	0.022	45.491	285.8273	81697.2524

Table 2.3 - Modal Periods and Frequencies (continued)

Case	Mode	Period sec	Frequency cyc/sec	Circular Frequency rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
Modal	33	0.019	52.809	331.8061	110095.3063
Modal	34	0.017	57.797	363.1522	131879.4924
Modal	35	0.014	73.297	460.5393	212096.4455
Modal	36	0.013	78.85	495.4302	245451.085
Modal	37	0.009	109.671	689.0815	474833.2679
Modal	38	0.008	121.553	763.7384	583296.2783
Modal	39	0.005	217.906	1369.1441	1874555.6279
Modal	40	0.004	232.741	1462.3558	2138484.4738

Table 2.4 - Modal Participating Mass Ratios (Part 1 of 2)

Case	Mode	Period sec	UX	UY	UZ	Sum UX	Sum UY	Sum UZ
Modal	1	0.248	0.784	0.0004	0	0.784	0.0004	0
Modal	2	0.142	0.0012	0.8496	0	0.7851	0.85	0
Modal	3	0.105	0.0064	0.0409	0	0.7915	0.8909	0
Modal	4	0.088	0.0028	0.0003	0	0.7943	0.8913	0
Modal	5	0.087	0.0055	8.86E-06	0	0.7998	0.8913	0
Modal	6	0.077	0.0844	5.263E-06	0	0.8842	0.8913	0
Modal	7	0.074	0.065	1.65E-06	0	0.9493	0.8913	0
Modal	8	0.069	0.0003	7.879E-06	0	0.9496	0.8913	0
Modal	9	0.068	0.001	0	0	0.9506	0.8913	0
Modal	10	0.064	0.0002	6.382E-06	0	0.9508	0.8913	0
Modal	11	0.054	0.0098	0.0116	0	0.9606	0.9029	0
Modal	12	0.053	0.0167	0.0091	0	0.9773	0.912	0
Modal	13	0.052	0.0009	0.0003	0	0.9782	0.9124	0
Modal	14	0.047	3.087E-05	7.369E-06	0	0.9782	0.9124	0
Modal	15	0.047	0	0.0001	0	0.9782	0.9125	0
Modal	16	0.045	0.0001	0.0018	0	0.9784	0.9143	0
Modal	17	0.045	0.0005	0.0017	0	0.9789	0.916	0
Modal	18	0.044	0.0004	0.003	0	0.9793	0.919	0
Modal	19	0.044	0.0008	0.0045	0	0.9801	0.9235	0
Modal	20	0.042	0.0011	2.209E-05	0	0.9812	0.9235	0
Modal	21	0.041	0	0.0054	0	0.9812	0.9289	0
Modal	22	0.039	0.0008	0.001	0	0.9821	0.9299	0
Modal	23	0.039	3.899E-05	0.0055	0	0.9821	0.9354	0
Modal	24	0.036	0.0008	0.0023	0	0.9829	0.9378	0
Modal	25	0.036	0.0003	0.0065	0	0.9833	0.9443	0
Modal	26	0.033	0.0015	0.0002	0	0.9847	0.9445	0
Modal	27	0.032	4.31E-05	0.0024	0	0.9848	0.9469	0
Modal	28	0.028	0.0002	0.01	0	0.9849	0.9569	0
Modal	29	0.027	2.375E-05	0.0119	0	0.985	0.9689	0
Modal	30	0.025	0.0011	0.0006	0	0.986	0.9695	0
Modal	31	0.023	0.0009	0.003	0	0.987	0.9725	0
Modal	32	0.022	0.0005	0.0057	0	0.9875	0.9782	0
Modal	33	0.019	0.0004	0.0042	0	0.9878	0.9824	0
Modal	34	0.017	0.0005	0.001	0	0.9883	0.9834	0
Modal	35	0.014	0.0009	0.0019	0	0.9892	0.9854	0
Modal	36	0.013	0.0022	0.0008	0	0.9914	0.9862	0

Table 2.4 - Modal Participating Mass Ratios (Part 1 of 2, continued)

Case	Mode	Period sec	UX	UY	UZ	Sum UX	Sum UY	Sum UZ
Modal	37	0.009	0.0007	0.0028	0	0.9921	0.989	0
Modal	38	0.008	0.0018	0.0008	0	0.9939	0.9898	0
Modal	39	0.005	0.0036	0.002	0	0.9975	0.9918	0
Modal	40	0.004	0.0011	0.0059	0	0.9986	0.9977	0

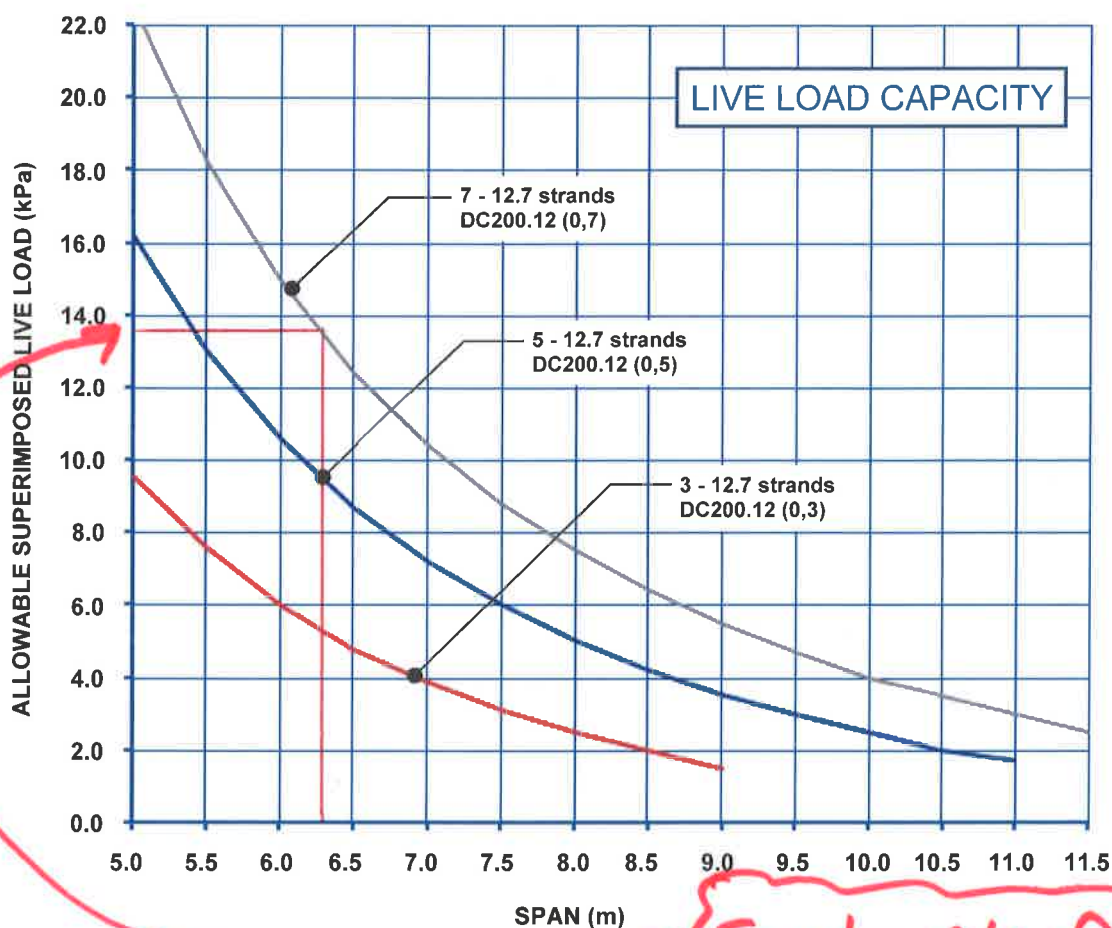
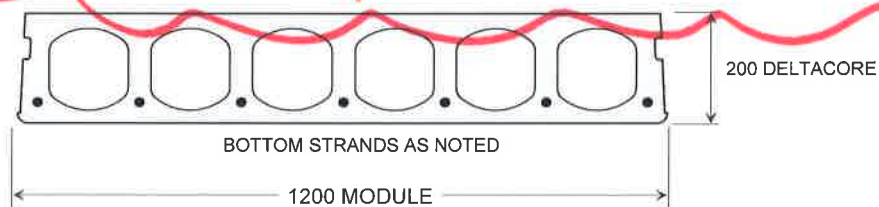
Table 2.4 - Modal Participating Mass Ratios (Part 2 of 2)

Case	Mode	RX	RY	RZ	Sum RX	Sum RY	Sum RZ
Modal	1	0.0001	0.2305	0.0043	0.0001	0.2305	0.0043
Modal	2	0.0941	0.0003	0.045	0.0942	0.2308	0.0493
Modal	3	0.0069	0.0001	0.7345	0.1011	0.2309	0.7838
Modal	4	0.0002	0.0151	0.0016	0.1013	0.246	0.7853
Modal	5	1.492E-06	0.0298	0.0023	0.1013	0.2758	0.7877
Modal	6	2.558E-05	0.3059	0.0013	0.1013	0.5817	0.7889
Modal	7	0.0004	0.2223	0.0004	0.1017	0.8041	0.7893
Modal	8	0.0001	0.0013	0.0004	0.1017	0.8054	0.7897
Modal	9	0.0001	0.0035	0.0017	0.1018	0.8089	0.7914
Modal	10	0.0014	0.0011	0.001	0.1032	0.81	0.7924
Modal	11	0.3215	0.0325	0.0001	0.4246	0.8425	0.7924
Modal	12	0.2164	0.0471	0.0009	0.641	0.8896	0.7934
Modal	13	0.0058	0.002	0.0003	0.6469	0.8916	0.7936
Modal	14	0.0001	0.0002	0.0003	0.6469	0.8918	0.7939
Modal	15	0.0004	6.129E-07	4.141E-05	0.6474	0.8918	0.794
Modal	16	0.0074	0.0007	0.0002	0.6548	0.8925	0.7942
Modal	17	0.0082	0.0019	0.0002	0.663	0.8944	0.7944
Modal	18	0.0109	0.0031	0.0001	0.6739	0.8975	0.7945
Modal	19	0.019	0.0051	8.144E-06	0.693	0.9026	0.7946
Modal	20	0.0002	0.0037	0.015	0.6931	0.9063	0.8095
Modal	21	0.0181	9.144E-06	0.0011	0.7112	0.9063	0.8106
Modal	22	0.0017	0.0031	0.012	0.7129	0.9094	0.8226
Modal	23	0.0122	0.0006	0.0029	0.7251	0.91	0.8255
Modal	24	0.0052	0.0032	0.0001	0.7303	0.9132	0.8256
Modal	25	0.0157	0.0019	0.0219	0.746	0.9151	0.8475
Modal	26	0.0008	0.0089	0.0013	0.7468	0.924	0.8487
Modal	27	0.0068	0.0004	0.0045	0.7536	0.9243	0.8532
Modal	28	0.0375	0.0004	0.0009	0.7911	0.9247	0.8541
Modal	29	0.0539	0.0001	0.0042	0.845	0.9248	0.8582
Modal	30	0.0022	0.0038	0.002	0.8472	0.9285	0.8602
Modal	31	0.0083	0.0044	0.0008	0.8555	0.9329	0.8611
Modal	32	0.0145	0.0021	3.396E-05	0.87	0.935	0.8611
Modal	33	0.014	0.0014	0.005	0.884	0.9364	0.8661
Modal	34	0.0035	0.0025	0.002	0.8875	0.9389	0.8681
Modal	35	0.0068	0.0039	0.0012	0.8943	0.9428	0.8693
Modal	36	0.0025	0.0094	3.008E-05	0.8968	0.9523	0.8693
Modal	37	0.0143	0.0033	0.0002	0.9111	0.9555	0.8696
Modal	38	0.0044	0.0093	2.948E-05	0.9155	0.9648	0.8696
Modal	39	0.0103	0.0185	0.0003	0.9258	0.9833	0.8699
Modal	40	0.0297	0.0056	0.0002	0.9555	0.9889	0.8701

# Deltacore 200

## DC200 Live Load Capacity

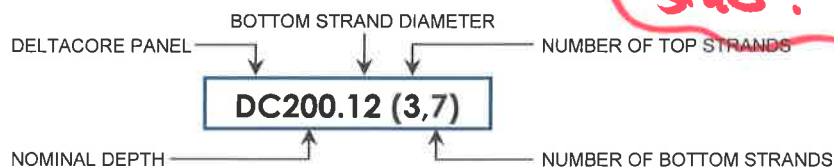
*Deltacore Panels for L1, L2 & L3 suspended slabs*



### NOTES:

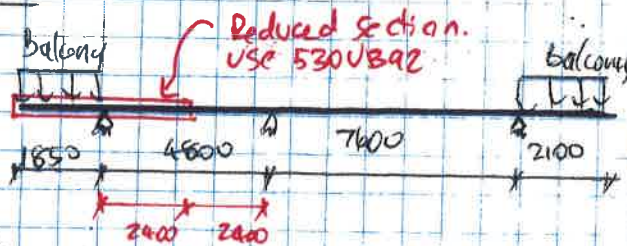
1. Concrete Compressive Strength: Deltacore Planks - 60 MPa
2. All strands are stressed to 70% U.T.S.
3. Cover to bottom strands 40mm

*Easily OK for Live load of 80mm topping slab.*



## Steel transfer Beams over around Floor (FB2)

### Layout



$$- FLW = 63m$$

### loads

$$\begin{aligned} \text{Floor DL} &= 24kN/m^2 \times 6.3m \times (0.105 + 0.08)m = 27.97kN/m \downarrow \\ \text{Floor LL} &= 2.00kPa \times 6.3m = 12.60kN/m \downarrow \\ \text{Floor finishes} &= 0.50kPa \times 6.3m = 3.15kN/m \downarrow \\ \text{wall Panels} &= 0.15m \times 24kN/m^2 \times 3.3m \times 3 = 35.64kN/m \downarrow \\ \text{Roof DL} &= 0.40kPa \times 6.3m = 2.52kN/m \downarrow \\ \text{Roof LL} &= 0.25kPa \times 6.3m = 1.58kN/m \downarrow \\ \text{Floors over (DL)} &= 2 \times (27.97 + 3.15) = 62.24kN/m \downarrow \\ \text{Floors over (LL)} &= 2 \times 12.6 = 25.2kN/m \downarrow \\ \text{Balcony LL} &= 3.00kPa \times 6.3m \times 3 = 56.7kN/m \downarrow \end{aligned}$$

### Serviceability Design

$$\begin{aligned} \Delta_{lim} &= 4/500 \text{ (for transfer) under } (DL + 0.7LL) \neq L/250 \text{ cantilever} \\ &= 15.2mm \qquad \qquad \qquad = 8.4mm \end{aligned}$$

⇒ 530UB92/700UB150 beam OK for deflection.  
from microstran  $\Delta_{max} = 8mm$ ,  $\Delta_{sum}$  @ cantilever end

### Strength

See microstran design output → 700UB150/530UB92 OK for strength.

→ Adopt 700UB150/530UB92 for FB2

Sections:  
10 700WB150 Y  
11 530UB92.4 Y



Y  
X  
theta: 270 phi: 0

## == S T E E L M E M B E R S S U M M A R Y R E P O R T ==

554

Mem. Code	Length Selected mm Section	Mass kg	Crit. Ratio	Load Critical Case Condition
Section No. 10 - 700WB150 Grade 300 (analysis)				All spans
106* AS4100	12100 700WB150	1814	1.388	11 Shear yield
	12100	1814		
Section No. 11 - 530UB92.4 Grade 300 (analysis)				
101* AS4100	4250 530UB92.4	394	1.533	11 Section bending
	4250	394		
Total mass of selected sections:		2208		

## == L O A D C A S E S - S T E E L D E S I G N ==

Case Type	Title
11	C ult

## == S T E E L M E M B E R S F U L L R E P O R T ==

MEMBER: 101 (Code Check to AS4100) (2 members, 101-105 linked)

Section: 530UB92.4 Axis: Y Grade: 300 fyf: 300 fyw: 320 fu: 440 hot rolled

## Section Dimensions and Properties

D=	533.0	B=	209.0	Tf=	15.6	Tw=	10.2
Ag=	11800.0	rx=	217.0	Zx=	2.08E+06	Sx=	2.37E+06
		ry=	44.9	Zy=	2.28E+05	Sy=	3.55E+05
		J=	7.75E+05	Iw=	1.59E+12		

## Section Properties for Design

Form Factor=	0.928	Class Mx: Compact	Zex=	2.370E+06
Ae=	10956	Class My: Compact	Zey=	3.420E+05

## Member Restraints

No	Offset	/--Beam--/		Load	Cant	Ht	/-----Column-----/			
		Top	Btm				XX	kx	YY	ky
1	0.000	L	N	Y	S	Y	1.00	Y	1.00	
2	1.000	L	N		S					
3	1.850	L	L		S	Y	1.00	Y	1.00	
4	2.850	L	N		S					
5	4.250	L	L	N						

Sidesway - about XX axis: N about YY axis: N

Connection: Uniform and concentric

Critical conditions for design load cases:

Case	Cap/Load	Condition
11	1.533	Section bending

## SECTION CHECKS

Case: 11 Off: 1850 Cap/Load= 1.533 Section bending (5.2)

Design loads:	N*=	0.00	M*x=	-417.40	M*y=	0.00
Design capacities:	øNt=	0.00	øMsx=	639.90	øMsy=	92.34
	øNs=	0.00	øMrx=	0.00	øMry=	0.00

## MEMBER/SEGMENT CHECKS

Case: 11 Off: 1851/4250 Cap/Load= 1.533 Member bending (5.6)

Design loads:	N*=	0.00	M*x=	-417.40	M*y=	0.00
Lmx=	2400 column o/a length	βmx=	1.000			
Lmy=	2400	βmy=	0.000			
Lx=	2400	βme=	-0.124			
Ly=	2400	αm=	2.500	BM modification factor		
Le=	2400 beam eff. length	Mo=	2224.82	reference buckling moment		
Lz=	2400 torsion eff. length	αs=	0.87	BM slend. reductn. factor		
Transversely loaded.						

Design capacities:	øNcx=	0.00	øMsx=	639.90	øNcy=	0.00	øMcy=	0.00
	øNcy=	0.00	øMrx=	0.00	øMcy=	0.00	øMbx=	0.00
			øMsy=	92.34	øMix=	0.00	øNoz=	0.00
			øMry=	0.00	øMiy=	0.00	øMcy=	0.00
			øMbx=	639.90	# computed with kL ≤ Lm (8.4.2.2)			

## SHEAR CHECKS (Appendix I excluded)

Case: 11 Off: 1850 Cap/Load= 2.075 Section bending (5.2)

Design loads:	V*=	451.25
Design capacities:	øVv=	936.53
	øMf=	455.47

MEMBER: 106 (Code Check to AS4100) (4 members, 106-107-108-104 linked)

Section: 700WB150 Axis: Y Grade: 300 fyf: 280 fyw: 320 fu: 440 heavily welded

SSS

## Section Dimensions and Properties

D=	710.0	B=	250.0	Tf=	25.0	Tw=	10.0
Ag=	19100.0	rx=	299.0	Zx=	4.81E+06	Sx=	5.37E+06
		ry=	58.4	Zy=	5.21E+05	Sy=	7.98E+05
		J=	2.69E+06	Iw=	7.64E+12		

## Section Properties for Design

Form Factor=	0.828	Class Mx: Compact	Zex=	5.370E+06
Ae=	15807	Class My: Compact	Zey=	7.815E+05

## Member Restraints

		/--Beam--/		Load		/-----Column-----/			
No	Offset	Top	Btm	Cant	Ht	XX	kx	YY	ky
1	0.000	L	L	N	S	Y	1.00	Y	1.00
2	1.000	L	N		S				
3	2.400	L	L		S	Y	1.00	Y	1.00
4	3.400	L	N		S				
5	4.400	L	N		S				
6	5.400	L	N		S				
7	6.200	L	N		S				
8	7.200	L	N		S				
9	8.200	L	N		S				
10	9.200	L	N		S				
11	10.000	L	L		S	Y	1.00	Y	1.00
12	11.000	L	N		S				
13	12.100	L	N	Y					

Sidesway - about XX axis: N about YY axis: N

Connection: Uniform and concentric

Critical conditions for design load cases:

Case	Cap/Load	Condition
11	1.388	Shear yield

## SECTION CHECKS

Case: 11 Off: 2400 Cap/Load= 1.434 Section bending (5.2)

Design loads: N\*= 0.00 M\*x=-943.76 M\*y= 0.00

Design capacities:	ØNt= 0.00	ØMsx=1353.24	ØMsy= 196.94
	ØNs= 0.00	ØMrx= 0.00	ØMry= 0.00

## MEMBER/SEGMENT CHECKS

Case: 11 Off: 0/2400 Cap/Load= 1.434 Member bending (5.6)

Design loads: N\*= 0.00 M\*x=-943.76 M\*y= 0.00

Lmx= 2400 column o/a length	βmx= 1.000
Lmy= 2400	βmy= 0.000
Lx= 2400	βme= -0.055
Ly= 2400	αm= 2.260 BM modification factor
Le= 2400 beam eff. length	Mo=7956.65 reference buckling moment
Lz= 2400 torsion eff. length	αs= 0.93 BM slend. reductn. factor
Transversely loaded.	

## Design capacities:

ØNcx= 0.00	ØMsx=1353.24	ØNcx= 0.00 #	ØMox= 0.00
ØNcy= 0.00	ØMrx= 0.00	ØNcy= 0.00 #	ØMbxo= 0.00
	ØMsy= 196.94	ØMix= 0.00	ØNoz= 0.00
	ØMry= 0.00	ØMiy= 0.00	ØMcy= 0.00
	ØMbx=1353.24	# computed with kL ≤ Lm (8.4.2.2)	

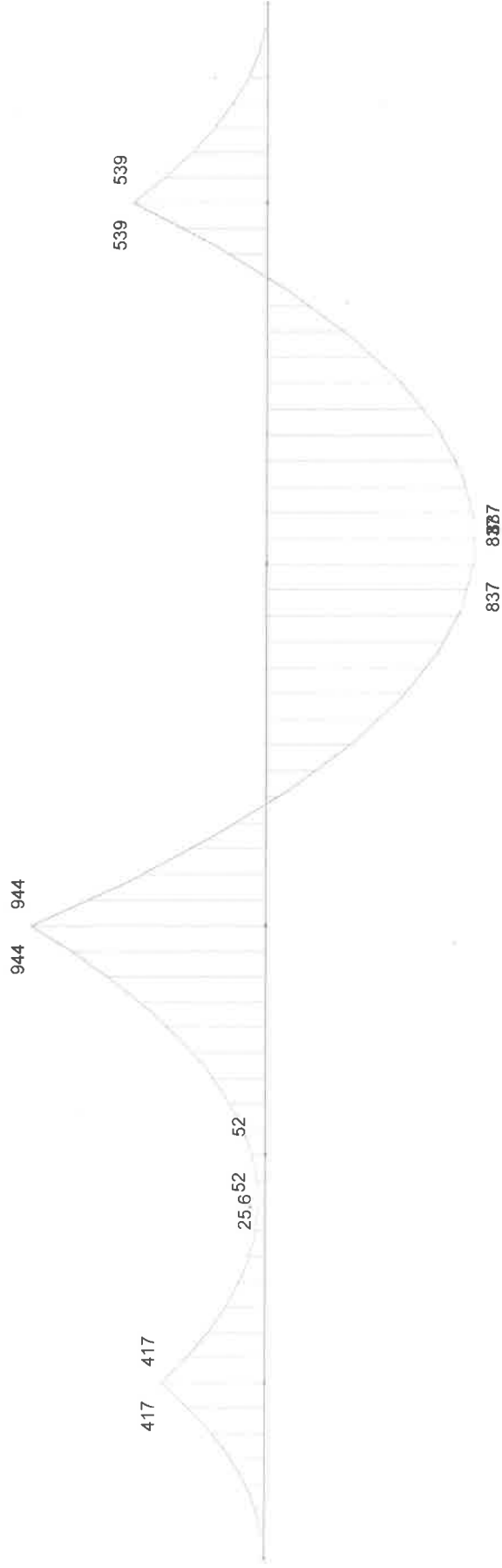
## SHEAR CHECKS (Appendix I excluded)

Case: 11 Off: 2401 Cap/Load= 1.388 Shear yield (5.11.4)

Design loads: V\*= 883.94

Design capacities: ØVv=1226.88 ØMf=1078.88

Load Cases:  
11 C ult



Y  
Z  
X

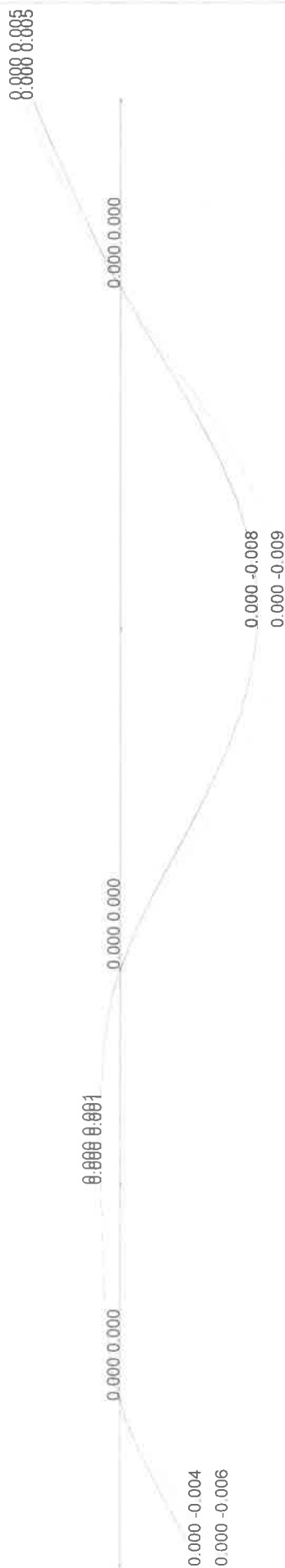
theta: 270 phi: 0

Bending Moment, Mz

TMK Consulting Engineers  
Job: 1806063.msw1 - FB2  
82-90 Johns Road 1806063  
Transfer Beam FB2

16 May 2019  
09:55 AM

Load Cases:  
1 P dl ( gy=9.81 )  
12 C serv



Y  
Z  
X

theta: 270 phi: 0

Displaced Shape

== INPUT / ANALYSIS REPORT ==

Job: 1806063 msw1 - FB2  
Title: 82-90 Johns Road 1806063  
Type: Transfer Beam FB2  
Date: 16 May 2019  
Time: 09:56 AM

Nodes ..... 7  
Members ..... 6  
Spring supports ..... 0  
Sections ..... 2  
Materials ..... 1  
Primary load cases ..... 2  
Combination load cases ..... 2

Analysis: Linear elastic

== LOAD CASES ==

Case Type Analysis Title

1 P L dl  
2 P L ll  
11 C L ult  
12 C L serv

Analysis Types:

S - Skipped (not analysed)  
L - Linear  
N - Non-linear

== NODE COORDINATES ==

Node	X	Y	Z	Restraint
101	0.000	0.000	0.000	000000
102	1.850	0.000	0.000	110000
103	6.650	0.000	0.000	010000
104	14.250	0.000	0.000	010000
105	16.350	0.000	0.000	000000
106	4.250	0.000	0.000	000000
107	10.450	0.000	0.000	000000

== MEMBER DEFINITION ==

Member	A	B	C	Prop	Matl	Rel-A	Rel-B	Length
101	101	102	Y	11	1	000000	000000	1.850
104	104	105	Y	10	1	000000	000000	2.100
105	102	106	Y	11	1	000000	000000	2.400
106	106	103	Y	10	1	000000	000000	2.400
107	103	107	Y	10	1	000000	000000	3.800
108	107	104	Y	10	1	000000	000000	3.800

== LIBRARY SECTIONS ==

Section	Library	Name	Axis	Comment
10	asw	700WB150	Y	All_spans
11	asw	530UB92.4	Y	

== SECTION PROPERTIES ==

Section	Ax	As	AY	AZ	J	IY	IZ	fact
	m <sup>2</sup>	m <sup>2</sup>	m <sup>2</sup>	m <sup>2</sup>	m <sup>4</sup>	m <sup>4</sup>	m <sup>4</sup>	
10	1.910E-02	0.000E+00	0.000E+00	2.690E-06	6.520E-06	1.710E-03	1.710E-03	
11	1.180E-02	0.000E+00	0.000E+00	7.750E-07	2.380E-05	5.540E-04	5.540E-04	

== MATERIAL PROPERTIES ==

Material	E	u	Density	Alpha
	kn/m <sup>2</sup>		t/m <sup>3</sup>	/deg C
1	2.000E+08	0.2500	7.850E+00	1.170E-05

== TABLE OF QUANTITIES ==

MATERIAL 1 STEEL

Section	Name	Length	Mass	Comment
		m	tonne	
10	700WB150	12.100	1.814	All_spans
11	530UB92.4	4.250	0.394	
		16.350	2.208	

== CONDITION NUMBER ==

Maximum condition number: 8.154E+00 at node: 105 DOFN: 6

CASE 1: dl

-- Gravitational Acceleration --

X Comp Y Comp Z Comp  
m/sec<sup>2</sup> m/sec<sup>2</sup> m/sec<sup>2</sup>  
0.000 -9.810 0.000

-- Member Loads --

Member	Form	T	A	S	F1	F2	X1	X2
101	UNIF	FY	GL		-62.240			
101	UNIF	FY	GL		-27.970			
101	UNIF	FY	GL		-3.150			
101	UNIF	FY	GL		-35.600			
101	UNIF	FY	GL		-2.520			
104	UNIF	FY	GL		-62.240			
104	UNIF	FY	GL		-27.970			
104	UNIF	FY	GL		-3.150			
104	UNIF	FY	GL		-35.600			
104	UNIF	FY	GL		-2.520			
105	UNIF	FY	GL		-62.240			
105	UNIF	FY	GL		-27.970			
105	UNIF	FY	GL		-3.150			
105	UNIF	FY	GL		-35.600			
105	UNIF	FY	GL		-2.520			
106	UNIF	FY	GL		-62.240			
106	UNIF	FY	GL		-27.970			
106	UNIF	FY	GL		-3.150			
106	UNIF	FY	GL		-35.600			
106	UNIF	FY	GL		-2.520			
107	UNIF	FY	GL		-62.240			
107	UNIF	FY	GL		-27.970			
107	UNIF	FY	GL		-3.150			
107	UNIF	FY	GL		-35.600			
107	UNIF	FY	GL		-2.520			
108	UNIF	FY	GL		-62.240			
108	UNIF	FY	GL		-27.970			
108	UNIF	FY	GL		-3.150			
108	UNIF	FY	GL		-35.600			
108	UNIF	FY	GL		-2.520			

-- Sum of Applied Loads (Global Axes): --

FX: 0.000 FY: -2171.357 FZ: 0.000  
Moments about the global origin:  
MX: 0.000 MY: 0.000 MZ: -17765.303

== SIGN CONVENTION ==

Positive Forces (Member Axes):  
Axial - Tension Shear - End A sagging  
Torque - Right-hand twist Moment - Sagging  
Deflections:  
Global deflections are absolute.  
Local deflections are relative to chord joining displaced end nodes.

