VR Access Solutions Ltd

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SCAFFOLDING ASSOCIATION

ISO 9001:2008 REGISTERED FIRM

Issue 3 February 2016

SECTION 1

VR Access Solutions Ltd

Contents

INTRODUCTION

This User guide has been prepared in accordance with the guidance as set out within BS EN12810-1:2003 clause 8, the NASC Code of Practice and where applicable additional information within associated European Standards. This User Guide is only applicable to VR Access Solutions Lattice beams and associated components, other applications such as temporary roofing scaffolds outside of the scope of this guide must be designed and calculated by a competent engineer in accordance with the requirements of BS EN12811, TG20:08 and BS5975:2003. For further technical information see the Technical Data and Support section at the rear of this guide.

It is recommended that all uses of the VR Access Solutions Lattice Beams should be initially based upon the technical information included in this guide but should also be independently verified and checked by a suitably qualified and experienced temporary works engineer in accordance with the requirements of BS EN 12811 or BS5973:2003 for its specific intended use.

Manufacturing and Distribution

VR Access Solutions Lattice Beams are manufactured under a quality management procedure in accordance with ISO 9001 Quality Management Systems and the system is documented and implemented in accordance with this. Inspections and testing of the products are carried out by qualified and well trained persons. Each product is checked at every production stage form incoming materials to final finishing and delivery as per the relevant inspection forms and specific customer needs. Inspection forms are laid down to meet the dimension requirements, which are determined on the basis of design drawings. The components and system configurations all undergo the necessary testing and calculation checks in accordance with the current codes of practice. All fixtures, testing equipment, measuring instruments and gauges are calibrated at planned intervals. Our branches work under a regime of constant monitoring of our components.

SAFETY ASPECTS

All scaffold erectors must wear a harness while erecting, dismantling and working on any scaffold over 4 metres lift height. They must follow site, local and national occupational health and safety regulations and the requirements of SG04:10 from the NASC in Britain.

Safety Information

1. Ensure that all scaffolds are erected on a foundation and is capable of resisting design loads.
2. Platform units shall be locked against unintentional lifting.
3. Do not overload the scaffold with bricks and other materials. Load materials as close to the Standard as possible.
4. All lattice beams should be installed to provide adequate restraint to the compression flange in accordance with the design criteria using loose tubes to EN39 and couplers to EN74 which are also available from VR Access Solutions.
5. Ensure that working and access areas are safeguarded by a side protection consisting of at least two guardrails and a toe board.
6. Side protection shall be secured against unintentional removal.
7. The side protection should not be provided by cladding on its own.
8. All installations should comply with the design drawings and should be checked and certified by the designer prior to use as being in accordance with the design intentions.
9. The platform surface shall be free from trip hazards.
10. Working areas shall be as level as practicable.
11. The gaps between platform units shall be as small as possible but not exceeding 25mm.
12. Lateral stability shall be provided by tie members to the adjacent building or structure. Any part of a building or structure used to support the scaffold shall be capable of supporting the maximum intended load to be applied.
13. Provide adequate bracing to give stiff vertical plane of scaffold.

14. Connections between separate parts shall be effective and easy to monitor. They shall be easy to assemble and secure against accidental disconnection.

15. Inspection of scaffold shall be carried out by competent person before use every time and a report issued/filed.

16. No ties should be removed without adequate supervision, and if necessary, the prior fixing of alternative ties or bracing should take place to ensure the continuing safety of the scaffold.

RULES OF USE

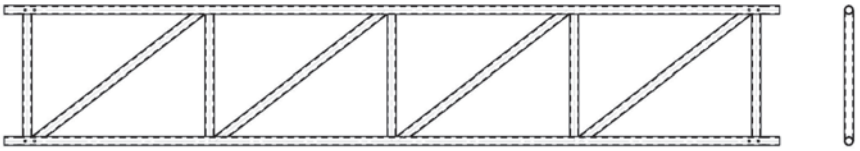
- Never remove ties or bracing.
- Never remove ladders
- Never remove components or adapt a certified scaffold.
- Never remove guardrails, toe boards or brick guards.
- Never create gaps in the working platform by removing scaffolding boards.
- Never work on or use scaffolds which are in the process of being erected or dismantled.
- Never undermine the scaffold by digging trenches or foundations under or adjacent to it.
- Never add sheeting or debris netting to a scaffold without the approval of the scaffolding designer.
- Never forklift loads directly onto an access scaffold or platform using lattice beams for support use a suitably designed loading tower.
- Never allow site vehicles to run over scaffolding materials, damaged scaffold boards cause accidents.
- Never allow site vehicles to run into a scaffold. Bent tubes could lead to collapse of the structure even the slightest misalignment will significantly reduce the scaffolds capacity.
- Never jump on to planks or platforms.

VR ACCESS SOLUTIONS LATTICE BEAM COMPONENTS

750mm Lattice Beams

The 750mm N2 Lattice Beams are constructed out of 48.3mm diameter by 4.0mm wall thickness in 6082-T6 aluminum tubes. Beam lengths are generally in 1m increments up to 7m and sections can be connected together using 38.1mm diameter x 4.0mm thick spigot connectors in pairs using 2 x M12 bolts.

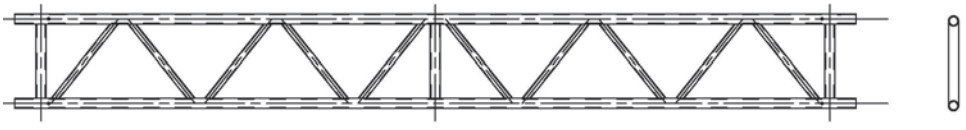
Code	Nominal Length (m)	Overall Length (m)	Weight (kg)
VRS24	1.0	1.15	5.8
VRS25	2.0	2.198	11.2
VRS26	3.0	3.173	15.0
VRS27	4.0	4.148	18.0
VRS28	5.0	5.123	21.0
VRS29	6.0	6.098	24.2
VRS30	7.0	7.073	27.5



450mm Lattice Beams

The 450mm Lattice Beams are constructed out of 48.3mm diameter by 4.0mm wall thickness top bottom and vertical tubes, in 6082-T6 aluminum. Diagonal members are oval sections of 22mm x 38.2mm minor and major axes with a 2.6mm wall thickness. Beam lengths are generally in 2m increments up to 8m with a 1m additional length and sections can be connected together using 38.1mm diameter x 4.0mm thick spigot connectors in pairs using 2 x M12 bolts

Code	Nominal Length (m)	Overall Length (m)	Weight (kg)
VRS31	1.1	1.1	4.2
VRS32	2.1	2.1	8.0
VRS33	3.1	3.1	11.8
VRS34	4.1	4.1	15.0
VRS35	5.1	5.1	18.7
VRS36	6.1	6.1	23.7
VRS37	8.1	8.1	44.5



Spigot Connectors

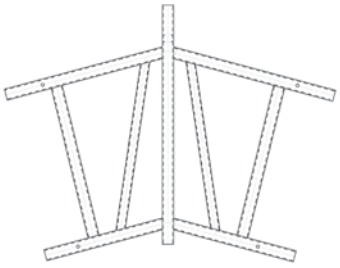
This item connects the differing lengths of trusses to enable non standard sizes to be built up for specific uses. They are connected into each end of the trusses and fixed using 2No. M12 bolts to each side of the joint and are always used in pairs to the top and bottom chords

Code	Weight (kg)
VRS38	1.15

750mm Beam Ridge Piece

To enable the formation of a duo-pitched roof form for temporary roof construction. They are always used in conjunction with two lattice beams and 4No. Splices.

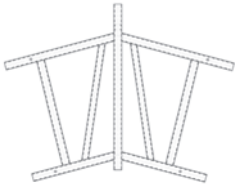
Code	Weight (kg)
VRS40	1.15



450mm Beam Ridge Piece

To enable the formation of a duo-pitched roof form for temporary roof construction. They are always used in conjunction with two lattice beams and 4No. Splices.

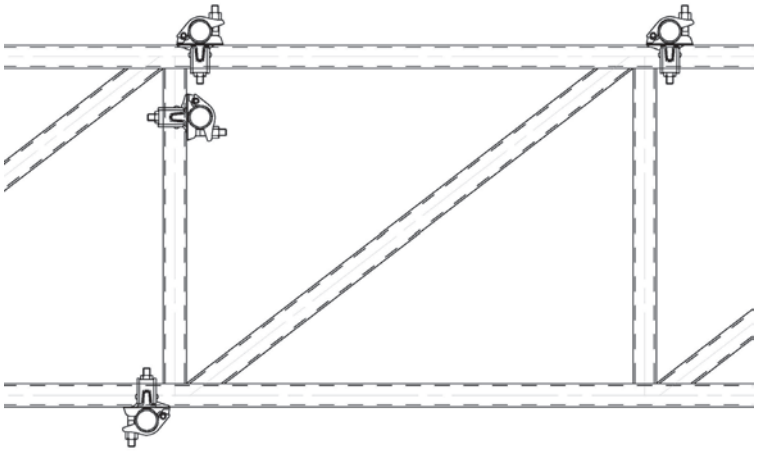
Code	Weight (kg)
VRS41	1.15



CONNECTION LOCATIONS

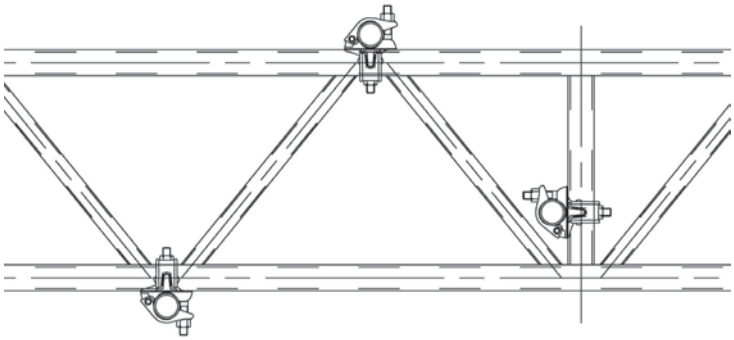
750mm Lattice Beams

The use of standard tube dimensions to the elements allows for the connection of couplers to the top, bottom or vertical members using EN74 couplers. All couplers should be located as close as possible to the nodes to minimize any secondary effects.



450mm Lattice Beams

The spacing of the pairs of diagonals between the vertical members is set out to allow for the location of couplers to the top and bottom chords apart from the interface of a diagonal to a vertical member. At these locations the connector should be placed to the vertical member only and as close to the top or bottom chord as possible.



BEAM BRACING

When a lattice beam spans an opening it will act as a beam by creating a tension force in one chord and a compression force in the opposite one. The beams work to their capacity if the compression chord is held in place along its full length. In typical scaffolding arrangements this continuous support is not normally present and so the compression chord will tend to buckle between the centers of lateral support, normally by transoms or brace ties perpendicular to the span, thereby reducing the capacity of the beam. The greater gap between these points of restraint the less capacity the lattice beam will be able to accommodate.

In simply supported beam arrangements where the beams span between two supports and the primary loading is downwards the compression force is the top chord. Should the wind loading be high at the site and the supported load low then it is possible that the out of service loadcase could reverse this condition and the bottom chord could go into compression. In the case of cantilever beams or continuous beams the bottom chord at internal supports will be in compression and depending on the span lengths this will swap over to the top chord along its length.

When using VR Access Soultions lattice beams it is therefore important to brace the compression chord perpendicularly (between adjacent beam chords) and diagonally (through plan bracing) as well as tying the beams tension chords with vertical diagonal braces and tension chord ties.

In some conditions where the compression force chord changes from the top to the bottom along its length there will be a need for chord braces and plan bracing to both chords. For more information regarding the bracing requirements for different beam configurations you should consult VR Access Solutions, a suitably qualified Engineer or the Scaffolding designer.

Note: Incorrectly installed beam bracing will reduce the load bearing capacity of the beams and hence the scaffold significantly and may lead to collapse at low loads.

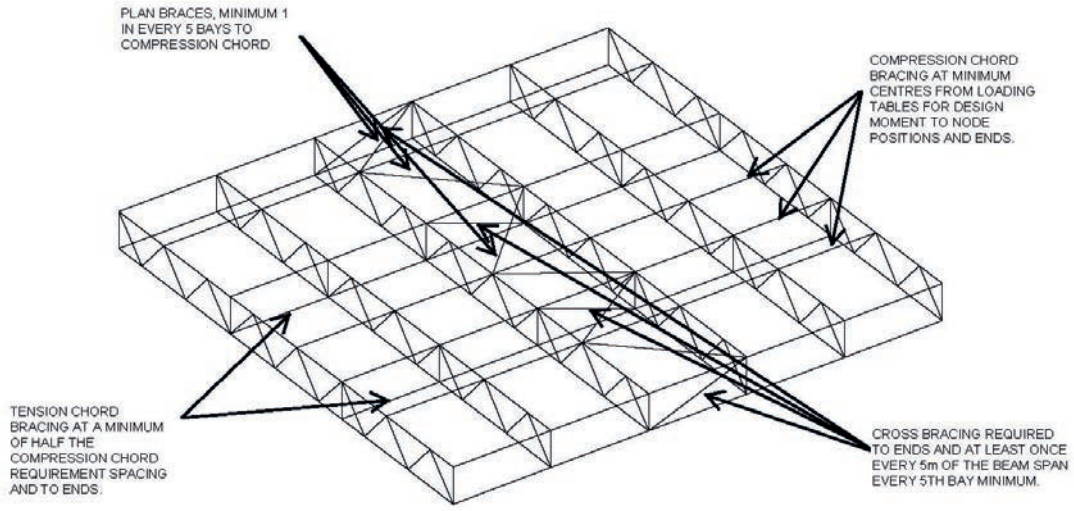
Compression chord bracing should be installed to the minimum centers as determined from the span load tables for the design case moment. Tension chord bracing should be installed at a minimum of twice the spacing of the compression chord and both braces should be installed at the bearings.

Plan bracing is required to the compression chord once every fifth bay for the beams full length and should then be continuous with a system of braced down to ground or a tie to the main building structure.

Cross bracing should be installed to the beam ends and a minimum of every 5m of the beams span all at a minimum of one bay in every 5.

Bracing Arrangement

The bracing arrangement indicated below is a typical arrangement for a simply supported span condition where the loadcase is vertically downwards.



All standards to the beams span should be fixed to both the top and bottom chords with check fitting in accordance with the design drawings.

All knee braces or tie back braces should also be fixed to both the top and bottom chords and will normally require a number of check fittings to each location.

All beam bearings should be made to both the top and bottom chords close to a node point and with the necessary check fittings to comply with the design.

SPIGOT CONNECTION

In order to provide for longer spans of the 450mm Lattice Beam the spigot connector can be used to connect together two lengths of beam. The spigot connector is secured by 2No. M12 Bolts to each of the two beams and this is repeated in both the top and bottom chord of the beam.

The permissible tension force in the spigot is high enough to enable the full design load in the beams chords to be safely transferred across the joint.

It is recommended that in a series of beams the spigot joint positions of adjacent beams are staggered. The spigot joints should also be located away from any points of vertical loading

INSTRUCTIONS FOR STORAGE, MAINTENANCE OR REPAIR

1.STORAGE

1. Prefabricated components shall be stored, if possible, under a suitable cover, protected from weather in a dry location. They shall be exposed to good ventilation. They shall be supported during storage so as to avoid permanent set.

2. At the work site, provide enough space to drive the forklift and other vehicles otherwise there are chances of damages to the components.

3. Tags should be used to differentiate good components from the damaged components.

4. All the components shall be stored in a marked storage place.

5. Do not stack any items on the road to avoid injury to passersby.

2.MAINTENANCE

1. Before allowing people or material on the scaffold structure ensure that it has been erected correctly and complies with the user's requirements.

2. Ensure that all people using the scaffold are aware of the purpose for which it is intended to be used and the maximum loading to which it can be subjected.

3. Ensure that users understand that any unauthorised modification to the scaffold or removal of components other than those which have been specifically designed for it will materially weaken the scaffold and create a safety hazard.

4. Carry out regular inspections to check that components have not been removed or damaged, or that components have not been removed and replaced incorrectly.

5. Alterations or extensions-(e.g. removal or repositioning of ties, removal of guardrails or handrails, the addition of boarded platform, sheeting, debris netting, etc) should only be carried out within the restrictions set out in this handbook or under the direction of a competent designer who is prepared to accept the onus of his modifications.

6. Provide barriers and warning notices to prevent access to incomplete sections of scaffolding.

7. Ensure that safe access and egress routes are provided to all working platforms, and that such route, including ladders or preferably stairways, are kept clear.

8. Do not overload platforms-use properly designed loading towers and ensure that crane and forklift drivers understand loading restrictions on each part of the scaffold structure.

9. Where necessary ensure that all areas below scaffolds in use are marked so that site personnel can avoid the area. If the area has to be accessed then the site personnel should be made aware of the potential risks or hazards.

10. Because of the increased use of mechanical lifting plant on site there is an increased possibility for scaffolding components to become found / caught. When using cranes or other mechanical lifting devices near any scaffold structure care should be taken to ensure that nothing catches under any part of the scaffold otherwise uplift could occur with potentially dangerous consequences.

3 REPAIRS

If any scaffold gets damaged, inform the scaffolding contractor or authorized person then repairs can be carried out. The repaired item is only to be used after the approval of said competent person.

4.TRANSPORT

During transportation it should be ensured that the prefabricated components are loaded properly and securely tightened to the vehicle to avoid dropping of components during travelling. Loading and unloading should be carried out under the supervision of a competent person to avoid damage to the components.

SPAN LOAD TABLES AND CAPACITIES.

All Section Capacities are based on unfactored safe working loads derived in accordance with BS EN 12811-1:2003 BS EN1999:2007+A2:2013 and BS EN 1993-1-1:2005.

The safe span tables and section capacities contained within the User Guide are based upon live loading from the intended use only. Additional loading may accrue on the working platforms or components as a consequence of atmospheric precipitations such as ice, snow, sand or dust. The working processes may also cause debris such as sand, grit or demolition debris to accumulate on the working platform of components which will increase the live loading above that allowed for within the live loading. Where this is seen to occur or is known will occur, further guidance should be sought from VR Access Solutions Ltd which may result in a downgrading of the Load Class for the scaffold.

Most scaffolds will impose forces upon an adjacent structure they are fixed to through their ties. An assessment should be initially made regarding the ability of the structure to sustain the loads either globally, due to its own instability, or locally as a result of defective finishes. Loadings from the ties into the supporting structure are dependent upon the live loading to the working platforms, the height of the scaffold and in the majority of cases the wind loading imposed upon the scaffold and its cladding status. For guidance with regards to the design of ties into building facades we would refer you to Section 5 of TG20:08 or to VR Access Solutions.