== MEMBER FORCES AND DEFLECTIONS ==

CASE 1: dl

MEMBER 101: Nodes 101 - 102 Section 11: 530UB92.4 Y

Point Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
	m	KN	KN	KNm	KNm	KNm
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.37	0.00	48.98	0.00	0.00	-9.06
3	0.74	0.00	97.97	0.00	0.00	-36.25
4	1.11	0.00	146.95	0.00	0.00	-81.56
5	1.48	0.00	195.94	0.00	0.00	-144.99
6	1.85	0.00	244.92	0.00	0.00	-226.55

Point Offset X-glob Y-glob Z-glob y-local z-local

SSS

MEMBER 104: Nodes 104 - 105 Section 10: 700WB150 Y

Point Offset	m	mm	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	1.3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	1.7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	2.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Point Offset	m	mm	X-glob	Y-glob	Z-glob	Y-local	Z-local
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	1.3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	1.7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	2.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MEMBER 105: Nodes 102 - 106 Section 11: 530UB92.4 Y

Point Offset	m	mm	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.48	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.96	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	1.44	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	1.92	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	2.40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Point Offset	m	mm	X-glob	Y-glob	Z-glob	Y-local	Z-local
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	1.4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	1.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	2.4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MEMBER 106: Nodes 106 - 103 Section 10: 700WB150 Y

Point Offset	m	mm	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.48	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.96	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	1.44	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	1.92	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	2.40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Point Offset	m	mm	X-glob	Y-glob	Z-glob	Y-local	Z-local
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	1.4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	1.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	2.4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MEMBER 107: Nodes 103 - 107 Section 10: 700WB150 Y

Point Offset	m	mm	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.76	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1.52	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	2.28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	3.04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	3.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Point Offset	m	mm	X-glob	Y-glob	Z-glob	Y-local	Z-local
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	2.3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	3.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	3.8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MEMBER 108: Nodes 107 - 104 Section 10: 700WB150 Y

Point Offset	m	mm	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.76	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1.52	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	2.28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	3.04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	3.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Point Offset	m	mm	X-glob	Y-glob	Z-glob	Y-local	Z-local
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	2.3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	3.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	3.8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

== SUPPORT REACTIONS ==

CASE 1: dl

Node	Force-X	Force-Y	Force-Z	Moment-X	Moment-Y	Moment-Z
102	0.00	486.58	0.00	0.00	0.00	0.00
103	0.00	939.87	0.00	0.00	0.00	0.00
104	0.00	744.91	0.00	0.00	0.00	0.00
SUM:	0.00	2171.36	0.00	0.00	0.00	0.00

Max. residual: 1.705E-13 at DOFN: 9

(Reactions act on structure in positive global axis directions.)

CASE 2: ll

-- Member Loads --

Member	Form	T	A	S	F1	X1	F2	X2
101	UNIF	FY	GL		-56.700			
104	UNIF	FY	GL		-56.700			
105	UNIF	FY	GL	FR	-12.600			
105	UNIF	FY	GL	FR	-1.580			
105	UNIF	FY	GL	FR	-25.200			
106	UNIF	FY	GL	FR	-12.600			
106	UNIF	FY	GL	FR	-1.580			
106	UNIF	FY	GL	FR	-25.200			
107	UNIF	FY	GL	FR	-12.600			
107	UNIF	FY	GL	FR	-1.580			
108	UNIF	FY	GL	FR	-25.200			
108	UNIF	FY	GL	FR	-12.600			
108	UNIF	FY	GL	FR	-1.580			
108	UNIF	FY	GL	FR	-25.200			

-- Sum of Applied Loads (Global Axes) --

FX: 0.000 FY: -712.277 FZ: 0.000  
Moments about the global origin: M1: 0.000 M2: -5849.711  
MX: 0.000 MY: 0.000

== SIGN CONVENTION ==

Positive Forces (Member Axes):

Axial - Tension  
Torque - Right-hand twist  
Shear - End A sagging  
Moment - Sagging

Deflections:  
Global deflections are absolute.  
Local deflections are relative to chord joining displaced end nodes.

== MEMBER FORCES AND DEFLECTIONS ==

CASE 2: ll

MEMBER 101: Nodes 101 - 102 Section 11: 530UB92.4 Y

Point Offset	m	mm	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.37	0.0000	0.0000	20.98	0.0000	0.0000	0.0000	-3.88
3	0.74	0.0000	0.0000	41.96	0.0000	0.0000	0.0000	-15.52
4	1.11	0.0000	0.0000	62.94	0.0000	0.0000	0.0000	-34.93
5	1.48	0.0000	0.0000	83.92	0.0000	0.0000	0.0000	-64.10



K:\2018\06\1806063\Structural Drawings and Calcs\Design Calculations and Details\FK\1806063 msw1 - FB2.pl 05/16/19 09:5

MEMBER 104: Nodes 104 - 105 Section 10: 700WB150 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	-513.64	0.00	0.00	-539.32	0.00
2	0.42	0.00	-410.91	0.00	0.00	-345.17	0.00
3	0.84	0.00	-308.18	0.00	0.00	-194.16	0.00
4	1.26	0.00	-205.46	0.00	0.00	-86.29	0.00
5	1.68	0.00	-102.73	0.00	0.00	-21.57	0.00
6	2.10	0.00	0.00	0.00	0.00	0.00	0.00

Point Offset

X-glob	Y-glob	Z-glob	Y-local	z-local
m	m	m	m	m
1	0.0	0.0000	0.0000	0.0000
2	0.4	0.0000	0.0016	0.0000
3	0.8	0.0000	0.0031	0.0000
4	1.3	0.0000	0.0045	0.0000
5	1.7	0.0000	0.0058	0.0000
6	2.1	0.0000	0.0071	0.0000

MEMBER 105: Nodes 102 - 106 Section 11: 530UB92.4 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	-413.79	0.00	0.00	-417.40	0.00
2	0.48	0.00	-309.18	0.00	0.00	-243.89	0.00
3	0.96	0.00	-204.57	0.00	0.00	-120.59	0.00
4	1.44	0.00	-99.97	0.00	0.00	-47.50	0.00
5	1.92	0.00	4.84	0.00	0.00	-24.62	0.00
6	2.40	0.00	109.25	0.00	0.00	0.00	-51.95

Point Offset

X-glob	Y-glob	Z-glob	Y-local	z-local
m	m	m	m	m
1	0.0	0.0000	0.0000	0.0000
2	0.5	0.0000	0.0010	0.0000
3	1.0	0.0000	0.0015	0.0000
4	1.4	0.0000	0.0017	0.0000
5	1.9	0.0000	0.0019	0.0000
6	2.4	0.0000	0.0019	0.0000

MEMBER 106: Nodes 106 - 103 Section 10: 700WB150 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	109.25	0.00	0.00	-51.95	0.00
2	0.48	0.00	214.19	0.00	0.00	-129.58	0.00
3	0.96	0.00	319.12	0.00	0.00	-257.57	0.00
4	1.44	0.00	424.05	0.00	0.00	-435.94	0.00
5	1.92	0.00	528.99	0.00	0.00	-664.67	0.00
6	2.40	0.00	633.92	0.00	0.00	-943.76	0.00

Point Offset

X-glob	Y-glob	Z-glob	Y-local	z-local
m	m	m	m	m
1	0.0	0.0000	0.0019	0.0000
2	0.5	0.0000	0.0019	0.0000
3	1.0	0.0000	0.0018	0.0000
4	1.4	0.0000	0.0016	0.0000
5	1.9	0.0000	0.0010	0.0000
6	2.4	0.0000	0.0000	0.0000

MEMBER 107: Nodes 103 - 107 Section 10: 700WB150 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	-883.94	0.00	0.00	-943.76	0.00
2	0.76	0.00	-717.79	0.00	0.00	-835.11	0.00
3	1.52	0.00	-551.65	0.00	0.00	-677.28	0.00
4	2.28	0.00	-385.50	0.00	0.00	-503.40	0.00
5	3.04	0.00	-219.36	0.00	0.00	-333.25	0.00
6	3.80	0.00	-53.22	0.00	0.00	836.83	0.00

Point Offset

X-glob	Y-glob	Z-glob	Y-local	z-local
m	m	m	m	m
1	0.0	0.0000	0.0000	0.0000
2	0.8	0.0000	-0.0027	0.0000
3	1.5	0.0000	-0.0059	0.0000
4	2.3	0.0000	-0.0090	0.0000
5	3.0	0.0000	-0.0111	0.0000
6	3.8	0.0000	-0.0121	0.0000

MEMBER 108: Nodes 107 - 104 Section 10: 700WB150 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	-53.22	0.00	0.00	836.83	0.00

2	0.76	0.00	112.93	0.00	0.00	0.00	814.14
3	1.52	0.00	279.07	0.00	0.00	0.00	665.18
4	2.28	0.00	445.22	0.00	0.00	0.00	389.95
5	3.04	0.00	611.36	0.00	0.00	0.00	-11.55
6	3.80	0.00	777.51	0.00	0.00	0.00	-539.32

Point Offset

X-glob	Y-glob	Z-glob	Y-local	z-local
m	m	m	m	m
1	0.0	0.0000	-0.0121	0.0000
2	0.8	0.0000	-0.0117	0.0000
3	1.5	0.0000	-0.0099	0.0000
4	2.3	0.0000	-0.0070	0.0000
5	3.0	0.0000	-0.0035	0.0000
6	3.8	0.0000	0.0000	0.0000

== SUPPORT REACTIONS ==

CASE 11: ult

Node	Force-X	Force-Y	Force-Z	Moment-X	Moment-Y	Moment-Z
kN	kN	kN	kNm	kNm	kNm	kNm
102	0.00	865.04	0.00	0.00	0.00	0.00
103	0.00	1517.86	0.00	0.00	0.00	0.00
104	0.00	1291.15	0.00	0.00	0.00	0.00

SUM: 0.00 3674.04 0.00 (all nodes)

(Reactions act on structure in positive global axis directions.)

CASE 12: serv

-- Load Combinations --

Case Factor

1	1.000 d1
2	0.700 l1

-- Sum of Applied Loads (Global Axes): --

FX: 0.000 FY: -2669.951 FZ: 0.000

Moments about the global origin:

MX: 0.000 MY: 0.000 MZ: -21860.100

== SIGN CONVENTION ==

Positive Forces (Member Axes):

Axial - Tension	Shear - End A sagging
Torque - Right-hand twist	Moment - Sagging

Deflections:

Global deflections are absolute.

Local deflections are relative to chord joining displaced end nodes.

== MEMBER FORCES AND DEFLECTIONS ==

CASE 12: serv

MEMBER 101: Nodes 101 - 102 Section 11: 530UB92.4 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.37	0.00	63.67	0.00	0.00	0.00	-11.78
3	0.74	0.00	127.34	0.00	0.00	0.00	-47.12
4	1.11	0.00	191.01	0.00	0.00	0.00	-106.01
5	1.48	0.00	254.68	0.00	0.00	0.00	-188.46
6	1.85	0.00	318.35	0.00	0.00	0.00	-294.47

Point Offset

X-glob	Y-glob	Z-glob	Y-local	z-local
m	m	m	m	m
1	0.0	0.0000	-0.0060	0.0000
2	0.4	0.0000	-0.0046	0.0000
3	0.7	0.0000	-0.0033	0.0000
4	1.1	0.0000	-0.0020	0.0000
5	1.5	0.0000	-0.0009	0.0000
6	1.9	0.0000	0.0000	0.0000

MEMBER 104: Nodes 104 - 105 Section 10: 700WB150 Y

Point	Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
m	m	kN	kN	kN	kNm	kNm	kNm
1	0.00	0.00	-362.55	0.00	0.00	0.00	-380.67
2	0.42	0.00	-290.04	0.00	0.00	0.00	-243.63
3	0.84	0.00	-217.53	0.00	0.00	0.00	-137.04
4	1.26	0.00	-145.02	0.00	0.00	0.00	-60.91
5	1.68	0.00	-72.51	0.00	0.00	0.00	-15.23

Page: 8

SS11

6 2.10 0.00 0.00 0.00 0.00 0.00 0.00

Point Offset	X-glob	Y-glob	Z-glob	Y-local	z-local	m
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4	0.0000	0.0012	0.0000	0.0000	0.0000
3	0.8	0.0000	0.0024	0.0000	0.0000	0.0000
4	1.3	0.0000	0.0034	0.0000	0.0000	0.0000
5	1.7	0.0000	0.0044	0.0000	0.0000	0.0000
6	2.1	0.0000	0.0054	0.0000	0.0000	0.0000

MEMBER 105: Nodes 102 - 106 Section 11: 530UB92.4 Y

Point Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.00	0.00	-299.43	0.00	0.00	-294.47
2	0.48	0.00	-222.65	0.00	0.00	-169.17
3	0.96	0.00	-145.88	0.00	0.00	-80.72
4	1.44	0.00	-69.10	0.00	0.00	-29.13
5	1.92	0.00	7.68	0.00	0.00	-14.39
6	2.40	0.00	84.46	0.00	0.00	-36.50

Point Offset X-glob Y-glob Z-glob Y-local z-local m

1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.5	0.0000	0.0007	0.0000	0.0000	0.0000
3	1.0	0.0000	0.0010	0.0000	0.0000	0.0000
4	1.4	0.0000	0.0012	0.0000	0.0000	0.0000
5	1.9	0.0000	0.0013	0.0000	0.0000	0.0000
6	2.4	0.0000	0.0014	0.0000	0.0000	0.0000

MEMBER 106: Nodes 106 - 103 Section 10: 700WB150 Y

Point Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.00	0.00	84.46	0.00	0.00	-36.50
2	0.48	0.00	161.51	0.00	0.00	-95.53
3	0.96	0.00	238.55	0.00	0.00	-191.55
4	1.44	0.00	315.60	0.00	0.00	-324.55
5	1.92	0.00	392.65	0.00	0.00	-494.53
6	2.40	0.00	469.70	0.00	0.00	-701.49

Point Offset X-glob Y-glob Z-glob Y-local z-local m

1	0.0	0.0000	0.0014	0.0000	0.0000	0.0000
2	0.5	0.0000	0.0014	0.0000	0.0000	0.0000
3	1.0	0.0000	0.0013	0.0000	0.0000	0.0000
4	1.4	0.0000	0.0011	0.0000	0.0000	0.0000
5	1.9	0.0000	0.0007	0.0000	0.0000	0.0000
6	2.4	0.0000	0.0000	0.0000	0.0000	0.0000

MEMBER 107: Nodes 103 - 107 Section 10: 700WB150 Y

Point Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.00	0.00	-652.18	0.00	0.00	-701.49
2	0.76	0.00	-530.18	0.00	0.00	-252.19
3	1.52	0.00	-408.19	0.00	0.00	104.39
4	2.28	0.00	-286.20	0.00	0.00	368.26
5	3.04	0.00	-164.21	0.00	0.00	539.41
6	3.80	0.00	-42.21	0.00	0.00	617.85

Point Offset X-glob Y-glob Z-glob Y-local z-local m

1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.8	0.0000	-0.0020	0.0000	-0.0002	0.0000
3	1.5	0.0000	-0.0044	0.0000	-0.0008	0.0000
4	2.3	0.0000	-0.0066	0.0000	-0.0012	0.0000
5	3.0	0.0000	-0.0082	0.0000	-0.0011	0.0000
6	3.8	0.0000	-0.0090	0.0000	0.0000	0.0000

MEMBER 108: Nodes 107 - 104 Section 10: 700WB150 Y

Point Offset	Axial	Shear-y	Shear-z	Torque	Moment-y	Moment-z
1	0.00	0.00	-42.21	0.00	0.00	617.85
2	0.76	0.00	79.78	0.00	0.00	603.57
3	1.52	0.00	201.77	0.00	0.00	496.58
4	2.28	0.00	323.77	0.00	0.00	296.88
5	3.04	0.00	445.76	0.00	0.00	4.46
6	3.80	0.00	567.75	0.00	0.00	-380.67

Point Offset X-glob Y-glob Z-glob Y-local z-local m

1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.8	0.0000	-0.0090	0.0000	0.0000	0.0000
3	1.5	0.0000	-0.0074	0.0000	-0.0015	0.0000

4 2.3 0.0000 -0.0052 0.0000 -0.0016 0.0000

5 3.0 0.0000 -0.0026 0.0000 -0.0008 0.0000

6 3.8 0.0000 0.0000 0.0000 0.0000 0.0000

== SUPPORT REACTIONS ==

CASE 12: serv

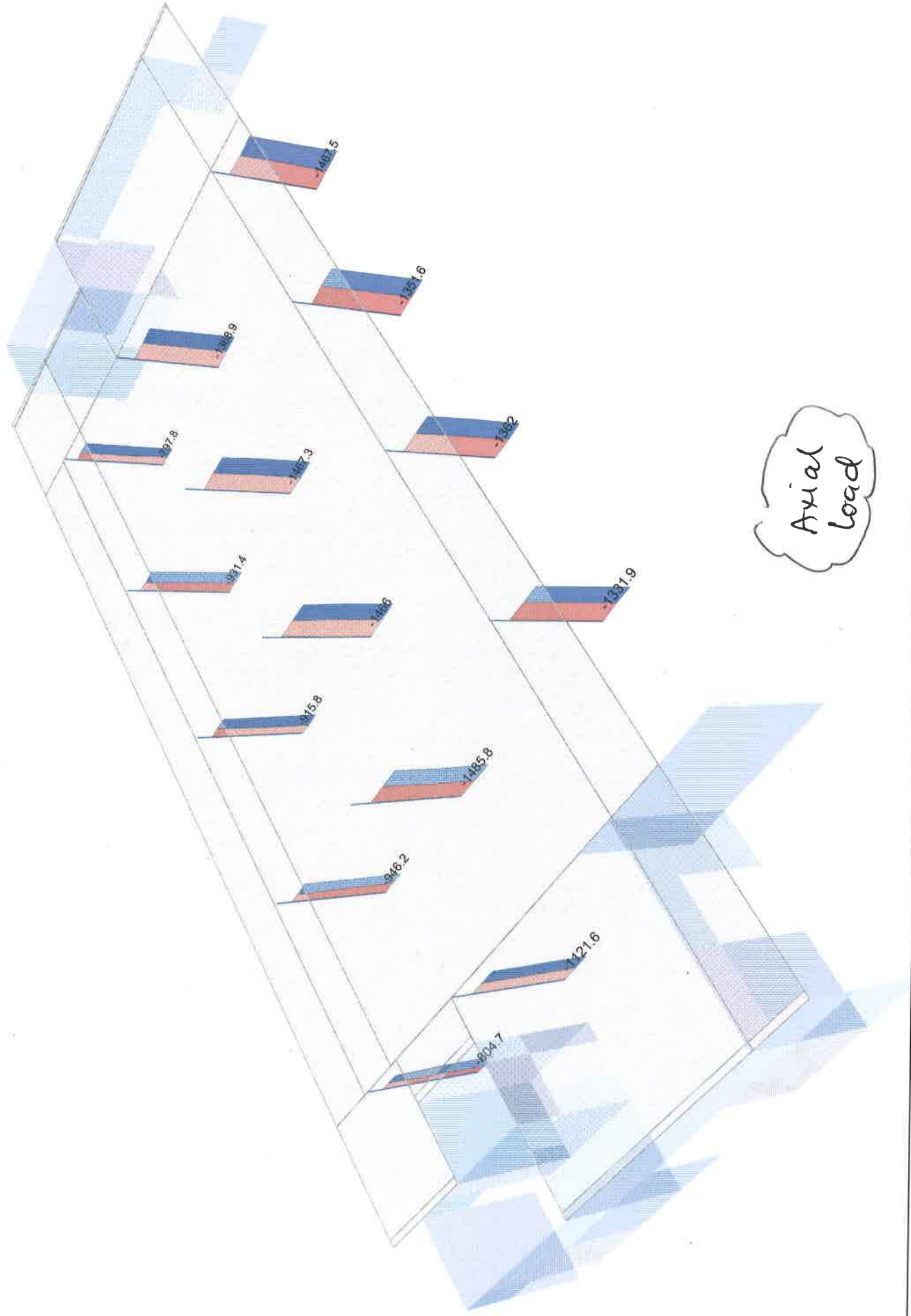
Node	Force-X	Force-Y	Force-Z	Moment-X	Moment-Y	Moment-Z
102	0.00	617.78	0.00	0.00	0.00	0.00
103	0.00	1121.88	0.00	0.00	0.00	0.00
104	0.00	930.30	0.00	0.00	0.00	0.00
SUM:	0.00	2669.95	0.00 (all nodes)			

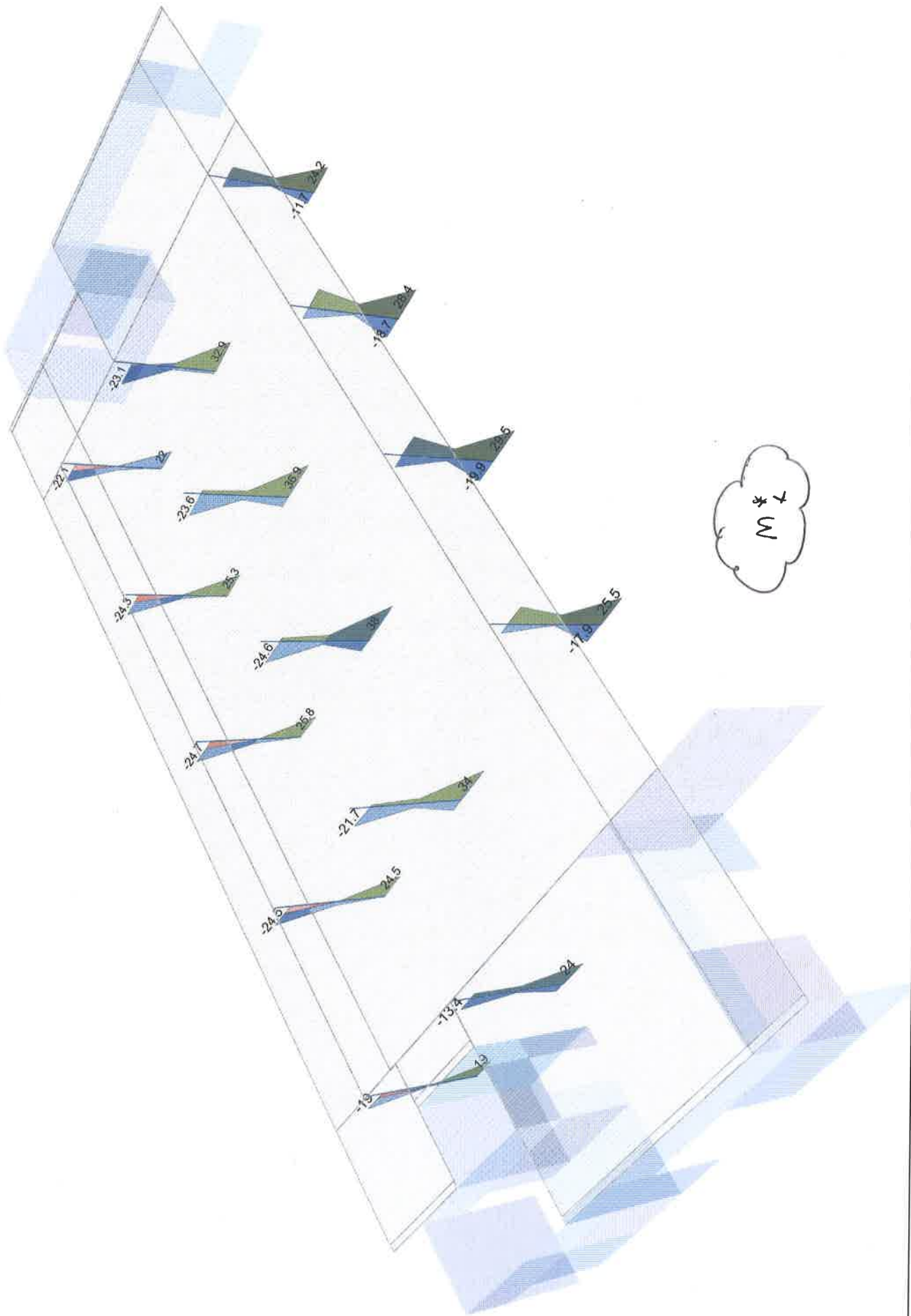
(Reactions act on structure in positive global axis directions.)

SS12

### Ground floor Concrete Columns

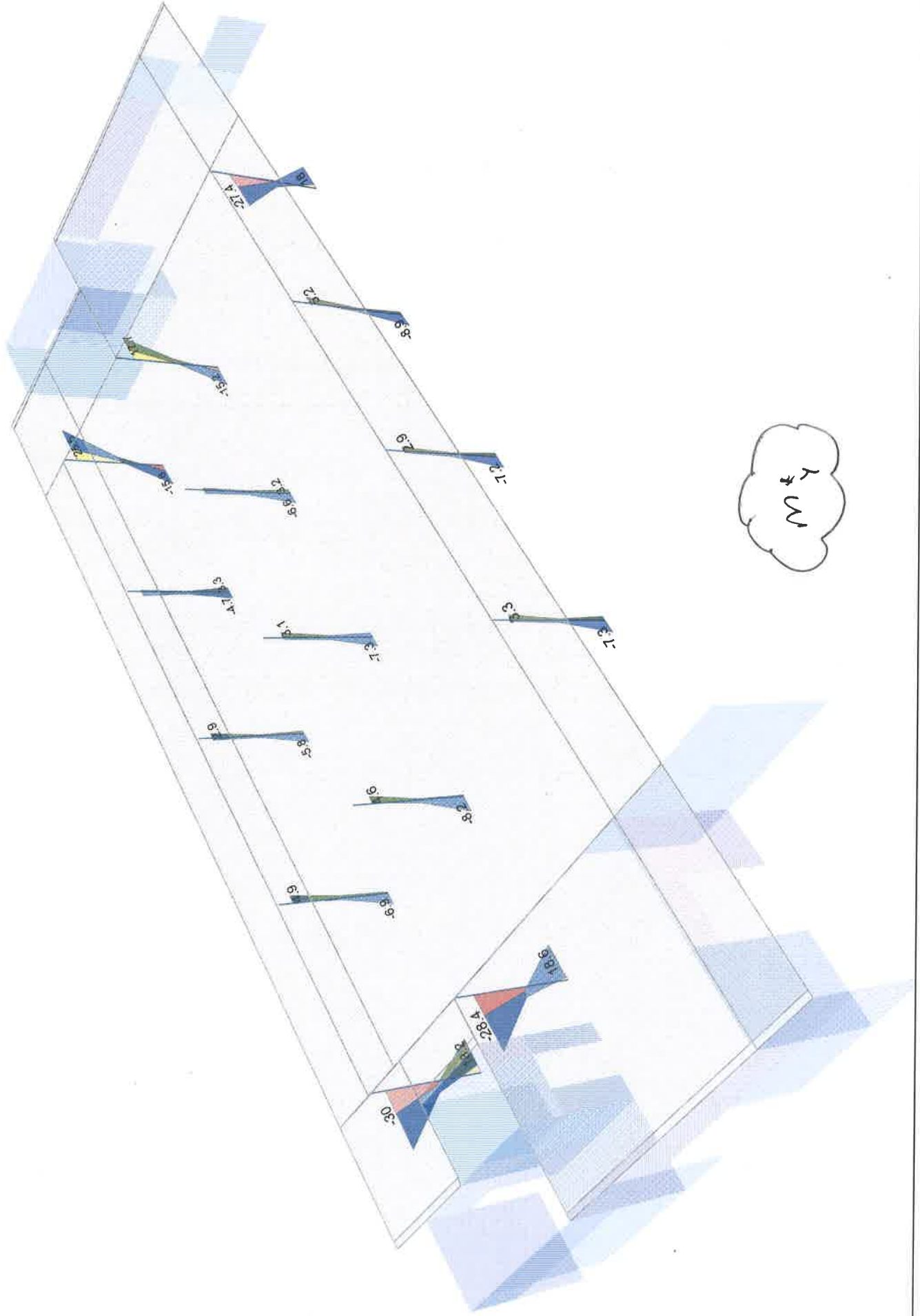
- \* Analyse in ETABS; design in RAPT for ultimate strength & fire rating.
  - \* Propose GCC1 300x600 12N28  
GCC2 300x750 12N28
  - \* Refer to sheets CC2-CC4 for ETABS analysis output  
" " " CC5-CC21 " RAPT Design output.
  - \* Also refer to CC22-CC43 for column verification for fire design
- ⇒ columns ok as specified above.





CC3

N \* L



CC4



### Rectangle

Solid/Void		X	Y	Width	Depth
#	List	mm	mm	mm	mm
1	Solid	0	0	300	600

### Reinforcement Bar

Reinforcement Bar	Type	Reinforcement Bar Size	Number of bundled bars	X	Y	Distance	Tendon Force
#	List	List	List	mm	mm	mm	kN
1	N, Deformed	500MPa	28, 26mm, 618mm <sup>2</sup>	64	64	10000	0

### Design Data

##	Code	Default	Unit	Value
##	Capacity Reduction Factor in Flexure - Tension	0.8		
##	Capacity Reduction Factor in Flexure - Compression	0.6		
##	Capacity Reduction Factor in Shear	0.7		
##	Concrete Material Factor Flexure	1		
##	Concrete Material Factor Shear	1		
##	Reinforcement Material Factor	1		
##	Maximum Depth of Neutral Axis for Ductility	0.4		
Y/N	Shear Enhancement near Support	N		
##	Time of Loading in Days	28		
MPa	Concrete Strength at Time of Loading	40		
##	Design Period in Years	30		
%	Relative Humidity	50		
C.	Average Temperature	20		
List	Long Term Calculation Basis			
List	Concrete Strength Gain Rate			

### Design Points

	Moment	Axial Force	Description
-1	kNm	kN	A
0	26	946	

## Slenderness

mm	List	3900
mm	Braced	0.7
mm	Braced	0.5
mm	Braced	25
mm	Braced	26
mm	Braced	946

CC5

General Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar 12 N28  
Reinforcement Ratio - 4.11%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression



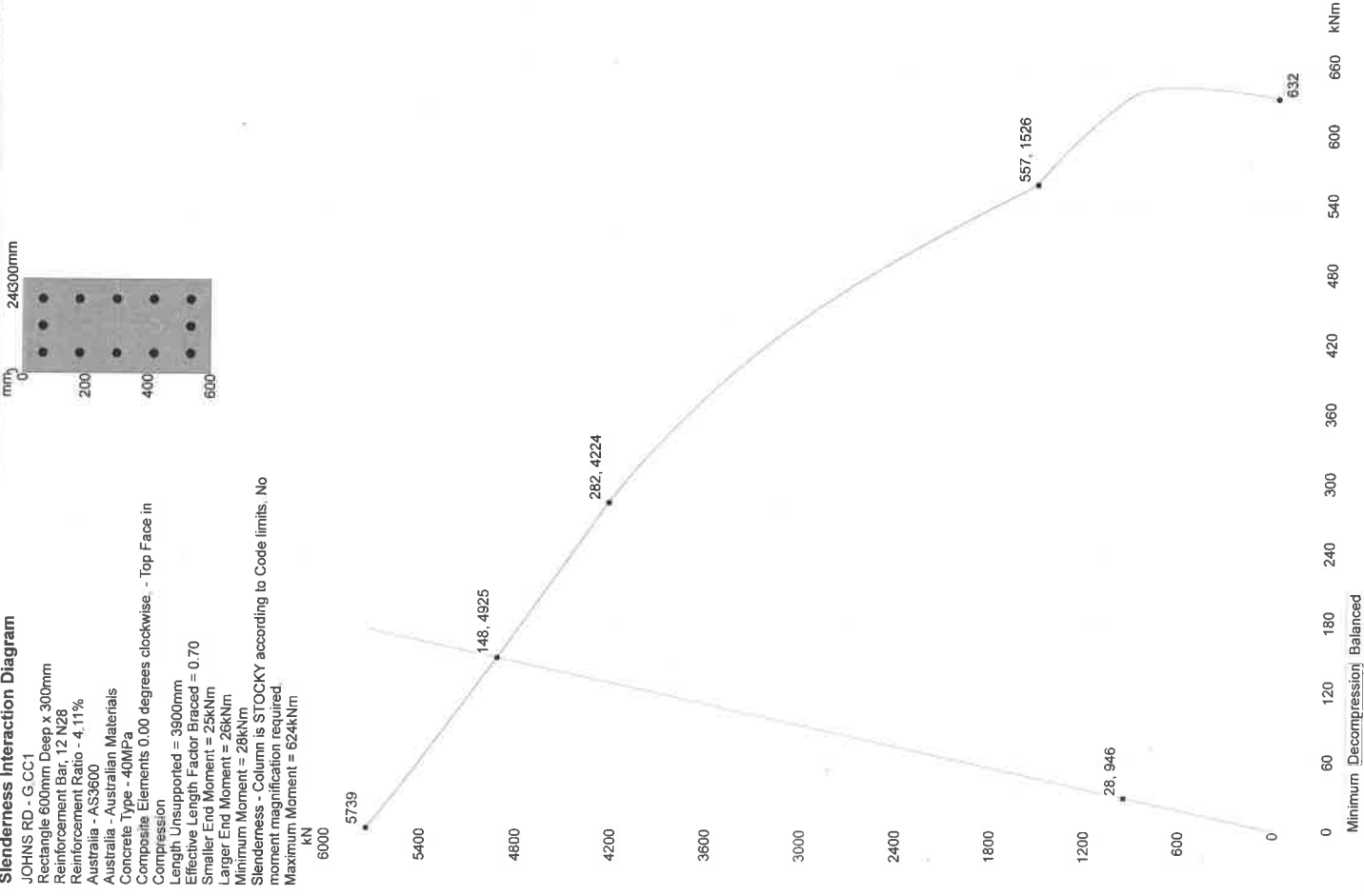
Column Interaction Diagram

Point	Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Face Strain	Compression Curvature	El x	Remarks
#	kNm	kN	##	##	mm	##	x 10E-6	10E12	
1	0	5738.8	0.6	99999	99999	0.0025	0	0	Pure Axial Nuo - dp = 300mm
2	15.08	5649.29	0.6	7.516	4028.6	0.0026	0.8688	28.9219	
3	32.25	5550.77	0.6	3.9179	2100	0.0027	1.6667	32.2471	
4	53.27	5433.71	0.6	2.7186	1457.1	0.0028	2.402	36.9624	
5	78.5	5295.72	0.6	2.1189	1135.7	0.0029	3.0818	42.4542	
6	108.29	5134.96	0.6	1.7591	942.9	0.0031	3.7121	48.6198	
7	143.03	4949.58	0.6	1.5192	814.3	0.0032	4.2982	55.4618	
8	183.18	4737.53	0.6	1.3479	722.4	0.0033	4.8446	63.0171	
9	229.23	4496.55	0.6	1.2193	653.6	0.0034	5.3552	71.3404	
10	281.75	4224.07	0.6	1.1194	600	0.0035	5.8333	80.5	
11	301.72	4104.47	0.6	1.0883	583.3	0.0035	6	83.8106	
12	319.78	3989.52	0.6	1.0589	567.6	0.0035	6.1667	86.4262	
13	336.15	3878.89	0.6	1.031	552.6	0.0035	6.3333	88.4607	
14	351.03	3772.27	0.6	1.0046	538.5	0.0035	6.5	90.0086	
15	365.27	3666.52	0.6	0.9795	525	0.0035	6.6667	91.3177	
16	378.52	3563.45	0.6	0.9556	512.2	0.0035	6.8333	92.3224	
17	390.77	3463.45	0.6	0.9328	500	0.0035	7	93.0404	
18	402.13	3366.31	0.6	0.9111	488.4	0.0035	7.1667	93.5176	
19	412.69	3271.85	0.6	0.8904	477.3	0.0035	7.3333	93.7926	
20	422.54	3179.9	0.6	0.8706	466.7	0.0035	7.5	93.8978	
21	431.76	3090.31	0.6	0.8517	456.5	0.0035	7.6667	93.8607	
22	440.41	3002.93	0.6	0.8336	446.8	0.0035	7.8333	93.7044	
23	448.55	2917.63	0.6	0.8162	437.5	0.0035	8	93.4486	
24	456.24	2834.3	0.6	0.7986	428.6	0.0035	8.1667	93.1098	
25	463.51	2752.83	0.6	0.7836	420	0.0035	8.3333	92.7024	
26	470.58	2671.74	0.6	0.7682	411.8	0.0035	8.5	92.2703	
27	477.37	2591.81	0.6	0.7534	403.8	0.0035	8.6667	91.8019	
28	483.87	2513.37	0.6	0.7392	396.2	0.0035	8.8333	91.2964	
29	490.11	2436.34	0.6	0.7255	388.9	0.0035	9	90.761	
30	496.11	2360.66	0.6	0.7123	381.8	0.0035	9.1667	90.2022	
31	501.9	2286.25	0.6	0.6996	375	0.0035	9.3333	89.6254	
32	507.5	2213.05	0.6	0.6874	368.4	0.0035	9.5	89.0353	
33	512.93	2140.99	0.6	0.6755	362.1	0.0035	9.6667	88.4358	
34	518.2	2070.03	0.6	0.6641	355.9	0.0035	9.8333	87.8303	
35	523.33	2000.11	0.6	0.653	350	0.0035	10	87.2217	
36	528.34	1931.18	0.6	0.6423	344.3	0.0035	10.1667	86.6124	
37	533.23	1863.19	0.6	0.6319	338.7	0.0035	10.3333	86.0045	
38	538.02	1796.11	0.6	0.6219	333.3	0.0035	10.5	85.3987	
39	542.72	1729.9	0.6	0.6122	328.1	0.0035	10.6667	84.7995	
40	547.33	1664.51	0.6	0.6028	323.1	0.0035	10.8333	84.2051	
41	557.08	1525.68	0.6	0.5833	312.7	0.0035	11.194	82.9432	
42	566.12	1471.84	0.6103	0.5678	304.3	0.0035	11.5	80.6595	
43	575.61	1411.05	0.6214	0.5518	295.8	0.0035	11.8333	78.2807	
44	584.78	1347.98	0.6323	0.5367	287.7	0.0035	12.1667	76.0119	
45	593.54	1283.61	0.643	0.5224	280	0.0035	12.5	73.8488	
46	601.93	1218.03	0.6534	0.5088	272.7	0.0035	12.8333	71.7867	
47	609.98	1151.32	0.6635	0.4959	265.8	0.0035	13.1667	69.8211	
48	617.75	1083.54	0.6735	0.4837	259.3	0.0035	13.5	67.947	
49	625.25	1014.75	0.6832	0.472	253	0.0035	13.8333	66.1599	
50	632.51	945	0.6927	0.4609	247.1	0.0035	14.1667	64.4552	
51	637.25	883.39	0.7009	0.4503	241.4	0.0035	14.5	62.7061	
52	638.79	833.31	0.7073	0.4402	236	0.0035	14.8333	60.8829	
53	640.13	783.43	0.7137	0.4305	230.8	0.0035	15.1667	59.1413	
54	641.29	733.75	0.7198	0.4213	225.8	0.0035	15.5	57.4769	
55	641.77	681.04	0.7262	0.4124	221.1	0.0035	15.8333	55.8119	
56	641.78	626.43	0.7328	0.4039	216.5	0.0035	16.1667	54.1755	
57	641.62	571.81	0.7392	0.3957	212.1	0.0035	16.5	52.6087	
58	641.3	517.19	0.7454	0.3879	207.9	0.0035	16.8333	51.1077	
59	640.85	462.56	0.7516	0.3804	203.9	0.0035	17.1667	49.6689	
60	640.26	407.92	0.7577	0.3731	200	0.0035	17.5	48.2888	
61	639.55	353.28	0.7636	0.3662	196.3	0.0035	17.8333	46.9644	
62	638.73	298.62	0.7695	0.3594	192.7	0.0035	18.1667	45.6927	
63	637.81	243.96	0.7752	0.353	189.2	0.0035	18.5	44.4709	
64	636.79	189.28	0.7809	0.3467	185.8	0.0035	18.8333	43.2965	
65	635.68	134.59	0.7865	0.3407	182.6	0.0035	19.1667	42.167	
66	634.43	78.24	0.7922	0.3349	179.5	0.0035	19.5	41.0675	
67	631.85	0	0.8	0.3275	175.5	0.0035	19.8333	39.8147	Pure Moment Nuo - d = 535mm

CC6

Slenderness Interaction Diagram

JOHNS RD - G CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 4.11%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression  
Length Unsupported = 3800mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 25kNm  
Larger End Moment = 28kNm  
Minimum Moment = 28kNm  
Slenderness - Column is STOCKY according to Code limits. No moment magnification required.  
Maximum Moment = 624kNm



Column Interaction Diagram

Point	Moment kNm	Axial kN	Phi #	Ratio of Neutral Axis Depth #	Neutral Axis depth mm	Compression Face Strain #	Curvature x 10E-6 #	El x 10E12 kNm/m2	Buckling Load kN	Magnified Moment kNm
1	0	5738.8	0.6	99999	99999	0.0025	0	0	0	172.16
2	15.08	5649.29	0.6	7.516	4028.6	0.0026	0.8688	28.9219	0	169.46
3	32.25	5550.77	0.6	3.9179	2100	0.0027	1.6667	32.2471	0	166.52
4	53.27	5433.71	0.6	2.7186	1457.1	0.0028	2.402	36.9624	0	163.01
5	78.5	5295.72	0.6	2.1189	1135.7	0.0029	3.0818	42.4542	0	158.87
6	108.29	5134.96	0.6	1.7591	942.9	0.0031	3.7121	48.6198	0	154.05
7	143.03	4949.58	0.6	1.5192	814.3	0.0032	4.2982	55.4618	0	148.49
8	183.18	4737.53	0.6	1.3479	722.4	0.0033	4.8446	63.0171	0	142.13
9	229.23	4496.55	0.6	1.2193	653.6	0.0034	5.3552	71.3404	0	134.9
10	281.75	4224.07	0.6	1.1194	600	0.0035	5.8333	80.5	0	126.72
11	301.72	4104.47	0.6	1.0883	583.3	0.0035	6	83.8106	0	123.13
12	319.78	3989.52	0.6	1.0589	567.6	0.0035	6.1667	86.4262	0	119.69
13	336.15	3878.89	0.6	1.031	552.6	0.0035	6.3333	88.4607	0	116.37
14	351.03	3772.27	0.6	1.0046	538.5	0.0035	6.5	90.0086	0	113.17
15	365.27	3666.52	0.6	0.9795	525	0.0035	6.6667	91.3177	0	110
16	378.52	3563.45	0.6	0.9556	512.2	0.0035	6.8333	92.3224	0	106.9
17	390.77	3463.45	0.6	0.9328	500	0.0035	7	93.0404	0	103.9
18	402.13	3366.31	0.6	0.9111	488.4	0.0035	7.1667	93.5176	0	100.99
19	412.69	3271.85	0.6	0.8904	477.3	0.0035	7.3333	93.7926	0	98.16
20	422.54	3179.9	0.6	0.8706	466.7	0.0035	7.5	93.8978	0	95.4
21	431.76	3090.31	0.6	0.8517	456.5	0.0035	7.6667	93.8607	0	92.71
22	440.41	3002.93	0.6	0.8336	446.8	0.0035	7.8333	93.7044	0	90.09
23	448.55	2917.63	0.6	0.8162	437.5	0.0035	8	93.4486	0	87.53
24	456.24	2834.3	0.6	0.7986	428.6	0.0035	8.1667	93.1098	0	85.03
25	463.51	2752.83	0.6	0.7836	420	0.0035	8.3333	92.7024	0	82.58
26	470.58	2671.74	0.6	0.7682	411.8	0.0035	8.5	92.2703	0	80.15
27	477.37	2591.81	0.6	0.7534	403.8	0.0035	8.6667	91.8019	0	77.75
28	483.87	2513.37	0.6	0.7392	396.2	0.0035	8.8333	91.2964	0	75.4
29	490.11	2436.34	0.6	0.7255	388.9	0.0035	9	90.761	0	73.09
30	496.11	2360.66	0.6	0.7123	381.8	0.0035	9.1667	90.2022	0	70.82
31	501.9	2286.25	0.6	0.6996	375	0.0035	9.3333	89.6254	0	68.59
32	507.5	2213.05	0.6	0.6874	368.4	0.0035	9.5	89.0353	0	66.39
33	512.93	2140.99	0.6	0.6755	362.1	0.0035	9.6667	88.4368	0	64.23
34	518.2	2070.03	0.6	0.6641	355.9	0.0035	9.8333	87.8303	0	62.1
35	523.33	2000.11	0.6	0.653	350	0.0035	10	87.2217	0	60
36	528.34	1931.18	0.6	0.6423	344.3	0.0035	10.1667	86.6124	0	57.94
37	533.23	1863.19	0.6	0.6319	338.7	0.0035	10.3333	86.0045	0	55.9
38	538.02	1796.11	0.6	0.6219	333.3	0.0035	10.5	85.3987	0	53.88
39	542.72	1729.9	0.6	0.6122	328.1	0.0035	10.6667	84.7995	0	51.9
40	547.33	1664.51	0.6	0.6028	323.1	0.0035	10.8333	84.2051	0	49.94
41	557.08	1525.68	0.6	0.5833	312.7	0.0035	11.194	82.9432	0	45.77
42	566.12	1471.84	0.6103	0.5678	304.3	0.0035	11.5	80.6595	0	44.16
43	575.61	1411.05	0.6214	0.5518	295.8	0.0035	11.8333	78.2807	0	42.33
44	584.78	1347.98	0.6323	0.5367	287.7	0.0035	12.1667	76.0119	0	40.44
45	593.54	1283.61	0.643	0.5224	280	0.0035	12.5	73.8488	0	38.51
46	601.93	1218.03	0.6534	0.5088	272.7	0.0035	12.8333	71.7867	0	36.54
47	609.98	1151.32	0.6635	0.4959	265.8	0.0035	13.1667	69.8211	0	34.54
48	617.75	1083.54	0.6735	0.4837	259.3	0.0035	13.5	67.947	0	32.51
49	625.25	1014.75	0.6832	0.472	253	0.0035	13.8333	66.1599	0	30.44
50	632.51	945	0.6927	0.4609	247.1	0.0035	14.1667	64.4552	0	28.35
51	637.25	883.39	0.7009	0.4503	241.4	0.0035	14.5	62.7051	0	26.5
52	638.79	833.31	0.7073	0.4402	236	0.0035	14.8333	60.8829	0	25
53	640.13	783.43	0.7137	0.4305	230.8	0.0035	15.1667	59.1413	0	23.5
54	641.29	733.75	0.7198	0.4213	225.8	0.0035	15.5	57.4769	0	22.01
55	641.77	681.04	0.7262	0.4124	221.1	0.0035	15.8333	55.8119	0	20.43
56	641.78	626.43	0.7328	0.4039	216.5	0.0035	16.1667	54.1755	0	18.79
57	641.82	571.81	0.7392	0.3957	212.1	0.0035	16.5	52.6087	0	17.15
58	641.3	517.19	0.7454	0.3879	207.9	0.0035	16.8333	51.1077	0	15.52
59	640.85	462.56	0.7516	0.3804	203.9	0.0035	17.1667	49.6889	0	13.88
60	640.26	407.92	0.7577	0.3731	200	0.0035	17.5	48.2888	0	12.24
61	639.55	353.28	0.7636	0.3662	196.3	0.0035	17.8333	46.9844	0	10.6
62	638.73	298.62	0.7695	0.3594	192.7	0.0035	18.1667	45.6927	0	8.96
63	637.81	243.96	0.7752	0.353	189.2	0.0035	18.5	44.4709	0	7.32
64	636.79	189.28	0.7809	0.3467	185.8	0.0035	18.8333	43.2965	0	5.68
65	635.68	134.59	0.7865	0.3407	182.6	0.0035	19.1667	42.167	0	4.04
66	634.43	78.24	0.7922	0.3349	179.5	0.0035	19.5	41.0675	0	2.35
67	631.85	0	0.8	0.3275	175.5	0.0035	19.9373	39.6147	0	1

cc7

RAPT 6.5.16.0  
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Page 7/8  
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Errors and Warnings

Input

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Output

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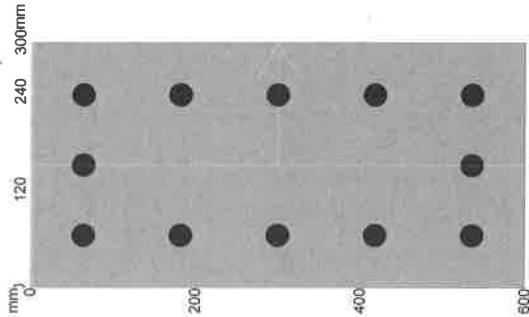
Remarks	
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Pure Axial Nuo - dp = 300mm	
Decompression	
Balanced Point	
Pure Moment Muo - d = 536mm	

008

Project Name: JOHNS RD  
Project Number: 1806063  
Description: G.CC1  
Designer: RGC  
K:\2018\061806063\Structural Drawings and Details\RGC\G.CC1 weak dir.rpt

RAPT - Version: 6.5.16.0  
Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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TMK Consulting Engineers  
Level 6  
100 Pirie Street  
Adelaide SA 5000  
11169065160718WPN3



Input

General			
Designer	A	RG	
Project Name	A	JOHNS RD	
Project Number	A	1806063	
Description	A	G.CC1	
Design Code	List	Australia - AS3600*SAVED	
Material	List	Australia - Australian Materials*SAVED	
Concrete Type	List	Standard Concrete - Brisbane/Sydney	
Concrete Strength	List	40MPa	
Rotation	##	90	
Tension Curve	Y/N	N	

Rectangle

#	Width	X	Y	Depth
List	mm	mm	mm	mm
1	Solid	0	0	300 600

Reinforcement Bar

Reinforcement Bar Type		Reinforcement Bar Size		Number of bundled bars		X		Y		Distance Tendon Force	
#	List	List	List	List	List	mm	mm	mm	mm	mm	kN
1	N, Deformed, 500MPa	28, 28mm, 616mm <sup>2</sup>	1	-64	64	10000	0				

#	List	Reinforcement Bar Size	Number of bundled bars	X	Y	Distance	Tendon Force
2	List	List	List	mm	mm	mm	kN
3				-536	150	10000	0
4				-536	236	10000	0
5				-182	64	10000	0
6				-300	64	10000	0
7				-418	64	10000	0
8				-536	64	10000	0
9				-64	236	10000	0
10				-300	236	10000	0
11				-418	236	10000	0
12				-536	236	10000	0

Design Data

Capacity Reduction Factor in Flexure - Tension	##	0.8
Capacity Reduction Factor in Flexure - Compression	##	0.6
Capacity Reduction Factor in Shear	##	0.7
Concrete Material Factor Flexure	##	1
Concrete Material Factor Shear	##	1
Reinforcement Material Factor	##	1
Maximum Depth of Neutral Axis for Ductility	##	0.4
Shear Enhancement near Support	Y/N	N
Time of Loading in Days	##	28
Concrete Strength at Time of Loading	MPa	40
Design Period in Years	##	30
Relative Humidity	%	50
Average Temperature	C.	20
Long Term Calculation Basis	List	Code Default
Concrete Strength Gain Rate	List	S

Design Points

Moment		Axial		Description	
#	kNm	KN	A		
0	30	946			

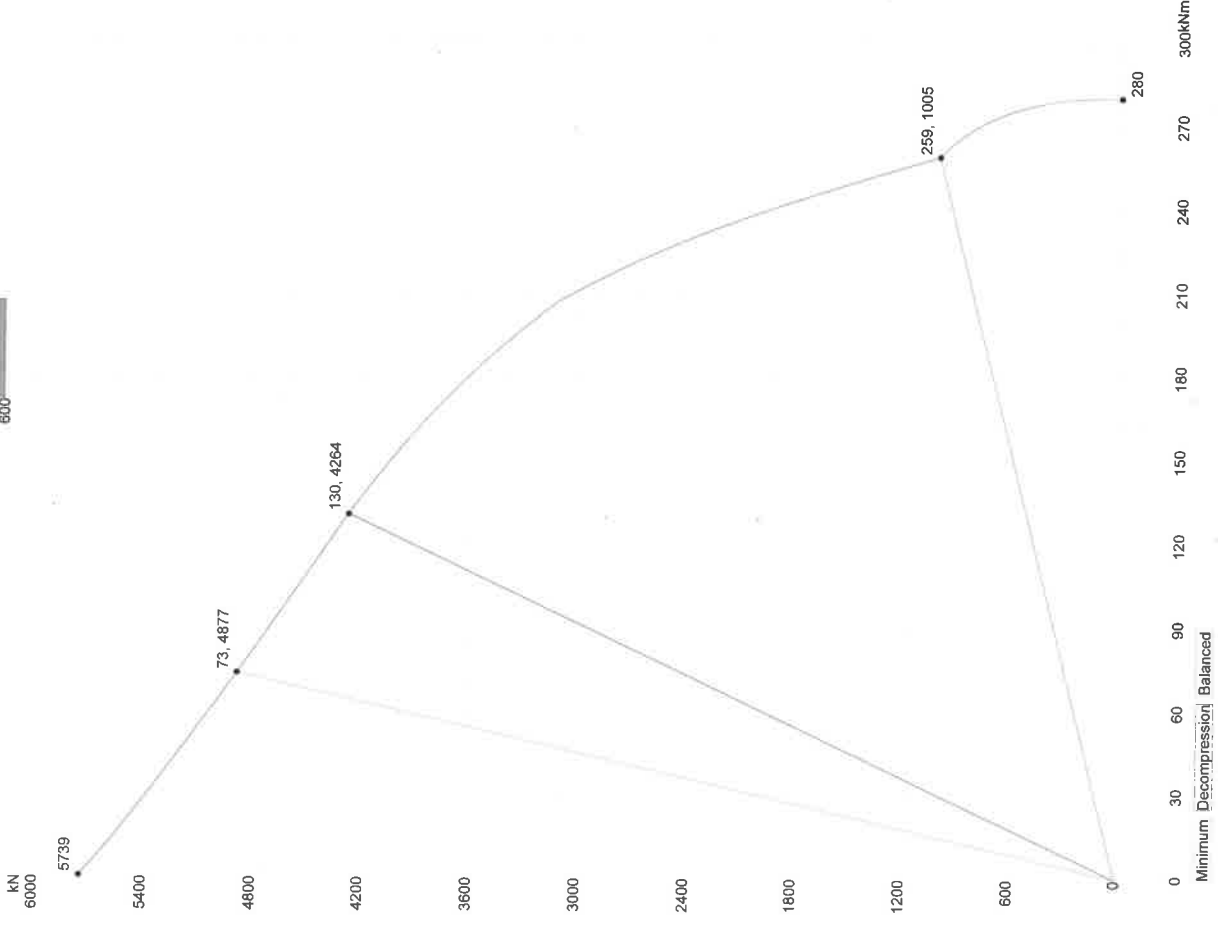
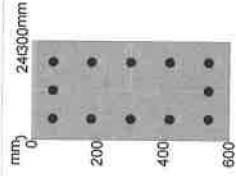
Slenderness

Length Unsupported	mm	3900
Column Framing	List	Braced
Effective Length Factor Braced	##	0.7
Moment Ratio for Creep	##	0.5
Smaller End Moment M1	kNm	13
Larger End Moment M2	kNm	30
Applied Axial Load	kN	946

cc.9

General Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 4.11%  
Australia - AS3600  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 90.00 degrees clockwise. - Left Face in Compression