RESCUE PLAN

Erectors need to be mindful of the risks and plan to work as safely as possible. In accordance with the Fall From Heights Regulations 2005 (as amended), every attempt should be made to "mitigate the risk involved by prevention of falls by using work equipment or other measures to prevent fall. Where they cannot avoid working at height and where they cannot eliminate the risk of a fall, use work equipment or other measures to minimize the distance and consequences of a fall should one occur".

VR Access Solutions recommend the use of collective measures such as Advanced Guardrail systems, Hop-Ups and Steps where structural parts and handrails can be installed from a place of safety during the erection process. Alternatively the use of fall protection equipment to restrain and limit any falls. Harnesses should be worn and used at all stages of erection of scaffolds using VR Access Solutions Lattice Beams.

The "Work at Height Regulations 2005" specifically requires every employer to take account of the need for an easy and timely evacuation in the event of an emergency where scaffolders or operatives suffer disability or falls when suspended in a harness.

A site specific Risk Assessment and Method Statement is essential in determining the plan required for the recovery of a disabled or incapacitated person. VR Access Solutions recommend that contractors and employers develop their own rescue plan in accordance with the recommendations of the NASC in their documents SG4:10 and Guide to Formulating a Rescue Plan SG19:06.

All erectors should be trained in the use of special rescue equipment and ensure all equipment for rescue is available and is fit for use at all times.

NB: Legislation is constantly being updated and users are responsible to ensure that the latest and most appropriate is used at the time.

TECHNICAL SERVICES

This User guide incorporates the basic information on the capacities and safe use of the VR Access Solutions Lattice Beams for typical use situations only. For specialist arrangements and locations of use it is recommended that you contact VR Access Solutions in the first instance, or our Consulting Structural Engineers, S-Mech Ltd, for more specialist advice or a competent temporary works engineer.

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Telephone: 01257 367 580

Email: info@s-mech.co.uk

SECTION 2

VR Access Solutions Ltd

Structural Calculations:

450 Deep Aluminium Lattice Beams

Client: VR Access Solutions

Reference: #1440-C1a

Date: May 2015

S-MECH LTD
Suite 9 – Railway House – Railway Road - Chorley – PR6 0LY • 01257 367 580• info@s-mech.co.uk •

Contents

Tables

Appendices

Revision	Date	Details
a	Feb 2016	Details of testing added.

1. Introduction

This calculation package has been produced to derive the maximum safe working loads that can be applied to the aluminium lattice beams for certain prescribed loading patterns.

Calculations are in accordance with the requirements of BS EN 12811-1:2003 with material design in accordance with the requirements of BS EN 1999-1-1:2007+A2:2013.

For the purposes of analysis deflection is limited to span/100. This is not found to be critical in any analysis case.

Load conditions considered are UDL, central point load, two point loads at third points and three point loads at quarter points. In order to ensure the load is applied at node points the exact locations of the loads are adjusted to suit the geometry of the beams.

A brief test program has been undertaken to validate the results derived by calculation and details of this are summarised in this document.

2. Section Capacities

Calculations relating to the derivation of the member capacities with regard to axial force, bending and shear are given in Appendix A. The information is summarized as follows:

Section	Material	Location	Axial (kN)	M_c (kN.m)	V_c (kN)
48.3 4.0 ACHS	6082 T6	Top and bottom chords, vertical internals	L = 0.4m: 42.2 L = 1.0m: 41.3 L = 1.5m: 26.2 L = 2.0m: 16.3	0.56	14.6
33 22 2.6 Ellipse	6082 T6	Diagonal internals	L = 0.53m: 12.8		

Table 2-1 Section Capacities (permissible)

3. Beam Resistance – Moment and Shear

Moment Resistance

Tabulated moment resistance is based on the axial compression resistance of the chord taking into account the relevant restraint conditions. The lever arm between centres of chords is 0.4m thus:

$$M = N \times 0.4m$$

Restraint	Moment Capacity
1.0m c/c	16.5 kN.m
1.5m c/c	10.5 kN.m
2.0m c/c	6.5 kN.m

Table 3-1 Beam Moment Capacity (permissible)

Shear Resistance

Shear resistance is based on the shear capacity of a single chord. This accommodates the case where the beam is supported using a clamp directly adjacent to the node point on the bottom chord, and the top chord is restrained laterally only.

Therefore14.6 kN is the shear limit of the beam (permissible)

4. Safe Working Loads

The following summary sheets show the safe working loads for the conditions discussed previously. Loads are iterated until the critical member reaches its capacity, typically the chords on the longer beams and the strut on the shorter beams. Deflection at L/100 was not found to be critical in any case.

S-Mech Ltd.	Project#:	1440
Consulting Engineering	Element:	Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length 2000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

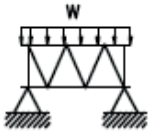
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	16.5	10.5	6.5
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working Loads

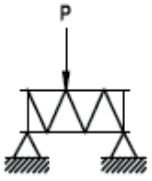
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	11.6	-	11.6
Central Point Load (kN)	15.4	-	15.4
Two Point Loads at Third Points (each)	-	-	-
Three PL at Quarter Points (kN, each)	-	-	-

4.0 Load Position Diagrams

UDL



CPL



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads.

2) Loads should be applied at node points only

3) Capacities are calculated based on simple supports at each end

4) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440
Consulting Engineering	Element:	Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length 4000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	16.5	10.5	6.5
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	6.0	5.6	3.4
Central Point Load (kN)	17.0	10.8	6.6
Two Point Loads at Third Points (each)	9.1	9.2	8.2
Three PL at Quarter Points (kN, each)	6.1	5.9	3.6

4.0 Load Position Diagrams

UDL CPL 2PL 3PL

5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads.

2) Loads should be applied at node points only

3) Capacities are calculated based on simple supports at each end

4) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440
Consulting Engineering	Element:	Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length 6000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	16.5	10.5	6.5
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	3.3	2.5	1.5
Central Point Load (kN)	12.9	8.1	5.0
Two Point Loads at Third Points (each)	8.5	5.3	3.3
Three PL at Quarter Points (kN, each)	6.0	4.6	2.8

4.0 Load Position Diagrams

UDL CPL 2PL 3PL

5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads.

2) Loads should be applied at node points only

3) Capacities are calculated based on simple supports at each end

4) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440
Consulting Engineering	Element:	Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length 8000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	16.5	10.5	6.5
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	2.2	1.4	0.8
Central Point Load (kN)	9.3	5.8	3.6
Two Point Loads at Third Points (each)	8.4	5.2	3.2
Three PL at Quarter Points (kN, each)	4.4	2.7	1.7

4.0 Load Position Diagrams

UDL CPL 2PL 3PL

5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads.

2) Loads should be applied at node points only

3) Capacities are calculated based on simple supports at each end

4) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440
Consulting Engineering	Element:	Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length 10000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

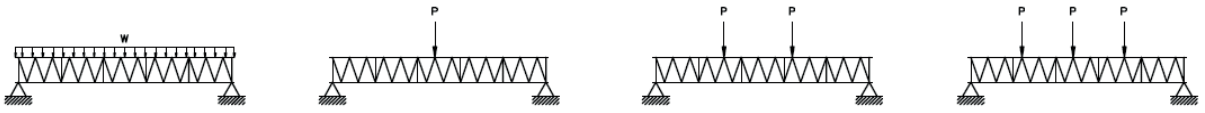
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	16.5	10.5	6.5
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	1.3	0.8	0.5
Central Point Load (kN)	7.1	4.4	2.7
Two Point Loads at Third Points (each)	4.8	3.0	1.8
Three PL at Quarter Points (kN, each)	3.3	2.1	1.2

4.0 Load Position Diagrams

UDL CPL 2PL 3PL



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads.

2) Loads should be applied at node points only

3) Capacities are calculated based on simple supports at each end

4) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#: 1440
Consulting Engineering	Element: Lattice Beams
Suite 9, Railway House,	Material: As noted below
Railway Road, Chorley, PR6 0HW	Codes: As noted below

1.0 Beam Data

Length 12000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

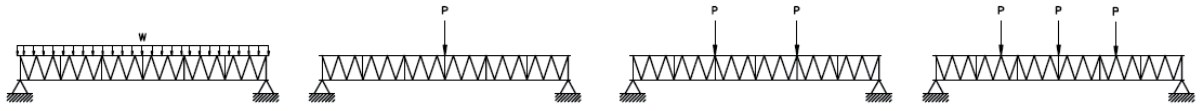
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	16.5	10.5	6.5
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	0.9	0.5	0.3
Central Point Load (kN)	5.4	3.4	2.0
Two Point Loads at Third Points (each)	4.1	2.5	1.5
Three PL at Quarter Points (kN, each)	2.6	1.6	0.9

4.0 Load Position Diagrams

UDL CPL 2PL 3PL



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads.

2) Loads should be applied at node points only

3) Capacities are calculated based on simple supports at each end

4) Beams should be supported at node points and not at ends of cantilever tube sections

5. Validation by Testing

A test program specified by S-Mech was completed in the 4m and 6m span beams to allow a comparison to be made against the capacities derived by calculation. UDL and central point load cases were tested when the top chord was restrained at 2m centres. In the central point load case the beams were loaded through to failure to give an indication of the residual capacity when the material moves from the elastic range.

The results are detailed in Tesmec Report TES000109 and are summarised below.

Beam Length	Centre Point Load (two parallel beams loaded equally)				UDL (two parallel beams at 1m c/c loaded equally)			
	Load by Calculation and Test Load		Deflections		Load by Calculation and Test Load		Deflections	
	SLS	ULS	SLS Calc	SLS Test	SLS	ULS	SLS Calc	SLS Test
4m	13.2 kN	21.8 kN	4.0 mm	**4.75 mm**	6.8 kN/m²	11.2 kN/m²	4.3 mm	**5.61 mm**
6m	10.0 kN	16.5 kN	8.0 mm	**9.51 mm**	3.0 kN/m²	5.0 kN/m²	8.4 mm	**11.56 mm**

Table 5-1 Summary of Testing

When the central point load was increased to failure the 4m beam failed at 51.3 kN, the 6m failed at 38.2 kN. These represent safety factors of 3.9 and 3.8 respectively from permissible to collapse loading.

Deflections recorded under test loads are considered sufficiently close to the theoretical displacements to validate the calculations as accurate.

It is therefore considered that the analysis is validated to BS EN 1999-1-1:2007+A2:2013.

Appendix A Section Capacities

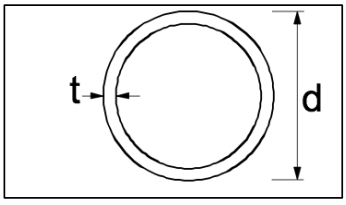
S-Mech Ltd. **Consulting Engineering** Suite 9, Railway House, Railway Road, Chorley, PR6 0HW		Project#: 1440 Section: ACHS Material: 6082 T6 Aluminium Code: BS EN 1999-1

1.0 Global Partial Factors

Cross Section Partial Factor (γ_{M0})	1	
Material Partial Factor (γ_{m1}) =	1.1	
Material Partial Factor (γ_{m2}) =	1.25	
Load Partial Factor (γ_f) =	1.5	
$\rho_{o,haz}$ =	0.5	From Table 3.2b
$\rho_{u,haz}$ =	0.64	From Table 3.2b

2.0 Section Properties

Section : 48.3 4.0 CHS



Outside Dia.	48.3	mm
Inside Dia.	40.3	mm
Thickness	4	mm
f_o	250	N/mm^2
f_u	290	N/mm^2
Area	556.7	mm^2
Tube I_{yy}	137675.8	mm^4
R_{yy}	15.73	mm
R_{zz}	15.73	mm
Z_{yy}	5701	mm^3
S_{xx}	7871	mm^3
Weight	0.043	kN/m

3.0 Section Classification

Modification Factor ε = $\sqrt{(250/f_o)}$

ε = 1

Buckling Parameter β = $\sqrt[3]{(D/t)}$

β = 2.23

β_1/ε =	9	For 6082 T6 Class A Material,
β_2/ε =	13	Internal parts
β_3/ε =	18	

Therefore:

β_1 =	9
β_2 =	13
β_3 =	18

Section Classification =	Class 1

As a beam

S-Mech Ltd. **Consulting Engineering** Suite 9, Railway House, Railway Road, Chorley, PR6 0HW		Project#: 1440 Section: ACHS Material: 6082 T6 Aluminium Code: BS EN 1999-1

4.0 Axial Capacity

Axial Capacity Ignoring Buckling

Max Capacity $N_{U,Rd}$ = $\dfrac{A_{net}\, f_u}{\gamma_{M2}}$

Max Capacity $N_{o,Rd}$ = $\dfrac{A_{eff}\, f_o}{\gamma_{M2}}$

$N_{U,Rd}$ = 82.66 kN

$N_{c,Rd}$ = 63.26 kN

Min Capacity $N_{,Rd}$ = 63.26 kN

Permissible Axial Force =	42.17	kN	(Ignoring Buckling)

Buckling Capacity

Buckling Capacity ($N_{b,Rd)}$ = $\dfrac{\kappa\chi\, A_{eff}\, f_o}{\gamma_{M1}}$

Flexural Buckling Reduction Factor (χ) = $\dfrac{1}{\omega + \sqrt{(\omega^2 - \lambda^2)}}$ To be verified in table as <1

(NB. $\chi \leq 1$)

φ = $0.5\,[1 + \alpha\,(\underline{\lambda}\text{-}\underline{\lambda_0}) + \underline{\lambda}^2]$

$\underline{\lambda}$ = $(1\, L_{cr} / \pi\, i) * (A_{eff}\, f_o / A\, E)^{0.5}$

Relevant Radius of Gyration i = 15.73 mm

$\kappa = \omega_x$ = 0.653 To be Verified as <1

α = 0.2

$\underline{\lambda_0}$ = 0.1

Modulus of Elasticity E= 70000 Mpa (For 6082 T6)

Axial Buckling Capacities

Effective Length (mm)	**400**	**1000**	**1500**	**2000**	**1000**	**1000**	**1000**
$\underline{\lambda}$	0.342	0.855	1.283	1.711	0.855	0.855	0.855
φ	0.583	0.941	1.441	2.124	0.941	0.941	0.941
χ	0.948	0.749	0.477	0.296	0.749	0.749	0.749
$N_{b,Rd}$ (kN)	78.39	61.94	39.40	24.43	61.94	61.94	61.94
Permissible Force (KN) (1)	52.26	41.30	26.26	16.29	41.30	41.30	41.30
Permissible Force (kN) (2)	**42.17**	**41.30**	**26.26**	**16.29**	**41.30**	**41.30**	**41.30**

If (2)<(1) Local Squashing Controls

5.0 Tensile Capacity

Tensile Design Plastic Resistance $N_{o,Rd}$ = $\frac{A_g f_o}{\gamma_{M1}}$

Tensile Design Plastic Resistance $N_{u,Rd}$ = $\frac{A_{eff} f_u}{\gamma_{M2}}$

$N_{o,Rd}$ = 63.26 kN

$N_{u,Rd}$ = 82.66 kN

Tensile Design Plastic Resistance $N_{pl,Rd}$ = 63.26 kN

Permissible Tensile Force = 42.17 kN

6.0 Section Bending Capacity

Section is not susceptible to lateral torsional buckling therefore:

Section Bending Resistance ($M_{u,Rd}$) = $\frac{W_{net} f_u}{\gamma_{M2}}$

Section Bending Resistance ($M_{c,Rd}$) = $\frac{\alpha W_{el} f_o}{\gamma_{M1}}$

α = W_{pl}/W_{el}

α = 1.38072

$M_{u,Rd}$ = 0.85 kN.m

$M_{c,Rd}$ = 0.89 kN.m

Section Bending Resistance ($M_{c,Rd}$) = 0.85 kN.m

Permissible Moment = 0.564 kN.m Class 1

7.0 Section Shear Capacity

Section Shear Resistance ($V_{pl,Rd}$) = $\dfrac{A_v f_o}{\sqrt{3}\,\gamma_{M1}}$

For CHS Section Shear Area (A_v) = $\eta\, A_e$

η = 0.6

Section Shear Resistance ($V_{pl,Rd}$) = 21.91 kN

Permissible Shear Resistance =	14.61	kN

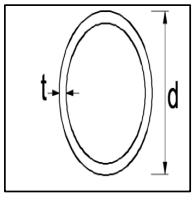
S-Mech Ltd. **Consulting Engineering** Suite 9, Railway House, Railway Road, Chorley, PR6 0HW		Project#: 1440 Section: ACHS Material: 6082 T6 Aluminium Code: BS EN 1999-1

1.0 Global Partial Factors

Cross Section Partial Factor (γ_{M0})	1	
Material Partial Factor (γ_{m1}) =	1.1	
Material Partial Factor (γ_{m2}) =	1.25	
Load Partial Factor (γ_f) =	1.5	
$\rho_{o,haz}$ =	0.5	From Table 3.2b
$\rho_{u,haz}$ =	0.64	From Table 3.2b

2.0 Section Properties

Section : 32.8 22.6 2.6 Ellipse



Outside Dia. 1	32.8	mm	
Inside Dia. 1	27.6	mm	
Outside Dia. 2	22		
Inside Dia. 2	16.8		
Thickness	2.6	mm	
f_o	250	N/mm^2	
f_u	290	N/mm^2	
Area	202.6	mm^2	
Tube I_{yy}	20769.5	mm^4	
Tube I_{zz}	10720.0		
R_{yy}	10.13	mm	
R_{zz}	7.27	mm	
Z_{yy}	1266	mm^3	
S_{yy}	1520	mm^3	Allow 1.2 Z
Weight	0.016	kN/m	

3.0 Section Classification

Modification Factor ε = $\sqrt{(250/f_o)}$

ε = 1

Buckling Parameter β = $\sqrt[3]{(D/t)}$

β = 2.26

β_1/ε =	9	For 6082 T6 Class A Material,
β_2/ε =	13	Internal parts
β_3/ε =	18	

Therefore:

β_1 =	9
β_2 =	13
β_3 =	18

Section Classification =	Class 1	As a beam

S-Mech Ltd.
Consulting Engineering
Suite 9, Railway House,
Railway Road, Chorley, PR6 0HW

Project#: 1440
Section: ACHS
Material: 6082 T6 Aluminium
Code: BS EN 1999-1

4.0 Axial Capacity

Axial Capacity Ignoring Buckling

Max Capacity $N_{U,Rd}$ = $\dfrac{A_{net}\, f_u}{\gamma_{M2}}$

Max Capacity $N_{o,Rd}$ = $\dfrac{A_{eff}\, f_o}{\gamma_{M2}}$

$N_{U,Rd}$ = 30.08 kN
$N_{c,Rd}$ = 23.02 kN

Min Capacity $N_{,Rd}$ = 23.02 kN

Permissible Axial Force =	15.35	kN	(Ignoring Buckling)