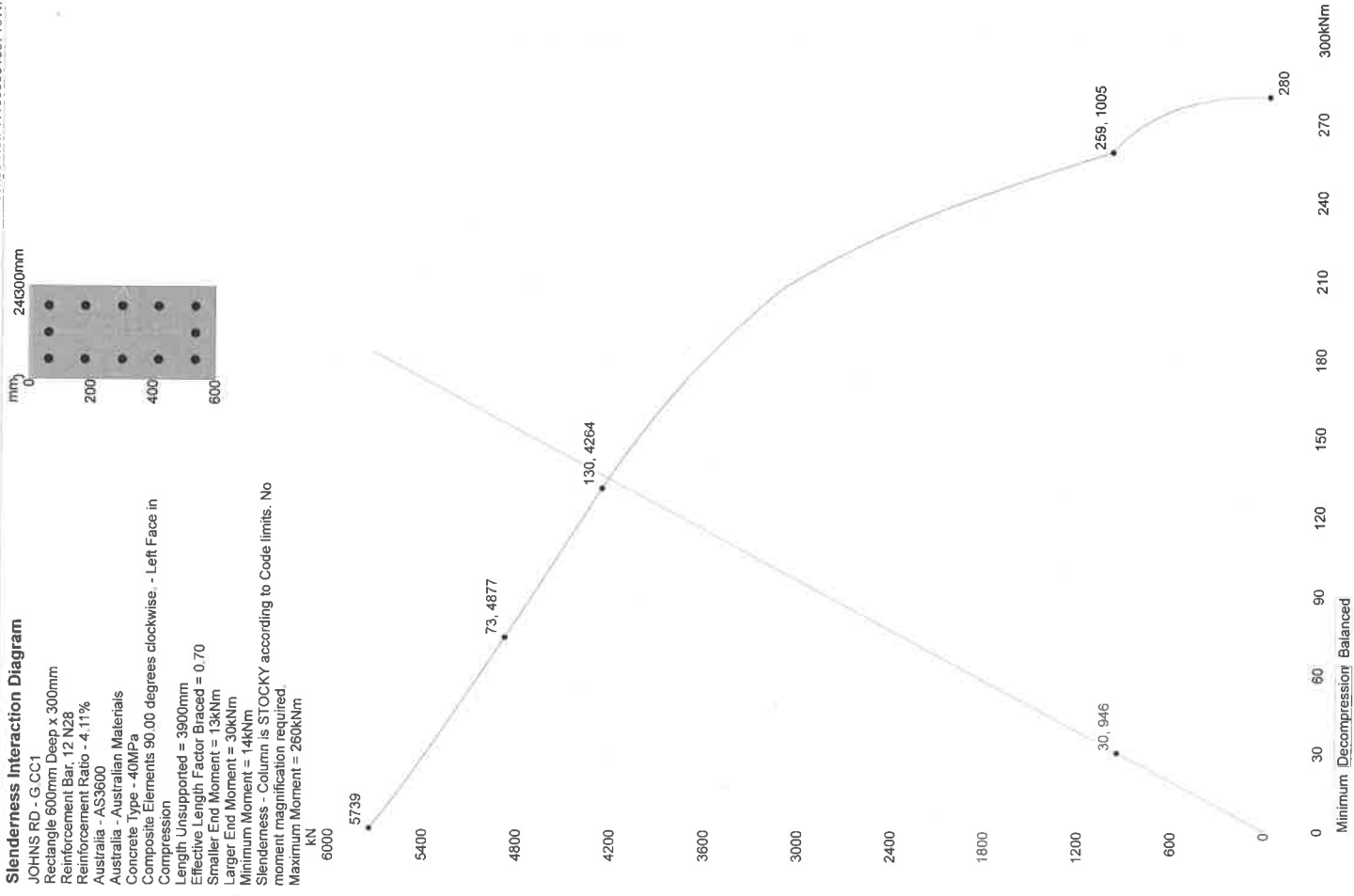
Column Interaction Diagram

#	kNm	Phi	Ratio of Neutral Axis Depth	Neutral Axis Depth	Face Strain	Compression Curvature	El x 10E-6	Remarks
1	0	5738.8	0.6	99999	0.0025	0	0	Pure Axial Nuo - dp = 150mm
2	6.21	5654.32	0.6	8.5351	0.0026	1.7376	5.96	
3	13.5	5560.71	0.6	4.4492	0.0027	3.3333	6.7478	
4	22.73	5448.45	0.6	3.0872	0.0028	4.8039	7.8859	
5	34.1	5315.1	0.6	2.4062	0.0029	6.1635	9.2202	
6	47.78	5158.84	0.6	1.9876	0.0031	7.4242	10.7255	
7	63.97	4977.78	0.6	1.7252	0.0032	8.5985	12.4025	
8	82.9	4769.84	0.6	1.5306	0.0033	9.6893	14.2606	
9	104.84	4532.72	0.6	1.3847	0.0034	10.7104	16.3139	
10	130.06	4263.85	0.6	1.2712	0.0035	11.6667	18.5798	Decompression
11	139.97	4149.23	0.6	1.2359	0.0035	12.1944	19.4409	
12	148.94	4039.23	0.6	1.2025	0.0035	12.3333	20.1274	
13	157.08	3933.51	0.6	1.1708	0.0035	12.6667	20.6679	
14	164.47	3831.76	0.6	1.1408	0.0035	13.1333	21.0862	
15	171.21	3733.71	0.6	1.1123	0.0035	13.3333	21.4018	
16	177.38	3639.12	0.6	1.0852	0.0035	13.6667	21.6311	
17	183.02	3547.76	0.6	1.0593	0.0035	14.3333	21.8834	
18	188.2	3459.44	0.6	1.0347	0.0035	14.6667	21.9275	
19	192.96	3373.97	0.6	1.0112	0.0035	15.1529	21.9529	
20	197.58	3288.6	0.6	0.9867	0.0035	15.6667	21.9396	
21	202.09	3203.07	0.6	0.9672	0.0035	16.3333	21.8265	
22	206.23	3118.69	0.6	0.9466	0.0035	16.6667	21.6951	
23	209.53	3029.41	0.6	0.9269	0.0035	17.1788	21.5488	
24	212.61	2942.01	0.6	0.908	0.0035	17.3333	21.2227	
25	215.49	2856.39	0.6	0.8898	0.0035	18.2066	21.0474	
26	218.18	2772.43	0.6	0.8724	0.0035	18.3333	20.8664	
27	220.72	2690.05	0.6	0.8556	0.0035	18.5798	20.6813	
28	223.1	2609.16	0.6	0.8395	0.0035	18.6667	20.4933	
29	225.36	2529.67	0.6	0.8239	0.0035	19.2034	20.3034	
30	227.49	2451.52	0.6	0.8089	0.0035	19.3333	20.1126	
31	229.52	2374.63	0.6	0.7945	0.0035	19.6667	19.9218	
32	231.46	2298.94	0.6	0.7806	0.0035	20.1915	19.7315	
33	233.31	2224.4	0.6	0.7671	0.0035	20.3333	19.5423	
34	235.08	2150.95	0.6	0.7541	0.0035	20.6667	19.3547	
35	236.78	2078.54	0.6	0.7415	0.0035	21.1916	19.169	
36	238.42	2007.13	0.6	0.7294	0.0035	21.3333	18.9855	
37	240	1936.66	0.6	0.7176	0.0035	21.6667	18.8045	
38	241.53	1867.09	0.6	0.7062	0.0035	22.18263	18.6263	
39	243.01	1798.39	0.6	0.6952	0.0035	22.3333	18.4509	
40	244.46	1730.52	0.6	0.6845	0.0035	22.6667	18.2785	
41	245.87	1663.44	0.6	0.6741	0.0035	23.181092	18.1092	
42	247.24	1597.13	0.6	0.6641	0.0035	23.3333	17.9431	
43	248.59	1531.54	0.6	0.6543	0.0035	23.6667	17.7802	
44	249.91	1466.66	0.6	0.6448	0.0035	24.3333	17.6206	
45	251.2	1402.45	0.6	0.6356	0.0035	24.6667	17.4642	
46	252.48	1337.59	0.6	0.6266	0.0035	25.4237	17.3111	
47	253.74	1273.31	0.6	0.6179	0.0035	26.164541	16.9756	
48	254.98	1209.59	0.6	0.6095	0.0035	26.6667	16.4541	
49	256.2	1146.41	0.6	0.6012	0.0035	27.3333	15.8775	
50	258.95	1084.79	0.6	0.5833	0.0035	27.6667	15.328	
51	261.44	966.49	0.6111	0.5704	0.0035	28.14041	14.8041	
52	264.06	920.83	0.6237	0.5561	0.0035	28.6667	14.3044	
53	266.41	873.82	0.6359	0.5426	0.0035	29.3333	13.8275	
54	268.52	825.58	0.6478	0.5297	0.0035	30.13721	13.3721	
55	270.4	776.19	0.6594	0.5173	0.0035	30.6667	12.9371	
56	272.08	725.74	0.6708	0.5056	0.0035	31.3333	12.5212	
57	273.55	674.3	0.6819	0.4944	0.0035	32.1235	12.1235	
58	274.85	621.93	0.6928	0.4836	0.0035	32.6667	11.7428	
59	275.99	568.68	0.7035	0.4733	0.0035	33.3333	11.3784	
60	276.96	514.61	0.7139	0.4635	0.0035	34.110292	11.0292	
61	277.79	459.75	0.7242	0.454	0.0035	34.6667	10.6945	
62	278.49	404.15	0.7343	0.4449	0.0035	35.3333	10.3734	
63	279.06	347.84	0.7442	0.4362	0.0035	36.10653	10.0653	
64	279.51	290.85	0.7539	0.4278	0.0035	36.6667	9.7695	
65	279.85	233.21	0.7635	0.4197	0.0035	37.959	9.2269	
66	280.09	174.95	0.773	0.412	0.0035	38.6667	8.6888	
67	280.22	116.08	0.7823	0.4045	0.0035	39.6667	8.1511	
68	280.17	0	0.8	0.3907	0.0035	40.6667	7.6134	

CC10

Slenderness Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar 12 N28  
Reinforcement Ratio = 4.11%  
Australia - Australian Materials  
Concrete Type = 40MPa  
Composite Elements 90.00 degrees clockwise - Left Face in Compression  
Length Unsupported = 3900mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 13kNm  
Larger End Moment = 30kNm  
Minimum Moment = 14kNm  
Slenderness - Column is STOCKY according to Code limits. No moment magnification required.  
Maximum Moment = 260kNm



Column Interaction Diagram

#	Point Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis Depth	Compression Face Strain	Curvature x 10E-6	El x 10E12	Buckling Magnified Load
1	0	5738.8	0.6	95999	95999	0.0025	0	0	181.99
2	6.21	5654.32	0.6	8.5351	2014.3	0.0026	1.7376	5.96	0
3	13.5	5560.71	0.6	4.4492	1050	0.0027	3.3333	6.7478	0
4	22.73	5448.45	0.6	3.0872	728.6	0.0028	4.8039	7.8859	0
5	34.1	5315.1	0.6	2.4062	567.9	0.0029	6.1635	9.2202	0
6	47.78	5158.84	0.6	1.9876	471.4	0.0031	7.4242	10.7255	0
7	63.97	4977.78	0.6	1.7252	407.1	0.0032	8.5965	12.4025	0
8	82.9	4769.84	0.6	1.5305	361.2	0.0033	9.6893	14.2606	0
9	104.84	4532.72	0.6	1.3847	326.8	0.0034	10.7104	16.3139	0
10	130.06	4263.85	0.6	1.2712	300	0.0035	11.6667	18.5798	0
11	139.97	4149.23	0.6	1.2359	291.7	0.0035	12	19.4409	0
12	148.94	4039.23	0.6	1.2025	283.8	0.0035	12.3333	20.1274	0
13	157.08	3933.51	0.6	1.1708	276.3	0.0035	12.6667	20.6679	0
14	164.47	3831.76	0.6	1.1408	269.2	0.0035	13	21.0862	0
15	171.21	3733.71	0.6	1.1123	262.5	0.0035	13.3333	21.4018	0
16	177.38	3639.12	0.6	1.0852	256.1	0.0035	13.6667	21.6311	0
17	183.02	3547.76	0.6	1.0593	250	0.0035	14	21.7878	0
18	188.2	3459.44	0.6	1.0347	244.2	0.0035	14.3333	21.8834	0
19	192.96	3373.97	0.6	1.0112	238.6	0.0035	14.6667	21.9275	0
20	197.58	3288.6	0.6	0.9887	233.3	0.0035	15	21.9529	0
21	202.09	3203.07	0.6	0.9672	228.3	0.0035	15.3333	21.9659	0
22	206.23	3118.69	0.6	0.9466	223.4	0.0035	15.6667	21.9396	0
23	209.53	3029.41	0.6	0.9269	218.8	0.0035	16	21.8265	0
24	212.61	2942.01	0.6	0.908	214.3	0.0035	16.3333	21.6951	0
25	215.49	2856.39	0.6	0.8898	210	0.0035	16.6667	21.5488	0
26	218.18	2772.43	0.6	0.8724	205.9	0.0035	17	21.3905	0
27	220.72	2690.05	0.6	0.8556	201.9	0.0035	17.3333	21.2227	0
28	223.1	2609.16	0.6	0.8395	198.1	0.0035	17.6667	21.0474	0
29	225.36	2529.67	0.6	0.8239	194.4	0.0035	18	20.8664	0
30	227.49	2451.52	0.6	0.8089	190.9	0.0035	18.3333	20.6813	0
31	229.52	2374.63	0.6	0.7945	187.5	0.0035	18.6667	20.4933	0
32	231.46	2298.94	0.6	0.7806	184.2	0.0035	19	20.3034	0
33	233.31	2224.4	0.6	0.7671	181	0.0035	19.3333	20.1126	0
34	235.08	2150.95	0.6	0.7541	178	0.0035	19.6667	19.9218	0
35	236.78	2078.54	0.6	0.7415	175	0.0035	20	19.7315	0
36	238.42	2007.13	0.6	0.7294	172.1	0.0035	20.3333	19.5423	0
37	240	1936.66	0.6	0.7178	169.4	0.0035	20.6667	19.3547	0
38	241.53	1867.09	0.6	0.7062	166.7	0.0035	21	19.169	0
39	243.01	1798.39	0.6	0.6952	164.1	0.0035	21.3333	18.9855	0
40	244.46	1730.52	0.6	0.6845	161.5	0.0035	21.6667	18.8045	0
41	245.87	1663.44	0.6	0.6741	159.1	0.0035	22	18.6263	0
42	247.24	1597.13	0.6	0.6641	156.7	0.0035	22.3333	18.4509	0
43	248.59	1531.54	0.6	0.6543	154.4	0.0035	22.6667	18.2785	0
44	249.91	1466.66	0.6	0.6448	152.2	0.0035	23	18.1092	0
45	251.2	1402.45	0.6	0.6356	150	0.0035	23.3333	17.9431	0
46	252.48	1337.59	0.6	0.6266	147.9	0.0035	23.6667	17.7802	0
47	253.74	1273.31	0.6	0.6179	145.8	0.0035	24	17.6206	0
48	254.98	1209.59	0.6	0.6095	143.8	0.0035	24.3333	17.4642	0
49	256.2	1146.41	0.6	0.6012	141.9	0.0035	24.6667	17.3111	0
50	258.95	1004.79	0.6	0.5833	137.7	0.0035	25.3333	16.9756	0
51	261.44	966.49	0.6111	0.5704	134.6	0.0035	26	16.4541	0
52	264.06	920.83	0.6237	0.5561	131.2	0.0035	26.6667	15.8775	0
53	266.41	873.82	0.6359	0.5426	128	0.0035	27.3333	15.328	0
54	268.52	825.58	0.6478	0.5297	125	0.0035	28	14.8041	0
55	270.4	776.19	0.6594	0.5173	122.1	0.0035	28.6667	14.3044	0
56	272.08	725.74	0.6708	0.5056	119.3	0.0035	29.3333	13.8275	0
57	273.55	674.3	0.6819	0.4944	116.7	0.0035	30	13.3721	0
58	274.85	621.93	0.6928	0.4836	114.1	0.0035	30.6667	12.9371	0
59	275.99	568.68	0.7035	0.4733	111.7	0.0035	31.3333	12.5212	0
60	276.96	514.61	0.7139	0.4635	109.4	0.0035	32	12.1235	0
61	277.79	459.75	0.7242	0.454	107.1	0.0035	32.6667	11.7428	0
62	278.49	404.15	0.7343	0.4449	105	0.0035	33.3333	11.3784	0
63	279.06	347.84	0.7442	0.4362	102.9	0.0035	34	11.0292	0
64	279.51	290.85	0.7539	0.4278	101	0.0035	34.6667	10.6945	0
65	279.85	233.21	0.7635	0.4197	99.1	0.0035	35.3333	10.3734	0
66	280.09	174.95	0.773	0.412	97.2	0.0035	36	10.0653	0
67	280.22	116.08	0.7823	0.4045	95.5	0.0035	36.6667	9.7695	0
68	280.17	0	0.8	0.3907	92.2	0.0035	37.9559	9.2269	0

CC11

Errors and Warnings

- Input

No errors or warnings were found.
- Output

No errors or warnings were found.

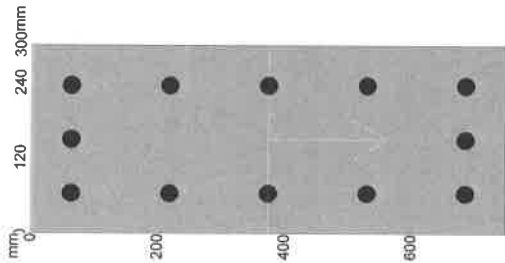
Remarks
A
Pure Axial Nuo - dp = 150mm
Decompression
Balanced Point
Pure Moment Muo - d = 236mm

CC12

Project Name: JOHNS RD  
Project Number: 1806063  
Description: G.CC2  
Designer: RGC  
K:\2018\06\1806063\Structural Drawings and Details\RGC\G.CC2.rpo

RAPT - Version: 6.5.16.0  
Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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Licensee  
TMK Consulting Engineers  
Level 6  
100 Pirie Street  
Adelaide SA 5000  
11169065160718WPN3



#### Input

General			
Designer	A	JOHNS RD	RGC
Project Name	A	1806063	
Project Number	A	G.CC2	
Description	A		
Design Code	List	Australia - AS3600*SAVED	
Material	List	Australia - Australian Materials*SAVED	
Concrete Type	List	Standard Concrete - Brisbane/Sydney	
Concrete Strength	List	40MPa	
Rotation	##	0	
Tension Curve	Y/N	N	

#### Rectangle

#	List	X	Y	Width	Depth
1	Solid	0	0	300	750

#### Reinforcement Bar

Reinforcement Bar Type		Reinforcement Bar Size	Number of bundled bars	X	Y	Distance	Tendon Force
#	List	List	List	mm	mm	mm	kN
1	N, Deformed, 500MPa	28, 28mm, 618mm2	1	64	64	10000	0

#	List	Reinforcement Bar Size	Number of bundled bars	X	Y	Distance	Tendon Force
1	List	List	List	mm	mm	mm	kN
2				150	64	10000	0
3				150	886	10000	0
4				236	886	10000	0
5				64	219.5	10000	0
6				64	375	10000	0
7				64	530.5	10000	0
8				236	64	10000	0
9				236	219.5	10000	0
10				236	375	10000	0
11				236	530.5	10000	0
12							

#### Design Data

Capacity Reduction Factor in Flexure - Tension	##	0.8
Capacity Reduction Factor in Flexure - Compression	##	0.6
Capacity Reduction Factor in Shear	##	0.7
Concrete Material Factor Flexure	##	1
Concrete Material Factor Shear	##	1
Reinforcement Material Factor	##	1
Maximum Depth of Neutral Axis for Ductility	Y/N	0.4
Shear Enhancement near Support	##	28
Time of Loading in Days	##	40
Concrete Strength at Time of Loading	MPa	30
Design Period in Years	##	50
Relative Humidity	%	20
Average Temperature	C.	Code Default
Long Term Calculation Basis	List	List
Concrete Strength Gain Rate	List	S

#### Design Points

Moment	Axial	Description
-1	kNm	kN
0	56	1486

#### Slenderness

Length Unsupported	mm	3900
Column Framing	List	Braced
Effective Length Factor Braced	##	0.7
Moment Ratio for Creep	##	0.5
Smaller End Moment M1	kNm	28
Larger End Moment M2	kNm	56
Applied Axial Load	kN	1486

CC13

General Interaction Diagram

JOHNS RD - G.CC2  
Rectangle 750mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 3.29%  
Australia - AS3600  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression

mm

0  
200  
400  
600

300mm

CC14

Slenderness Interaction Diagram

JOHNS RD - G CC2  
Rectangle 750mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 3.29%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise. - Top Face in Compression  
Length Unsupported = 3900mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 28kNm  
Larger End Moment = 56kNm  
Minimum Moment = 56kNm  
Slenderness - Column is STOCKY according to Code limits. No moment magnification required.  
Maximum Moment = 867kNm

Point Moment		Phi		Ratio of Neutral Axis Depth		Neutral Axis depth		Compression Face Strain		Curvature x 10E-6		EI x 10E12		Remarks	
#	kNm	kN	#	#	#	mm	#	#	#	#	#	kNm/m2	#		
70	877.8	254.53	0.7803	0.3037	208.3	0.0035	16.8	66.9632						A	
71	873.48	218.48	0.7831	0.2989	205.1	0.0035	17.0667	65.3535							
72	869.13	182.8	0.7859	0.2943	201.9	0.0035	17.3333	63.799							
73	864.75	147.45	0.7887	0.2899	198.9	0.0035	17.6	62.2971							
74	860.35	112.44	0.7914	0.2856	195.9	0.0035	17.8667	60.8454							
75	855.92	77.75	0.7941	0.2814	193	0.0035	18.1333	59.4416							
76	851.47	43.36	0.7967	0.2773	190.2	0.0035	18.4	58.0835							
77	845.82	0	0.8	0.2722	186.8	0.0035	18.7407	56.4156							Pure Moment Muo - d = 686mm

Minimum Decompression Balanced

Column Interaction Diagram

Point	Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Compression Face Strain	Curvature x 10E-6	EI x 10E12	Buckling Load	Magnified Moment
#	kNm	kN	#	#	mm	#	#	kNmm2	kN	kNm
1	0	6565.8	0.6	99999	99999	0.0025	0	0	0	250.85
2	20.64	6565.42	0.6	7.3407	5035.7	0.0026	0.695	49.4942	0	247.42
3	44.56	6462.71	0.6	3.8285	2625	0.0027	1.3333	55.7007	0	243.55
4	74.52	6336.69	0.6	2.6551	1821.4	0.0028	1.9216	64.6388	0	238.8
5	111.09	6184.32	0.6	2.0694	1419.6	0.0029	2.4654	75.0999	0	233.06
6	154.81	6003.33	0.6	1.718	1178.6	0.0031	2.9697	86.8834	0	226.24
7	206.3	5791.35	0.6	1.4938	1017.9	0.0032	3.4386	99.9923	0	218.25
8	266.26	5545.84	0.6	1.3164	903.1	0.0033	3.8757	114.499	0	209
9	335.48	5263.95	0.6	1.1909	817	0.0034	4.2842	130.51	0	198.37
10	414.85	4942.46	0.6	1.0933	750	0.0035	4.6667	148.16	0	186.26
11	445.04	4802.31	0.6	1.0629	729.2	0.0035	4.8	154.526	0	180.98
12	472.25	4667.93	0.6	1.0342	709.5	0.0035	4.9333	159.544	0	175.91
13	496.84	4538.89	0.6	1.007	690.8	0.0035	5.0667	163.433	0	171.05
14	519.92	4412.19	0.6	0.9812	673.1	0.0035	5.2	166.641	0	166.27
15	541.3	4288.98	0.6	0.9566	656.3	0.0035	5.3333	169.156	0	161.63
16	560.91	4169.86	0.6	0.9333	640.2	0.0035	5.4667	171.009	0	157.14
17	578.95	4054.55	0.6	0.9111	625	0.0035	5.6	172.307	0	152.8
18	595.6	3942.8	0.6	0.8899	610.5	0.0035	5.7333	173.14	0	148.58
19	611.01	3834.38	0.6	0.8697	596.6	0.0035	5.8667	173.584	0	144.5
20	625.32	3729.07	0.6	0.8503	583.3	0.0035	6	173.7	0	140.53
21	638.63	3626.69	0.6	0.8319	570.7	0.0035	6.1333	173.542	0	136.87
22	651.06	3527.04	0.6	0.8142	558.5	0.0035	6.2667	173.155	0	132.92
23	662.7	3429.98	0.6	0.7972	546.9	0.0035	6.4	172.578	0	129.26
24	673.62	3335.35	0.6	0.7809	535.7	0.0035	6.5333	171.843	0	125.69
25	684.05	3242.07	0.6	0.7653	525	0.0035	6.6667	171.013	0	122.18
26	694.05	3150.02	0.6	0.7503	514.7	0.0035	6.8	170.11	0	118.71
27	703.54	3059.93	0.6	0.7359	504.8	0.0035	6.9333	169.121	0	115.31
28	712.58	2971.7	0.6	0.722	495.3	0.0035	7.0667	168.061	0	111.99
29	721.2	2885.23	0.6	0.7086	486.1	0.0035	7.2	166.946	0	108.73
30	729.46	2800.43	0.6	0.6957	477.3	0.0035	7.3333	165.787	0	105.53
31	737.39	2717.21	0.6	0.6833	468.8	0.0035	7.4667	164.595	0	102.4
32	745.01	2635.48	0.6	0.6713	460.5	0.0035	7.6	163.38	0	99.32
33	752.37	2555.18	0.6	0.6597	452.6	0.0035	7.7333	162.149	0	96.29
34	759.48	2476.24	0.6	0.6486	444.9	0.0035	7.8667	160.907	0	93.32
35	766.38	2398.58	0.6	0.6378	437.5	0.0035	8	159.662	0	90.39
36	773.08	2322.15	0.6	0.6273	430.3	0.0035	8.1333	158.417	0	87.51
37	779.6	2246.89	0.6	0.6172	423.4	0.0035	8.2667	157.177	0	84.67
38	785.96	2172.76	0.6	0.6074	416.7	0.0035	8.4	155.944	0	81.88
39	792.17	2099.69	0.6	0.5979	410.2	0.0035	8.5333	154.721	0	79.13
40	801.84	1985.05	0.6	0.5833	400.2	0.0035	8.7464	152.796	0	74.81
41	816.74	1903.27	0.612	0.5627	386	0.0035	9.0667	147.192	0	71.72
42	828.2	1834.38	0.6216	0.5466	375	0.0035	9.3333	142.753	0	69.13
43	839.28	1762.86	0.6312	0.5315	364.6	0.0035	9.6	138.516	0	66.43
44	849.71	1690.55	0.6404	0.5171	354.7	0.0035	9.8667	134.472	0	63.71
45	859.57	1617.54	0.6494	0.5035	345.4	0.0035	10.1333	130.616	0	60.96
46	868.93	1543.88	0.6582	0.4906	336.5	0.0035	10.4	126.938	0	58.18
47	877.84	1469.63	0.6668	0.4783	328.1	0.0035	10.6667	123.431	0	55.38
48	886.36	1394.84	0.6751	0.4667	320.1	0.0035	10.9333	120.086	0	52.56
49	894.53	1319.53	0.6833	0.4555	312.5	0.0035	11.2	116.895	0	49.73
50	898.57	1255.64	0.69	0.4449	305.2	0.0035	11.4667	113.573	0	47.32
51	899.63	1200.41	0.6957	0.4348	298.3	0.0035	11.7333	110.211	0	45.24
52	900.39	1145.64	0.7012	0.4252	291.7	0.0035	12	107.001	0	43.17
53	900.9	1091.35	0.7066	0.4159	285.3	0.0035	12.2667	103.933	0	41.13
54	901.18	1037.5	0.7119	0.4071	279.3	0.0035	12.5333	101.001	0	39.1
55	901.25	984.08	0.717	0.3986	273.4	0.0035	12.8	98.1966	0	37.09
56	901.14	931.08	0.722	0.3905	267.9	0.0035	13.0667	95.5128	0	35.09
57	900.86	878.49	0.7269	0.3827	262.5	0.0035	13.3333	92.9431	0	33.11
58	900.44	826.29	0.7317	0.3751	257.4	0.0035	13.6	90.4814	0	31.14
59	899.88	774.47	0.7364	0.3679	252.4	0.0035	13.8667	88.1217	0	29.19
60	899.2	723.01	0.741	0.361	247.6	0.0035	14.1333	85.8586	0	27.25
61	898.42	671.9	0.7455	0.3543	243.1	0.0035	14.4	83.687	0	25.32
62	897.54	621.12	0.7499	0.3479	238.6	0.0035	14.6667	81.6021	0	23.41
63	896.58	570.68	0.7543	0.3417	234.4	0.0035	14.9333	79.5994	0	21.51
64	895.54	520.55	0.7585	0.3357	230.3	0.0035	15.2	77.6746	0	19.62
65	894.44	470.72	0.7627	0.3299	226.3	0.0035	15.4667	75.8238	0	17.74
66	892.84	419.31	0.7669	0.3243	222.5	0.0035	15.7333	73.9926	0	15.8
67	890.53	364.98	0.7714	0.3189	218.8	0.0035	16	72.152	0	13.75
68	886.33	327.76	0.7744	0.3137	215.2	0.0035	16.2667	70.3594	0	12.35
69	882.08	290.95	0.7774	0.3086	211.7	0.0035	16.5333	68.6309	0	10.96

Remarks
A
Pure Axial Nuo - dp = 375mm
Decompression
Balanced Point

CC16

Remarks
A

Pure Moment Muo - d = 686mm

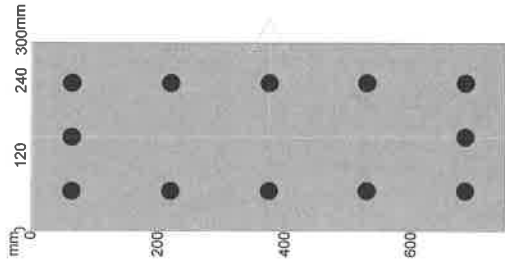
**Errors and Warnings**  
**Input**  
No errors or warnings were found.  
**Output**  
No errors or warnings were found.

CC16

Project Name: JOHNS RD  
Project Number: 1806063  
Description: G.CC2  
Designer: RGC  
K:\2018\06\1806063\Structural Drawings and Details\RG\G.CC2 weak dir.rpo

RAPT - Version: 6.5.16.0  
Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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Licensee  
TMK Consulting Engineers  
Level 6  
100 Pirie Street  
Adelaide SA 5000  
11169065160718WPN3



Input

General			
Designer	A	RG	RGC
Project Name	A	JOHNS RD	
Project Number	A	1806063	
Description	A	G.CC2	
Design Code	List	Australia - AS3600*SAVED*	
Material	List	Australia - Australian Materials*SAVED*	
Concrete Type	List	Standard Concrete - Brisbane/Sydney	
Concrete Strength	List	40MPa	
Rotation	##	90	
Tension Curve	Y/N	N	

Rectangle

Solid/Void			
#	List	X mm	Y mm
1	Solid	0	0

Reinforcement Bar

Reinforcement Bar Type			
#	List	Size	Number of bundled bars
1	N, Deformed, 500MPa	28, 28mm, 616mm2	1

Reinforcement Bar Type			
#	List	Size	Number of bundled bars
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Design Data

Capacity Reduction Factor in Flexure - Tension	##	0.8
Capacity Reduction Factor in Flexure - Compression	##	0.6
Capacity Reduction Factor in Shear	##	0.7
Concrete Material Factor Flexure	##	1
Concrete Material Factor Shear	##	1
Reinforcement Material Factor	##	0.4
Maximum Depth of Neutral Axis for Ductility	Y/N	N
Shear Enhancement near Support	##	28
Time of Loading in Days	##	40
Concrete Strength at Time of Loading	MPa	30
Design Period in Years	##	50
Relative Humidity	%	20
Average Temperature	C	
Long Term Calculation Basis	List	Code Default
Concrete Strength Gain Rate	\$	

Design Points

Moment Axial Description			
#	Force	kN	A
-1		28.4	1486

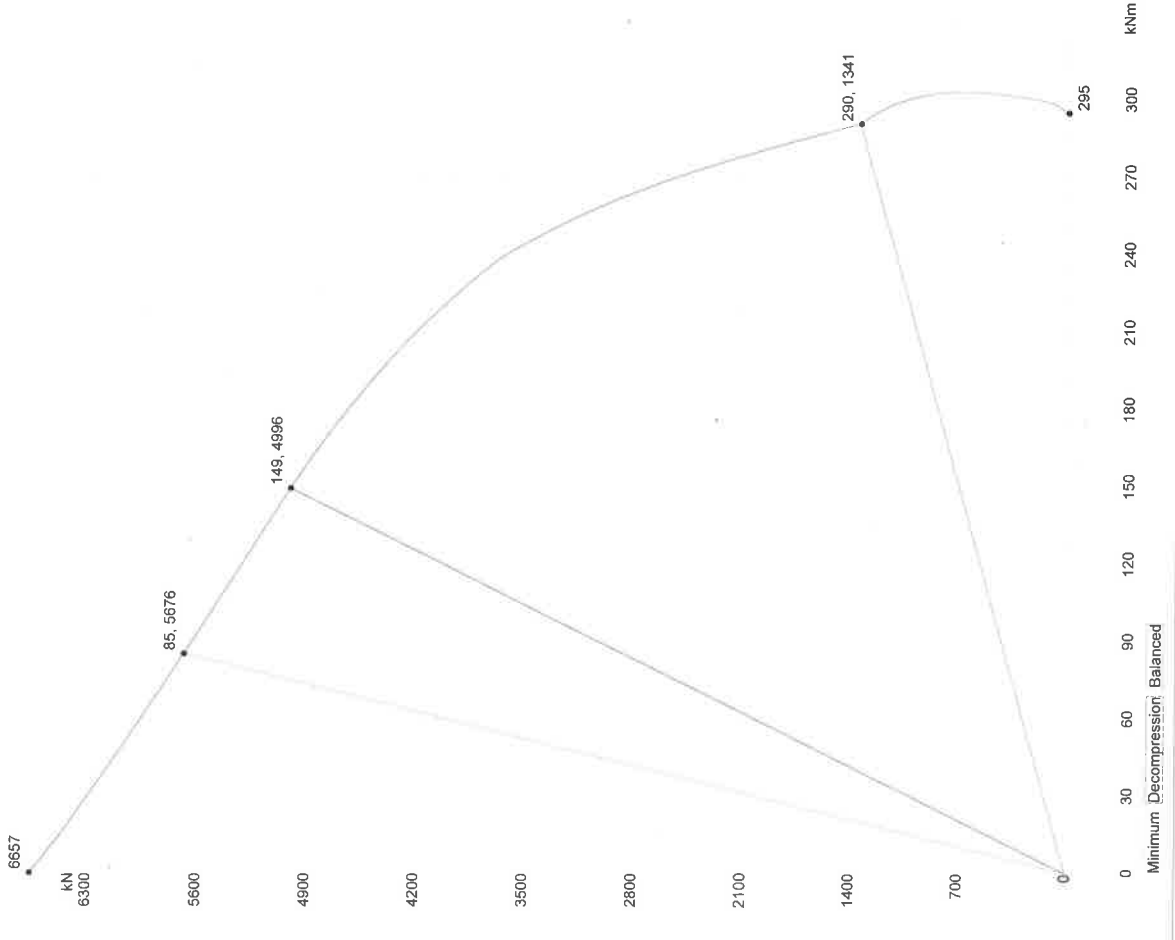
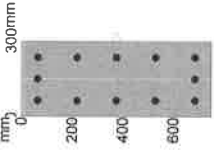
Slenderness

Length Unsupported	mm	3900
Column Framing	List	Braced
Effective Length Factor Braced	##	0.7
Moment Ratio for Creep	##	0.5
Smaller End Moment M1	kNm	18.6
Larger End Moment M2	kNm	28.4
Applied Axial Load	kN	1486

CC17

General Interaction Diagram

JOHNS RD - G.CC2  
Rectangle 750mm Deep x 300mm  
Reinforcement Bar 12 N28  
Reinforcement Ratio - 3.25%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 90.00 degrees clockwise, - Left Face in Compression



Column Interaction Diagram

Point	Moment kNm	Axial kN	Phi #	Ratio of Neutral Axis Depth #	Neutral Axis depth mm	Compression Face Strain #	Curvature x 10E-6 #	El x 10E12 kNm/m2	Remarks
1	0	6656.8	0.6	99999	99999	0.0025	0	0	Pure Axial Nuo - dp = 150mm
2	6.22	6572.29	0.6	8.5351	2014.3	0.0026	1.7376	5.965	
3	13.78	6476.28	0.6	4.4492	1050	0.0027	3.3333	6.89	
4	23.8	6356.77	0.6	3.0872	728.6	0.0028	4.8039	8.256	
5	36.5	6210.71	0.6	2.4062	567.9	0.0029	6.1635	9.869	
6	52.1	6035.78	0.6	1.9976	471.4	0.0031	7.4242	11.697	
7	70.87	5829.61	0.6	1.7252	407.1	0.0032	8.5965	13.7409	
8	93.09	5589.6	0.6	1.5306	361.2	0.0033	9.6893	16.0125	
9	119.07	5312.84	0.6	1.3847	326.8	0.0034	10.7104	18.5295	
10	149.2	4996.11	0.6	1.2712	300	0.0035	11.6667	21.3136	
11	161.03	4861.15	0.6	1.2359	291.7	0.0035	12	22.3651	
12	171.68	4731.91	0.6	1.2025	283.8	0.0035	12.3333	23.2004	
13	181.3	4607.96	0.6	1.1708	276.3	0.0035	12.6667	23.8549	
14	189.99	4486.92	0.6	1.1408	269.2	0.0035	13	24.3583	
15	197.88	4374.44	0.6	1.1123	262.5	0.0035	13.3333	24.735	
16	205.04	4264.22	0.6	1.0852	256.1	0.0035	13.6667	25.0052	
17	211.56	4157.98	0.6	1.0593	250	0.0035	14	25.186	
18	217.51	4055.46	0.6	1.0347	244.2	0.0035	14.3333	25.2917	
19	222.94	3956.45	0.6	1.0112	238.6	0.0035	14.6667	25.3343	
20	228.14	3858.14	0.6	0.9887	233.3	0.0035	15	25.3485	
21	233.15	3760.23	0.6	0.9672	228.3	0.0035	15.3333	25.3424	
22	237.73	3663.99	0.6	0.9466	223.4	0.0035	15.6667	25.2902	
23	241.4	3563.35	0.6	0.9269	218.8	0.0035	16	25.1458	
24	244.79	3465.06	0.6	0.908	214.3	0.0035	16.3333	24.9787	
25	247.93	3368.97	0.6	0.8898	210	0.0035	16.6667	24.7931	
26	250.84	3274.96	0.6	0.8724	205.9	0.0035	17	24.5926	
27	253.55	3182.92	0.6	0.8556	201.9	0.0035	17.3333	24.3803	
28	256.08	3092.73	0.6	0.8395	198.1	0.0035	17.6667	24.1587	
29	258.45	3004.29	0.6	0.8239	194.4	0.0035	18	23.9302	
30	260.66	2917.5	0.6	0.8089	190.9	0.0035	18.3333	23.6965	
31	262.74	2832.3	0.6	0.7945	187.5	0.0035	18.6667	23.4592	
32	264.71	2748.58	0.6	0.7806	184.2	0.0035	19	23.2197	
33	266.56	2666.28	0.6	0.7671	181	0.0035	19.3333	22.9793	
34	268.32	2585.34	0.6	0.7541	178	0.0035	19.6667	22.7387	
35	269.99	2505.7	0.6	0.7415	175	0.0035	20	22.4989	
36	271.58	2427.28	0.6	0.7294	172.1	0.0035	20.3333	22.2605	
37	273.1	2350.03	0.6	0.7176	169.4	0.0035	20.6667	22.0241	
38	274.56	2273.9	0.6	0.7062	166.7	0.0035	21	21.7902	
39	275.96	2198.85	0.6	0.6952	164.1	0.0035	21.3333	21.5591	
40	277.3	2124.82	0.6	0.6845	161.5	0.0035	21.6667	21.3311	
41	278.61	2051.76	0.6	0.6741	159.1	0.0035	22	21.1066	
42	279.87	1979.65	0.6	0.6641	156.7	0.0035	22.3333	20.8857	
43	281.09	1908.44	0.6	0.6543	154.4	0.0035	22.6667	20.6686	
44	282.29	1838.09	0.6	0.6448	152.2	0.0035	23	20.4554	
45	283.45	1768.58	0.6	0.6356	150	0.0035	23.3333	20.2462	
46	284.58	1698.56	0.6	0.6266	147.9	0.0035	23.6667	20.0411	
47	285.7	1629.27	0.6	0.6179	145.8	0.0035	24	19.8401	
48	286.79	1560.67	0.6	0.6095	143.8	0.0035	24.3333	19.6432	
49	287.87	1492.75	0.6	0.6012	141.9	0.0035	24.6667	19.4504	
50	290.25	1340.82	0.6	0.5833	137.7	0.0035	25.4237	19.0277	
51	292.24	1297.59	0.6094	0.5704	134.6	0.0035	26	18.4428	
52	294.26	1246.6	0.6201	0.5561	131.2	0.0035	26.6667	17.7959	
53	296.01	1194.66	0.6304	0.5426	128	0.0035	27.3333	17.1791	
54	297.51	1141.86	0.6404	0.5297	125	0.0035	28	16.591	
55	298.78	1088.29	0.6502	0.5173	122.1	0.0035	28.6667	16.0299	
56	299.85	1034.01	0.6597	0.5056	119.3	0.0035	29.3333	15.4944	
57	300.72	979.09	0.669	0.4944	116.7	0.0035	30	14.9831	
58	301.42	923.59	0.6781	0.4836	114.1	0.0035	30.6667	14.4946	
59	301.95	867.54	0.687	0.4733	111.7	0.0035	31.3333	14.0277	
60	302.34	810.99	0.6957	0.4635	109.4	0.0035	32	13.5812	
61	302.58	753.98	0.7042	0.454	107.1	0.0035	32.6667	13.154	
62	302.7	696.53	0.7125	0.4449	105	0.0035	33.3333	12.745	
63	302.7	638.67	0.7207	0.4362	102.9	0.0035	34	12.3532	
64	302.58	580.43	0.7287	0.4278	101	0.0035	34.6667	11.9777	
65	302.37	521.82	0.7366	0.4197	99.1	0.0035	35.3333	11.6177	
66	302.06	462.87	0.7443	0.412	97.2	0.0035	36	11.2722	
67	301.66	403.58	0.752	0.4045	95.5	0.0035	36.6667	10.9406	
68	301.17	343.98	0.7595	0.3972	93.7	0.0035	37.3333	10.6222	
69	300.61	284.08	0.7668	0.3903	92.1	0.0035	38	10.3161	

CC18

Slenderness Interaction Diagram

JOHNS RD - G CC2  
Rectangle 750mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 3.29%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 90.00 degrees clockwise. - Left Face in Compression  
Length Unsupported = 3900mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 19kNm  
Larger End Moment = 28kNm  
Minimum Moment = 22kNm  
Slenderness - Column is STOCKY according to Code limits. No moment magnification required.  
Maximum Moment = 288kNm

300mm

mm

0

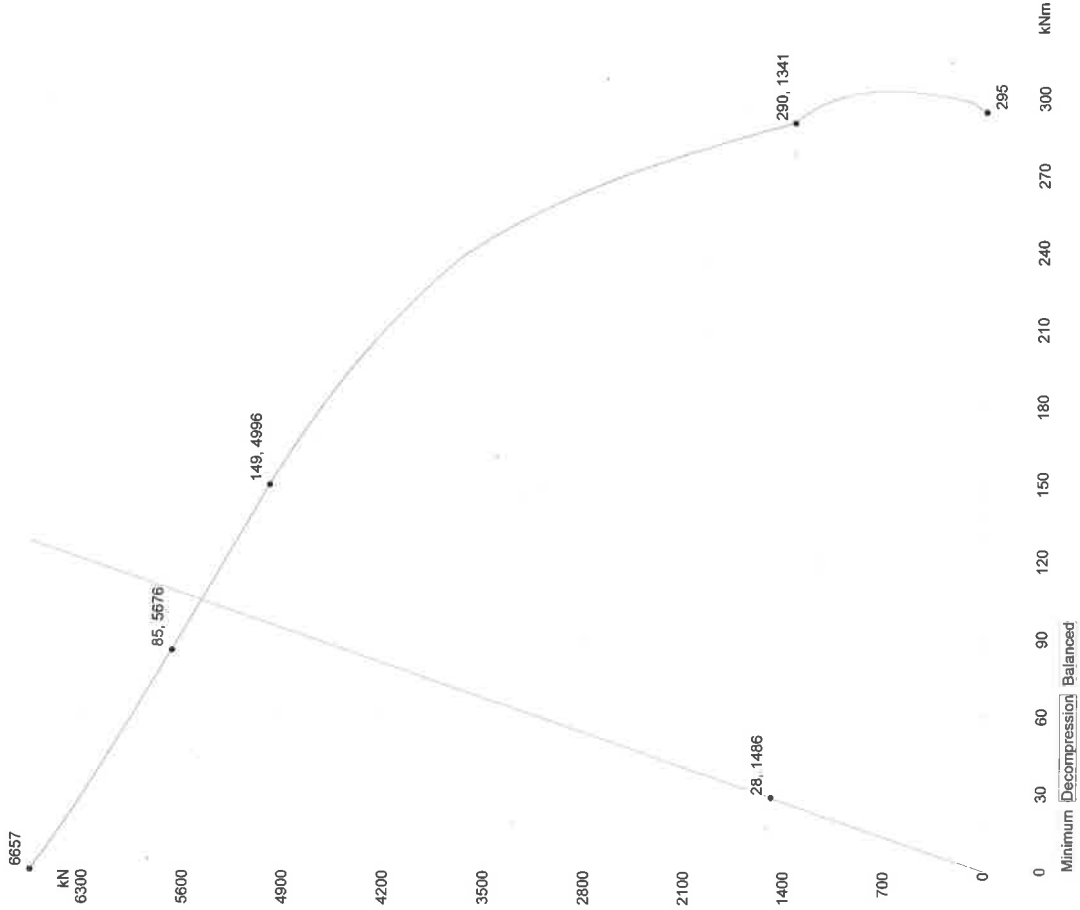
200

400

600

#	Point Moment kNm	Axial kN	Phi # #	Ratio of Neutral Axis Depth # #	Neutral Axis depth mm	Compression Face Strain # #	Curvature x 10E-6 # #	EI x 10E12 kNm <sup>2</sup>	Remarks
70	299.98	223.88	0.7741	0.3835	90.5	0.0035	38.6667	10.0219	A
71	299.28	163.4	0.7813	0.377	89	0.0035	39.3333	9.7389	
72	298.52	102.66	0.7883	0.3708	87.5	0.0035	40	9.4665	
73	296.87	61.07	0.7931	0.3647	86.1	0.0035	40.6667	9.2043	
74	294.83	0	0.8	0.3555	83.9	0.0035	41.7206	8.8274	Pure Moment Muo - d = 236mm

CC19



Column Interaction Diagram

Point/Moment		Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Compression Face Strain	Curvature x 10E-6	El x 10E12	Buckling Load	Magnified Moment
#	kNm	kN	#	#	mm	#	#	kNm/m2	kN	kNm
1	0	6656.8	0.6	99999	99999	0.0025	0	0	0	127.22
2	6.22	8572.29	0.6	8.5351	2014.3	0.0026	1.7376	5.965	0	125.61
3	13.78	6476.28	0.6	4.4482	1050	0.0027	3.3333	8.89	0	123.77
4	23.8	6356.77	0.6	3.0872	728.6	0.0028	4.8039	8.256	0	121.49
5	36.5	6210.71	0.6	2.4062	567.9	0.0029	6.1635	9.869	0	118.7
6	52.1	6035.78	0.6	1.9876	471.4	0.0031	7.4242	11.697	0	115.35
7	70.87	5829.61	0.6	1.7252	407.1	0.0032	8.5965	13.7409	0	111.41
8	93.09	5589.6	0.6	1.5306	361.2	0.0033	9.6893	16.0125	0	106.83
9	119.07	5312.84	0.6	1.3947	326.8	0.0034	10.7104	18.5295	0	101.54
10	149.2	4986.11	0.6	1.2712	300	0.0035	11.6667	21.3136	0	95.46
11	161.03	4661.15	0.6	1.2359	291.7	0.0035	12	22.3651	0	92.9
12	171.68	4731.91	0.6	1.2025	283.8	0.0035	12.3333	23.2004	0	90.43
13	181.3	4607.96	0.6	1.1708	276.3	0.0035	12.6667	23.8549	0	88.07
14	189.99	4488.92	0.6	1.1408	269.2	0.0035	13	24.3583	0	85.79
15	197.88	4374.44	0.6	1.1123	262.5	0.0035	13.3333	24.735	0	83.6
16	205.04	4264.22	0.6	1.0852	256.1	0.0035	13.6667	25.0052	0	81.5
17	211.56	4157.98	0.6	1.0593	250	0.0035	14	25.186	0	79.47
18	217.51	4055.46	0.6	1.0347	244.2	0.0035	14.3333	25.2917	0	77.51
19	222.94	3956.45	0.6	1.0112	238.6	0.0035	14.6667	25.3343	0	75.61
20	228.14	3858.14	0.6	0.9887	233.3	0.0035	15	25.3485	0	73.74
21	233.15	3760.23	0.6	0.9672	228.3	0.0035	15.3333	25.3424	0	71.86
22	237.73	3663.99	0.6	0.9466	223.4	0.0035	15.6667	25.2902	0	70.03
23	241.4	3563.35	0.6	0.9269	218.8	0.0035	16	25.1458	0	68.1
24	244.79	3465.06	0.6	0.908	214.3	0.0035	16.3333	24.9787	0	66.22
25	247.93	3368.97	0.6	0.8898	210	0.0035	16.6667	24.7931	0	64.39
26	250.84	3274.96	0.6	0.8724	205.9	0.0035	17	24.5926	0	62.59
27	253.55	3182.92	0.6	0.8556	201.9	0.0035	17.3333	24.3803	0	60.83
28	256.08	3092.73	0.6	0.8395	198.1	0.0035	17.6667	24.1587	0	59.11
29	258.45	3004.29	0.6	0.8239	194.4	0.0035	18	23.9302	0	57.42
30	260.66	2917.5	0.6	0.8089	190.9	0.0035	18.3333	23.6965	0	55.76
31	262.74	2832.3	0.6	0.7945	187.5	0.0035	18.6667	23.4592	0	54.13
32	264.71	2748.58	0.6	0.7806	184.2	0.0035	19	23.2197	0	52.53
33	266.56	2666.28	0.6	0.7671	181	0.0035	19.3333	22.9793	0	50.96
34	268.32	2585.34	0.6	0.7541	178	0.0035	19.6667	22.7387	0	49.41
35	269.99	2505.7	0.6	0.7415	175	0.0035	20	22.4989	0	47.89
36	271.58	2427.28	0.6	0.7294	172.1	0.0035	20.3333	22.2605	0	46.39
37	273.1	2350.03	0.6	0.7176	169.4	0.0035	20.6667	22.0241	0	44.91
38	274.56	2273.9	0.6	0.7062	166.7	0.0035	21	21.7902	0	43.46
39	275.96	2198.85	0.6	0.6952	164.1	0.0035	21.3333	21.5591	0	42.02
40	277.3	2124.82	0.6	0.6845	161.5	0.0035	21.6667	21.3311	0	40.61
41	278.61	2051.76	0.6	0.6741	159.1	0.0035	22	21.1068	0	39.21
42	279.87	1979.65	0.6	0.6641	156.7	0.0035	22.3333	20.8857	0	37.83
43	281.09	1908.44	0.6	0.6543	154.4	0.0035	22.6667	20.6886	0	36.47
44	282.29	1838.09	0.6	0.6448	152.2	0.0035	23	20.4554	0	35.13
45	283.45	1768.58	0.6	0.6356	150	0.0035	23.3333	20.2462	0	33.8
46	284.58	1698.56	0.6	0.6266	147.9	0.0035	23.6667	20.0411	0	32.46
47	285.7	1629.27	0.6	0.6179	145.8	0.0035	24	19.8401	0	31.14
48	286.79	1560.67	0.6	0.6095	143.8	0.0035	24.3333	19.6432	0	29.83
49	287.87	1492.75	0.6	0.6012	141.9	0.0035	24.6667	19.4504	0	28.53
50	290.25	1340.82	0.6	0.5833	137.7	0.0035	25.4237	19.0277	0	25.63
51	292.24	1297.59	0.6094	0.5704	134.6	0.0035	26	18.4428	0	24.8
52	294.26	1246.6	0.6201	0.5561	131.2	0.0035	26.6667	17.7959	0	23.82
53	296.01	1194.66	0.6304	0.5426	128	0.0035	27.3333	17.1791	0	22.83
54	297.51	1141.86	0.6404	0.5297	125	0.0035	28	16.591	0	21.82
55	298.78	1088.29	0.6502	0.5173	122.1	0.0035	28.6667	16.0299	0	20.8
56	299.85	1034.01	0.6597	0.5056	119.3	0.0035	29.3333	15.4944	0	19.76
57	300.72	979.09	0.669	0.4944	116.7	0.0035	30	14.9831	0	18.71
58	301.42	923.59	0.6781	0.4836	114.1	0.0035	30.6667	14.4946	0	17.65
59	301.95	867.54	0.687	0.4733	111.7	0.0035	31.3333	14.0277	0	16.58
60	302.34	810.99	0.6957	0.4635	109.4	0.0035	32	13.5812	0	15.5
61	302.58	753.98	0.7042	0.454	107.1	0.0035	32.6667	13.154	0	14.41
62	302.7	696.53	0.7125	0.4449	105	0.0035	33.3333	12.745	0	13.31
63	302.7	638.67	0.7207	0.4362	102.9	0.0035	34	12.3532	0	12.21
64	302.58	580.43	0.7287	0.4278	101	0.0035	34.6667	11.9777	0	11.09
65	302.37	521.82	0.7366	0.4197	99.1	0.0035	35.3333	11.6177	0	9.97
66	302.06	462.87	0.7443	0.412	97.2	0.0035	36	11.2722	0	8.85
67	301.66	403.58	0.752	0.4045	95.5	0.0035	36.6667	10.9406	0	7.71
68	301.17	343.98	0.7595	0.3972	93.7	0.0035	37.3333	10.6222	0	6.57
69	300.61	284.08	0.7668	0.3903	92.1	0.0035	38	10.3161	0	5.43

Remarks

A

Pure Axial Nuo - dp = 150mm

Decompression

Balanced Point

CC20

Remarks
A
Pure Moment Muo - d' = 236mm

Errors and Warnings

Input  
No errors or warnings were found.

Output  
No errors or warnings were found.

cc21

## Check Ground Floor Columns for Fire

### GCC1

from ETABS, under the fire load case

$$N^* = 581 \text{ kN}$$

$$M_x^* = 15 \text{ kNm} \rightarrow \text{take } 17.4 \text{ kNm as } 0.058N^* (\text{minimum required})$$

$$M_y^* = 17.4 \text{ kNm}$$

$$\Rightarrow \text{from RAPT, } \mu_{fi} = 581 / 4264 = 0.14$$

$\Rightarrow$  from AS3600 T5.6.3, using 40mm cover, 120 FRL can adopt  $D_c \geq 250 \text{ mm}$   $\therefore$  OK.

### GCC2

from ETABS under fire load case

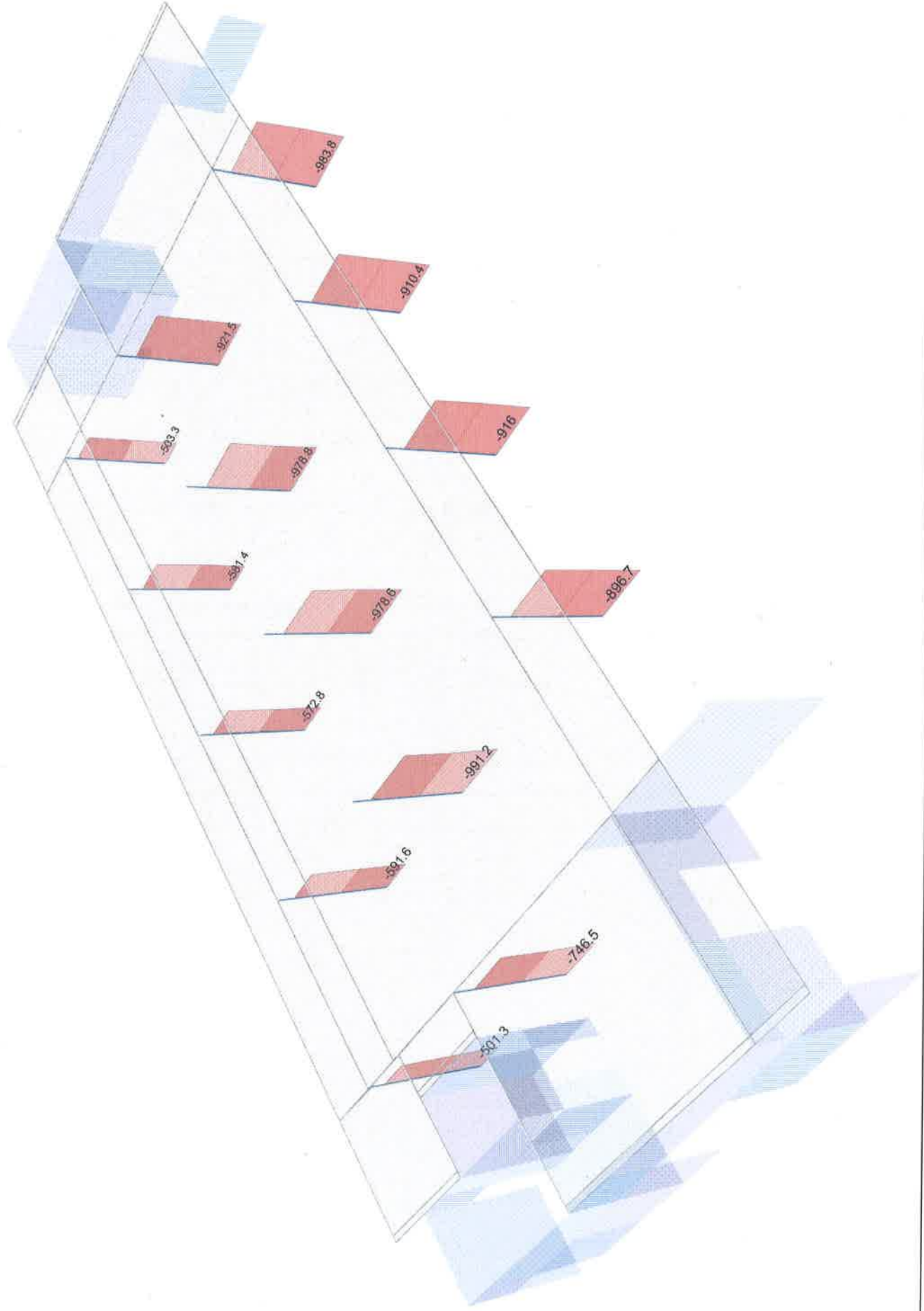
$$N^* = 991.2 \text{ kN}$$

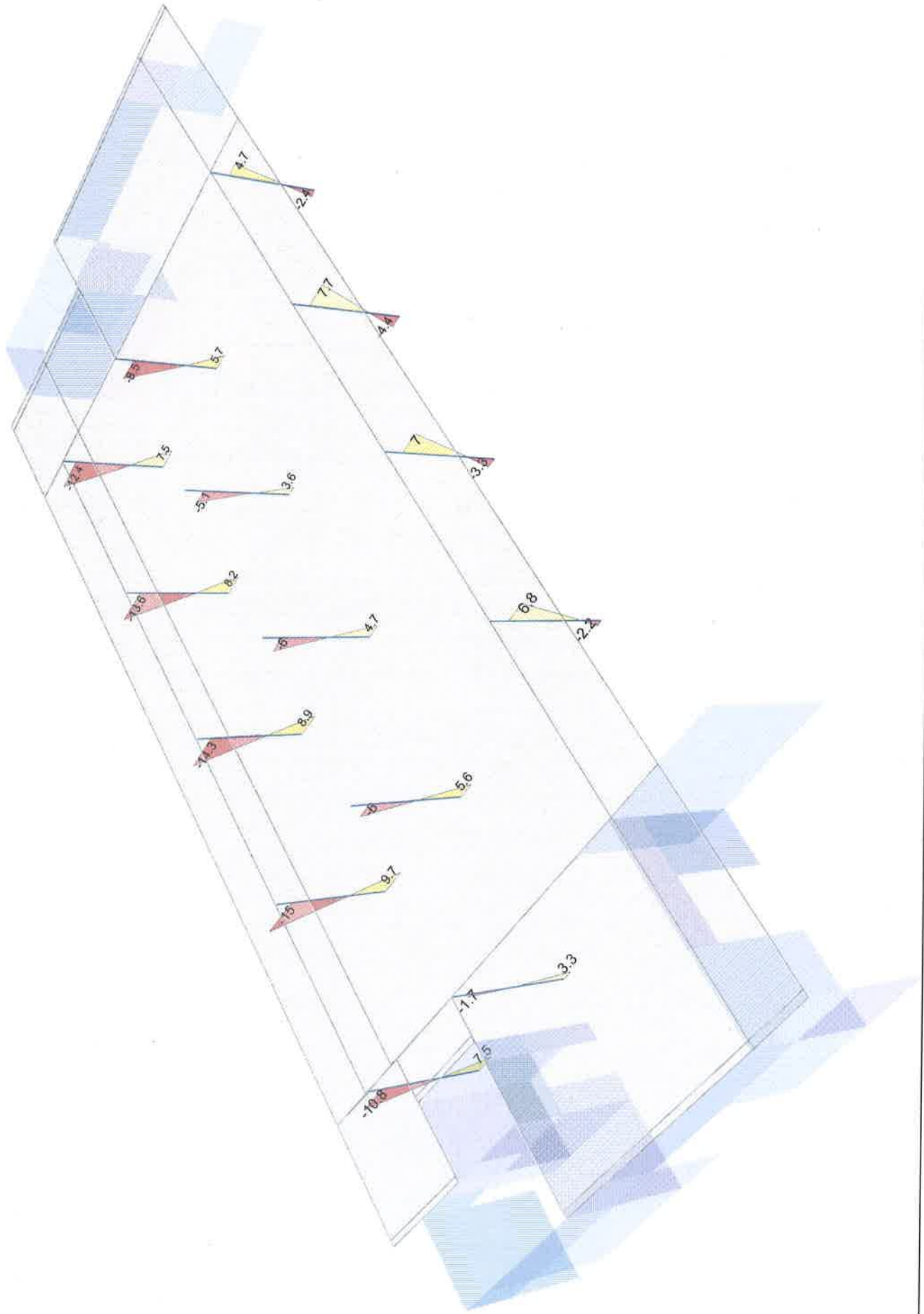
$$M_x^* = 6 \text{ kNm} \rightarrow \text{take } 0.05 + 0.75 \times 991.2 = 37.2 \text{ kNm}$$

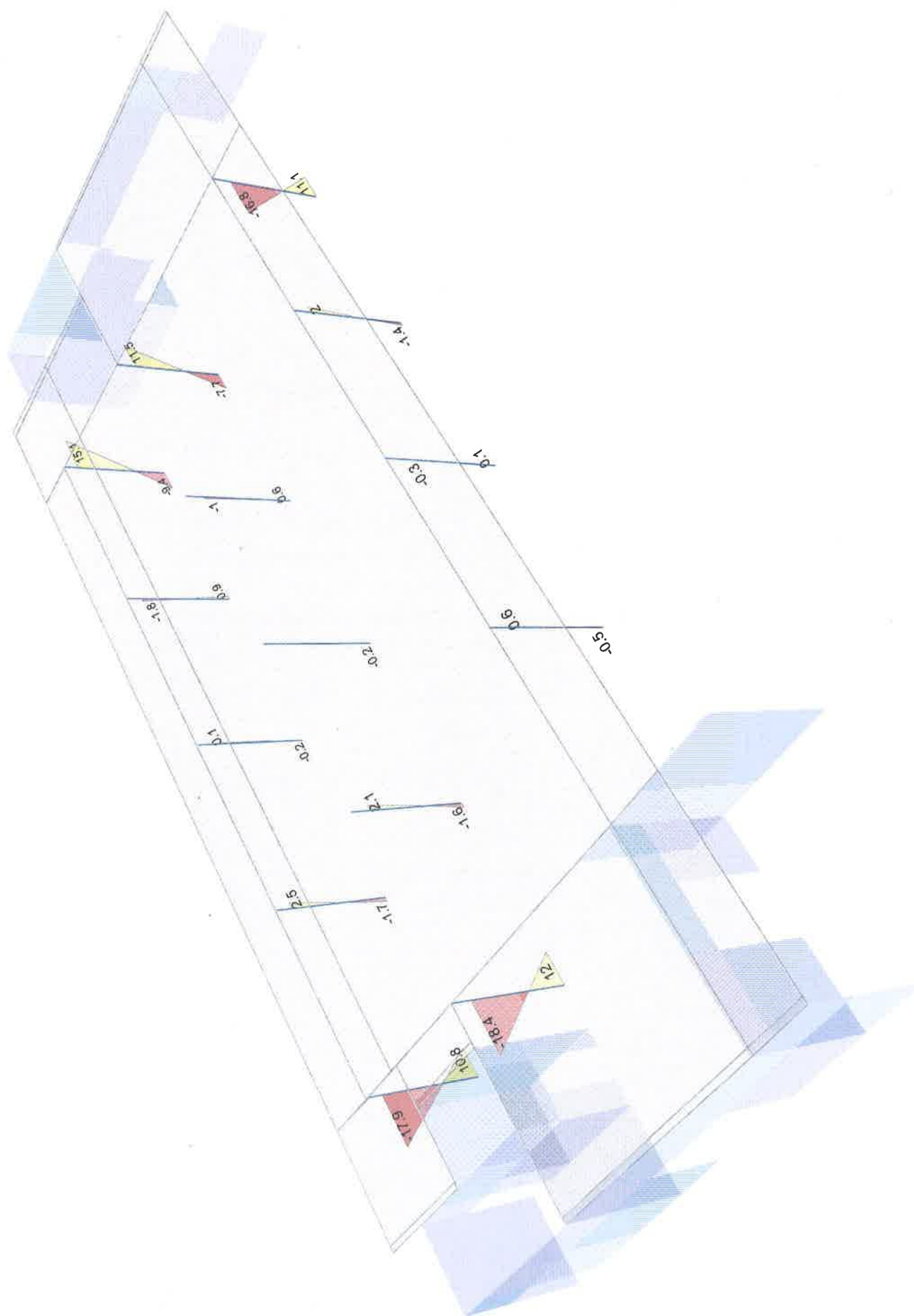
$$M_y^* = 18.4 \text{ kNm}$$

$$\Rightarrow \text{from RAPT take } \mu_{fi} = 991.2 / 5450 = 0.18$$

$\Rightarrow$  from AS3600 T5.6.3 using 40mm cover, 120 FRL can adopt  $D_c \geq 250 \text{ mm}$   $\therefore$  OK.