Buckling Capacity

Buckling Capacity ($N_{b,Rd)}$ = $\dfrac{\kappa\chi\, A_{eff}\, f_o}{\gamma_{M1}}$

Flexural Buckling Reduction Factor (χ) = $\dfrac{1}{\omega + \sqrt{(\omega^2 - \lambda^2)}}$ To be verified in table as <1
(NB. $\chi \leq 1$)

φ = $0.5\,[1 + \alpha\,(\underline{\lambda}-\underline{\lambda_0}) + \underline{\lambda}^2]$

$\underline{\lambda}$ = $(1\, L_{cr} / \pi\, i) * (A_{eff}\, f_o / A\, E)^{0.5}$

Relevant Radius of Gyration i = 7.27 mm

$\kappa = \omega_x$ = 0.653 To be Verified as <1

α = 0.2
$\underline{\lambda_0}$ = 0.1

Modulus of Elasticity E= 70000 Mpa (For 6082 T6)

Axial Buckling Capacities

Effective Length (mm)	**553**	**553**	**0**	**0**	**0**	**0**	**0**
$\underline{\lambda}$	1.023	1.023	0.000	0.000	0.000	0.000	0.000
φ	1.115	1.115	0.490	0.490	0.490	0.490	0.490
χ	0.641	0.641	1.020	1.020	1.020	1.020	1.020
$N_{b,Rd}$ (kN)	19.28	19.28	30.69	30.69	30.69	30.69	30.69
Permissible Force (KN) (1)	12.86	12.86	20.46	20.46	20.46	20.46	20.46
Permissible Force (kN) (2)	**12.86**	**12.86**	**15.35**	**15.35**	**15.35**	**15.35**	**15.35**

If (2)<(1) Local Squashing Controls

5.0 Tensile Capacity

Tensile Design Plastic Resistance $N_{o,Rd}$ = $\frac{A_g f_o}{\gamma_{M1}}$

Tensile Design Plastic Resistance $N_{u,Rd}$ = $\frac{A_{eff} f_u}{\gamma_{M2}}$

$N_{o,Rd}$ = 23.02 kN

$N_{u,Rd}$ = 30.08 kN

Tensile Design Plastic Resistance $N_{pl,Rd}$ = 23.02 kN

Permissible Tensile Force = 15.35 kN

6.0 Section Bending Capacity

Section is not susceptible to lateral torsional buckling therefore:

Section Bending Resistance ($M_{u,Rd}$) = $\frac{W_{net} f_u}{\gamma_{M2}}$

Section Bending Resistance ($M_{c,Rd}$) = $\frac{\alpha W_{el} f_o}{\gamma_{M1}}$

α = W_{pl}/W_{el}

α = 1.2

$M_{u,Rd}$ = 0.19 kN.m

$M_{c,Rd}$ = 0.17 kN.m

Section Bending Resistance ($M_{c,Rd}$) = 0.17 kN.m

Permissible Moment = 0.115 kN.m Class 1

7.0 Section Shear Capacity

Section Shear Resistance ($V_{pl,Rd}$) = $\dfrac{A_v f_o}{\sqrt{3}\,\gamma_{M1}}$

For CHS Section Shear Area (A_v) = ηA_e

η = 0.6

Section Shear Resistance ($V_{pl,Rd}$) = 7.97 kN

Permissible Shear Resistance = 5.32 kN

Appendix B Analysis Outputs

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12385

Job Ref : 1440
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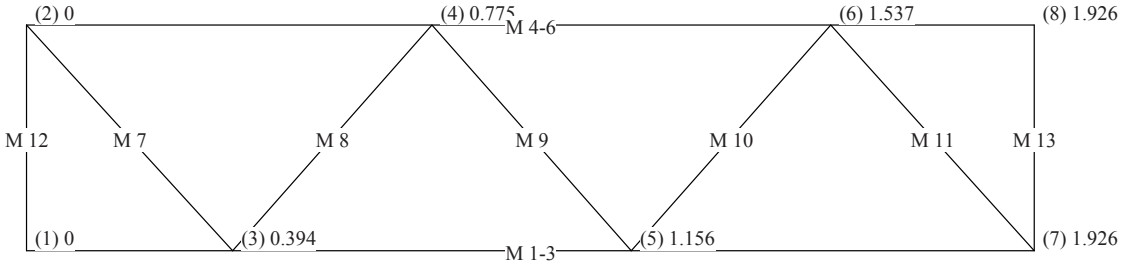
Checked : IH
Approved :



Frame Geometry - (Full Frame) - Front View

Not to Scale

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12385
Suite 9
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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group B1	Dead Load
Load Group B2	Dead Load

Load Case 001 : 1.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

Load Case 002 : 1.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L2

Load Case 003 : 2.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B1

Load Case 004 : 2.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B2

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.000	0.400	0.000
3	0.394	0.000	0.000	4	0.775	0.400	0.000
5	1.156	0.000	0.000	6	1.537	0.400	0.000
7	1.926	0.000	0.000	8	1.926	0.400	0.000

Member Properties

Members 1-6 and 12-13
```
M  ...  ...          48.3 CHS 4.0 []    E 70E6    G 40E6
 A 5.56E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

Members 7-11
```
M  ...  ...          32.8 22 2.6 []    E 70E6    G 40E6
 A 2.02E-4           Ix 2.077E-8         Iy 1.013E-8         J 4.154E-8
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 4-6
```
L1 UDLY -011.600             ( kN/m )
L2 PY   -015.400 0.775       ( kN,m )
B1 UDLY -011.600             ( kN/m )
B2 PY   -015.400 0.775       ( kN,m )
```

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Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 0 0 0 (Pinned)
NODE 7
UT Rs 0 1 0 0 0 0

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Nodal Deflections Serviceability (001 : 1.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	0.35	-0.12	0.37
3	0.00	-0.99	0.99	4	0.22	-1.69	1.71
5	0.25	-1.50	1.52	6	0.01	-1.09	1.09
7	0.43	0.00	0.43	8	0.01	-0.02	0.02

Nodal Deflections Serviceability (002 : 1.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	0.45	-0.09	0.46
3	0.00	-1.26	1.26	4	0.27	-2.20	2.22
5	0.35	-1.66	1.70	6	0.03	-0.90	0.90
7	0.47	0.00	0.47	8	0.03	0.00	0.03

Nodal Deflections Serviceability (003 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	0.35	-0.12	0.37
3	0.00	-0.99	0.99	4	0.22	-1.69	1.71
5	0.25	-1.50	1.52	6	0.01	-1.09	1.09
7	0.43	0.00	0.43	8	0.01	-0.02	0.02

Nodal Deflections Serviceability (004 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	0.45	-0.09	0.46
3	0.00	-1.26	1.26	4	0.27	-2.20	2.22
5	0.35	-1.66	1.70	6	0.03	-0.90	0.90
7	0.47	0.00	0.47	8	0.03	0.00	0.03

Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-12.974	23.3	0.762	T
3	5	7	-8.695	15.6	0.770	T	4	2	4	6.601	11.9	0.775	C
5	4	6	10.841	19.5	0.762	C	6	6	8	0.000	0.0	0.389	C
7	2	3	-9.407	46.6	0.561	T	8	3	4	9.239	45.7	0.552	C
9	4	5	3.092	15.3	0.552	C	10	5	6	-3.112	15.4	0.552	T
11	6	7	12.472	61.7	0.558	C	12	1	2	11.207	20.2	0.400	C
13	7	8	2.262	4.1	0.400	C							

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Checked : IH
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Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2	Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2	Force (kN)	Stress (N/mm)	Length (m)	CT
1	1 3	0.000	0.0	0.394	T	2	3 5	-17.871	32.1	0.762	T
3	5 7	-6.052	10.9	0.770	T	4	2 4	9.091	16.4	0.775	C
5	4 6	11.968	21.5	0.762	C	6	6 8	0.000	0.0	0.389	C
7	2 3	-12.955	64.1	0.561	T	8	3 4	12.730	63.0	0.552	C
9	4 5	8.558	42.4	0.552	C	10	5 6	-8.578	42.5	0.552	T
11	6 7	8.681	43.0	0.558	C	12	1 2	9.240	16.6	0.400	C
13	7 8	0.006	0.0	0.400	C						

Member Forces (003 : 2.0 UDL)

Member	Nodes End 1-2	Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2	Force (kN)	Stress (N/mm)	Length (m)	CT
1	1 3	0.000	0.0	0.394	T	2	3 5	-12.974	23.3	0.762	T
3	5 7	-8.695	15.6	0.770	T	4	2 4	6.601	11.9	0.775	C
5	4 6	10.841	19.5	0.762	C	6	6 8	0.000	0.0	0.389	C
7	2 3	-9.407	46.6	0.561	T	8	3 4	9.239	45.7	0.552	C
9	4 5	3.092	15.3	0.552	C	10	5 6	-3.112	15.4	0.552	T
11	6 7	12.472	61.7	0.558	C	12	1 2	11.207	20.2	0.400	C
13	7 8	2.262	4.1	0.400	C						

Member Forces (004 : 2.0 CPL)

Member	Nodes End 1-2	Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2	Force (kN)	Stress (N/mm)	Length (m)	CT
1	1 3	0.000	0.0	0.394	T	2	3 5	-17.871	32.1	0.762	T
3	5 7	-6.052	10.9	0.770	T	4	2 4	9.091	16.4	0.775	C
5	4 6	11.968	21.5	0.762	C	6	6 8	0.000	0.0	0.389	C
7	2 3	-12.955	64.1	0.561	T	8	3 4	12.730	63.0	0.552	C
9	4 5	8.558	42.4	0.552	C	10	5 6	-8.578	42.5	0.552	T
11	6 7	8.681	43.0	0.558	C	12	1 2	9.240	16.6	0.400	C
13	7 8	0.006	0.0	0.400	C						

Support Reactions Serviceability (001 : 1.0 UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	11.213	7	0.000	11.213
Total	0.000	22.427			

Support Reactions Serviceability (002 : 1.0 CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.246	7	0.000	6.239
Total	0.000	15.485			

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Support Reactions Serviceability (003 : 2.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	11.213	7	0.000	11.213
Total	0.000	22.427			

Support Reactions Serviceability (004 : 2.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.246	7	0.000	6.239
Total	0.000	15.485			

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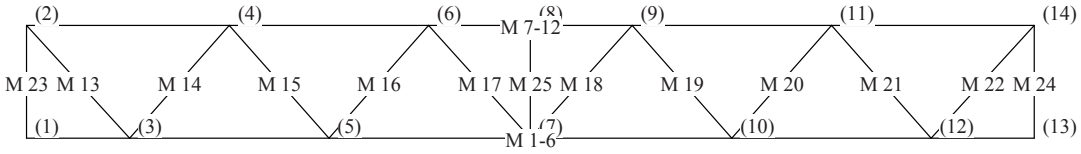

Frame Geometry - (Full Frame) - Front View

Not to Scale

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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group A1	Dead Load
Load Group A2	Dead Load
Load Group A3	Dead Load
Load Group A4	Dead Load
Load Group B1	Dead Load
Load Group B2	Dead Load
Load Group B3	Dead Load
Load Group B4	Dead Load

Load Case 001 : 1.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

Load Case 002 : 1.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L2

Load Case 003 : 1.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L3

Load Case 004 : 1.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L4

Load Case 005 : 1.5 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A1

Load Case 006 : 1.5 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A2

Load Case 007 : 1.5 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A3

Load Case 008 : 1.5 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A4

Load Case 009 : 2.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B1

Load Case 010 : 2.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B2

Load Case 011 : 2.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B3

Load Case 012 : 2.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B4

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The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.000	0.400	0.000
3	0.394	0.000	0.000	4	0.775	0.400	0.000
5	1.156	0.000	0.000	6	1.537	0.400	0.000
7	1.926	0.000	0.000	8	1.926	0.400	0.000
9	2.315	0.400	0.000	10	2.696	0.000	0.000
11	3.077	0.400	0.000	12	3.458	0.000	0.000
13	3.852	0.000	0.000	14	3.852	0.400	0.000

Member Properties

Members 1-12 and 23-25

```
M  ...  ...          48.3 CHS 4.0 []    E 70E6    G 40E6
 A 5.56E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

Members 13-22

```
M  ...  ...          32.8 22 2.6 []    E 70E6    G 40E6
 A 2.02E-4           Ix 2.077E-8         Iy 1.013E-8         J 4.154E-8
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 7-12

```
   L1 UDLY -006.000             ( kN/m )
   L2 PY   -017.000 1.926       ( kN,m )
   L3 PY   -009.100 0.775       ( kN,m )
   L3 PY   -009.100 3.077       ( kN,m )
   L4 PY   -006.100 0.775       ( kN,m )
   L4 PY   -006.100 1.926       ( kN,m )
   L4 PY   -006.100 3.077       ( kN,m )
   A1 UDLY -005.600             ( kN/m )
   A2 PY   -010.800 1.926       ( kN,m )
   A3 PY   -009.200 0.775       ( kN,m )
   A3 PY   -009.200 3.077       ( kN,m )
   A4 PY   -005.900 0.775       ( kN,m )
   A4 PY   -005.900 1.926       ( kN,m )
   A4 PY   -005.900 3.077       ( kN,m )
   B1 UDLY -003.400             ( kN/m )
   B2 PY   -006.600 1.926       ( kN,m )
   B3 PY   -008.200 0.775       ( kN,m )
   B3 PY   -008.200 3.077       ( kN,m )
   B4 PY   -003.600 0.775       ( kN,m )
   B4 PY   -003.600 1.926       ( kN,m )
   B4 PY   -003.600 3.077       ( kN,m )
```

Nodal Loading and Support Conditions

NODE 11

```
      L4 Ls +0000.000 -0000.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
      UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 13