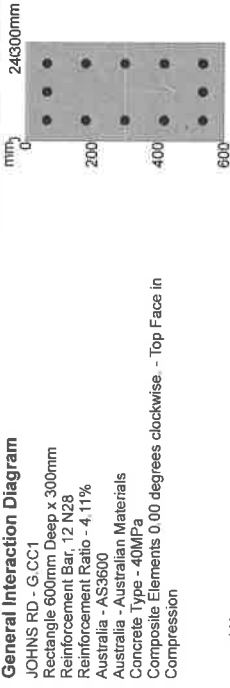






General Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 4.11%  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression



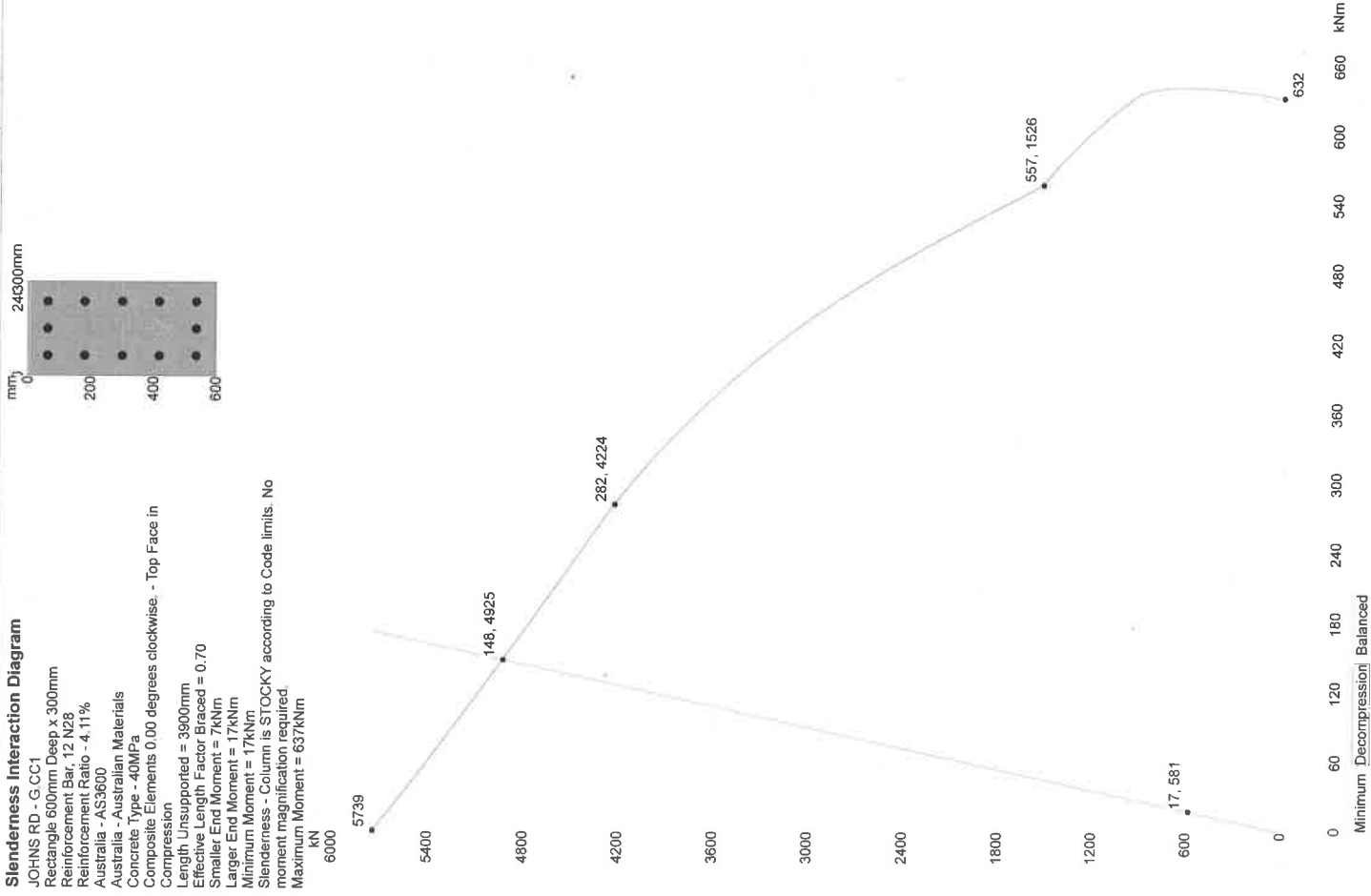
Column Interaction Diagram

Point	Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Face Strain	Compression Curvature	El x	Remarks
#	kNm	kN	#	#	mm	#	#	10E-6	
1	0	5738.8	0.6	99999	99999	0.0025	0	0	Pure Axial Nuo - dp = 300mm
2	15.08	5649.29	0.6	7.516	4028.6	0.0026	0.8688	28.9219	
3	32.25	5550.77	0.6	3.9179	2100	0.0027	1.6667	32.2471	
4	53.27	5433.71	0.6	2.7186	1457.1	0.0028	2.402	36.9624	
5	78.5	5295.72	0.6	2.1189	1135.7	0.0029	3.0818	42.4542	
6	108.29	5134.96	0.6	1.7591	942.9	0.0031	3.7121	48.6198	
7	143.03	4949.58	0.6	1.5192	814.3	0.0032	4.2982	55.4618	
8	183.18	4737.53	0.6	1.3479	722.4	0.0033	4.8446	63.0171	
9	229.23	4496.55	0.6	1.2193	653.6	0.0034	5.3552	71.3404	
10	281.75	4224.07	0.6	1.1194	600	0.0035	5.8333	80.5	Decompression
11	301.72	4104.47	0.6	1.0883	583.3	0.0035	6	83.8106	
12	319.78	3989.52	0.6	1.0589	567.6	0.0035	6.1667	86.4262	
13	336.15	3878.89	0.6	1.031	552.6	0.0035	6.3333	88.4607	
14	351.03	3772.27	0.6	1.0046	538.5	0.0035	6.5	90.0086	
15	365.27	3666.52	0.6	0.9795	525	0.0035	6.6667	91.3177	
16	378.52	3563.45	0.6	0.9556	512.2	0.0035	6.8333	92.3224	
17	390.77	3463.45	0.6	0.9328	500	0.0035	7	93.0404	
18	402.13	3366.31	0.6	0.9111	488.4	0.0035	7.1667	93.5176	
19	412.69	3271.85	0.6	0.8904	477.3	0.0035	7.3333	93.7926	
20	422.54	3179.9	0.6	0.8706	466.7	0.0035	7.5	93.8978	
21	431.76	3090.31	0.6	0.8517	456.5	0.0035	7.6667	93.8607	
22	440.41	3002.93	0.6	0.8336	446.8	0.0035	7.8333	93.7044	
23	448.55	2917.63	0.6	0.8162	437.5	0.0035	8	93.4486	
24	456.24	2834.3	0.6	0.7996	428.6	0.0035	8.1667	93.1088	
25	463.51	2752.83	0.6	0.7836	420	0.0035	8.3333	92.7024	
26	470.58	2671.74	0.6	0.7682	411.8	0.0035	8.5	92.2703	
27	477.37	2591.81	0.6	0.7534	403.8	0.0035	8.6667	91.8019	
28	483.87	2513.37	0.6	0.7392	396.2	0.0035	8.8333	91.2964	
29	490.11	2438.34	0.6	0.7255	388.9	0.0035	9	90.761	
30	496.11	2366.66	0.6	0.7123	381.8	0.0035	9.1667	90.2022	
31	501.9	2286.25	0.6	0.6996	375	0.0035	9.3333	89.6254	
32	507.5	2213.05	0.6	0.6874	368.4	0.0035	9.5	89.0353	
33	512.93	2140.99	0.6	0.6755	362.1	0.0035	9.6667	88.4358	
34	516.2	2070.03	0.6	0.6641	355.9	0.0035	9.8333	87.8303	
35	523.33	2000.11	0.6	0.653	350	0.0035	10	87.2217	
36	528.34	1931.18	0.6	0.6423	344.3	0.0035	10.1667	86.6124	
37	533.23	1863.19	0.6	0.6319	338.7	0.0035	10.3333	86.0045	
38	538.02	1796.11	0.6	0.6219	333.3	0.0035	10.5	85.3997	
39	542.72	1729.9	0.6	0.6122	328.1	0.0035	10.6667	84.7995	
40	547.33	1664.51	0.6	0.6028	323.1	0.0035	10.8333	84.2051	
41	557.08	1525.68	0.6	0.5833	312.7	0.0035	11.194	82.9432	
42	566.12	1471.84	0.6103	0.5678	304.3	0.0035	11.5	80.6595	
43	575.61	1411.05	0.6214	0.5518	295.8	0.0035	11.8333	78.2807	
44	584.78	1347.98	0.6323	0.5367	287.7	0.0035	12.1667	76.0119	
45	593.54	1283.61	0.643	0.5224	280	0.0035	12.5	73.8488	
46	601.93	1218.03	0.6534	0.5088	272.7	0.0035	12.8333	71.7867	
47	609.98	1151.32	0.6635	0.4959	265.8	0.0035	13.1667	69.8211	
48	617.75	1083.54	0.6735	0.4837	259.3	0.0035	13.5	67.947	
49	625.25	1014.75	0.6832	0.472	253	0.0035	13.8333	66.1599	
50	632.51	945	0.6927	0.4609	247.1	0.0035	14.1667	64.4552	
51	637.25	883.39	0.7009	0.4503	241.4	0.0035	14.5	62.7061	
52	638.79	833.31	0.7073	0.4402	236	0.0035	14.8333	60.8829	
53	640.13	783.43	0.7137	0.4305	230.8	0.0035	15.1667	59.1413	
54	641.29	733.75	0.7198	0.4213	225.8	0.0035	15.5	57.4769	
55	641.77	681.04	0.7262	0.4124	221.1	0.0035	15.8333	55.8119	
56	641.78	626.43	0.7328	0.4039	216.5	0.0035	16.1667	54.1755	
57	641.62	571.81	0.7392	0.3957	212.1	0.0035	16.5	52.6087	
58	641.3	517.19	0.7454	0.3879	207.9	0.0035	16.8333	51.1077	
59	640.85	462.56	0.7516	0.3804	203.9	0.0035	17.1667	49.6689	
60	640.26	407.92	0.7577	0.3731	200	0.0035	17.5	48.2888	
61	639.55	353.28	0.7636	0.3662	196.3	0.0035	17.8333	46.9644	
62	638.73	298.62	0.7695	0.3594	192.7	0.0035	18.1667	45.6927	
63	637.81	243.96	0.7752	0.353	189.2	0.0035	18.5	44.4709	
64	636.79	189.28	0.7809	0.3467	185.8	0.0035	18.8333	43.2965	
65	635.68	134.59	0.7865	0.3407	182.6	0.0035	19.1667	42.167	
66	634.43	78.24	0.7922	0.3349	179.5	0.0035	19.5	41.0675	
67	631.85	0	0.8	0.3275	175.5	0.0035	19.9373	39.6147	Pure Moment Muo - d = 536mm

CC27

Slenderness Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio = 4.11%  
Australia - AS3600  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression  
Length Unsupported = 3900mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 7kNm  
Larger End Moment = 17kNm  
Minimum Moment = 17kNm  
Slenderness - Column is STOCKY according to Code limits. No moment magnification required.  
Maximum Moment = 637kNm



Column Interaction Diagram

Point	Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Compression Face Strain	Curvature	El x 10E-6	Buckling Magnified Load
#	kNm	kN	#	#	mm	#	#	kNmm2	kN
1	0	5738.8	0.6	99999	99999	0.0025	0	0	172.15
2	15.08	5649.29	0.6	7.516	4028.6	0.0026	0.8688	28.9219	0
3	32.25	5550.77	0.6	3.9179	2100	0.0027	1.6667	32.2471	0
4	53.27	5433.71	0.6	2.7186	1457.1	0.0028	2.402	36.9624	0
5	78.5	5295.72	0.6	2.1189	1135.7	0.0029	3.0818	42.4542	0
6	108.29	5134.96	0.6	1.7591	942.9	0.0031	3.7121	48.6198	0
7	143.03	4949.58	0.6	1.5192	814.3	0.0032	4.2982	55.4618	0
8	183.18	4737.53	0.6	1.3479	722.4	0.0033	4.8446	63.0171	0
9	229.23	4496.55	0.6	1.2193	653.6	0.0034	5.3552	71.3404	0
10	281.75	4224.07	0.6	1.1194	600	0.0035	5.8333	80.5	0
11	301.72	4104.47	0.6	1.0883	583.3	0.0035	6	83.8106	0
12	319.78	3989.52	0.6	1.0589	567.6	0.0035	6.1667	86.4262	0
13	336.15	3878.89	0.6	1.031	552.6	0.0035	6.3333	88.4607	0
14	351.03	3772.27	0.6	1.0046	538.5	0.0035	6.5	90.0086	0
15	365.27	3666.52	0.6	0.9795	525	0.0035	6.6667	91.3177	0
16	378.52	3563.45	0.6	0.9556	512.2	0.0035	6.8333	92.3224	0
17	390.77	3463.45	0.6	0.9328	500	0.0035	7	93.0404	0
18	402.13	3366.31	0.6	0.9111	488.4	0.0035	7.1667	93.5176	0
19	412.69	3271.85	0.6	0.8904	477.3	0.0035	7.3333	93.7926	0
20	422.54	3179.9	0.6	0.8706	468.7	0.0035	7.5	93.8978	0
21	431.76	3090.91	0.6	0.8517	456.5	0.0035	7.6667	93.8607	0
22	440.41	3002.93	0.6	0.8336	446.8	0.0035	7.8333	93.7044	0
23	448.55	2917.63	0.6	0.8162	437.5	0.0035	8	93.4486	0
24	456.24	2834.3	0.6	0.7996	428.6	0.0035	8.1667	93.1098	0
25	463.51	2752.83	0.6	0.7836	420	0.0035	8.3333	92.7024	0
26	470.58	2671.74	0.6	0.7682	411.8	0.0035	8.5	92.2703	0
27	477.37	2591.81	0.6	0.7534	403.8	0.0035	8.6667	91.8019	0
28	483.87	2513.37	0.6	0.7392	396.2	0.0035	8.8333	91.2964	0
29	490.11	2436.34	0.6	0.7255	388.9	0.0035	9	90.761	0
30	496.11	2360.66	0.6	0.7123	381.8	0.0035	9.1667	90.2022	0
31	501.9	2286.25	0.6	0.6996	375	0.0035	9.3333	89.6254	0
32	507.5	2213.05	0.6	0.6874	368.4	0.0035	9.5	89.0353	0
33	512.93	2140.99	0.6	0.6755	362.1	0.0035	9.6667	88.4358	0
34	518.2	2070.03	0.6	0.6641	355.9	0.0035	9.8333	87.8303	0
35	523.33	2000.11	0.6	0.653	350	0.0035	10	87.2217	0
36	528.34	1931.18	0.6	0.6423	344.3	0.0035	10.1667	86.6124	0
37	533.23	1863.19	0.6	0.6319	338.7	0.0035	10.3333	86.0045	0
38	538.02	1796.11	0.6	0.6219	333.3	0.0035	10.5	85.3997	0
39	542.72	1729.9	0.6	0.6122	328.1	0.0035	10.6667	84.7995	0
40	547.33	1664.51	0.6	0.6028	323.1	0.0035	10.8333	84.2051	0
41	557.08	1525.68	0.6	0.5833	312.7	0.0035	11.194	82.9432	0
42	566.12	1471.84	0.6103	0.5678	304.3	0.0035	11.5	80.6595	0
43	575.61	1411.05	0.6214	0.5518	295.8	0.0035	11.8333	78.2807	0
44	584.78	1347.98	0.6323	0.5367	287.7	0.0035	12.1667	76.0119	0
45	593.54	1283.61	0.643	0.5224	280	0.0035	12.5	73.8488	0
46	601.93	1218.03	0.6534	0.5088	272.7	0.0035	12.8333	71.7867	0
47	609.98	1151.32	0.6635	0.4959	265.8	0.0035	13.1667	69.8211	0
48	617.75	1083.54	0.6735	0.4837	259.3	0.0035	13.5	67.947	0
49	625.25	1014.75	0.6832	0.472	253	0.0035	13.8333	66.1599	0
50	632.51	945	0.6927	0.4609	247.1	0.0035	14.1667	64.4552	0
51	637.25	883.39	0.7009	0.4503	241.4	0.0035	14.5	62.7061	0
52	638.79	833.31	0.7073	0.4402	236	0.0035	14.8333	60.8829	0
53	640.13	783.43	0.7137	0.4305	230.8	0.0035	15.1667	59.1413	0
54	641.29	733.75	0.7198	0.4213	225.8	0.0035	15.5	57.4769	0
55	641.77	681.04	0.7262	0.4124	221.1	0.0035	15.8333	55.8119	0
56	641.78	626.43	0.7328	0.4039	216.5	0.0035	16.1667	54.1755	0
57	641.62	571.81	0.7392	0.3957	212.1	0.0035	16.5	52.6087	0
58	641.3	517.19	0.7454	0.3879	207.9	0.0035	16.8333	51.1077	0
59	640.85	462.56	0.7516	0.3804	203.9	0.0035	17.1667	49.6689	0
60	640.26	407.92	0.7577	0.3731	200	0.0035	17.5	48.2888	0
61	639.55	353.28	0.7636	0.3662	196.3	0.0035	17.8333	46.9644	0
62	638.73	298.62	0.7695	0.3594	192.7	0.0035	18.1667	45.6927	0
63	637.81	243.96	0.7752	0.353	189.2	0.0035	18.5	44.4709	0
64	636.79	189.28	0.7809	0.3467	185.8	0.0035	18.8333	43.2965	0
65	635.68	134.59	0.7865	0.3407	182.6	0.0035	19.1667	42.167	0
66	634.43	78.24	0.7922	0.3349	179.5	0.0035	19.5	41.0875	0
67	631.85	0	0.8	0.3275	175.5	0.0035	19.9373	39.6147	0

Errors and Warnings

Input

No errors or warnings were found.

Output

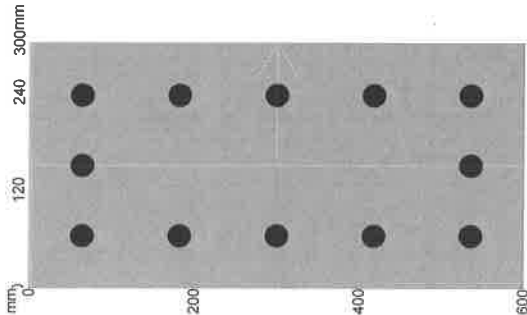
No errors or warnings were found.

Remarks
A
Pure Axial Nuo - dp = 300mm
Decompression
Balanced Point
Pure Moment Muo - d = 536mm

Project Name: JOHNS RD  
Project Number: 1806063  
Description: G.CC1  
Designer: RGC  
K:\2018\061806063\Structural Drawings and Details\RGC\G.CC1 fire weak  
dir.rpo

RAPT - Version: 6.5.16.0  
Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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Licensee  
TMK Consulting Engineers  
Level 6  
100 Pine Street  
Adelaide SA 5000  
11169065160718WPN3



### Reinforcement Bar

#	List	Reinforcement Bar Type	Reinforcement Bar Size	Number of bundled bars	X mm	Y mm	Distance mm	Tendon Force kN
1	N, Deformed, 500MPa	28, 28mm, 616mm <sup>2</sup>	1	-84	64	10000	0	0
2				-64	150	10000	0	0
3				-536	150	10000	0	0
4				-536	236	10000	0	0
5				-182	64	10000	0	0
6				-300	64	10000	0	0
7				-418	64	10000	0	0
8				-536	64	10000	0	0
9				-64	236	10000	0	0
10				-182	236	10000	0	0
11				-300	236	10000	0	0
12				-418	236	10000	0	0

### Design Data

Capacity Reduction Factor in Flexure - Tension	##	0.8
Capacity Reduction Factor in Flexure - Compression	##	0.6
Capacity Reduction Factor in Shear	##	0.7
Concrete Material Factor Flexure	##	1
Concrete Material Factor Shear	##	1
Reinforcement Material Factor	##	1
Maximum Depth of Neutral Axis for Ductility	##	0.4
Shear Enhancement near Support	Y/N	N
Time of Loading in Days	##	28
Concrete Strength at Time of Loading	MPa	40
Design Period in Years	##	30
Relative Humidity	%	50
Average Temperature	C.	20
Long Term Calculation Basis	List	Code Default
Concrete Strength Gain Rate	List	S

### Design Points

Moment, Axial Force	Description
-1 kNm	A
0	17.9 581

### Slenderness

Length Unsupported	mm	3900
Column Framing	List	Braced
Effective Length Factor Braced	##	0.7
Moment Ratio for Creep	##	0.5
Smaller End Moment M1	kNm	9
Larger End Moment M2	kNm	17.9
Applied Axial Load	kN	581

### Input

General	A	RGC
Designer	A	JOHNS RD
Project Name	A	1806063
Project Number	A	G.CC1
Description	A	Australia - AS3600*SAVED*
Design Code	List	Australia - Australian Materials*SAVED*
Material	List	Standard Concrete - Brisbane/Sydney
Concrete Type	List	40MPa
Concrete Strength	List	90
Rotation	##	N
Tension Curve	Y/N	N

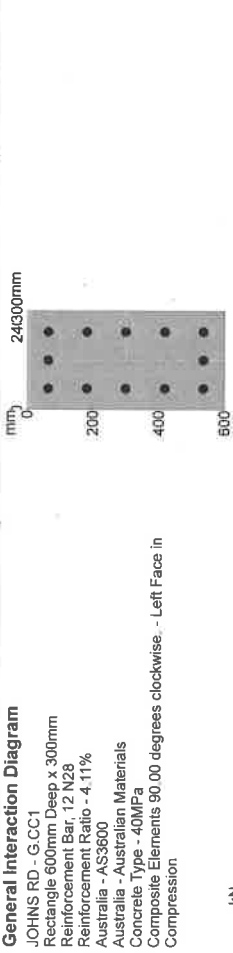
### Rectangle

Solid/Void	X mm	Y mm	Width mm	Depth mm
#	List	List	mm	mm
1	Solid	0	300	600

CC30

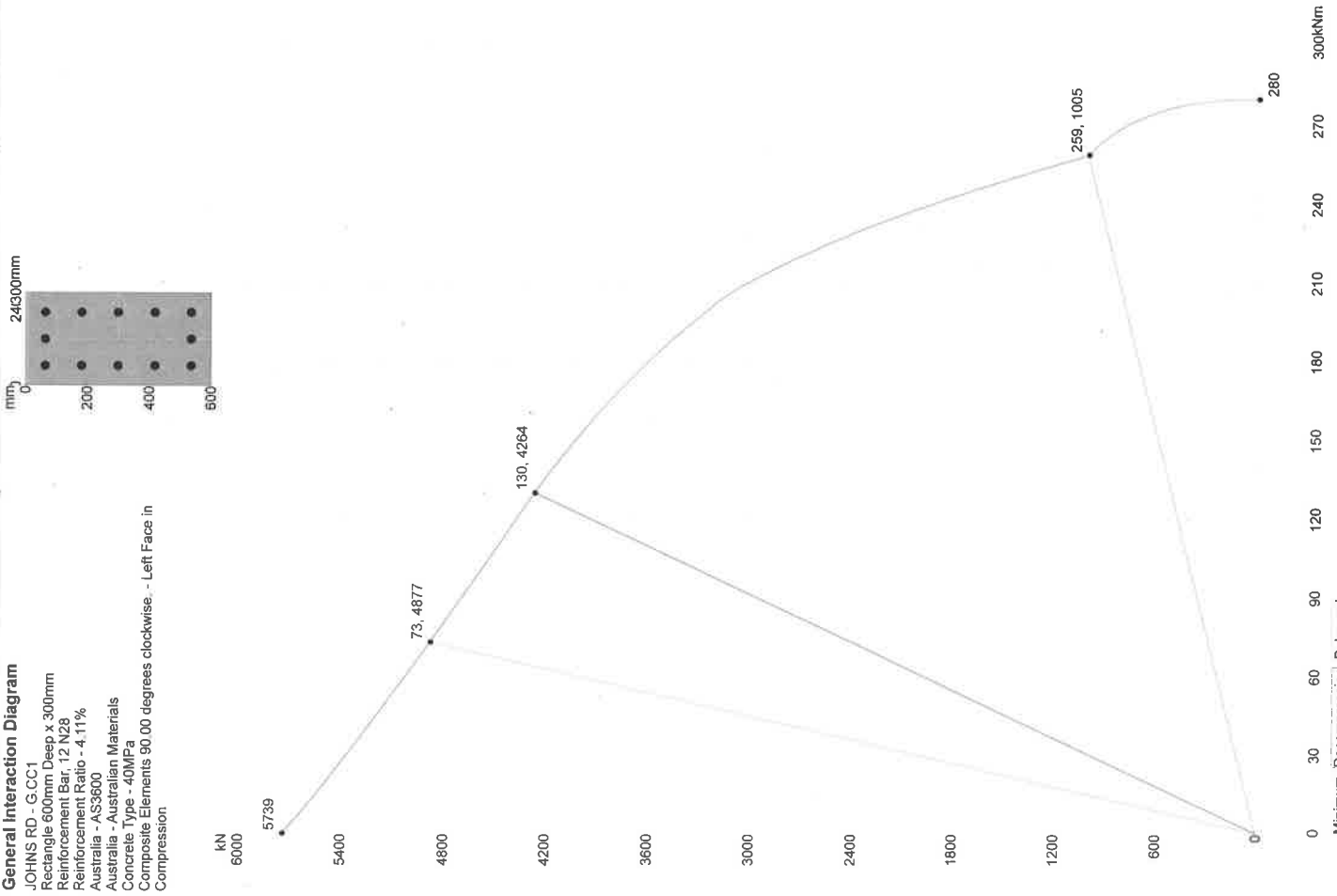
General Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 4.11%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 90.00 degrees clockwise. - Left Face in Compression



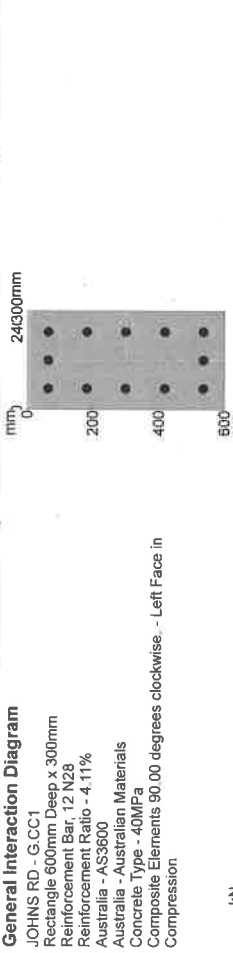
Column Interaction Diagram

#	kNm	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth mm	Compression Face Strain	Curvature x 10E-6	El x 10E12	Remarks
1	0	5738.8	0.6	99999	99999	0.0025	0	Pure Axial Nuo - dp = 150mm
2	6.21	5654.32	0.6	8.5351	2014.3	0.0026	1.7376	5.96
3	13.5	5580.71	0.6	4.4492	1050	0.0027	3.3333	6.7478
4	22.73	5448.45	0.6	3.0872	728.6	0.0028	4.8039	7.8859
5	34.1	5315.1	0.6	2.4062	567.9	0.0029	6.1635	9.2202
6	47.78	5158.84	0.6	1.9976	471.4	0.0031	7.4242	10.7255
7	63.97	4977.78	0.6	1.7252	407.1	0.0032	8.5965	12.4025
8	82.9	4769.84	0.6	1.5306	361.2	0.0033	9.6893	14.2606
9	104.84	4532.72	0.6	1.3847	326.8	0.0034	10.7104	16.3139
10	130.06	4263.85	0.6	1.2712	300	0.0035	11.6667	18.5798
11	139.97	4149.23	0.6	1.2359	291.7	0.0035	12	19.4409
12	148.94	4039.23	0.6	1.2025	283.8	0.0035	12.3333	20.1274
13	157.08	3933.51	0.6	1.1708	276.3	0.0035	12.6667	20.6679
14	164.47	3831.76	0.6	1.1408	269.2	0.0035	13	21.0862
15	171.21	3733.71	0.6	1.1123	262.5	0.0035	13.3333	21.4018
16	177.38	3639.12	0.6	1.0852	256.1	0.0035	13.6667	21.6311
17	183.02	3547.76	0.6	1.0593	250	0.0035	14	21.7878
18	188.2	3459.44	0.6	1.0347	244.2	0.0035	14.3333	21.8834
19	192.96	3373.97	0.6	1.0112	238.6	0.0035	14.6667	21.9275
20	197.58	3288.6	0.6	0.9887	233.3	0.0035	15	21.9529
21	202.09	3203.07	0.6	0.9672	228.3	0.0035	15.3333	21.9659
22	206.23	3118.69	0.6	0.9466	223.4	0.0035	15.6667	21.9396
23	209.53	3029.41	0.6	0.9269	218.8	0.0035	16	21.8265
24	212.61	2942.01	0.6	0.908	214.3	0.0035	16.3333	21.8951
25	215.49	2856.39	0.6	0.8898	210	0.0035	16.6667	21.8488
26	218.18	2772.43	0.6	0.8724	205.9	0.0035	17	21.3905
27	220.72	2690.05	0.6	0.8556	201.9	0.0035	17.3333	21.2227
28	223.1	2609.16	0.6	0.8395	198.1	0.0035	17.6667	21.0474
29	225.36	2529.67	0.6	0.8239	194.4	0.0035	18	20.8664
30	227.49	2451.52	0.6	0.8089	190.9	0.0035	18.3333	20.8813
31	229.52	2374.63	0.6	0.7945	187.5	0.0035	18.6667	20.4933
32	231.46	2298.94	0.6	0.7806	184.2	0.0035	19	20.3034
33	233.31	2224.4	0.6	0.7671	181	0.0035	19.3333	20.1126
34	235.08	2150.95	0.6	0.7541	178	0.0035	19.6667	19.9218
35	236.78	2078.54	0.6	0.7415	175	0.0035	20	19.7315
36	238.42	2007.13	0.6	0.7294	172.1	0.0035	20.3333	19.5423
37	240	1936.66	0.6	0.7176	169.4	0.0035	20.6667	19.3547
38	241.53	1867.09	0.6	0.7062	166.7	0.0035	21	19.169
39	243.01	1798.39	0.6	0.6952	164.1	0.0035	21.3333	18.9855
40	244.46	1730.52	0.6	0.6845	161.5	0.0035	21.6667	18.8045
41	245.87	1663.44	0.6	0.6741	159.1	0.0035	22	18.6263
42	247.24	1597.13	0.6	0.6641	156.7	0.0035	22.3333	18.4509
43	248.59	1531.54	0.6	0.6543	154.4	0.0035	22.6667	18.2785
44	249.91	1466.66	0.6	0.6448	152.2	0.0035	23	18.1092
45	251.2	1402.45	0.6	0.6356	150	0.0035	23.3333	17.9431
46	252.48	1337.59	0.6	0.6266	147.9	0.0035	23.6667	17.7802
47	253.74	1273.31	0.6	0.6179	145.8	0.0035	24	17.6206
48	254.98	1209.59	0.6	0.6095	143.8	0.0035	24.3333	17.4642
49	256.2	1146.41	0.6	0.6012	141.9	0.0035	24.6667	17.3111
50	258.95	1084.79	0.6	0.5833	137.7	0.0035	25.4237	16.9756
51	261.44	966.49	0.6111	0.5704	134.6	0.0035	26	16.4541
52	264.06	920.83	0.6237	0.5561	131.2	0.0035	26.6667	15.8775
53	266.41	873.82	0.6359	0.5426	128	0.0035	27.3333	15.328
54	268.52	825.58	0.6478	0.5297	125	0.0035	28	14.8041
55	270.4	776.19	0.6594	0.5173	122.1	0.0035	28.6667	14.3044
56	272.08	725.74	0.6708	0.5056	119.3	0.0035	29.3333	13.8275
57	273.55	674.3	0.6819	0.4944	116.7	0.0035	30	13.3721
58	274.85	621.93	0.6928	0.4836	114.1	0.0035	30.6667	12.9371
59	275.99	568.68	0.7035	0.4733	111.7	0.0035	31.3333	12.5212
60	276.96	514.61	0.7139	0.4635	109.4	0.0035	32	12.1235
61	277.79	459.75	0.7242	0.454	107.1	0.0035	32.6667	11.7428
62	278.49	404.15	0.7343	0.4449	105	0.0035	33.3333	11.3784
63	279.06	347.84	0.7442	0.4362	102.9	0.0035	34	11.0292
64	279.51	290.85	0.7539	0.4278	101	0.0035	34.6667	10.6945
65	279.85	233.21	0.7635	0.4197	99.1	0.0035	35.3333	10.3794
66	280.09	174.95	0.773	0.412	97.2	0.0035	36	10.0653
67	280.22	116.08	0.7823	0.4045	95.5	0.0035	36.6667	9.7695
68	280.17	0	0.8	0.3907	92.2	0.0035	37.9559	9.2269



General Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 4.11%  
Australia - AS3600  
Concrete Type - 40MPa  
Composite Elements 90.00 degrees clockwise. - Left Face in Compression

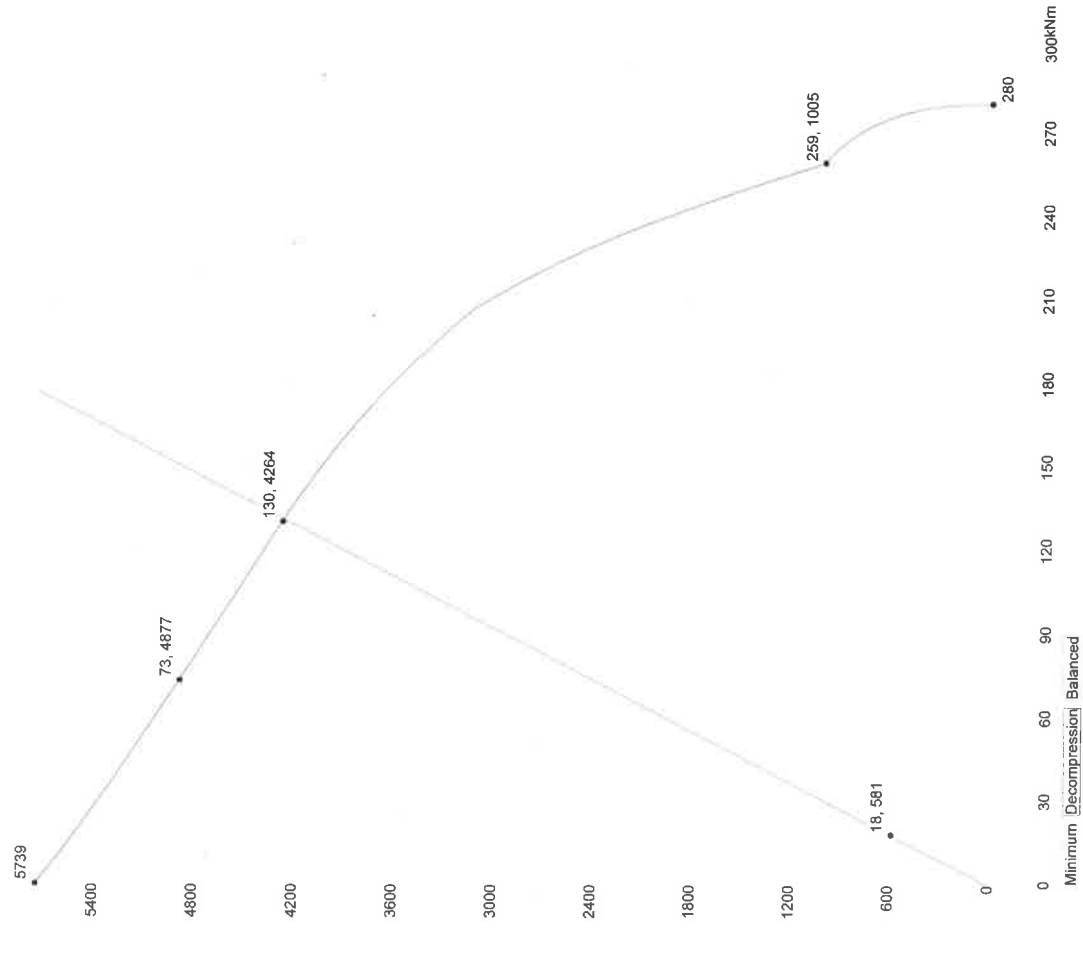
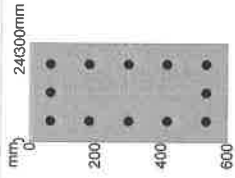


Column Interaction Diagram

Point Moment	Axial	Phi				
#	kNm	kN	#	#		
1	0	5738.8	0.6			
2	6.21	5654.32	0.6			
3	13.5	5580.71	0.6			
4	22.73	5448.45	0.6			
5	34.1	5315.1	0.6			
6	47.78	5158.84	0.6			
7	63.97	4977.78	0.6			
8	82.9	4769.84	0.6			
9	104.84	4532.72	0.6			
10	130.06	4263.85	0.6			
11	139.97	4149.23	0.6			
12	148.94	4039.23	0.6			
13	157.08	3933.51	0.6			
14	164.47	3831.76	0.6			
15	171.21	3733.71	0.6			
16	177.38	3639.12	0.6			
17	183.02	3547.76	0.6			
18	188.2	3459.44	0.6			
19	192.96	3373.97	0.6			
20	197.58	3288.6	0.6			
21	202.09	3203.07	0.6			
22	206.23	3118.69	0.6			
23	209.53	3029.41	0.6			
24	212.61	2942.01	0.6			
25	215.49	2856.39	0.6			
26	218.18	2772.43	0.6			
27	220.72	2690.05	0.6			
28	223.1	2609.16	0.6			
29	225.36	2529.67	0.6			
30	227.49	2451.52	0.6			
31	229.52	2374.63	0.6			
32	231.46	2298.94	0.6			
33	233.31	2224.4	0.6			
34	235.08	2150.95	0.6			
35	236.78	2078.54	0.6			
36	238.42	2007.13	0.6			
37	240	1936.66	0.6			
38	241.53	1867.09	0.6			
39	243.01	1798.39	0.6			
40	244.46	1730.52	0.6			
41	245.87	1663.44	0.6			
42	247.24	1597.13	0.6			
43	248.59	1531.54	0.6			
44	249.91	1466.66	0.6			
45	251.2	1402.45	0.6			
46	252.48	1337.59	0.6			
47	253.74	1273.31	0.6			
48	254.98	1209.59	0.6			
49	256.2	1146.41	0.6			
50	258.55	1084.79	0.6			
51	261.44	966.49	0.6111			
52	264.06	920.83	0.6237			
53	266.41	873.82	0.6359			
54	268.52	825.58	0.6478			
55	270.44	776.19	0.6594			
56	272.08	725.74	0.6708			
57	273.55	674.3	0.6819			
58	274.85	621.93	0.6928			
59	275.99	568.61	0.7035			
60	276.96	514.68	0.7139			
61	277.79	459.75	0.7242			
62	278.49	404.15	0.7343			
63	279.06	347.84	0.7442			
64	279.51	290.85	0.7539			
65	279.85	233.21	0.7635			
66	280.08	174.95	0.773			
67	280.22	116.08	0.7823			
68	280.17	0	0.8			

Slenderness Interaction Diagram

JOHNS RD - G.CC1  
Rectangle 600mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio = 4.11%  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 90.00 degrees clockwise. - Left Face in Compression  
Length Unsupported = 3900mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 9kNm  
Larger End Moment = 18kNm  
Minimum Moment = 9kNm  
Slenderness - Column is STOCKY according to Code limits. No moment magnification required.  
Maximum Moment = 273kNm



Column Interaction Diagram

Point	Moment kNm	Axial kN	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth mm	Compression Face Strain	Curvature x 10E-6	El x 10E12	Buckling Magnified Load kN	Moment kNm
1	0	5738.8	0.6	99999	99999	0.0025	0	0	0	176.81
2	6.21	5654.32	0.6	8.5351	2014.3	0.0026	1.7376	5.96	0	174.2
3	13.5	5560.71	0.6	4.4492	1050	0.0027	3.3333	6.7478	0	171.32
4	22.73	5448.45	0.6	3.0872	728.6	0.0028	4.8039	7.8859	0	167.85
5	34.1	5315.1	0.6	2.4062	567.9	0.0029	6.1635	9.2202	0	163.75
6	47.78	5158.84	0.6	1.9976	471.4	0.0031	7.4242	10.7255	0	158.94
7	63.97	4977.78	0.6	1.7252	407.1	0.0032	8.5985	12.4025	0	153.36
8	82.9	4769.84	0.6	1.5306	361.2	0.0033	9.6893	14.2606	0	146.95
9	104.84	4532.72	0.6	1.3847	326.8	0.0034	10.7104	16.3139	0	139.65
10	130.06	4263.85	0.6	1.2712	300	0.0035	11.6667	18.5798	0	131.36
11	139.97	4149.23	0.6	1.2359	291.7	0.0035	12	19.4409	0	127.83
12	148.94	4039.23	0.6	1.2025	283.8	0.0035	12.3333	20.1274	0	124.44
13	157.08	3933.51	0.6	1.1708	276.3	0.0035	12.6667	20.6679	0	121.19
14	164.47	3831.76	0.6	1.1408	269.2	0.0035	13	21.0862	0	118.05
15	171.21	3733.71	0.6	1.1123	262.5	0.0035	13.3333	21.4018	0	115.03
16	177.38	3639.12	0.6	1.0852	256.1	0.0035	13.6667	21.6311	0	112.12
17	183.02	3547.76	0.6	1.0593	250	0.0035	14	21.7878	0	109.3
18	188.2	3459.44	0.6	1.0347	244.2	0.0035	14.3333	21.8834	0	106.58
19	192.96	3373.97	0.6	1.0112	238.6	0.0035	14.6667	21.9275	0	103.95
20	197.58	3288.6	0.6	0.9887	233.3	0.0035	15	21.9529	0	101.32
21	202.09	3203.07	0.6	0.9672	228.3	0.0035	15.3333	21.9659	0	98.68
22	206.23	3118.69	0.6	0.9466	223.4	0.0035	15.6667	21.9366	0	96.08
23	209.53	3029.41	0.6	0.9269	218.8	0.0035	16	21.8265	0	93.33
24	212.61	2942.01	0.6	0.908	214.3	0.0035	16.3333	21.6951	0	90.64
25	215.49	2856.39	0.6	0.8898	210	0.0035	16.6667	21.5488	0	88
26	218.18	2772.43	0.6	0.8724	205.9	0.0035	17	21.3905	0	85.42
27	220.72	2690.05	0.6	0.8556	201.9	0.0035	17.3333	21.2227	0	82.88
28	223.1	2609.16	0.6	0.8395	198.1	0.0035	17.6667	21.0474	0	80.39
29	225.36	2529.67	0.6	0.8239	194.4	0.0035	18	20.8664	0	77.94
30	227.49	2451.52	0.6	0.8089	190.9	0.0035	18.3333	20.6813	0	75.53
31	229.52	2374.63	0.6	0.7945	187.5	0.0035	18.6667	20.4933	0	73.16
32	231.46	2298.94	0.6	0.7806	184.2	0.0035	19	20.3034	0	70.83
33	233.31	2224.4	0.6	0.7671	181	0.0035	19.3333	20.1126	0	68.53
34	235.08	2150.95	0.6	0.7541	178	0.0035	19.6667	19.9218	0	66.27
35	236.78	2078.54	0.6	0.7415	175	0.0035	20	19.7315	0	64.04
36	238.42	2007.13	0.6	0.7294	172.1	0.0035	20.3333	19.5423	0	61.84
37	240	1936.66	0.6	0.7176	169.4	0.0035	20.6667	19.3547	0	59.67
38	241.53	1867.09	0.6	0.7062	166.7	0.0035	21	19.169	0	57.52
39	243.01	1798.39	0.6	0.6952	164.1	0.0035	21.3333	18.9855	0	55.41
40	244.46	1730.52	0.6	0.6845	161.5	0.0035	21.6667	18.8045	0	53.32
41	245.87	1663.44	0.6	0.6741	159.1	0.0035	22	18.6263	0	51.25
42	247.24	1597.13	0.6	0.6641	156.7	0.0035	22.3333	18.4509	0	49.21
43	248.59	1531.54	0.6	0.6543	154.4	0.0035	22.6667	18.2785	0	47.19
44	249.91	1466.66	0.6	0.6448	152.2	0.0035	23	18.1092	0	45.19
45	251.2	1402.45	0.6	0.6356	150	0.0035	23.3333	17.9431	0	43.21
46	252.48	1337.59	0.6	0.6266	147.9	0.0035	23.6667	17.7802	0	41.21
47	253.74	1273.31	0.6	0.6179	145.8	0.0035	24	17.6206	0	39.23
48	254.98	1209.59	0.6	0.6095	143.8	0.0035	24.3333	17.4642	0	37.27
49	256.2	1146.41	0.6	0.6012	141.9	0.0035	24.6667	17.3111	0	35.32
50	258.95	1004.79	0.6	0.5833	137.7	0.0035	25.4237	16.9756	0	30.96
51	261.44	966.49	0.6111	0.5704	134.6	0.0035	26	16.4541	0	29.78
52	264.06	920.83	0.6237	0.5561	131.2	0.0035	26.6667	15.8775	0	28.37
53	266.41	873.82	0.6359	0.5426	128	0.0035	27.3333	15.328	0	26.92
54	268.52	825.58	0.6478	0.5297	125	0.0035	28	14.8041	0	25.44
55	270.4	776.19	0.6594	0.5173	122.1	0.0035	28.6667	14.3044	0	23.91
56	272.08	725.74	0.6708	0.5056	119.3	0.0035	29.3333	13.8275	0	22.36
57	273.55	674.3	0.6819	0.4944	116.7	0.0035	30	13.3721	0	20.77
58	274.85	621.93	0.6928	0.4836	114.1	0.0035	30.6667	12.9371	0	19.16
59	275.99	568.68	0.7035	0.4733	111.7	0.0035	31.3333	12.5212	0	17.52
60	276.96	514.61	0.7139	0.4635	109.4	0.0035	32	12.1235	0	15.85
61	277.79	459.75	0.7242	0.454	107.1	0.0035	32.6667	11.7428	0	14.16
62	278.49	404.15	0.7343	0.4449	105	0.0035	33.3333	11.3764	0	12.45
63	279.06	347.84	0.7442	0.4362	102.9	0.0035	34	11.0292	0	10.72
64	279.51	290.85	0.7539	0.4278	101	0.0035	34.6667	10.6945	0	8.98
65	279.85	233.21	0.7635	0.4197	99.1	0.0035	35.3333	10.3734	0	7.19
66	280.09	174.95	0.773	0.412	97.2	0.0035	36	10.0653	0	5.39
67	280.22	116.08	0.7823	0.4045	95.5	0.0035	36.6667	9.7695	0	3.58
68	280.17	0	0.8	0.3907	92.2	0.0035	37.9559	9.2269	0	1

CC32

Errors and Warnings

Input

No errors or warnings were found.

Output

No errors or warnings were found.

Remarks

A

Pure Axial Nuo - dp = 150mm

Decompression

Balanced Point

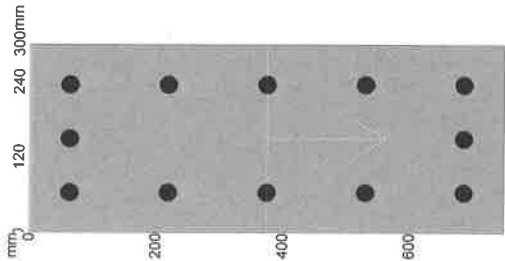
Pure Moment Muo - d = 236mm

CC33

CC34

Project Name: JOHNS RD  
Project Number: 1806063  
Description: G.CC2  
Designer: RGC  
K:\2018\06\1806063\Structural Drawings and Details\RGC\G.CC2 fire.rpt  
RAPT - Version: 6.5.16.0  
Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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Licensee  
TMK Consulting Engineers  
Level 6  
100 Pirie Street  
Adelaide SA 5000  
11169065160718WPN3



Input

General		Reinforcement Bar		Reinforcement Bar		Reinforcement Bar		Reinforcement Bar		Reinforcement Bar	
Designer	Project Name	Project Number	Description	Design Code	Material	Concrete Type	Concrete Strength	Rotation	Tension Curve	Y/N	N
RGC	JOHNS RD	1806063	G.CC2	Australia - AS3600*SAVED	Australia - Australian Materials*SAVED	Standard Concrete - Brisbane/Sydney	40MPa	0	N		

Rectangle

#	List	X	Y	Width	Depth
1	Solid	0	0	300	750

Reinforcement Bar

#	List	Reinforcement Bar	Type	Reinforcement Bar	Size	Number of bundled bars	X	Y	Distance	Tendon Force
1	N	Deformed, 500MPa	28, 28mm, 616mm2	1	64	10000	0			

#	List	Reinforcement Bar	Type	Reinforcement Bar	Size	Number of bundled bars	X	Y	Distance	Tendon Force
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

Design Data

Capacity Reduction Factor in Flexure - Tension	##	0.8
Capacity Reduction Factor in Flexure - Compression	##	0.6
Capacity Reduction Factor in Shear	##	0.7
Concrete Material Factor Flexure	##	1
Concrete Material Factor Shear	##	1
Reinforcement Material Factor	##	1
Maximum Depth of Neutral Axis for Ductility	##	0.4
Shear Enhancement near Support	Y/N	N
Time of Loading in Days	##	28
Concrete Strength at Time of Loading	MPa	40
Design Period in Years	##	30
Relative Humidity	%	50
Average Temperature	C.	20
Long Term Calculation Basis	List	Code Default
Concrete Strength Gain Rate	List	S

Design Points

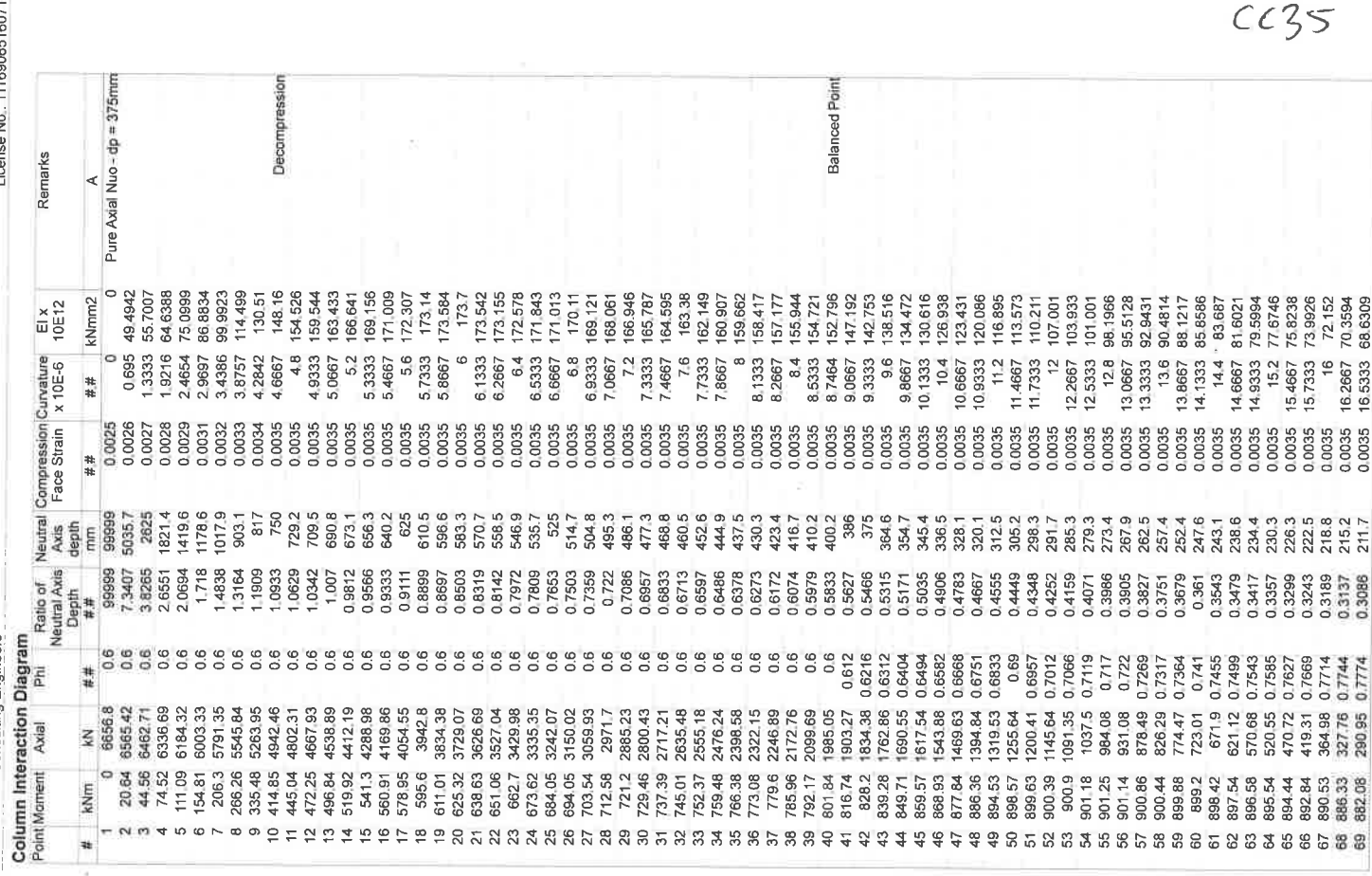
Moment	Axial Force	Description
-1	kNm	A
0	37.2	991.2

Slenderness

Length Unsupported	mm	3900
Column Framing	List	Braced
Effective Length Factor Braced	##	0.7
Moment Ratio for Creep	##	0.5
Smaller End Moment M1	kNm	18.6
Larger End Moment M2	kNm	37.2
Applied Axial Load	kN	991.2

General Interaction Diagram

JOHNS RD - G.CC2  
Rectangle 750mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 3.28%  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise - Top Face in Compression