```
      UT Rs 0 1 0 0 0 0
```

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Nodal Deflections Serviceability (001 : 1.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.79	-0.12	1.79
3	0.00	-2.61	2.61	4	1.60	-4.82	5.08
5	0.35	-6.36	6.37	6	1.16	-7.48	7.57
7	0.88	-7.84	7.89	8	0.88	-7.87	7.92
9	0.60	-7.48	7.51	10	1.42	-6.36	6.52
11	0.16	-4.82	4.83	12	1.77	-2.61	3.15
13	1.77	0.00	1.77	14	-0.02	-0.12	0.12

Nodal Deflections Serviceability (002 : 1.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.04	-0.09	2.04
3	0.00	-2.77	2.77	4	1.87	-5.18	5.51
5	0.32	-7.29	7.30	6	1.39	-8.94	9.04
7	0.97	-9.99	10.04	8	0.97	-10.16	10.21
9	0.56	-8.94	8.95	10	1.62	-7.29	7.47
11	0.08	-5.18	5.18	12	1.95	-2.77	3.38
13	1.95	0.00	1.95	14	-0.09	-0.09	0.12

Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.41	-0.09	1.41
3	0.00	-2.20	2.20	4	1.23	-4.05	4.23
5	0.35	-4.89	4.90	6	0.88	-5.39	5.46
7	0.70	-5.57	5.61	8	0.70	-5.57	5.61
9	0.52	-5.39	5.42	10	1.05	-4.89	5.00
11	0.17	-4.05	4.05	12	1.40	-2.20	2.60
13	1.40	0.00	1.40	14	-0.01	-0.09	0.09

Nodal Deflections Serviceability (004 : 1.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.67	-0.09	1.68
3	0.00	-2.46	2.46	4	1.49	-4.57	4.81
5	0.35	-5.89	5.90	6	1.09	-6.82	6.91
7	0.82	-7.31	7.36	8	0.82	-7.38	7.42
9	0.55	-6.82	6.84	10	1.29	-5.89	6.03
11	0.14	-4.57	4.57	12	1.64	-2.46	2.96
13	1.64	0.00	1.64	14	-0.04	-0.09	0.10

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Nodal Deflections Serviceability (005 : 1.5 UDL)							
Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.67	-0.11	1.67
3	0.00	-2.43	2.43	4	1.50	-4.50	4.75
5	0.33	-5.94	5.95	6	1.09	-6.99	7.07
7	0.83	-7.33	7.37	8	0.83	-7.35	7.39
9	0.56	-6.99	7.01	10	1.32	-5.94	6.09
11	0.15	-4.50	4.51	12	1.65	-2.43	2.94
13	1.65	0.00	1.65	14	-0.02	-0.11	0.11

Nodal Deflections Serviceability (006 : 1.5 CPL)							
Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.30	-0.06	1.30
3	0.00	-1.76	1.76	4	1.19	-3.30	3.51
5	0.21	-4.65	4.65	6	0.88	-5.70	5.76
7	0.62	-6.37	6.40	8	0.62	-6.48	6.51
9	0.36	-5.70	5.71	10	1.04	-4.65	4.76
11	0.05	-3.30	3.30	12	1.24	-1.76	2.16
13	1.24	0.00	1.24	14	-0.06	-0.06	0.08

Nodal Deflections Serviceability (007 : 1.5 2PL)							
Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.42	-0.10	1.42
3	0.00	-2.22	2.22	4	1.24	-4.09	4.27
5	0.35	-4.94	4.95	6	0.89	-5.45	5.52
7	0.71	-5.63	5.67	8	0.71	-5.63	5.67
9	0.53	-5.45	5.48	10	1.06	-4.94	5.05
11	0.18	-4.09	4.09	12	1.41	-2.22	2.63
13	1.41	0.00	1.41	14	-0.01	-0.10	0.10

Nodal Deflections Serviceability (008 : 1.5 3PL)							
Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.62	-0.09	1.62
3	0.00	-2.38	2.38	4	1.44	-4.42	4.65
5	0.34	-5.70	5.71	6	1.05	-6.60	6.68
7	0.79	-7.08	7.12	8	0.79	-7.14	7.18
9	0.53	-6.60	6.62	10	1.25	-5.70	5.83
11	0.14	-4.42	4.42	12	1.58	-2.38	2.86
13	1.58	0.00	1.58	14	-0.03	-0.09	0.10

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Nodal Deflections Serviceability (009 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.02	-0.07	1.02
3	0.00	-1.48	1.48	4	0.91	-2.75	2.90
5	0.20	-3.62	3.63	6	0.66	-4.26	4.31
7	0.50	-4.47	4.50	8	0.50	-4.48	4.51
9	0.34	-4.26	4.28	10	0.81	-3.62	3.71
11	0.09	-2.75	2.75	12	1.01	-1.48	1.79
13	1.01	0.00	1.01	14	-0.01	-0.07	0.07

Nodal Deflections Serviceability (010 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	0.80	-0.03	0.80
3	0.00	-1.08	1.08	4	0.73	-2.03	2.16
5	0.13	-2.86	2.86	6	0.54	-3.50	3.54
7	0.38	-3.91	3.93	8	0.38	-3.98	4.00
9	0.22	-3.50	3.51	10	0.64	-2.86	2.93
11	0.03	-2.03	2.03	12	0.76	-1.08	1.33
13	0.76	0.00	0.76	14	-0.03	-0.03	0.05

Nodal Deflections Serviceability (011 : 2.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.27	-0.09	1.27
3	0.00	-1.98	1.98	4	1.11	-3.65	3.81
5	0.31	-4.41	4.42	6	0.79	-4.86	4.93
7	0.63	-5.02	5.06	8	0.63	-5.02	5.06
9	0.47	-4.86	4.89	10	0.95	-4.41	4.51
11	0.16	-3.65	3.65	12	1.26	-1.98	2.35
13	1.26	0.00	1.26	14	-0.01	-0.09	0.09

Nodal Deflections Serviceability (012 : 2.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	0.99	-0.06	0.99
3	0.00	-1.46	1.46	4	0.89	-2.71	2.85
5	0.21	-3.49	3.50	6	0.64	-4.05	4.10
7	0.49	-4.34	4.37	8	0.49	-4.38	4.40
9	0.33	-4.05	4.06	10	0.76	-3.49	3.58
11	0.09	-2.71	2.71	12	0.97	-1.46	1.75
13	0.97	0.00	0.97	14	-0.02	-0.06	0.06

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Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-18.001	32.4	0.762	T
3	5	7	-26.863	48.3	0.770	T	4	7	10	-26.863	48.3	0.770	T
5	10	12	-18.001	32.4	0.762	T	6	12	13	0.000	0.0	0.394	
7	2	4	9.157	16.5	0.775	C	8	4	6	22.439	40.4	0.762	C
9	6	8	28.011	50.4	0.389	C	10	8	9	28.011	50.4	0.389	C
11	9	11	22.439	40.4	0.762	C	12	11	14	9.157	16.5	0.775	C
13	2	3	-13.049	64.6	0.561	T	14	3	4	12.823	63.5	0.552	C
15	4	5	-6.435	31.9	0.552	T	16	5	6	6.415	31.8	0.552	C
17	6	7	-1.646	8.1	0.558	T	18	7	9	-1.646	8.1	0.558	T
19	9	10	6.415	31.8	0.552	C	20	10	11	-6.435	31.9	0.552	T
21	11	12	12.823	63.5	0.552	C	22	12	14	-13.049	64.6	0.561	T
23	1	2	11.632	20.9	0.400	C	24	13	14	11.632	20.9	0.400	C
25	7	8	2.343	4.2	0.400	C							

Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-16.585	29.8	0.762	T
3	5	7	-32.839	59.1	0.770	T	4	7	10	-32.839	59.1	0.770	T
5	10	12	-16.585	29.8	0.762	T	6	12	13	0.000	0.0	0.394	T
7	2	4	8.437	15.2	0.775	C	8	4	6	24.719	44.5	0.762	C
9	6	8	41.118	74.0	0.389	C	10	8	9	41.118	74.0	0.389	C
11	9	11	24.719	44.5	0.762	C	12	11	14	8.437	15.2	0.775	C
13	2	3	-12.023	59.5	0.561	T	14	3	4	11.813	58.5	0.552	C
15	4	5	-11.793	58.4	0.552	T	16	5	6	11.773	58.3	0.552	C
17	6	7	-11.875	58.8	0.558	T	18	7	9	-11.875	58.8	0.558	T
19	9	10	11.773	58.3	0.552	C	20	10	11	-11.793	58.4	0.552	T
21	11	12	11.813	58.5	0.552	C	22	12	14	-12.023	59.5	0.561	T
23	1	2	8.576	15.4	0.400	C	24	13	14	8.576	15.4	0.400	C
25	7	8	17.009	30.6	0.400	C							

Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-17.747	31.9	0.762	T
3	5	7	-17.809	32.0	0.770	T	4	7	10	-17.809	32.0	0.770	T
5	10	12	-17.747	31.9	0.762	T	6	12	13	0.000	0.0	0.394	
7	2	4	9.028	16.2	0.775	C	8	4	6	17.785	32.0	0.762	C
9	6	8	17.821	32.1	0.389	C	10	8	9	17.821	32.1	0.389	C
11	9	11	17.785	32.0	0.762	C	12	11	14	9.028	16.2	0.775	C
13	2	3	-12.865	63.7	0.561	T	14	3	4	12.642	62.6	0.552	C
15	4	5	-0.054	0.3	0.552	T	16	5	6	0.034	0.2	0.552	C
17	6	7	-0.018	0.1	0.558	T	18	7	9	-0.018	0.1	0.558	T
19	9	10	0.034	0.2	0.552	C	20	10	11	-0.054	0.3	0.552	T
21	11	12	12.642	62.6	0.552	C	22	12	14	-12.865	63.7	0.561	T
23	1	2	9.176	16.5	0.400	C	24	13	14	9.176	16.5	0.400	C
25	7	8	0.009	0.0	0.400	C							

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Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-17.844	32.1	0.762	T
3	5	7	-23.716	42.7	0.770	T	4	7	10	-23.716	42.7	0.770	T
5	10	12	-17.844	32.1	0.762	T	6	12	13	0.000	0.0	0.394	T
7	2	4	9.077	16.3	0.775	C	8	4	6	20.787	37.4	0.762	C
9	6	8	26.695	48.0	0.389	C	10	8	9	26.695	48.0	0.389	C
11	9	11	20.787	37.4	0.762	C	12	11	14	9.077	16.3	0.775	C
13	2	3	-12.936	64.0	0.561	T	14	3	4	12.711	62.9	0.552	C
15	4	5	-4.267	21.1	0.552	T	16	5	6	4.247	21.0	0.552	C
17	6	7	-4.273	21.2	0.558	T	18	7	9	-4.273	21.2	0.558	T
19	9	10	4.247	21.0	0.552	C	20	10	11	-4.267	21.1	0.552	T
21	11	12	12.711	62.9	0.552	C	22	12	14	-12.936	64.0	0.561	T
23	1	2	9.226	16.6	0.400	C	24	13	14	9.226	16.6	0.400	C
25	7	8	6.109	11.0	0.400	C							

Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-16.809	30.2	0.762	T
3	5	7	-25.084	45.1	0.770	T	4	7	10	-25.084	45.1	0.770	T
5	10	12	-16.809	30.2	0.762	T	6	12	13	0.000	0.0	0.394	
7	2	4	8.551	15.4	0.775	C	8	4	6	20.954	37.7	0.762	C
9	6	8	26.157	47.0	0.389	C	10	8	9	26.157	47.0	0.389	C
11	9	11	20.954	37.7	0.762	C	12	11	14	8.551	15.4	0.775	C
13	2	3	-12.185	60.3	0.561	T	14	3	4	11.973	59.3	0.552	C
15	4	5	-6.009	29.7	0.552	T	16	5	6	5.989	29.7	0.552	C
17	6	7	-1.538	7.6	0.558	T	18	7	9	-1.538	7.6	0.558	T
19	9	10	5.989	29.7	0.552	C	20	10	11	-6.009	29.7	0.552	T
21	11	12	11.973	59.3	0.552	C	22	12	14	-12.185	60.3	0.561	T
23	1	2	10.862	19.5	0.400	C	24	13	14	10.862	19.5	0.400	C
25	7	8	2.187	3.9	0.400	C							

Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.579	19.0	0.762	T
3	5	7	-20.927	37.6	0.770	T	4	7	10	-20.927	37.6	0.770	T
5	10	12	-10.579	19.0	0.762	T	6	12	13	0.000	0.0	0.394	T
7	2	4	5.384	9.7	0.775	C	8	4	6	15.760	28.3	0.762	C
9	6	8	26.191	47.1	0.389	C	10	8	9	26.191	47.1	0.389	C
11	9	11	15.760	28.3	0.762	C	12	11	14	5.384	9.7	0.775	C
13	2	3	-7.672	38.0	0.561	T	14	3	4	7.532	37.3	0.552	C
15	4	5	-7.512	37.2	0.552	T	16	5	6	7.492	37.1	0.552	C
17	6	7	-7.551	37.4	0.558	T	18	7	9	-7.551	37.4	0.558	T
19	9	10	7.492	37.1	0.552	C	20	10	11	-7.512	37.2	0.552	T
21	11	12	7.532	37.3	0.552	C	22	12	14	-7.672	38.0	0.561	T
23	1	2	5.476	9.8	0.400	C	24	13	14	5.476	9.8	0.400	C
25	7	8	10.809	19.4	0.400	C							

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Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-17.941	32.3	0.762	T
3	5	7	-18.002	32.4	0.770	T	4	7	10	-18.002	32.4	0.770	T
5	10	12	-17.941	32.3	0.762	T	6	12	13	0.000	0.0	0.394	C
7	2	4	9.127	16.4	0.775	C	8	4	6	17.979	32.3	0.762	C
9	6	8	18.015	32.4	0.389	C	10	8	9	18.015	32.4	0.389	C
11	9	11	17.979	32.3	0.762	C	12	11	14	9.127	16.4	0.775	C
13	2	3	-13.006	64.4	0.561	T	14	3	4	12.780	63.3	0.552	C
15	4	5	-0.054	0.3	0.552	T	16	5	6	0.034	0.2	0.552	C
17	6	7	-0.018	0.1	0.558	T	18	7	9	-0.018	0.1	0.558	T
19	9	10	0.034	0.2	0.552	C	20	10	11	-0.054	0.3	0.552	T
21	11	12	12.780	63.3	0.552	C	22	12	14	-13.006	64.4	0.561	T
23	1	2	9.276	16.7	0.400	C	24	13	14	9.276	16.7	0.400	C
25	7	8	0.009	0.0	0.400	C							

Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-17.263	31.0	0.762	T
3	5	7	-22.944	41.3	0.770	T	4	7	10	-22.944	41.3	0.770	T
5	10	12	-17.263	31.0	0.762	T	6	12	13	0.000	0.0	0.394	T
7	2	4	8.782	15.8	0.775	C	8	4	6	20.110	36.2	0.762	C
9	6	8	25.826	46.4	0.389	C	10	8	9	25.826	46.4	0.389	C
11	9	11	20.110	36.2	0.762	C	12	11	14	8.782	15.8	0.775	C
13	2	3	-12.514	62.0	0.561	T	14	3	4	12.297	60.9	0.552	C
15	4	5	-4.128	20.4	0.552	T	16	5	6	4.108	20.3	0.552	C
17	6	7	-4.133	20.5	0.558	T	18	7	9	-4.133	20.5	0.558	T
19	9	10	4.108	20.3	0.552	C	20	10	11	-4.128	20.4	0.552	T
21	11	12	12.297	60.9	0.552	C	22	12	14	-12.514	62.0	0.561	T
23	1	2	8.926	16.1	0.400	C	24	13	14	8.926	16.1	0.400	C
25	7	8	5.909	10.6	0.400	C							

Member Forces (009 : 2.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.251	18.4	0.762	T
3	5	7	-15.299	27.5	0.770	T	4	7	10	-15.299	27.5	0.770	T
5	10	12	-10.251	18.4	0.762	T	6	12	13	0.000	0.0	0.394	T
7	2	4	5.217	9.4	0.775	C	8	4	6	12.782	23.0	0.762	C
9	6	8	15.955	28.7	0.389	C	10	8	9	15.955	28.7	0.389	C
11	9	11	12.782	23.0	0.762	C	12	11	14	5.217	9.4	0.775	C
13	2	3	-7.435	36.8	0.561	T	14	3	4	7.299	36.1	0.552	C
15	4	5	-3.670	18.2	0.552	T	16	5	6	3.650	18.1	0.552	C
17	6	7	-0.941	4.7	0.558	T	18	7	9	-0.941	4.7	0.558	T
19	9	10	3.650	18.1	0.552	C	20	10	11	-3.670	18.2	0.552	T
21	11	12	7.299	36.1	0.552	C	22	12	14	-7.435	36.8	0.561	T
23	1	2	6.624	11.9	0.400	C	24	13	14	6.624	11.9	0.400	C
25	7	8	1.331	2.4	0.400	C							

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Member Forces (010 : 2.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-6.510	11.7	0.762	T
3	5	7	-12.858	23.1	0.770	T	4	7	10	-12.858	23.1	0.770	T
5	10	12	-6.510	11.7	0.762	T	6	12	13	0.000	0.0	0.394	T
7	2	4	3.315	6.0	0.775	C	8	4	6	9.691	17.4	0.762	C
9	6	8	16.080	28.9	0.389	C	10	8	9	16.080	28.9	0.389	C
11	9	11	9.691	17.4	0.762	C	12	11	14	3.315	6.0	0.775	C
13	2	3	-4.724	23.4	0.561	T	14	3	4	4.632	22.9	0.552	C
15	4	5	-4.612	22.8	0.552	T	16	5	6	4.592	22.7	0.552	C
17	6	7	-4.622	22.9	0.558	T	18	7	9	-4.622	22.9	0.558	T
19	9	10	4.592	22.7	0.552	C	20	10	11	-4.612	22.8	0.552	T
21	11	12	4.632	22.9	0.552	C	22	12	14	-4.724	23.4	0.561	T
23	1	2	3.376	6.1	0.400	C	24	13	14	3.376	6.1	0.400	C
25	7	8	6.609	11.9	0.400	C							

Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-16.004	28.8	0.762	T
3	5	7	-16.065	28.9	0.770	T	4	7	10	-16.065	28.9	0.770	T
5	10	12	-16.004	28.8	0.762	T	6	12	13	0.000	0.0	0.394	
7	2	4	8.142	14.6	0.775	C	8	4	6	16.041	28.9	0.762	C
9	6	8	16.078	28.9	0.389	C	10	8	9	16.078	28.9	0.389	C
11	9	11	16.041	28.9	0.762	C	12	11	14	8.142	14.6	0.775	C
13	2	3	-11.602	57.4	0.561	T	14	3	4	11.399	56.4	0.552	C
15	4	5	-0.054	0.3	0.552	T	16	5	6	0.034	0.2	0.552	C
17	6	7	-0.018	0.1	0.558	T	18	7	9	-0.018	0.1	0.558	T
19	9	10	0.034	0.2	0.552	C	20	10	11	-0.054	0.3	0.552	T
21	11	12	11.399	56.4	0.552	C	22	12	14	-11.602	57.4	0.561	T
23	1	2	8.276	14.9	0.400	C	24	13	14	8.276	14.9	0.400	C
25	7	8	0.009	0.0	0.400	C							

Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.579	19.0	0.762	T
3	5	7	-14.069	25.3	0.770	T	4	7	10	-14.069	25.3	0.770	T
5	10	12	-10.579	19.0	0.762	T	6	12	13	0.000	0.0	0.394	
7	2	4	5.384	9.7	0.775	C	8	4	6	12.331	22.2	0.762	C
9	6	8	15.832	28.5	0.389	C	10	8	9	15.832	28.5	0.389	C
11	9	11	12.331	22.2	0.762	C	12	11	14	5.384	9.7	0.775	C
13	2	3	-7.672	38.0	0.561	T	14	3	4	7.532	37.3	0.552	C
15	4	5	-2.540	12.6	0.552	T	16	5	6	2.520	12.5	0.552	C
17	6	7	-2.529	12.5	0.558	T	18	7	9	-2.529	12.5	0.558	T
19	9	10	2.520	12.5	0.552	C	20	10	11	-2.540	12.6	0.552	T
21	11	12	7.532	37.3	0.552	C	22	12	14	-7.672	38.0	0.561	T
23	1	2	5.476	9.8	0.400	C	24	13	14	5.476	9.8	0.400	C
25	7	8	3.609	6.5	0.400	C							

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Support Reactions Serviceability (001 : 1.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	11.638	13	0.000	11.638
Total	0.000	23.276			

Support Reactions Serviceability (002 : 1.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	8.582	13	0.000	8.582
Total	0.000	17.164			

Support Reactions Serviceability (003 : 1.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.182	13	0.000	9.182
Total	0.000	18.364			

Support Reactions Serviceability (004 : 1.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.232	13	0.000	9.232
Total	0.000	18.464			

Support Reactions Serviceability (005 : 1.5 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	10.868	13	0.000	10.868
Total	0.000	21.735			

Support Reactions Serviceability (006 : 1.5 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.482	13	0.000	5.482
Total	0.000	10.964			

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Support Reactions Serviceability (007 : 1.5 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.282	13	0.000	9.282
Total	0.000	18.564			

Support Reactions Serviceability (008 : 1.5 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	8.932	13	0.000	8.932
Total	0.000	17.864			

Support Reactions Serviceability (009 : 2.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	6.630	13	0.000	6.630
Total	0.000	13.261			

Support Reactions Serviceability (010 : 2.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.382	13	0.000	3.382
Total	0.000	6.764			

Support Reactions Serviceability (011 : 2.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	8.282	13	0.000	8.282
Total	0.000	16.564			

Support Reactions Serviceability (012 : 2.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.482	13	0.000	5.482
Total	0.000	10.964			

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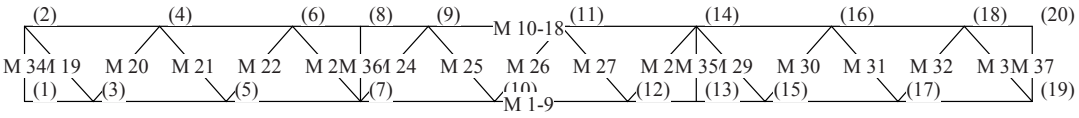

Frame Geometry - (Full Frame) - Front View

Not to Scale

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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group A1	Dead Load
Load Group A2	Dead Load
Load Group A3	Dead Load
Load Group A4	Dead Load
Load Group B1	Dead Load
Load Group B2	Dead Load
Load Group B3	Dead Load
Load Group B4	Dead Load

Load Case 001 : 1.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

Load Case 002 : 1.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L2

Load Case 003 : 1.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L3

Load Case 004 : 1.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L4

Load Case 005 : 1.5 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A1

Load Case 006 : 1.5 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A2

Load Case 007 : 1.5 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A3

Load Case 008 : 1.5 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A4

Load Case 009 : 2.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B1

Load Case 010 : 2.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B2

Load Case 011 : 2.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B3

Load Case 012 : 2.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B4

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The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.000	0.400	0.000
3	0.394	0.000	0.000	4	0.775	0.400	0.000
5	1.156	0.000	0.000	6	1.537	0.400	0.000
7	1.926	0.000	0.000	8	1.926	0.400	0.000
9	2.315	0.400	0.000	10	2.696	0.000	0.000
11	3.077	0.400	0.000	12	3.458	0.000	0.000
13	3.852	0.000	0.000	14	3.852	0.400	0.000
15	4.246	0.000	0.000	16	4.627	0.400	0.000
17	5.008	0.000	0.000	18	5.389	0.400	0.000
19	5.778	0.000	0.000	20	5.778	0.400	0.000

Member Properties

Members 1-18 and 34-37

```
M  ...  ...          48.3 CHS 4.0 []    E 70E6    G 40E6
 A 5.56E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

Members 19-33

```
M  ...  ...          32.8 22 2.6 []    E 70E6    G 40E6
 A 2.02E-4           Ix 2.077E-8         Iy 1.013E-8         J 4.154E-8
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm^2	Density kN/m^3
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 10-18

```
L1 UDLY -003.300              ( kN/m )
L2 PY   -012.900 3.077        ( kN,m )
L3 PY   -008.500 1.926        ( kN,m )
L3 PY   -008.500 3.852        ( kN,m )
L4 PY   -006.000 0.775        ( kN,m )
L4 PY   -006.000 3.077        ( kN,m )
L4 PY   -006.000 4.627        ( kN,m )
A1 UDLY -002.500              ( kN/m )
A2 PY   -008.100 3.077        ( kN,m )
A3 PY   -005.300 1.926        ( kN,m )
A3 PY   -005.300 3.852        ( kN,m )
A4 PY   -004.600 0.775        ( kN,m )
A4 PY   -004.600 3.077        ( kN,m )
A4 PY   -004.600 4.627        ( kN,m )
B1 UDLY -001.500              ( kN/m )
B2 PY   -005.000 3.077        ( kN,m )
B3 PY   -003.300 1.926        ( kN,m )
B3 PY   -003.300 3.852        ( kN,m )
B4 PY   -002.800 0.775        ( kN,m )
B4 PY   -002.800 3.077        ( kN,m )
B4 PY   -002.800 4.627        ( kN,m )
```

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Nodal Loading and Support Conditions

NODES 11 and 20
L4 Ls +0000.000 -0000.000 +0000.000 +0000.000 +0000.000 +0000.000
NODE 1
UT Rs 1 1 1 0 0 0 (Pinned)
NODE 19
UT Rs 0 1 0 0 0 0

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Nodal Deflections Serviceability (001 : 1.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.39	-0.10	3.39
3	0.00	-4.09	4.09	4	3.23	-7.79	8.43
5	0.32	-10.99	10.99	6	2.80	-13.79	14.07
7	0.86	-15.98	16.00	8	2.49	-15.99	16.18
9	2.18	-17.46	17.60	10	1.52	-18.14	18.21
11	1.51	-18.19	18.25	12	2.20	-17.39	17.53
13	2.51	-15.93	16.12	14	0.86	-15.93	15.95
15	2.82	-13.64	13.93	16	0.33	-10.93	10.93
17	3.26	-7.61	8.28	18	0.03	-4.00	4.00
19	3.43	0.00	3.43	20	0.03	-0.01	0.03

Nodal Deflections Serviceability (002 : 1.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.41	-0.06	3.41
3	0.00	-3.90	3.90	4	3.29	-7.48	8.17
5	0.23	-10.85	10.85	6	2.94	-13.88	14.19
7	0.70	-16.53	16.54	8	2.65	-16.53	16.74
9	2.35	-18.60	18.75	10	1.40	-19.96	20.01
11	1.55	-20.56	20.61	12	2.31	-19.31	19.45
13	2.65	-17.23	17.43	14	0.75	-17.23	17.25
15	2.99	-14.48	14.78	16	0.22	-11.32	11.32
17	3.38	-7.79	8.49	18	-0.05	-4.00	4.00
19	3.52	0.00	3.52	20	-0.05	0.00	0.05

Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.09	-0.09	4.09
3	0.00	-4.79	4.79	4	3.92	-9.16	9.96
5	0.33	-13.22	13.22	6	3.43	-16.81	17.16
7	0.98	-19.85	19.88	8	3.02	-19.94	20.17
9	2.61	-21.44	21.60	10	1.80	-22.21	22.28
11	1.80	-22.21	22.28	12	2.61	-21.44	21.59
13	3.02	-19.83	20.05	14	0.97	-19.83	19.85
15	3.44	-16.72	17.07	16	0.32	-13.11	13.11
17	3.93	-9.03	9.85	18	-0.01	-4.65	4.65
19	4.09	0.00	4.09	20	-0.01	0.00	0.01

Nodal Deflections Serviceability (004 : 1.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.35	-0.10	3.35
3	0.00	-4.12	4.12	4	3.17	-7.83	8.45
5	0.35	-10.76	10.77	6	2.76	-13.29	13.58

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Nodal Deflections Serviceability (004 : 1.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
7	0.83	-15.41	15.44	8	2.48	-15.41	15.61
9	2.21	-17.00	17.14	10	1.44	-17.97	18.03
11	1.55	-18.32	18.39	12	2.15	-17.54	17.67
13	2.47	-16.05	16.24	14	0.87	-16.05	16.08
15	2.78	-13.95	14.23	16	0.31	-11.38	11.39
17	3.28	-7.89	8.54	18	-0.03	-4.07	4.07
19	3.46	0.00	3.46	20	-0.03	0.00	0.03

Nodal Deflections Serviceability (005 : 1.5 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.58	-0.08	2.58
3	0.00	-3.11	3.11	4	2.45	-5.92	6.41
5	0.24	-8.36	8.36	6	2.13	-10.49	10.70
7	0.65	-12.15	12.17	8	1.89	-12.16	12.31
9	1.66	-13.28	13.38	10	1.15	-13.80	13.85
11	1.15	-13.83	13.88	12	1.67	-13.23	13.33
13	1.91	-12.11	12.26	14	0.65	-12.11	12.13
15	2.15	-10.37	10.59	16	0.25	-8.31	8.31
17	2.48	-5.79	6.30	18	0.02	-3.04	3.04
19	2.61	0.00	2.61	20	0.02	-0.01	0.02

Nodal Deflections Serviceability (006 : 1.5 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.15	-0.04	2.15
3	0.00	-2.47	2.47	4	2.08	-4.73	5.17
5	0.15	-6.86	6.86	6	1.86	-8.78	8.97
7	0.44	-10.45	10.46	8	1.67	-10.45	10.58
9	1.49	-11.76	11.85	10	0.88	-12.62	12.65
11	0.98	-12.99	13.03	12	1.46	-12.21	12.29
13	1.68	-10.89	11.02	14	0.47	-10.89	10.90
15	1.89	-9.15	9.35	16	0.14	-7.16	7.16
17	2.14	-4.92	5.37	18	-0.03	-2.53	2.53
19	2.22	0.00	2.22	20	-0.03	0.00	0.03

Nodal Deflections Serviceability (007 : 1.5 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.56	-0.06	2.56
3	0.00	-3.00	3.00	4	2.46	-5.75	6.25
5	0.20	-8.29	8.29	6	2.15	-10.55	10.76
7	0.61	-12.45	12.47	8	1.89	-12.51	12.65
9	1.63	-13.45	13.55	10	1.13	-13.93	13.98
11	1.13	-13.93	13.98	12	1.64	-13.45	13.55

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Nodal Deflections Serviceability (007 : 1.5 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
13	1.90	-12.43	12.58	14	0.61	-12.43	12.45
15	2.16	-10.49	10.71	16	0.20	-8.22	8.23
17	2.46	-5.67	6.18	18	0.00	-2.92	2.92
19	2.57	0.00	2.57	20	0.00	0.00	0.00

Nodal Deflections Serviceability (008 : 1.5 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.58	-0.07	2.58
3	0.00	-3.17	3.17	4	2.44	-6.03	6.50
5	0.27	-8.28	8.29	6	2.12	-10.23	10.45
7	0.64	-11.86	11.88	8	1.91	-11.86	12.01
9	1.70	-13.08	13.19	10	1.11	-13.83	13.87
11	1.19	-14.10	14.15	12	1.66	-13.49	13.59
13	1.90	-12.35	12.50	14	0.67	-12.35	12.37
15	2.14	-10.73	10.95	16	0.24	-8.76	8.76
17	2.53	-6.07	6.57	18	-0.02	-3.13	3.13
19	2.66	0.00	2.66	20	-0.02	0.00	0.02

Nodal Deflections Serviceability (009 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.56	-0.05	1.56
3	0.00	-1.89	1.89	4	1.49	-3.59	3.89
5	0.15	-5.07	5.07	6	1.29	-6.36	6.49
7	0.39	-7.37	7.38	8	1.15	-7.37	7.46
9	1.01	-8.05	8.12	10	0.70	-8.37	8.40
11	0.70	-8.39	8.42	12	1.01	-8.02	8.09
13	1.16	-7.35	7.44	14	0.40	-7.35	7.36
15	1.30	-6.29	6.42	16	0.15	-5.04	5.04
17	1.50	-3.51	3.82	18	0.01	-1.85	1.85
19	1.58	0.00	1.58	20	0.01	0.00	0.01

Nodal Deflections Serviceability (010 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.35	-0.03	1.35
3	0.00	-1.54	1.54	4	1.30	-2.96	3.23
5	0.09	-4.29	4.29	6	1.16	-5.48	5.60
7	0.28	-6.53	6.53	8	1.04	-6.53	6.61
9	0.93	-7.34	7.40	10	0.55	-7.87	7.89
11	0.61	-8.10	8.13	12	0.91	-7.62	7.67
13	1.05	-6.80	6.88	14	0.30	-6.80	6.80
15	1.18	-5.71	5.83	16	0.09	-4.47	4.47
17	1.34	-3.07	3.35	18	-0.02	-1.58	1.58

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Nodal Deflections Serviceability (010 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
19	1.39	0.00	1.39	20	-0.02	0.00	0.02

Nodal Deflections Serviceability (011 : 2.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.61	-0.04	1.61
3	0.00	-1.89	1.89	4	1.54	-3.61	3.93
5	0.13	-5.21	5.22	6	1.35	-6.63	6.77
7	0.39	-7.83	7.84	8	1.19	-7.86	7.95
9	1.03	-8.45	8.52	10	0.71	-8.76	8.79
11	0.71	-8.76	8.79	12	1.03	-8.45	8.51
13	1.19	-7.82	7.91	14	0.38	-7.82	7.83
15	1.36	-6.59	6.73	16	0.13	-5.17	5.17
17	1.55	-3.56	3.89	18	0.00	-1.83	1.83
19	1.61	0.00	1.61	20	0.00	0.00	0.00

Nodal Deflections Serviceability (012 : 2.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.59	-0.05	1.59
3	0.00	-1.95	1.95	4	1.50	-3.71	4.00
5	0.17	-5.09	5.10	6	1.30	-6.29	6.43
7	0.39	-7.30	7.31	8	1.17	-7.30	7.39
9	1.04	-8.05	8.11	10	0.68	-8.51	8.53
11	0.73	-8.67	8.70	12	1.02	-8.30	8.36
13	1.17	-7.60	7.69	14	0.41	-7.60	7.61
15	1.32	-6.60	6.73	16	0.15	-5.38	5.38
17	1.55	-3.73	4.04	18	-0.01	-1.93	1.93
19	1.64	0.00	1.64	20	-0.01	0.00	0.01

Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-16.187	29.1	0.762	T
3	5	7	-27.218	49.0	0.770	T	4	7	10	-33.475	60.2	0.770	T
5	10	12	-34.703	62.4	0.762	T	6	12	13	-30.983	55.7	0.394	T
7	13	15	-30.983	55.7	0.394	T	8	15	17	-22.235	40.0	0.762	T
9	17	19	-8.750	15.7	0.770	T	10	2	4	8.235	14.8	0.775	C
11	4	6	21.709	39.0	0.762	C	12	6	8	30.983	55.7	0.389	C
13	8	9	30.983	55.7	0.389	C	14	9	11	34.096	61.3	0.762	C
15	11	14	32.880	59.1	0.775	C	16	14	16	26.542	47.7	0.775	C
17	16	18	15.499	27.9	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-11.735	58.1	0.561	T	20	3	4	11.529	57.1	0.552	C
21	4	5	-8.007	39.6	0.552	T	22	5	6	7.987	39.5	0.552	C
23	6	7	-5.402	26.7	0.558	T	24	7	9	3.574	17.7	0.558	C

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Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
25	9	10	-0.900	4.5	0.552	T	26	10	11	0.880	4.4	0.552	C
27	11	12	2.643	13.1	0.552	C	28	12	14	-2.702	13.4	0.561	T
29	14	15	6.330	31.3	0.561	C	30	15	16	-6.244	30.9	0.552	T
31	16	17	9.766	48.3	0.552	C	32	17	18	-9.786	48.4	0.552	T
33	18	19	12.550	62.1	0.558	C	34	1	2	9.649	17.4	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	1.293	2.3	0.400	C
37	19	20	0.648	1.2	0.400	C							

Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-11.876	21.4	0.762	T
3	5	7	-23.500	42.3	0.770	T	4	7	10	-35.306	63.5	0.770	T
5	10	12	-46.808	84.2	0.762	T	6	12	13	-33.458	60.2	0.394	T
7	13	15	-33.458	60.2	0.394	T	8	15	17	-20.034	36.0	0.762	T
9	17	19	-6.783	12.2	0.770	T	10	2	4	6.043	10.9	0.775	C
11	4	6	17.695	31.8	0.762	C	12	6	8	29.416	52.9	0.389	C
13	8	9	29.416	52.9	0.389	C	14	9	11	41.064	73.9	0.762	C
15	11	14	40.250	72.4	0.775	C	16	14	16	26.639	47.9	0.775	C
17	16	18	13.416	24.1	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-8.612	42.6	0.561	T	20	3	4	8.457	41.9	0.552	C
21	4	5	-8.437	41.8	0.552	T	22	5	6	8.417	41.7	0.552	C
23	6	7	-8.485	42.0	0.558	T	24	7	9	8.448	41.8	0.558	C
25	9	10	-8.348	41.3	0.552	T	26	10	11	8.328	41.2	0.552	C
27	11	12	9.507	47.1	0.552	C	28	12	14	-9.679	47.9	0.561	T
29	14	15	9.717	48.1	0.561	C	30	15	16	-9.576	47.4	0.552	T
31	16	17	9.597	47.5	0.552	C	32	17	18	-9.617	47.6	0.552	T
33	18	19	9.729	48.2	0.558	C	34	1	2	6.146	11.1	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.009	0.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-16.661	30.0	0.762	T
3	5	7	-32.990	59.3	0.770	T	4	7	10	-41.333	74.3	0.770	T
5	10	12	-41.347	74.4	0.762	T	6	12	13	-41.308	74.3	0.394	T
7	13	15	-41.308	74.3	0.394	T	8	15	17	-24.726	44.5	0.762	T
9	17	19	-8.369	15.1	0.770	T	10	2	4	8.476	15.2	0.775	C
11	4	6	24.833	44.7	0.762	C	12	6	8	41.308	74.3	0.389	C
13	8	9	41.308	74.3	0.389	C	14	9	11	41.347	74.4	0.762	C
15	11	14	41.334	74.3	0.775	C	16	14	16	32.883	59.1	0.775	C
17	16	18	16.554	29.8	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-12.079	59.8	0.561	T	20	3	4	11.868	58.8	0.552	C
21	4	5	-11.848	58.7	0.552	T	22	5	6	11.828	58.6	0.552	C
23	6	7	-11.930	59.1	0.558	T	24	7	9	0.037	0.2	0.558	C
25	9	10	-0.020	0.1	0.552	T	26	10	11	0.000	0.0	0.552	C
27	11	12	0.020	0.1	0.552	C	28	12	14	-0.037	0.2	0.561	T

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Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
29	14	15	12.005	59.4	0.561	C	30	15	16	-11.828	58.6	0.552	T
31	16	17	11.848	58.7	0.552	C	32	17	18	-11.868	58.8	0.552	T
33	18	19	12.003	59.4	0.558	C	34	1	2	8.615	15.5	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	8.509	15.3	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-18.008	32.4	0.762	T
3	5	7	-24.232	43.6	0.770	T	4	7	10	-30.523	54.9	0.770	T
5	10	12	-36.624	65.9	0.762	T	6	12	13	-31.150	56.0	0.394	T
7	13	15	-31.150	56.0	0.394	T	8	15	17	-25.603	46.0	0.762	T
9	17	19	-8.665	15.6	0.770	T	10	2	4	9.161	16.5	0.775	C
11	4	6	21.127	38.0	0.762	C	12	6	8	27.390	49.3	0.389	C
13	8	9	27.390	49.3	0.389	C	14	9	11	33.581	60.4	0.762	C
15	11	14	33.939	61.0	0.775	C	16	14	16	28.336	51.0	0.775	C
17	16	18	17.141	30.8	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-13.054	64.6	0.561	T	20	3	4	12.828	63.5	0.552	C
21	4	5	-4.522	22.4	0.552	T	22	5	6	4.502	22.3	0.552	C
23	6	7	-4.531	22.4	0.558	T	24	7	9	4.494	22.2	0.558	C
25	9	10	-4.433	21.9	0.552	T	26	10	11	4.413	21.8	0.552	C
27	11	12	3.893	19.3	0.552	C	28	12	14	-3.974	19.7	0.561	T
29	14	15	4.011	19.9	0.561	C	30	15	16	-3.963	19.6	0.552	T
31	16	17	12.269	60.7	0.552	C	32	17	18	-12.289	60.8	0.552	T
33	18	19	12.429	61.5	0.558	C	34	1	2	9.311	16.7	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.009	0.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-12.309	22.1	0.762	T
3	5	7	-20.699	37.2	0.770	T	4	7	10	-25.458	45.8	0.770	T
5	10	12	-26.392	47.5	0.762	T	6	12	13	-23.564	42.4	0.394	T
7	13	15	-23.564	42.4	0.394	T	8	15	17	-16.910	30.4	0.762	T
9	17	19	-6.653	12.0	0.770	T	10	2	4	6.264	11.3	0.775	C
11	4	6	16.511	29.7	0.762	C	12	6	8	23.565	42.4	0.389	C
13	8	9	23.565	42.4	0.389	C	14	9	11	25.932	46.6	0.762	C