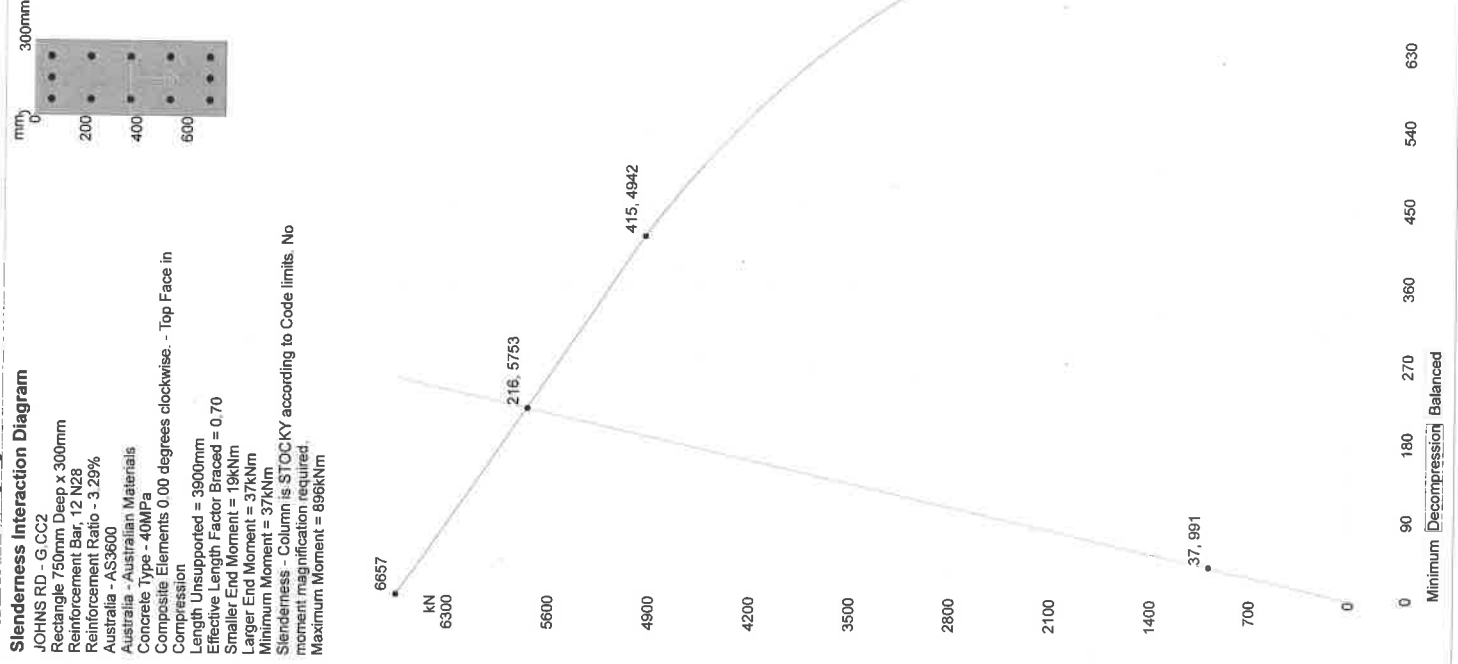
Column Interaction Diagram

#	kNm	kN	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth mm	Face Strain	Curvature x 10E-6	EI x 10E12	Remarks
1	0	8656.8	0.6	99999	99999	0.0025	0	0	Pure Axial Nuo - dp = 375mm
2	20.64	8585.42	0.6	7.3407	5035.7	0.0026	0.695	49.4942	
3	44.56	8462.71	0.6	3.8265	2825	0.0027	1.3333	55.7007	
4	74.52	8336.69	0.6	2.6551	1821.4	0.0028	1.9216	64.6388	
5	111.09	8184.32	0.6	2.0694	1419.6	0.0029	2.4654	75.0999	
6	154.81	8003.33	0.6	1.718	1178.6	0.0031	2.9987	86.8834	
7	206.3	7791.35	0.6	1.4838	1017.9	0.0032	3.4386	99.9923	
8	266.26	5545.84	0.6	1.3164	903.1	0.0033	3.8757	114.499	
9	335.48	5263.95	0.6	1.1909	817	0.0034	4.2842	130.51	
10	414.85	4942.46	0.6	1.0833	750	0.0035	4.6667	148.16	Decompression
11	445.04	4802.31	0.6	1.0629	729.2	0.0035	4.8	154.526	
12	472.25	4687.93	0.6	1.0342	709.5	0.0035	4.9333	159.544	
13	496.84	4538.89	0.6	1.007	690.8	0.0035	5.0667	163.433	
14	519.92	4412.19	0.6	0.9812	673.1	0.0035	5.2	166.641	
15	541.3	4288.98	0.6	0.9566	656.3	0.0035	5.3333	169.156	
16	560.91	4169.86	0.6	0.9333	640.2	0.0035	5.4667	171.009	
17	578.95	4054.55	0.6	0.9111	625	0.0035	5.6	172.307	
18	595.6	3942.8	0.6	0.8899	610.5	0.0035	5.7333	173.14	
19	611.01	3834.38	0.6	0.8697	596.6	0.0035	5.8667	173.584	
20	625.32	3729.07	0.6	0.8503	583.3	0.0035	6	173.7	
21	638.63	3626.69	0.6	0.8319	570.7	0.0035	6.1333	173.542	
22	651.06	3527.04	0.6	0.8142	558.5	0.0035	6.2667	173.155	
23	662.7	3429.98	0.6	0.7972	546.9	0.0035	6.4	172.578	
24	673.62	3335.35	0.6	0.7809	535.7	0.0035	6.5333	171.843	
25	684.05	3242.07	0.6	0.7653	525	0.0035	6.6667	171.013	
26	694.05	3150.02	0.6	0.7503	514.7	0.0035	6.8	170.11	
27	703.54	3059.93	0.6	0.7359	504.8	0.0035	6.9333	169.121	
28	712.58	2971.7	0.6	0.722	495.3	0.0035	7.0667	168.061	
29	721.2	2885.23	0.6	0.7086	486.1	0.0035	7.2	166.946	
30	729.46	2800.43	0.6	0.6957	477.3	0.0035	7.3333	165.767	
31	737.39	2717.21	0.6	0.6833	468.8	0.0035	7.4667	164.595	
32	745.01	2635.48	0.6	0.6713	460.5	0.0035	7.6	163.38	
33	752.37	2555.18	0.6	0.6597	452.6	0.0035	7.7333	162.149	
34	759.48	2476.24	0.6	0.6486	444.9	0.0035	7.8667	160.907	
35	766.38	2398.58	0.6	0.6378	437.5	0.0035	8	159.662	
36	773.08	2322.15	0.6	0.6273	430.3	0.0035	8.1333	158.417	
37	779.6	2246.89	0.6	0.6172	423.4	0.0035	8.2667	157.177	
38	785.96	2172.76	0.6	0.6074	416.7	0.0035	8.4	155.944	
39	792.17	2099.69	0.6	0.5979	410.2	0.0035	8.5333	154.721	
40	801.84	1985.05	0.6	0.5833	400.2	0.0035	8.7464	152.796	
41	816.74	1903.27	0.612	0.5627	386	0.0035	9.0667	147.192	
42	828.2	1834.38	0.6216	0.5466	375	0.0035	9.3333	142.753	
43	839.28	1762.86	0.6312	0.5315	364.6	0.0035	9.6	138.516	
44	849.71	1690.55	0.6404	0.5171	354.7	0.0035	9.8667	134.472	
45	859.57	1617.54	0.6494	0.5035	345.4	0.0035	10.1333	130.616	
46	868.93	1543.88	0.6582	0.4906	336.5	0.0035	10.6667	123.431	
47	877.84	1469.63	0.6668	0.4783	328.1	0.0035	10.9333	120.086	
48	886.36	1394.84	0.6751	0.4667	320.1	0.0035	11.2	116.895	
49	894.53	1319.53	0.6833	0.4555	312.5	0.0035	11.4667	113.573	
50	898.57	1255.64	0.69	0.4449	305.2	0.0035	11.7333	110.211	
51	899.63	1200.41	0.6957	0.4348	298.3	0.0035	12	107.001	
52	900.39	1145.64	0.7012	0.4252	291.7	0.0035	12.2667	103.893	
53	900.9	1091.35	0.7066	0.4159	285.3	0.0035	12.5333	101.001	
54	901.18	1037.5	0.7119	0.4071	279.3	0.0035	12.8	98.1966	
55	901.25	984.08	0.717	0.3986	273.4	0.0035	13.0667	95.5128	
56	901.14	931.08	0.722	0.3905	267.9	0.0035	13.3333	92.9431	
57	900.86	878.49	0.7269	0.3827	262.5	0.0035	13.6	90.4814	
58	900.44	826.29	0.7317	0.3751	257.4	0.0035	13.8667	88.1217	
59	899.88	774.47	0.7364	0.3679	252.4	0.0035	14.1333	85.8586	
60	899.2	723.01	0.741	0.361	247.6	0.0035	14.4	83.687	
61	898.42	671.9	0.7455	0.3543	243.1	0.0035	14.6667	81.6021	
62	897.54	621.12	0.7499	0.3479	238.6	0.0035	14.9333	79.5994	
63	896.58	570.68	0.7543	0.3417	234.4	0.0035	15.2	77.6746	
64	895.54	520.55	0.7585	0.3357	230.3	0.0035	15.4667	75.8238	
65	894.44	470.72	0.7627	0.3299	226.3	0.0035	15.7333	73.9926	
66	892.84	419.31	0.7669	0.3243	222.5	0.0035	16	72.152	
67	890.53	364.98	0.7714	0.3189	218.8	0.0035	16.2667	70.3594	
68	886.33	327.76	0.7744	0.3137	215.2	0.0035	16.5333	68.6309	
69	882.08	290.95	0.7774	0.3086	211.7	0.0035			

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### Slenderness Interaction Diagram

JOHNS RD. - G.CC2  
Rectangle 750mm Deep x 300mm  
Reinforcement Bar, 12 N28  
Reinforcement Ratio - 3.29%  
Australia - AS3600  
Australia - Australian Materials  
Concrete Type - 40MPa  
Composite Elements 0.00 degrees clockwise. - Top Face in  
Compression  
Length Unsupported = 3900mm  
Effective Length Factor Braced = 0.70  
Smaller End Moment = 19kNm  
Larger End Moment = 37kNm  
Minimum Moment = 37kNm  
Slenderness - Column is STOCKY according to Code limits.  
Maximum magnification required.  
Maximum Moment = 896kNm



Point Moment		Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Compression Face Strain	Curvature x 10E-6	EI x 10E12	Remarks
#	kNm	kN	#	#	mm	#	#	kNm/m2	A
70	877.8	254.53	0.7803	0.3037	208.3	0.0035	16.8	66.9632	
71	873.48	218.48	0.7831	0.2989	205.1	0.0035	17.0667	65.3535	
72	869.13	182.8	0.7859	0.2943	201.9	0.0035	17.3333	63.799	
73	864.75	147.45	0.7887	0.2899	198.9	0.0035	17.6	62.2971	
74	860.35	112.44	0.7914	0.2866	195.9	0.0035	17.8667	60.8454	
75	855.92	77.75	0.7941	0.2814	193	0.0035	18.1333	59.4416	
76	851.47	43.36	0.7967	0.2773	190.2	0.0035	18.4	58.0835	
77	845.82	0	0.8	0.2722	186.8	0.0035	18.7407	56.4156	Pure Moment Muo - d = 886mm

Column Interaction Diagram

Point/Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	Compression Face Strain	Curvature x 10E-6	EI x 10E12	Buckling Load	Magnified Moment
#	kNm	#	#	mm	#	#	kNm/m2	kN	kNm
1	0	6555.8	0.6	99999	0.0025	0	0	0	249.83
2	20.64	6595.42	0.6	7.3407	0.0026	0.695	49.4942	0	246.4
3	44.56	6462.71	0.6	3.8265	0.0027	1.3333	55.7007	0	242.55
4	74.52	6336.69	0.6	2.6551	0.0028	1.9216	64.6398	0	237.82
5	111.09	6184.32	0.6	2.0894	0.0029	2.4654	75.0999	0	232.1
6	146.81	6003.33	0.6	1.718	0.0031	2.9897	86.8834	0	225.31
7	206.3	5791.35	0.6	1.4838	0.0032	3.4386	99.9923	0	217.35
8	266.26	5545.84	0.6	1.3164	0.0033	3.8757	114.4599	0	208.14
9	335.48	5263.95	0.6	1.1909	0.0034	4.2842	130.51	0	197.56
10	414.85	4942.46	0.6	1.0933	0.0035	4.6667	148.16	0	185.49
11	445.04	4802.31	0.6	1.0629	0.0035	4.8	154.526	0	180.23
12	472.25	4667.93	0.6	1.0342	0.0035	4.9333	159.544	0	175.19
13	496.84	4538.89	0.6	1.007	0.0035	5.0667	163.433	0	170.35
14	519.92	4412.19	0.6	0.9812	0.0035	5.2	166.641	0	165.59
15	541.3	4288.98	0.6	0.9566	0.0035	5.3333	169.156	0	160.97
16	560.91	4169.86	0.6	0.9333	0.0035	5.4667	171.009	0	156.5
17	578.95	4054.55	0.6	0.9111	0.0035	5.6	172.307	0	152.17
18	595.6	3942.8	0.6	0.8899	0.0035	5.7333	173.14	0	147.97
19	611.01	3834.38	0.6	0.8697	0.0035	5.8667	173.584	0	143.91
20	625.32	3729.07	0.6	0.8503	0.0035	6	173.7	0	139.95
21	638.63	3626.69	0.6	0.8319	0.0035	6.1333	173.542	0	136.11
22	651.06	3527.04	0.6	0.8142	0.0035	6.2667	173.155	0	132.37
23	662.7	3429.98	0.6	0.7972	0.0035	6.4	172.578	0	128.73
24	673.62	3335.35	0.6	0.7809	0.0035	6.5333	171.843	0	125.18
25	684.05	3242.07	0.6	0.7653	0.0035	6.6667	171.013	0	121.68
26	694.05	3150.02	0.6	0.7503	0.0035	6.8	170.11	0	118.22
27	703.54	3059.93	0.6	0.7359	0.0035	6.9333	169.121	0	114.84
28	712.58	2971.7	0.6	0.722	0.0035	7.0667	168.061	0	111.53
29	721.2	2885.23	0.6	0.7086	0.0035	7.2	166.946	0	108.28
30	729.46	2800.43	0.6	0.6957	0.0035	7.3333	165.787	0	105.1
31	737.39	2717.21	0.6	0.6833	0.0035	7.4667	164.595	0	101.98
32	745.01	2635.48	0.6	0.6713	0.0035	7.6	163.38	0	98.91
33	752.37	2555.18	0.6	0.6597	0.0035	7.7333	162.149	0	95.9
34	759.48	2476.24	0.6	0.6486	0.0035	7.8667	160.907	0	92.93
35	766.38	2398.58	0.6	0.6378	0.0035	8	159.662	0	90.02
36	773.08	2322.15	0.6	0.6273	0.0035	8.1333	158.417	0	87.15
37	779.6	2246.89	0.6	0.6172	0.0035	8.2667	157.177	0	84.33
38	785.96	2172.76	0.6	0.6074	0.0035	8.4	155.944	0	81.54
39	792.17	2099.69	0.6	0.5978	0.0035	8.5333	154.721	0	78.8
40	801.84	1985.05	0.6	0.5833	0.0035	8.7464	152.796	0	74.5
41	816.74	1903.27	0.612	0.5627	0.0035	9.0667	147.192	0	71.43
42	828.2	1834.38	0.6216	0.5466	0.0035	9.3333	142.753	0	68.84
43	839.28	1762.86	0.6312	0.5315	0.0035	9.6	138.516	0	66.16
44	849.71	1690.55	0.6404	0.5171	0.0035	9.8667	134.472	0	63.45
45	859.57	1617.54	0.6494	0.5035	0.0035	10.1333	130.616	0	60.71
46	868.93	1543.88	0.6582	0.4906	0.0035	10.4	126.938	0	57.94
47	877.84	1469.63	0.6668	0.4783	0.0035	10.6667	123.431	0	55.16
48	886.36	1394.84	0.6751	0.4667	0.0035	10.9333	120.086	0	52.35
49	894.53	1319.53	0.6833	0.4555	0.0035	11.2	116.895	0	49.52
50	898.57	1255.64	0.69	0.4449	0.0035	11.4667	113.573	0	47.12
51	899.63	1200.41	0.6957	0.4348	0.0035	11.7333	110.211	0	45.05
52	900.39	1145.64	0.7012	0.4252	0.0035	12	107.001	0	43
53	900.9	1091.35	0.7066	0.4159	0.0035	12.2667	103.933	0	40.96
54	901.18	1037.5	0.7119	0.4071	0.0035	12.5333	101.001	0	38.94
55	901.25	984.08	0.717	0.3986	0.0035	12.8	98.1966	0	36.93
56	901.14	931.08	0.722	0.3905	0.0035	13.0667	95.5128	0	34.94
57	900.86	878.49	0.7269	0.3827	0.0035	13.3333	92.9431	0	32.97
58	900.44	826.29	0.7317	0.3751	0.0035	13.6	90.4814	0	31.01
59	899.88	774.47	0.7364	0.3679	0.0035	13.8667	88.1217	0	29.07
60	899.2	723.01	0.741	0.361	0.0035	14.1333	85.8586	0	27.13
61	898.42	671.9	0.7455	0.3543	0.0035	14.4	83.687	0	25.22
62	897.54	621.12	0.7499	0.3479	0.0035	14.6667	81.6021	0	23.31
63	896.56	570.69	0.7543	0.3417	0.0035	14.9333	79.5994	0	21.42
64	895.54	520.55	0.7585	0.3357	0.0035	15.2	77.6746	0	19.54
65	894.44	470.72	0.7627	0.3299	0.0035	15.4667	75.8238	0	17.67
66	892.84	419.31	0.7669	0.3243	0.0035	15.7333	73.9826	0	15.74
67	890.53	364.98	0.7714	0.3189	0.0035	16	72.152	0	13.7
68	886.33	327.76	0.7744	0.3137	0.0035	16.2667	70.3594	0	12.3
69	882.08	290.95	0.7774	0.3086	0.0035	16.5333	68.6309	0	10.92

Remarks

A

Pure Axial Nuo - dp = 375mm

Decompression

Balanced Point

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Remarks
A

Pure Moment Muo - d = 686mm

**Errors and Warnings**

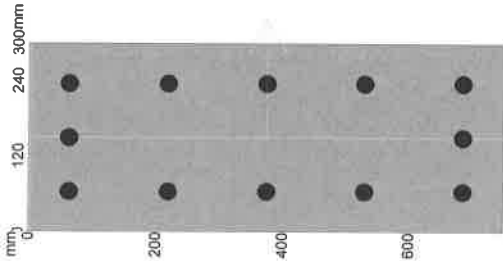
**Input**  
No errors or warnings were found.

**Output**  
No errors or warnings were found.

Project Name: JOHNS RD  
Project Number: 1806063  
Description: G.CC2  
Designer: RGC  
K:\2018\06\1806063\Structural Drawings and Details\RGC\G.CC2 fire weak  
dir.rpo

RAPT - Version: 6.5.16.0  
Reinforced And Post-Tensioned Concrete Analysis & Design Package  
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Licensee  
TMK Consulting Engineers  
Level 6  
100 Pirie Street  
Adelaide SA 5000  
11169065160718WPN3



Input

General		A	A	A	A	RGC
Designer	Project Name	JOHNS RD		1806063		G.CC2
Project Number	Description	Australia - AS3600 "SAVED"		Standard Concrete - Brisbane/Sydney		40MPa
Design Code	Material	List		List		90
Concrete Type	Concrete Strength	List		List		N
Rotation	Tension Curve	##		Y/N		

Rectangle

Solid/Void		X	Y	Width	Depth
#	List	mm	mm	mm	mm
1	Solid	0	0	300	750

Reinforcement Bar

Reinforcement Bar Type		Reinforcement Bar Size	Number of bundled bars	X	Y	Distance	Tendon Force
#	List	List	List	mm	mm	mm	kN
1	N, Deformed, 500MPa	28, 28mm, 616mm <sup>2</sup>	1	-64	64	10000	0
2				-64	150	10000	0
3				-686	150	10000	0
4				-686	236	10000	0
5				-219.5	64	10000	0
6				-375	64	10000	0
7				-530.5	64	10000	0
8				-64	236	10000	0
9				-219.5	236	10000	0
10				-375	236	10000	0
11				-530.5	236	10000	0
12							

Design Data

Capacity Reduction Factor in Flexure - Tension	##	0.8
Capacity Reduction Factor in Flexure - Compression	##	0.6
Capacity Reduction Factor in Shear	##	0.7
Concrete Material Factor Flexure	##	1
Concrete Material Factor Shear	##	1
Reinforcement Material Factor	##	1
Maximum Depth of Neutral Axis for Ductility	##	0.4
Shear Enhancement near Support	Y/N	N
Time of Loading in Days	##	28
Concrete Strength at Time of Loading	MPa	40
Design Period in Years	##	30
Relative Humidity	%	50
Average Temperature	C	20
Long Term Calculation Basis	List	Code Default
Concrete Strength Gain Rate	List	S

Design Points

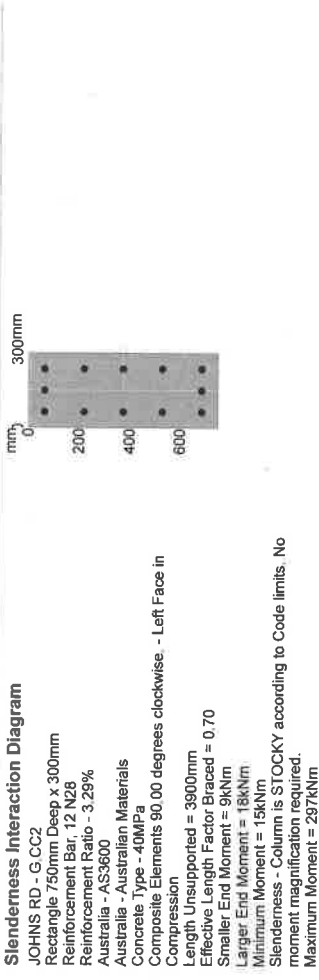
Moment	Axial Force	Description
-1	kNm	A
0	18.4	991.2

Slenderness

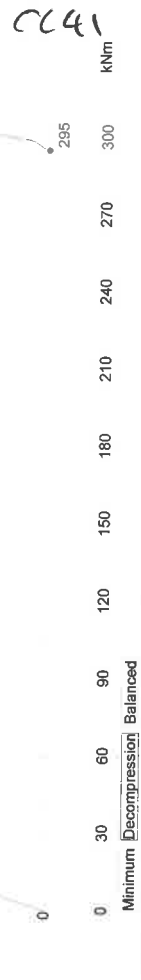
Length Unsupported	mm	3900
Column Framing	List	Braced
Effective Length Factor Braced	##	0.7
Moment Ratio for Creep	##	0.5
Smaller End Moment M1	kNm	9.2
Larger End Moment M2	kNm	18.4
Applied Axial Load	kN	991.2

CC39





Point Moment		Axial		Phi		Ratio of Neutral Axis Depth		Neutral Axis depth		Compression Face Strain		Curvature x 10E-6		EI x 10E12		Remarks
#	kNm	kN	#	#	#	#	#	mm	mm	#	#	#	#	kNm/m2	10.0219	A
70	286.98	223.88	0.7741	0.3835	90.5	0.0035	38.6667	10.0219								
71	299.28	163.4	0.7813	0.377	89	0.0035	39.3333	9.7389								
72	298.52	102.66	0.7883	0.3708	87.5	0.0035	40	9.4665								
73	296.87	61.07	0.7931	0.3647	86.1	0.0035	40.6667	9.2043								
74	294.63	0	0.8	0.3555	83.9	0.0035	41.7206	8.8274	Pure Moment Muo - d = 235mm							



## Column Interaction Diagram

#	kNm	Point Moment	Axial	Phi	Ratio of Neutral Axis Depth	Neutral Axis depth	mm	Compression Face Strain	Curvature x 10E-6	El x 10E12	Buckling Load	Magnified Moment
1	0	6656.8	0.6	99999	99999	0.0025	0	0	0	0	123.57	0
2	6.22	6572.29	0.6	8.5351	2014.3	0.0026	1.7376	5.965	0	122	0	122
3	13.78	6476.28	0.6	4.4492	1050	0.0027	3.3333	6.89	0	120.22	0	120.22
4	23.8	6356.77	0.6	3.0872	728.6	0.0028	4.8039	8.256	0	118	0	118
5	36.5	6210.71	0.6	2.4062	567.9	0.0029	6.1635	9.869	0	115.28	0	115.28
6	52.1	6035.78	0.6	1.9976	471.4	0.0031	7.4242	11.697	0	112.04	0	112.04
7	70.87	5829.61	0.6	1.7252	407.1	0.0032	8.5965	13.7409	0	108.22	0	108.22
8	93.09	5589.6	0.6	1.5306	361.2	0.0033	9.6893	16.0125	0	103.76	0	103.76
9	119.07	5312.84	0.6	1.3847	326.8	0.0034	10.7104	18.5295	0	98.62	0	98.62
10	149.2	4996.11	0.6	1.2712	300	0.0035	11.6667	21.3136	0	92.74	0	92.74
11	161.03	4861.15	0.6	1.2359	291.7	0.0035	12	22.3651	0	90.24	0	90.24
12	171.68	4731.91	0.6	1.2025	283.8	0.0035	12.3333	23.2004	0	87.84	0	87.84
13	181.3	4607.96	0.6	1.1708	276.3	0.0035	12.6667	23.8549	0	85.54	0	85.54
14	189.98	4488.92	0.6	1.1408	269.2	0.0035	13	24.3583	0	83.33	0	83.33
15	197.88	4374.44	0.6	1.1123	262.5	0.0035	13.3333	24.735	0	81.2	0	81.2
16	205.04	4264.22	0.6	1.0852	256.1	0.0035	13.6667	25.0052	0	79.16	0	79.16
17	211.56	4157.98	0.6	1.0593	250	0.0035	14	25.186	0	77.19	0	77.19
18	217.51	4055.45	0.6	1.0347	244.2	0.0035	14.3333	25.2917	0	75.28	0	75.28
19	222.94	3956.45	0.6	1.0112	238.6	0.0035	14.6667	25.3343	0	73.44	0	73.44
20	228.14	3858.14	0.6	0.9887	233.3	0.0035	15	25.3485	0	71.62	0	71.62
21	233.15	3760.23	0.6	0.9672	228.3	0.0035	15.3333	25.3424	0	69.8	0	69.8
22	237.73	3663.99	0.6	0.9466	223.4	0.0035	15.6667	25.2902	0	68.02	0	68.02
23	241.4	3563.35	0.6	0.9269	218.8	0.0035	16	25.1458	0	66.15	0	66.15
24	244.79	3468.07	0.6	0.908	214.3	0.0035	16.3333	24.9787	0	64.32	0	64.32
25	247.93	3368.97	0.6	0.8898	210	0.0035	16.6667	24.7931	0	62.54	0	62.54
26	250.84	3274.96	0.6	0.8724	205.9	0.0035	17	24.5926	0	60.79	0	60.79
27	253.55	3182.92	0.6	0.8556	201.9	0.0035	17.3333	24.3803	0	59.09	0	59.09
28	256.08	3092.73	0.6	0.8395	198.1	0.0035	17.6667	24.1587	0	57.41	0	57.41
29	258.45	3004.29	0.6	0.8239	194.4	0.0035	18	23.9302	0	55.77	0	55.77
30	260.66	2917.5	0.6	0.8089	190.9	0.0035	18.3333	23.6965	0	54.16	0	54.16
31	262.74	2832.3	0.6	0.7945	187.5	0.0035	18.6667	23.4592	0	52.58	0	52.58
32	264.71	2748.58	0.6	0.7806	184.2	0.0035	19	23.2197	0	51.02	0	51.02
33	266.56	2666.28	0.6	0.7671	181	0.0035	19.3333	22.9793	0	49.5	0	49.5
34	268.32	2585.34	0.6	0.7541	178	0.0035	19.6667	22.7387	0	47.99	0	47.99
35	269.99	2505.7	0.6	0.7415	175	0.0035	20	22.4989	0	46.51	0	46.51
36	271.58	2427.28	0.6	0.7294	172.1	0.0035	20.3333	22.2805	0	45.06	0	45.06
37	273.1	2350.03	0.6	0.7176	169.4	0.0035	20.6667	22.0241	0	43.62	0	43.62
38	274.56	2273.9	0.6	0.7062	166.7	0.0035	21	21.7902	0	42.21	0	42.21
39	275.96	2198.85	0.6	0.6952	164.1	0.0035	21.3333	21.5591	0	40.82	0	40.82
40	277.3	2124.82	0.6	0.6845	161.5	0.0035	21.6667	21.3311	0	39.44	0	39.44
41	278.61	2051.76	0.6	0.6741	159.1	0.0035	22	21.1066	0	38.09	0	38.09
42	279.87	1979.65	0.6	0.6641	156.7	0.0035	22.3333	20.8857	0	36.75	0	36.75
43	281.09	1908.44	0.6	0.6543	154.4	0.0035	22.6667	20.6686	0	35.43	0	35.43
44	282.29	1838.09	0.6	0.6448	152.2	0.0035	23	20.4554	0	34.12	0	34.12
45	283.45	1768.58	0.6	0.6356	150	0.0035	23.3333	20.2462	0	32.83	0	32.83
46	284.58	1698.96	0.6	0.6266	147.9	0.0035	23.6667	20.0411	0	31.53	0	31.53
47	285.7	1629.27	0.6	0.6179	145.8	0.0035	24	19.8401	0	30.24	0	30.24
48	286.79	1560.67	0.6	0.6095	143.8	0.0035	24.3333	19.6432	0	28.97	0	28.97
49	287.87	1492.75	0.6	0.6012	141.9	0.0035	24.6667	19.4504	0	27.71	0	27.71
50	290.25	1340.62	0.6	0.5833	137.7	0.0035	25.4237	19.0277	0	24.89	0	24.89
51	292.24	1297.59	0.6094	0.5704	134.6	0.0035	26	18.4428	0	24.09	0	24.09
52	294.26	1246.6	0.6201	0.5561	131.2	0.0035	26.6667	17.7959	0	23.14	0	23.14
53	296.01	1194.66	0.6304	0.5426	128	0.0035	27	17.1791	0	22.18	0	22.18
54	297.51	1141.86	0.6404	0.5297	125	0.0035	28	16.591	0	21.2	0	21.2
55	298.78	1088.29	0.6502	0.5173	122.1	0.0035	28.6667	16.0299	0	20.2	0	20.2
56	299.85	1034.01	0.6597	0.5056	119.3	0.0035	29.3333	15.4944	0	19.19	0	19.19
57	300.72	979.09	0.669	0.4944	116.7	0.0035	30	14.9831	0	18.18	0	18.18
58	301.42	923.59	0.6781	0.4836	114.1	0.0035	30.6667	14.4946	0	17.14	0	17.14
59	301.95	867.54	0.687	0.4733	111.7	0.0035	31.3333	14.0277	0	16.1	0	16.1
60	302.34	810.99	0.6957	0.4635	109.4	0.0035	32	13.5812	0	15.05	0	15.05
61	302.58	753.98	0.7042	0.454	107.1	0.0035	32.6667	13.154	0	14	0	14
62	302.7	696.53	0.7125	0.4449	105	0.0035	33.3333	12.745	0	12.93	0	12.93
63	302.7	638.87	0.7207	0.4362	102.9	0.0035	34	12.3532	0	11.86	0	11.86
64	302.58	580.43	0.7287	0.4278	101	0.0035	34.6667	11.9777	0	10.77	0	10.77
65	302.37	521.82	0.7366	0.4197	99.1	0.0035	35.3333	11.6177	0	9.69	0	9.69
66	302.06	462.87	0.7443	0.412	97.2	0.0035	36	11.2722	0	8.59	0	8.59
67	301.66	403.58	0.752	0.4045	95.5	0.0035	36.6667	10.9406	0	7.49	0	7.49
68	301.17	343.98	0.7595	0.3972	93.7	0.0035	37.3333	10.6222	0	6.39	0	6.39
69	300.61	284.08	0.7668	0.3903	92.1	0.0035	38	10.3161	0	5.27	0	5.27

Remarks

A

Pure Axial Nuo - dp = 150mm

Decompression

Balanced Point

Remarks
A

Pure Moment Muo - d = 236mm

**Errors and Warnings**

**Input**  
No errors or warnings were found.

**Output**  
No errors or warnings were found.

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