15	11	14	25.007	45.0	0.775	C	16	14	16	20.187	36.3	0.775	C
17	16	18	11.788	21.2	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-8.926	44.2	0.561	T	20	3	4	8.766	43.4	0.552	C
21	4	5	-6.092	30.2	0.552	T	22	5	6	6.072	30.1	0.552	C
23	6	7	-4.110	20.3	0.558	T	24	7	9	2.717	13.4	0.558	C
25	9	10	-0.687	3.4	0.552	T	26	10	11	0.666	3.3	0.552	C
27	11	12	2.007	9.9	0.552	C	28	12	14	-2.056	10.2	0.561	T
29	14	15	4.813	23.8	0.561	C	30	15	16	-4.752	23.5	0.552	T
31	16	17	7.425	36.8	0.552	C	32	17	18	-7.445	36.9	0.552	T

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Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
33	18	19	9.543	47.2	0.558	C	34	1	2	7.338	13.2	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.981	1.8	0.400	C
37	19	20	0.492	0.9	0.400	C							

Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-7.529	13.5	0.762	T
3	5	7	-14.878	26.8	0.770	T	4	7	10	-22.320	40.1	0.770	T
5	10	12	-29.547	53.1	0.762	T	6	12	13	-21.150	38.0	0.394	T
7	13	15	-21.150	38.0	0.394	T	8	15	17	-12.679	22.8	0.762	T
9	17	19	-4.297	7.7	0.770	T	10	2	4	3.833	6.9	0.775	C
11	4	6	11.211	20.2	0.762	C	12	6	8	18.612	33.5	0.389	C
13	8	9	18.612	33.5	0.389	C	14	9	11	25.940	46.7	0.762	C
15	11	14	25.425	45.7	0.775	C	16	14	16	16.849	30.3	0.775	C
17	16	18	8.495	15.3	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-5.462	27.0	0.561	T	20	3	4	5.358	26.5	0.552	C
21	4	5	-5.338	26.4	0.552	T	22	5	6	5.318	26.3	0.552	C
23	6	7	-5.355	26.5	0.558	T	24	7	9	5.318	26.3	0.558	C
25	9	10	-5.249	26.0	0.552	T	26	10	11	5.229	25.9	0.552	C
27	11	12	5.977	29.6	0.552	C	28	12	14	-6.091	30.2	0.561	T
29	14	15	6.129	30.3	0.561	C	30	15	16	-6.046	29.9	0.552	T
31	16	17	6.066	30.0	0.552	C	32	17	18	-6.086	30.1	0.552	T
33	18	19	6.164	30.5	0.558	C	34	1	2	3.902	7.0	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.009	0.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.461	18.8	0.762	T
3	5	7	-20.694	37.2	0.770	T	4	7	10	-25.925	46.6	0.770	T
5	10	12	-25.939	46.7	0.762	T	6	12	13	-25.900	46.6	0.394	T
7	13	15	-25.900	46.6	0.394	T	8	15	17	-15.518	27.9	0.762	T
9	17	19	-5.257	9.5	0.770	T	10	2	4	5.324	9.6	0.775	C
11	4	6	15.585	28.0	0.762	C	12	6	8	25.900	46.6	0.389	C
13	8	9	25.900	46.6	0.389	C	14	9	11	25.939	46.7	0.762	C
15	11	14	25.926	46.6	0.775	C	16	14	16	20.627	37.1	0.775	C
17	16	18	10.394	18.7	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-7.587	37.6	0.561	T	20	3	4	7.449	36.9	0.552	C
21	4	5	-7.428	36.8	0.552	T	22	5	6	7.408	36.7	0.552	C
23	6	7	-7.467	37.0	0.558	T	24	7	9	0.037	0.2	0.558	C
25	9	10	-0.020	0.1	0.552	T	26	10	11	0.000	0.0	0.552	C
27	11	12	0.020	0.1	0.552	C	28	12	14	-0.037	0.2	0.561	T
29	14	15	7.513	37.2	0.561	C	30	15	16	-7.409	36.7	0.552	T
31	16	17	7.429	36.8	0.552	C	32	17	18	-7.449	36.9	0.552	T
33	18	19	7.540	37.3	0.558	C	34	1	2	5.416	9.7	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	5.309	9.5	0.400	C

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Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
37	19	20	0.006	0.0	0.400	C							

Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-13.851	24.9	0.762	T
3	5	7	-18.654	33.6	0.770	T	4	7	10	-23.496	42.3	0.770	T
5	10	12	-28.176	50.7	0.762	T	6	12	13	-23.971	43.1	0.394	T
7	13	15	-23.971	43.1	0.394	T	8	15	17	-19.691	35.4	0.762	T
9	17	19	-6.667	12.0	0.770	T	10	2	4	7.047	12.7	0.775	C
11	4	6	16.260	29.2	0.762	C	12	6	8	21.088	37.9	0.389	C
13	8	9	21.088	37.9	0.389	C	14	9	11	25.843	46.5	0.762	C
15	11	14	26.114	47.0	0.775	C	16	14	16	21.800	39.2	0.775	C
17	16	18	13.186	23.7	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-10.043	49.7	0.561	T	20	3	4	9.865	48.8	0.552	C
21	4	5	-3.492	17.3	0.552	T	22	5	6	3.472	17.2	0.552	C
23	6	7	-3.491	17.3	0.558	T	24	7	9	3.454	17.1	0.558	C
25	9	10	-3.403	16.8	0.552	T	26	10	11	3.383	16.7	0.552	C
27	11	12	2.990	14.8	0.552	C	28	12	14	-3.055	15.1	0.561	T
29	14	15	3.092	15.3	0.561	C	30	15	16	-3.059	15.1	0.552	T
31	16	17	9.432	46.7	0.552	C	32	17	18	-9.452	46.8	0.552	T
33	18	19	9.563	47.3	0.558	C	34	1	2	7.165	12.9	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.009	0.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (009 : 2.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-7.463	13.4	0.762	T
3	5	7	-12.551	22.6	0.770	T	4	7	10	-15.437	27.8	0.770	T
5	10	12	-16.003	28.8	0.762	T	6	12	13	-14.291	25.7	0.394	T
7	13	15	-14.291	25.7	0.394	T	8	15	17	-10.252	18.4	0.762	T
9	17	19	-4.033	7.3	0.770	T	10	2	4	3.800	6.8	0.775	C
11	4	6	10.014	18.0	0.762	C	12	6	8	14.291	25.7	0.389	C
13	8	9	14.291	25.7	0.389	C	14	9	11	15.727	28.3	0.762	C
15	11	14	15.167	27.3	0.775	C	16	14	16	12.243	22.0	0.775	C
17	16	18	7.150	12.9	0.762	C	18	18	20	0.000	0.0	0.389	
19	2	3	-5.414	26.8	0.561	T	20	3	4	5.311	26.3	0.552	C
21	4	5	-3.699	18.3	0.552	T	22	5	6	3.679	18.2	0.552	C
23	6	7	-2.495	12.4	0.558	T	24	7	9	1.645	8.1	0.558	C
25	9	10	-0.420	2.1	0.552	T	26	10	11	0.400	2.0	0.552	C
27	11	12	1.212	6.0	0.552	C	28	12	14	-1.248	6.2	0.561	T
29	14	15	2.918	14.4	0.561	C	30	15	16	-2.887	14.3	0.552	T
31	16	17	4.499	22.3	0.552	C	32	17	18	-4.519	22.4	0.552	T
33	18	19	5.785	28.6	0.558	C	34	1	2	4.449	8.0	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.592	1.1	0.400	C
37	19	20	0.298	0.5	0.400	C							

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Member Forces (010 : 2.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-4.721	8.5	0.762	T
3	5	7	-9.310	16.7	0.770	T	4	7	10	-13.933	25.1	0.770	T
5	10	12	-18.400	33.1	0.762	T	6	12	13	-13.201	23.7	0.394	T
7	13	15	-13.201	23.7	0.394	T	8	15	17	-7.929	14.3	0.762	T
9	17	19	-2.692	4.8	0.770	T	10	2	4	2.406	4.3	0.775	C
11	4	6	7.023	12.6	0.762	C	12	6	8	11.634	20.9	0.389	C
13	8	9	11.634	20.9	0.389	C	14	9	11	16.173	29.1	0.762	C
15	11	14	15.850	28.5	0.775	C	16	14	16	10.526	18.9	0.775	C
17	16	18	5.317	9.6	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-3.428	17.0	0.561	T	20	3	4	3.357	16.6	0.552	C
21	4	5	-3.337	16.5	0.552	T	22	5	6	3.317	16.4	0.552	C
23	6	7	-3.334	16.5	0.558	T	24	7	9	3.297	16.3	0.558	C
25	9	10	-3.248	16.1	0.552	T	26	10	11	3.228	16.0	0.552	C
27	11	12	3.697	18.3	0.552	C	28	12	14	-3.774	18.7	0.561	T
29	14	15	3.812	18.9	0.561	C	30	15	16	-3.766	18.6	0.552	T
31	16	17	3.786	18.7	0.552	C	32	17	18	-3.806	18.8	0.552	T
33	18	19	3.861	19.1	0.558	C	34	1	2	2.453	4.4	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.009	0.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-6.586	11.8	0.762	T
3	5	7	-13.009	23.4	0.770	T	4	7	10	-16.295	29.3	0.770	T
5	10	12	-16.309	29.3	0.762	T	6	12	13	-16.270	29.3	0.394	T
7	13	15	-16.270	29.3	0.394	T	8	15	17	-9.763	17.6	0.762	T
9	17	19	-3.312	6.0	0.770	T	10	2	4	3.354	6.0	0.775	C
11	4	6	9.805	17.6	0.762	C	12	6	8	16.270	29.3	0.389	C
13	8	9	16.270	29.3	0.389	C	14	9	11	16.309	29.3	0.762	C
15	11	14	16.296	29.3	0.775	C	16	14	16	12.967	23.3	0.775	C
17	16	18	6.544	11.8	0.762	C	18	18	20	0.000	0.0	0.389	C
19	2	3	-4.780	23.7	0.561	T	20	3	4	4.686	23.2	0.552	C
21	4	5	-4.666	23.1	0.552	T	22	5	6	4.646	23.0	0.552	C
23	6	7	-4.677	23.2	0.558	T	24	7	9	0.037	0.2	0.558	C
25	9	10	-0.020	0.1	0.552	T	26	10	11	0.000	0.0	0.552	C
27	11	12	0.020	0.1	0.552	C	28	12	14	-0.037	0.2	0.561	T
29	14	15	4.706	23.3	0.561	C	30	15	16	-4.647	23.0	0.552	T
31	16	17	4.667	23.1	0.552	C	32	17	18	-4.687	23.2	0.552	T
33	18	19	4.750	23.5	0.558	C	34	1	2	3.416	6.1	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	3.309	6.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-8.507	15.3	0.762	T
3	5	7	-11.484	20.7	0.770	T	4	7	10	-14.461	26.0	0.770	T

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Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
5	10	12	-17.315	31.1	0.762	T	6	12	13	-14.740	26.5	0.394	T
7	13	15	-14.740	26.5	0.394	T	8	15	17	-12.090	21.7	0.762	T
9	17	19	-4.098	7.4	0.770	T	10	2	4	4.330	7.8	0.775	C
11	4	6	10.002	18.0	0.762	C	12	6	8	12.985	23.4	0.389	C
13	8	9	12.985	23.4	0.389	C	14	9	11	15.895	28.6	0.762	C
15	11	14	16.055	28.9	0.775	C	16	14	16	13.398	24.1	0.775	C
17	16	18	8.101	14.6	0.762	C	18	18	20	0.000	0.0	0.389	T
19	2	3	-6.171	30.5	0.561	T	20	3	4	6.055	30.0	0.552	C
21	4	5	-2.168	10.7	0.552	T	22	5	6	2.148	10.6	0.552	C
23	6	7	-2.153	10.7	0.558	T	24	7	9	2.117	10.5	0.558	C
25	9	10	-2.079	10.3	0.552	T	26	10	11	2.059	10.2	0.552	C
27	11	12	1.828	9.0	0.552	C	28	12	14	-1.874	9.3	0.561	T
29	14	15	1.911	9.5	0.561	C	30	15	16	-1.897	9.4	0.552	T
31	16	17	5.784	28.6	0.552	C	32	17	18	-5.804	28.7	0.552	T
33	18	19	5.878	29.1	0.558	C	34	1	2	4.407	7.9	0.400	C
35	13	14	-0.009	0.0	0.400	T	36	7	8	0.009	0.0	0.400	C
37	19	20	0.006	0.0	0.400	C							

Support Reactions Serviceability (001 : 1.0 UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.655	19	0.000	9.655
Total	0.000	19.310			

Support Reactions Serviceability (002 : 1.0 CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	6.152	19	0.000	6.991
Total	0.000	13.143			

Support Reactions Serviceability (003 : 1.0 2PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	8.621	19	0.000	8.621
Total	0.000	17.243			

Support Reactions Serviceability (004 : 1.0 3PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	9.317	19	0.000	8.926
Total	0.000	18.243			

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Support Reactions Serviceability (005 : 1.5 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	7.344	19	0.000	7.344
Total	0.000	14.688			

Support Reactions Serviceability (006 : 1.5 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.908	19	0.000	4.435
Total	0.000	8.343			

Support Reactions Serviceability (007 : 1.5 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.421	19	0.000	5.421
Total	0.000	10.843			

Support Reactions Serviceability (008 : 1.5 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	7.171	19	0.000	6.872
Total	0.000	14.043			

Support Reactions Serviceability (009 : 2.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.455	19	0.000	4.455
Total	0.000	8.910			

Support Reactions Serviceability (010 : 2.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.459	19	0.000	2.784
Total	0.000	5.243			

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Support Reactions Serviceability (011 : 2.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.421	19	0.000	3.421
Total	0.000	6.843			

Support Reactions Serviceability (012 : 2.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.413	19	0.000	4.230
Total	0.000	8.643			

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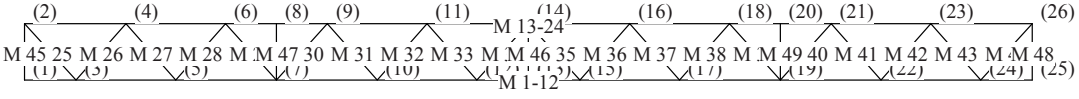

Frame Geometry - (Full Frame) - Front View

Not to Scale

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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group A1	Dead Load
Load Group A2	Dead Load
Load Group A3	Dead Load
Load Group A4	Dead Load
Load Group B1	Dead Load
Load Group B2	Dead Load
Load Group B3	Dead Load
Load Group B4	Dead Load

Load Case 001 : 1.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

Load Case 002 : 1.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L2

Load Case 003 : 1.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L3

Load Case 004 : 1.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L4

Load Case 005 : 1.5 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A1

Load Case 006 : 1.5 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A2

Load Case 007 : 1.5 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A3

Load Case 008 : 1.5 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A4

Load Case 009 : 2.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B1

Load Case 010 : 2.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B2

Load Case 011 : 2.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B3

Load Case 012 : 2.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B4

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The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.000	0.400	0.000
3	0.394	0.000	0.000	4	0.775	0.400	0.000
5	1.156	0.000	0.000	6	1.537	0.400	0.000
7	1.926	0.000	0.000	8	1.926	0.400	0.000
9	2.315	0.400	0.000	10	2.696	0.000	0.000
11	3.077	0.400	0.000	12	3.458	0.000	0.000
13	3.852	0.000	0.000	14	3.852	0.400	0.000
15	4.246	0.000	0.000	16	4.627	0.400	0.000
17	5.008	0.000	0.000	18	5.389	0.400	0.000
19	5.778	0.000	0.000	20	5.778	0.400	0.000
21	6.167	0.400	0.000	22	6.548	0.000	0.000
23	6.929	0.400	0.000	24	7.310	0.000	0.000
25	7.704	0.000	0.000	26	7.704	0.400	0.000

Member Properties

Members 1-24 and 45-49

```
M  ...  ...          48.3 CHS 4.0 []    E 70E6    G 40E6
 A 5.56E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

Members 25-44

```
M  ...  ...          32.8 22 2.6 []    E 70E6    G 40E6
 A 2.02E-4           Ix 2.077E-8         Iy 1.013E-8         J 4.154E-8
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 13-24

```
L1 UDLY -002.200             ( kN/m )
L2 PY   -009.300 3.852       ( kN,m )
L3 PY   -008.400 1.926       ( kN,m )
L3 PY   -008.400 5.778       ( kN,m )
L4 PY   -004.400 1.926       ( kN,m )
L4 PY   -004.400 3.852       ( kN,m )
L4 PY   -004.400 5.778       ( kN,m )
A1 UDLY -001.400             ( kN/m )
A2 PY   -005.800 3.852       ( kN,m )
A3 PY   -005.200 1.926       ( kN,m )
A3 PY   -005.200 5.778       ( kN,m )
A4 PY   -002.700 1.926       ( kN,m )
A4 PY   -002.700 3.852       ( kN,m )
A4 PY   -002.700 5.778       ( kN,m )
B1 UDLY -000.800             ( kN/m )
B2 PY   -003.600 3.852       ( kN,m )
B3 PY   -003.200 1.926       ( kN,m )
B3 PY   -003.200 5.778       ( kN,m )
B4 PY   -001.700 1.926       ( kN,m )
B4 PY   -001.700 3.852       ( kN,m )
B4 PY   -001.700 5.778       ( kN,m )
```

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Nodal Loading and Support Conditions

NODES 11 and 20
L4 Ls +0000.000 -0000.000 +0000.000 +0000.000 +0000.000 +0000.000
NODE 1
UT Rs 1 1 1 0 0 0 (Pinned)
NODE 25
UT Rs 0 1 0 0 0 0

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Nodal Deflections Serviceability (001 : 1.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	5.44	-0.09	5.44
3	0.00	-6.05	6.05	4	5.29	-11.67	12.81
5	0.29	-16.87	16.87	6	4.88	-21.69	22.23
7	0.82	-26.00	26.01	8	4.57	-26.01	26.41
9	4.26	-29.64	29.94	10	1.51	-32.45	32.48
11	3.52	-34.56	34.74	12	2.29	-35.79	35.87
13	2.71	-36.28	36.38	14	2.71	-36.28	36.38
15	3.13	-35.79	35.93	16	1.90	-34.56	34.61
17	3.91	-32.45	32.68	18	1.17	-29.64	29.66
19	4.61	-26.00	26.40	20	0.86	-26.01	26.02
21	0.55	-21.69	21.69	22	5.13	-16.87	17.63
23	0.14	-11.67	11.67	24	5.42	-6.05	8.13
25	5.42	0.00	5.42	26	-0.01	-0.09	0.09

Nodal Deflections Serviceability (002 : 1.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.53	-0.05	4.53
3	0.00	-4.89	4.89	4	4.44	-9.47	10.46
5	0.18	-13.88	13.88	6	4.17	-18.03	18.50
7	0.54	-21.92	21.92	8	3.94	-21.92	22.27
9	3.71	-25.35	25.62	10	1.09	-28.20	28.22
11	3.08	-30.44	30.60	12	1.80	-32.01	32.06
13	2.27	-32.83	32.90	14	2.27	-32.83	32.90
15	2.73	-32.01	32.12	16	1.45	-30.44	30.48
17	3.44	-28.20	28.41	18	0.82	-25.35	25.37
19	3.99	-21.92	22.27	20	0.59	-21.92	21.92
21	0.36	-18.03	18.03	22	4.35	-13.88	14.54
23	0.09	-9.47	9.47	24	4.53	-4.89	6.66
25	4.53	0.00	4.53	26	0.00	-0.05	0.05

Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	6.10	-0.09	6.10
3	0.00	-6.77	6.77	4	5.94	-13.06	14.34
5	0.32	-19.04	19.04	6	5.45	-24.56	25.16
7	0.97	-29.57	29.58	8	5.04	-29.66	30.08
9	4.63	-33.13	33.46	10	1.78	-35.85	35.90
11	3.83	-37.80	37.99	12	2.59	-38.98	39.07
13	3.01	-39.39	39.51	14	3.01	-39.39	39.51
15	3.43	-38.98	39.13	16	2.19	-37.80	37.86
17	4.23	-35.85	36.10	18	1.38	-33.13	33.16
19	5.04	-29.57	30.00	20	0.97	-29.66	29.67
21	0.56	-24.56	24.56	22	5.69	-19.04	19.87
23	0.08	-13.06	13.06	24	6.02	-6.77	9.06
25	6.02	0.00	6.02	26	-0.09	-0.09	0.12

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Nodal Deflections Serviceability (004 : 1.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	5.34	-0.07	5.34
3	0.00	-5.86	5.86	4	5.21	-11.32	12.46
5	0.26	-16.54	16.54	6	4.83	-21.39	21.93
7	0.77	-25.86	25.87	8	4.50	-25.90	26.29
9	4.18	-29.35	29.65	10	1.45	-32.12	32.15
11	3.46	-34.21	34.38	12	2.21	-35.56	35.63
13	2.65	-36.17	36.26	14	2.65	-36.17	36.26
15	3.08	-35.56	35.70	16	1.83	-34.21	34.25
17	3.84	-32.12	32.35	18	1.11	-29.35	29.37
19	4.53	-25.86	26.25	20	0.79	-25.90	25.92
21	0.47	-21.39	21.40	22	5.04	-16.54	17.29
23	0.09	-11.32	11.32	24	5.29	-5.86	7.90
25	5.29	0.00	5.29	26	-0.05	-0.07	0.08

Nodal Deflections Serviceability (005 : 1.5 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.50	-0.06	3.50
3	0.00	-3.89	3.89	4	3.40	-7.50	8.24
5	0.19	-10.85	10.85	6	3.14	-13.94	14.29
7	0.53	-16.72	16.73	8	2.94	-16.72	16.98
9	2.74	-19.06	19.25	10	0.97	-20.86	20.89
11	2.27	-22.22	22.33	12	1.47	-23.02	23.06
13	1.74	-23.33	23.39	14	1.74	-23.33	23.39
15	2.01	-23.02	23.10	16	1.22	-22.22	22.25
17	2.52	-20.86	21.01	18	0.75	-19.06	19.07
19	2.96	-16.72	16.98	20	0.55	-16.72	16.73
21	0.35	-13.94	13.95	22	3.30	-10.85	11.34
23	0.09	-7.50	7.50	24	3.49	-3.89	5.23
25	3.49	0.00	3.49	26	-0.01	-0.06	0.06

Nodal Deflections Serviceability (006 : 1.5 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.86	-0.03	2.86
3	0.00	-3.09	3.09	4	2.80	-5.99	6.61
5	0.12	-8.77	8.77	6	2.63	-11.39	11.69
7	0.35	-13.85	13.85	8	2.49	-13.85	14.07
9	2.34	-16.02	16.19	10	0.69	-17.81	17.82
11	1.95	-19.22	19.32	12	1.14	-20.21	20.24
13	1.43	-20.72	20.77	14	1.43	-20.72	20.77
15	1.72	-20.21	20.28	16	0.92	-19.22	19.25
17	2.17	-17.81	17.94	18	0.52	-16.02	16.02
19	2.52	-13.85	14.07	20	0.38	-13.85	13.85
21	0.23	-11.39	11.39	22	2.75	-8.77	9.19
23	0.06	-5.99	5.99	24	2.86	-3.09	4.21
25	2.86	0.00	2.86	26	0.00	-0.03	0.03

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Nodal Deflections Serviceability (007 : 1.5 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.82	-0.06	3.82
3	0.00	-4.23	4.23	4	3.71	-8.16	8.97
5	0.20	-11.90	11.91	6	3.41	-15.35	15.73
7	0.61	-18.49	18.50	8	3.15	-18.54	18.81
9	2.90	-20.72	20.92	10	1.12	-22.42	22.45
11	2.39	-23.64	23.76	12	1.62	-24.38	24.43
13	1.88	-24.64	24.71	14	1.88	-24.64	24.71
15	2.14	-24.38	24.47	16	1.37	-23.64	23.68
17	2.65	-22.42	22.58	18	0.86	-20.72	20.74
19	3.15	-18.49	18.75	20	0.61	-18.54	18.55
21	0.35	-15.35	15.36	22	3.56	-11.90	12.42
23	0.05	-8.16	8.16	24	3.76	-4.23	5.66
25	3.76	0.00	3.76	26	-0.05	-0.06	0.08

Nodal Deflections Serviceability (008 : 1.5 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.32	-0.04	3.32
3	0.00	-3.64	3.64	4	3.23	-7.03	7.74
5	0.16	-10.27	10.27	6	3.00	-13.28	13.62
7	0.48	-16.05	16.06	8	2.80	-16.08	16.32
9	2.60	-18.22	18.40	10	0.90	-19.94	19.96
11	2.15	-21.23	21.34	12	1.37	-22.08	22.12
13	1.64	-22.45	22.51	14	1.64	-22.45	22.51
15	1.91	-22.08	22.16	16	1.14	-21.23	21.26
17	2.39	-19.94	20.08	18	0.69	-18.22	18.23
19	2.81	-16.05	16.30	20	0.49	-16.08	16.09
21	0.29	-13.28	13.28	22	3.13	-10.27	10.73
23	0.05	-7.03	7.03	24	3.29	-3.64	4.90
25	3.29	0.00	3.29	26	-0.03	-0.04	0.05

Nodal Deflections Serviceability (009 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.04	-0.03	2.04
3	0.00	-2.27	2.27	4	1.98	-4.38	4.81
5	0.11	-6.33	6.33	6	1.83	-8.14	8.34
7	0.31	-9.76	9.76	8	1.71	-9.76	9.91
9	1.60	-11.12	11.24	10	0.57	-12.18	12.19
11	1.32	-12.97	13.03	12	0.86	-13.43	13.46
13	1.02	-13.61	13.65	14	1.02	-13.61	13.65
15	1.18	-13.43	13.48	16	0.71	-12.97	12.99
17	1.47	-12.18	12.26	18	0.44	-11.12	11.13
19	1.73	-9.76	9.91	20	0.32	-9.76	9.77
21	0.20	-8.14	8.14	22	1.92	-6.33	6.62
23	0.05	-4.38	4.38	24	2.04	-2.27	3.05
25	2.04	0.00	2.04	26	-0.01	-0.03	0.03

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Nodal Deflections Serviceability (010 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	1.81	-0.02	1.81
3	0.00	-1.96	1.96	4	1.78	-3.80	4.19
5	0.07	-5.56	5.56	6	1.67	-7.22	7.41
7	0.22	-8.77	8.78	8	1.58	-8.77	8.91
9	1.48	-10.15	10.25	10	0.44	-11.28	11.29
11	1.23	-12.17	12.23	12	0.72	-12.79	12.81
13	0.91	-13.11	13.14	14	0.91	-13.11	13.14
15	1.09	-12.79	12.84	16	0.58	-12.17	12.18
17	1.38	-11.28	11.36	18	0.33	-10.15	10.15
19	1.59	-8.77	8.92	20	0.24	-8.77	8.78
21	0.15	-7.22	7.22	22	1.74	-5.56	5.83
23	0.04	-3.80	3.80	24	1.81	-1.96	2.67
25	1.81	0.00	1.81	26	0.00	-0.02	0.02

Nodal Deflections Serviceability (011 : 2.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.39	-0.03	2.39
3	0.00	-2.65	2.65	4	2.32	-5.11	5.61
5	0.13	-7.44	7.44	6	2.13	-9.60	9.83
7	0.38	-11.56	11.56	8	1.97	-11.59	11.76
9	1.81	-12.96	13.08	10	0.70	-14.02	14.04
11	1.50	-14.79	14.87	12	1.01	-15.25	15.29
13	1.18	-15.42	15.46	14	1.18	-15.42	15.46
15	1.34	-15.25	15.31	16	0.85	-14.79	14.82
17	1.66	-14.02	14.12	18	0.54	-12.96	12.97
19	1.97	-11.56	11.73	20	0.38	-11.59	11.60
21	0.22	-9.60	9.60	22	2.23	-7.44	7.77
23	0.03	-5.11	5.11	24	2.35	-2.65	3.54
25	2.35	0.00	2.35	26	-0.03	-0.03	0.05

Nodal Deflections Serviceability (012 : 2.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.12	-0.03	2.12
3	0.00	-2.33	2.33	4	2.07	-4.50	4.96
5	0.10	-6.58	6.58	6	1.92	-8.51	8.72
7	0.31	-10.28	10.29	8	1.79	-10.30	10.45
9	1.66	-11.67	11.79	10	0.58	-12.77	12.79
11	1.38	-13.60	13.67	12	0.88	-14.14	14.17
13	1.05	-14.38	14.42	14	1.05	-14.38	14.42
15	1.23	-14.14	14.19	16	0.73	-13.60	13.62
17	1.53	-12.77	12.87	18	0.44	-11.67	11.68
19	1.80	-10.28	10.44	20	0.31	-10.30	10.30
21	0.19	-8.51	8.51	22	2.00	-6.58	6.88
23	0.03	-4.50	4.50	24	2.11	-2.33	3.14
25	2.11	0.00	2.11	26	-0.02	-0.03	0.03

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Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-15.037	27.0	0.762	T
3	5	7	-26.547	47.7	0.770	T	4	7	10	-34.942	62.8	0.770	T
5	10	12	-39.876	71.7	0.762	T	6	12	13	-41.565	74.8	0.394	T
7	13	15	-41.565	74.8	0.394	T	8	15	17	-39.876	71.7	0.762	T
9	17	19	-34.942	62.8	0.770	T	10	19	22	-26.547	47.7	0.770	T
11	22	24	-15.037	27.0	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	7.650	13.8	0.775	C	14	4	6	20.799	37.4	0.762	C
15	6	8	31.174	56.1	0.389	C	16	8	9	31.174	56.1	0.389	C
17	9	11	37.416	67.3	0.762	C	18	11	14	40.712	73.2	0.775	C
19	14	16	40.712	73.2	0.775	C	20	16	18	37.416	67.3	0.762	C
21	18	20	31.174	56.1	0.389	C	22	20	21	31.174	56.1	0.389	C
23	21	23	20.799	37.4	0.762	C	24	23	26	7.650	13.8	0.775	C
25	2	3	-10.901	54.0	0.561	T	26	3	4	10.710	53.0	0.552	C
27	4	5	-8.355	41.4	0.552	T	28	5	6	8.335	41.3	0.552	C
29	6	7	-6.636	32.9	0.558	T	30	7	9	5.405	26.8	0.558	C
31	9	10	-3.587	17.8	0.552	T	32	10	11	3.567	17.7	0.552	C
33	11	12	-1.212	6.0	0.552	T	34	12	14	1.215	6.0	0.561	C
35	14	15	1.215	6.0	0.561	C	36	15	16	-1.212	6.0	0.552	T
37	16	17	3.567	17.7	0.552	C	38	17	18	-3.587	17.8	0.552	T
39	18	19	5.405	26.8	0.558	C	40	19	21	-6.636	32.9	0.558	T
41	21	22	8.335	41.3	0.552	C	42	22	23	-8.355	41.4	0.552	T
43	23	24	10.710	53.0	0.552	C	44	24	26	-10.901	54.0	0.561	T
45	1	2	8.629	15.5	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	0.865	1.6	0.400	C	48	25	26	8.629	15.5	0.400	C
49	19	20	0.865	1.6	0.400	C							

Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-9.278	16.7	0.762	T
3	5	7	-18.348	33.0	0.770	T	4	7	10	-27.546	49.5	0.770	T
5	10	12	-36.494	65.6	0.762	T	6	12	13	-45.540	81.9	0.394	T
7	13	15	-45.540	81.9	0.394	T	8	15	17	-36.494	65.6	0.762	T
9	17	19	-27.546	49.5	0.770	T	10	19	22	-18.348	33.0	0.770	T
11	22	24	-9.278	16.7	0.762	T	12	24	25	0.000	0.0	0.394	
13	2	4	4.723	8.5	0.775	C	14	4	6	13.820	24.9	0.762	C
15	6	8	22.960	41.3	0.389	C	16	8	9	22.960	41.3	0.389	C
17	9	11	32.027	57.6	0.762	C	18	11	14	40.947	73.6	0.775	C
19	14	16	40.947	73.6	0.775	C	20	16	18	32.027	57.6	0.762	C
21	18	20	22.960	41.3	0.389	C	22	20	21	22.960	41.3	0.389	C
23	21	23	13.820	24.9	0.762	C	24	23	26	4.723	8.5	0.775	C
25	2	3	-6.730	33.3	0.561	T	26	3	4	6.605	32.7	0.552	C
27	4	5	-6.585	32.6	0.552	T	28	5	6	6.565	32.5	0.552	C
29	6	7	-6.615	32.7	0.558	T	30	7	9	6.578	32.6	0.558	C
31	9	10	-6.496	32.2	0.552	T	32	10	11	6.476	32.1	0.552	C
33	11	12	-6.456	32.0	0.552	T	34	12	14	6.546	32.4	0.561	C
35	14	15	6.546	32.4	0.561	C	36	15	16	-6.456	32.0	0.552	T
37	16	17	6.476	32.1	0.552	C	38	17	18	-6.497	32.2	0.552	T
39	18	19	6.578	32.6	0.558	C	40	19	21	-6.615	32.7	0.558	T
41	21	22	6.565	32.5	0.552	C	42	22	23	-6.585	32.6	0.552	T
43	23	24	6.605	32.7	0.552	C	44	24	26	-6.730	33.3	0.561	T

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Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
45	1	2	4.805	8.6	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	0.009	0.0	0.400	C	48	25	26	4.805	8.6	0.400	C
49	19	20	0.009	0.0	0.400	C							

Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-16.544	29.8	0.762	T
3	5	7	-32.758	58.9	0.770	T	4	7	10	-41.080	73.9	0.770	T
5	10	12	-41.170	74.0	0.762	T	6	12	13	-41.207	74.1	0.394	T
7	13	15	-41.207	74.1	0.394	T	8	15	17	-41.170	74.0	0.762	T
9	17	19	-41.080	73.9	0.770	T	10	19	22	-32.758	58.9	0.770	T
11	22	24	-16.544	29.8	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	8.416	15.1	0.775	C	14	4	6	24.658	44.3	0.762	C
15	6	8	41.016	73.8	0.389	C	16	8	9	41.016	73.8	0.389	C
17	9	11	41.132	74.0	0.762	C	18	11	14	41.193	74.1	0.775	C
19	14	16	41.193	74.1	0.775	C	20	16	18	41.132	74.0	0.762	C
21	18	20	41.016	73.8	0.389	C	22	20	21	41.016	73.8	0.389	C
23	21	23	24.658	44.3	0.762	C	24	23	26	8.416	15.1	0.775	C
25	2	3	-11.994	59.4	0.561	T	26	3	4	11.784	58.3	0.552	C
27	4	5	-11.764	58.2	0.552	T	28	5	6	11.744	58.1	0.552	C
29	6	7	-11.846	58.6	0.558	T	30	7	9	0.092	0.5	0.558	C
31	9	10	-0.075	0.4	0.552	T	32	10	11	0.055	0.3	0.552	C
33	11	12	-0.035	0.2	0.552	T	34	12	14	0.019	0.1	0.561	C
35	14	15	0.019	0.1	0.561	C	36	15	16	-0.035	0.2	0.552	T
37	16	17	0.055	0.3	0.552	C	38	17	18	-0.075	0.4	0.552	T
39	18	19	0.092	0.5	0.558	C	40	19	21	-11.846	58.6	0.558	T
41	21	22	11.744	58.1	0.552	C	42	22	23	-11.764	58.2	0.552	T
43	23	24	11.784	58.3	0.552	C	44	24	26	-11.994	59.4	0.561	T
45	1	2	8.555	15.4	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	8.409	15.1	0.400	C	48	25	26	8.555	15.4	0.400	C
49	19	20	8.409	15.1	0.400	C							

Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-13.057	23.5	0.762	T
3	5	7	-25.841	46.5	0.770	T	4	7	10	-34.553	62.1	0.770	T
5	10	12	-38.833	69.8	0.762	T	6	12	13	-43.133	77.6	0.394	T
7	13	15	-43.133	77.6	0.394	T	8	15	17	-38.833	69.8	0.762	T
9	17	19	-34.553	62.1	0.770	T	10	19	22	-25.841	46.5	0.770	T
11	22	24	-13.057	23.5	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	6.643	11.9	0.775	C	14	4	6	19.456	35.0	0.762	C
15	6	8	32.349	58.2	0.389	C	16	8	9	32.349	58.2	0.389	C
17	9	11	36.700	66.0	0.762	C	18	11	14	40.952	73.7	0.775	C
19	14	16	40.952	73.7	0.775	C	20	16	18	36.700	66.0	0.762	C
21	18	20	32.349	58.2	0.389	C	22	20	21	32.349	58.2	0.389	C
23	21	23	19.456	35.0	0.762	C	24	23	26	6.643	11.9	0.775	C

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Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
25	2	3	-9.467	46.9	0.561	T	26	3	4	9.298	46.0	0.552	C
27	4	5	-9.278	45.9	0.552	T	28	5	6	9.258	45.8	0.552	C
29	6	7	-9.335	46.2	0.558	T	30	7	9	3.161	15.6	0.558	C
31	9	10	-3.113	15.4	0.552	T	32	10	11	3.093	15.3	0.552	C
33	11	12	-3.073	15.2	0.552	T	34	12	14	3.107	15.4	0.561	C
35	14	15	3.107	15.4	0.561	C	36	15	16	-3.073	15.2	0.552	T
37	16	17	3.093	15.3	0.552	C	38	17	18	-3.113	15.4	0.552	T
39	18	19	3.161	15.6	0.558	C	40	19	21	-9.335	46.2	0.558	T
41	21	22	9.258	45.8	0.552	C	42	22	23	-9.278	45.9	0.552	T
43	23	24	9.298	46.0	0.552	C	44	24	26	-9.467	46.9	0.561	T
45	1	2	6.755	12.1	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	4.409	7.9	0.400	C	48	25	26	6.755	12.1	0.400	C
49	19	20	4.409	7.9	0.400	C							

Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-9.667	17.4	0.762	T
3	5	7	-17.068	30.7	0.770	T	4	7	10	-22.467	40.4	0.770	T
5	10	12	-25.639	46.1	0.762	T	6	12	13	-26.727	48.1	0.394	T
7	13	15	-26.727	48.1	0.394	T	8	15	17	-25.639	46.1	0.762	T
9	17	19	-22.467	40.4	0.770	T	10	19	22	-17.068	30.7	0.770	T
11	22	24	-9.667	17.4	0.762	T	12	24	25	0.000	0.0	0.394	T
13	2	4	4.920	8.8	0.775	C	14	4	6	13.374	24.1	0.762	C
15	6	8	20.045	36.1	0.389	C	16	8	9	20.045	36.1	0.389	C
17	9	11	24.060	43.3	0.762	C	18	11	14	26.179	47.1	0.775	C
19	14	16	26.179	47.1	0.775	C	20	16	18	24.060	43.3	0.762	C
21	18	20	20.045	36.1	0.389	C	22	20	21	20.045	36.1	0.389	C
23	21	23	13.374	24.1	0.762	C	24	23	26	4.920	8.8	0.775	C
25	2	3	-7.011	34.7	0.561	T	26	3	4	6.882	34.1	0.552	C
27	4	5	-5.376	26.6	0.552	T	28	5	6	5.356	26.5	0.552	C
29	6	7	-4.270	21.1	0.558	T	30	7	9	3.473	17.2	0.558	C
31	9	10	-2.310	11.4	0.552	T	32	10	11	2.290	11.3	0.552	C
33	11	12	-0.784	3.9	0.552	T	34	12	14	0.780	3.9	0.561	C
35	14	15	0.780	3.9	0.561	C	36	15	16	-0.784	3.9	0.552	T
37	16	17	2.290	11.3	0.552	C	38	17	18	-2.310	11.4	0.552	T
39	18	19	3.473	17.2	0.558	C	40	19	21	-4.270	21.1	0.558	T
41	21	22	5.356	26.5	0.552	C	42	22	23	-5.376	26.6	0.552	T
43	23	24	6.882	34.1	0.552	C	44	24	26	-7.011	34.7	0.561	T
45	1	2	5.548	10.0	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	0.553	1.0	0.400	C	48	25	26	5.548	10.0	0.400	C
49	19	20	0.553	1.0	0.400	C							

Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.888	10.6	0.762	T
3	5	7	-11.624	20.9	0.770	T	4	7	10	-17.418	31.3	0.770	T

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Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
5	10	12	-23.032	41.4	0.762	T	6	12	13	-28.688	51.6	0.394	T
7	13	15	-28.688	51.6	0.394	T	8	15	17	-23.032	41.4	0.762	T
9	17	19	-17.418	31.3	0.770	T	10	19	22	-11.624	20.9	0.770	T
11	22	24	-5.888	10.6	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	2.999	5.4	0.775	C	14	4	6	8.763	15.8	0.762	C
15	6	8	14.534	26.1	0.389	C	16	8	9	14.534	26.1	0.389	C
17	9	11	20.232	36.4	0.762	C	18	11	14	25.818	46.4	0.775	C
19	14	16	25.818	46.4	0.775	C	20	16	18	20.232	36.4	0.762	C
21	18	20	14.534	26.1	0.389	C	22	20	21	14.534	26.1	0.389	C
23	21	23	8.763	15.8	0.762	C	24	23	26	2.999	5.4	0.775	C
25	2	3	-4.274	21.2	0.561	T	26	3	4	4.189	20.7	0.552	C
27	4	5	-4.168	20.6	0.552	T	28	5	6	4.148	20.5	0.552	C
29	6	7	-4.174	20.7	0.558	T	30	7	9	4.137	20.5	0.558	C
31	9	10	-4.080	20.2	0.552	T	32	10	11	4.060	20.1	0.552	C
33	11	12	-4.040	20.0	0.552	T	34	12	14	4.089	20.2	0.561	C
35	14	15	4.089	20.2	0.561	C	36	15	16	-4.040	20.0	0.552	T
37	16	17	4.060	20.1	0.552	C	38	17	18	-4.080	20.2	0.552	T
39	18	19	4.137	20.5	0.558	C	40	19	21	-4.174	20.7	0.558	T
41	21	22	4.148	20.5	0.552	C	42	22	23	-4.168	20.6	0.552	T
43	23	24	4.189	20.7	0.552	C	44	24	26	-4.274	21.2	0.561	T
45	1	2	3.055	5.5	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	0.009	0.0	0.400	C	48	25	26	3.055	5.5	0.400	C
49	19	20	0.009	0.0	0.400	C							

Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.344	18.6	0.762	T
3	5	7	-20.462	36.8	0.770	T	4	7	10	-25.672	46.2	0.770	T
5	10	12	-25.762	46.3	0.762	T	6	12	13	-25.799	46.4	0.394	T
7	13	15	-25.799	46.4	0.394	T	8	15	17	-25.762	46.3	0.762	T
9	17	19	-25.672	46.2	0.770	T	10	19	22	-20.462	36.8	0.770	T
11	22	24	-10.344	18.6	0.762	T	12	24	25	0.000	0.0	0.394	
13	2	4	5.264	9.5	0.775	C	14	4	6	15.410	27.7	0.762	C
15	6	8	25.608	46.1	0.389	C	16	8	9	25.608	46.1	0.389	C
17	9	11	25.724	46.3	0.762	C	18	11	14	25.785	46.4	0.775	C
19	14	16	25.785	46.4	0.775	C	20	16	18	25.724	46.3	0.762	C
21	18	20	25.608	46.1	0.389	C	22	20	21	25.608	46.1	0.389	C
23	21	23	15.410	27.7	0.762	C	24	23	26	5.264	9.5	0.775	C
25	2	3	-7.502	37.1	0.561	T	26	3	4	7.365	36.5	0.552	C
27	4	5	-7.345	36.4	0.552	T	28	5	6	7.325	36.3	0.552	C
29	6	7	-7.382	36.5	0.558	T	30	7	9	0.092	0.5	0.558	C
31	9	10	-0.075	0.4	0.552	T	32	10	11	0.055	0.3	0.552	C
33	11	12	-0.035	0.2	0.552	T	34	12	14	0.019	0.1	0.561	C
35	14	15	0.019	0.1	0.561	C	36	15	16	-0.035	0.2	0.552	T
37	16	17	0.055	0.3	0.552	C	38	17	18	-0.075	0.4	0.552	T
39	18	19	0.092	0.5	0.558	C	40	19	21	-7.382	36.5	0.558	T
41	21	22	7.325	36.3	0.552	C	42	22	23	-7.345	36.4	0.552	T
43	23	24	7.365	36.5	0.552	C	44	24	26	-7.502	37.1	0.561	T
45	1	2	5.355	9.6	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	5.209	9.4	0.400	C	48	25	26	5.355	9.6	0.400	C

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Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
49	19	20	5.209	9.4	0.400	C							

Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-8.116	14.6	0.762	T
3	5	7	-16.043	28.9	0.770	T	4	7	10	-21.448	38.6	0.770	T
5	10	12	-24.109	43.4	0.762	T	6	12	13	-26.762	48.1	0.394	T
7	13	15	-26.762	48.1	0.394	T	8	15	17	-24.109	43.4	0.762	T
9	17	19	-21.448	38.6	0.770	T	10	19	22	-16.043	28.9	0.770	T
11	22	24	-8.116	14.6	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	4.132	7.4	0.775	C	14	4	6	12.086	21.7	0.762	C
15	6	8	20.071	36.1	0.389	C	16	8	9	20.071	36.1	0.389	C
17	9	11	22.785	41.0	0.762	C	18	11	14	25.419	45.7	0.775	C
19	14	16	25.419	45.7	0.775	C	20	16	18	22.785	41.0	0.762	C
21	18	20	20.071	36.1	0.389	C	22	20	21	20.071	36.1	0.389	C
23	21	23	12.086	21.7	0.762	C	24	23	26	4.132	7.4	0.775	C
25	2	3	-5.888	29.1	0.561	T	26	3	4	5.777	28.6	0.552	C
27	4	5	-5.757	28.5	0.552	T	28	5	6	5.737	28.4	0.552	C
29	6	7	-5.778	28.6	0.558	T	30	7	9	1.975	9.8	0.558	C
31	9	10	-1.939	9.6	0.552	T	32	10	11	1.919	9.5	0.552	C
33	11	12	-1.899	9.4	0.552	T	34	12	14	1.914	9.5	0.561	C
35	14	15	1.914	9.5	0.561	C	36	15	16	-1.899	9.4	0.552	T
37	16	17	1.919	9.5	0.552	C	38	17	18	-1.939	9.6	0.552	T
39	18	19	1.975	9.8	0.558	C	40	19	21	-5.778	28.6	0.558	T
41	21	22	5.737	28.4	0.552	C	42	22	23	-5.757	28.5	0.552	T
43	23	24	5.777	28.6	0.552	C	44	24	26	-5.888	29.1	0.561	T
45	1	2	4.205	7.6	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	2.709	4.9	0.400	C	48	25	26	4.205	7.6	0.400	C
49	19	20	2.709	4.9	0.400	C							

Member Forces (009 : 2.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.639	10.1	0.762	T
3	5	7	-9.959	17.9	0.770	T	4	7	10	-13.110	23.6	0.770	T
5	10	12	-14.961	26.9	0.762	T	6	12	13	-15.598	28.1	0.394	T
7	13	15	-15.598	28.1	0.394	T	8	15	17	-14.961	26.9	0.762	T
9	17	19	-13.110	23.6	0.770	T	10	19	22	-9.959	17.9	0.770	T
11	22	24	-5.639	10.1	0.762	T	12	24	25	0.000	0.0	0.394	
13	2	4	2.872	5.2	0.775	C	14	4	6	7.806	14.0	0.762	C
15	6	8	11.699	21.0	0.389	C	16	8	9	11.699	21.0	0.389	C
17	9	11	14.042	25.3	0.762	C	18	11	14	15.280	27.5	0.775	C
19	14	16	15.280	27.5	0.775	C	20	16	18	14.042	25.3	0.762	C
21	18	20	11.699	21.0	0.389	C	22	20	21	11.699	21.0	0.389	C
23	21	23	7.806	14.0	0.762	C	24	23	26	2.872	5.2	0.775	C
25	2	3	-4.093	20.3	0.561	T	26	3	4	4.011	19.9	0.552	C
27	4	5	-3.142	15.6	0.552	T	28	5	6	3.122	15.5	0.552	C

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Member Forces (009 : 2.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
29	6	7	-2.495	12.4	0.558	T	30	7	9	2.024	10.0	0.558	C
31	9	10	-1.352	6.7	0.552	T	32	10	11	1.332	6.6	0.552	C
33	11	12	-0.463	2.3	0.552	T	34	12	14	0.454	2.2	0.561	C
35	14	15	0.454	2.2	0.561	C	36	15	16	-0.463	2.3	0.552	T
37	16	17	1.332	6.6	0.552	C	38	17	18	-1.352	6.7	0.552	T
39	18	19	2.024	10.0	0.558	C	40	19	21	-2.495	12.4	0.558	T
41	21	22	3.122	15.5	0.552	C	42	22	23	-3.142	15.6	0.552	T
43	23	24	4.011	19.9	0.552	C	44	24	26	-4.093	20.3	0.561	T
45	1	2	3.237	5.8	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	0.320	0.6	0.400	C	48	25	26	3.237	5.8	0.400	C
49	19	20	0.320	0.6	0.400	C							

Member Forces (010 : 2.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.757	6.8	0.762	T
3	5	7	-7.397	13.3	0.770	T	4	7	10	-11.052	19.9	0.770	T
5	10	12	-14.570	26.2	0.762	T	6	12	13	-18.095	32.5	0.394	T
7	13	15	-18.095	32.5	0.394	T	8	15	17	-14.570	26.2	0.762	T
9	17	19	-11.052	19.9	0.770	T	10	19	22	-7.397	13.3	0.770	T
11	22	24	-3.757	6.8	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	1.915	3.4	0.775	C	14	4	6	5.584	10.0	0.762	C
15	6	8	9.237	16.6	0.389	C	16	8	9	9.237	16.6	0.389	C
17	9	11	12.818	23.1	0.762	C	18	11	14	16.308	29.3	0.775	C
19	14	16	16.308	29.3	0.775	C	20	16	18	12.818	23.1	0.762	C
21	18	20	9.237	16.6	0.389	C	22	20	21	9.237	16.6	0.389	C
23	21	23	5.584	10.0	0.762	C	24	23	26	1.915	3.4	0.775	C
25	2	3	-2.730	13.5	0.561	T	26	3	4	2.669	13.2	0.552	C
27	4	5	-2.649	13.1	0.552	T	28	5	6	2.629	13.0	0.552	C
29	6	7	-2.639	13.1	0.558	T	30	7	9	2.603	12.9	0.558	C
31	9	10	-2.561	12.7	0.552	T	32	10	11	2.541	12.6	0.552	C
33	11	12	-2.520	12.5	0.552	T	34	12	14	2.545	12.6	0.561	C
35	14	15	2.545	12.6	0.561	C	36	15	16	-2.520	12.5	0.552	T
37	16	17	2.541	12.6	0.552	C	38	17	18	-2.561	12.7	0.552	T
39	18	19	2.603	12.9	0.558	C	40	19	21	-2.639	13.1	0.558	T
41	21	22	2.629	13.0	0.552	C	42	22	23	-2.649	13.1	0.552	T
43	23	24	2.669	13.2	0.552	C	44	24	26	-2.730	13.5	0.561	T
45	1	2	1.955	3.5	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	0.009	0.0	0.400	C	48	25	26	1.955	3.5	0.400	C
49	19	20	0.009	0.0	0.400	C							

Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-6.469	11.6	0.762	T
3	5	7	-12.777	23.0	0.770	T	4	7	10	-16.042	28.9	0.770	T
5	10	12	-16.132	29.0	0.762	T	6	12	13	-16.169	29.1	0.394	T
7	13	15	-16.169	29.1	0.394	T	8	15	17	-16.132	29.0	0.762	T

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Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
9	17	19	-16.042	28.9	0.770	T	10	19	22	-12.777	23.0	0.770	T
11	22	24	-6.469	11.6	0.762	T	12	24	25	0.000	0.0	0.394	C
13	2	4	3.294	5.9	0.775	C	14	4	6	9.630	17.3	0.762	C
15	6	8	15.978	28.7	0.389	C	16	8	9	15.978	28.7	0.389	C
17	9	11	16.094	28.9	0.762	C	18	11	14	16.155	29.1	0.775	C
19	14	16	16.155	29.1	0.775	C	20	16	18	16.094	28.9	0.762	C
21	18	20	15.978	28.7	0.389	C	22	20	21	15.978	28.7	0.389	C
23	21	23	9.630	17.3	0.762	C	24	23	26	3.294	5.9	0.775	C
25	2	3	-4.695	23.2	0.561	T	26	3	4	4.603	22.8	0.552	C
27	4	5	-4.583	22.7	0.552	T	28	5	6	4.563	22.6	0.552	C
29	6	7	-4.592	22.7	0.558	T	30	7	9	0.092	0.5	0.558	C
31	9	10	-0.075	0.4	0.552	T	32	10	11	0.055	0.3	0.552	C
33	11	12	-0.035	0.2	0.552	T	34	12	14	0.019	0.1	0.561	C
35	14	15	0.019	0.1	0.561	C	36	15	16	-0.035	0.2	0.552	T
37	16	17	0.055	0.3	0.552	C	38	17	18	-0.075	0.4	0.552	T
39	18	19	0.092	0.5	0.558	C	40	19	21	-4.592	22.7	0.558	T
41	21	22	4.563	22.6	0.552	C	42	22	23	-4.583	22.7	0.552	T
43	23	24	4.603	22.8	0.552	C	44	24	26	-4.695	23.2	0.561	T
45	1	2	3.355	6.0	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	3.209	5.8	0.400	C	48	25	26	3.355	6.0	0.400	C
49	19	20	3.209	5.8	0.400	C							

Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.210	9.4	0.762	T
3	5	7	-10.279	18.5	0.770	T	4	7	10	-13.739	24.7	0.770	T
5	10	12	-15.448	27.8	0.762	T	6	12	13	-17.132	30.8	0.394	T
7	13	15	-17.132	30.8	0.394	T	8	15	17	-15.448	27.8	0.762	T
9	17	19	-13.739	24.7	0.770	T	10	19	22	-10.279	18.5	0.770	T
11	22	24	-5.210	9.4	0.762	T	12	24	25	0.000	0.0	0.394	
13	2	4	2.654	4.8	0.775	C	14	4	6	7.751	13.9	0.762	C
15	6	8	12.849	23.1	0.389	C	16	8	9	12.849	23.1	0.389	C
17	9	11	14.600	26.3	0.762	C	18	11	14	16.281	29.3	0.775	C
19	14	16	16.281	29.3	0.775	C	20	16	18	14.600	26.3	0.762	C
21	18	20	12.849	23.1	0.389	C	22	20	21	12.849	23.1	0.389	C
23	21	23	7.751	13.9	0.762	C	24	23	26	2.654	4.8	0.775	C
25	2	3	-3.782	18.7	0.561	T	26	3	4	3.705	18.3	0.552	C
27	4	5	-3.685	18.2	0.552	T	28	5	6	3.665	18.1	0.552	C
29	6	7	-3.686	18.2	0.558	T	30	7	9	1.277	6.3	0.558	C
31	9	10	-1.249	6.2	0.552	T	32	10	11	1.229	6.1	0.552	C
33	11	12	-1.208	6.0	0.552	T	34	12	14	1.212	6.0	0.561	C
35	14	15	1.212	6.0	0.561	C	36	15	16	-1.208	6.0	0.552	T
37	16	17	1.229	6.1	0.552	C	38	17	18	-1.249	6.2	0.552	T
39	18	19	1.277	6.3	0.558	C	40	19	21	-3.686	18.2	0.558	T
41	21	22	3.665	18.1	0.552	C	42	22	23	-3.685	18.2	0.552	T
43	23	24	3.705	18.3	0.552	C	44	24	26	-3.782	18.7	0.561	T
45	1	2	2.705	4.9	0.400	C	46	13	14	-0.009	0.0	0.400	T
47	7	8	1.709	3.1	0.400	C	48	25	26	2.705	4.9	0.400	C
49	19	20	1.709	3.1	0.400	C							

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Support Reactions Serviceability (001 : 1.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	8.635	25	0.000	8.635
Total	0.000	17.271			

Support Reactions Serviceability (002 : 1.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.811	25	0.000	4.811
Total	0.000	9.622			

Support Reactions Serviceability (003 : 1.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	8.561	25	0.000	8.561
Total	0.000	17.122			

Support Reactions Serviceability (004 : 1.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	6.761	25	0.000	6.761
Total	0.000	13.522			

Support Reactions Serviceability (005 : 1.5 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.554	25	0.000	5.554
Total	0.000	11.108			

Support Reactions Serviceability (006 : 1.5 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.061	25	0.000	3.061
Total	0.000	6.122			

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Support Reactions Serviceability (007 : 1.5 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.361	25	0.000	5.361
Total	0.000	10.722			

Support Reactions Serviceability (008 : 1.5 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.211	25	0.000	4.211
Total	0.000	8.422			

Support Reactions Serviceability (009 : 2.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.243	25	0.000	3.243
Total	0.000	6.485			

Support Reactions Serviceability (010 : 2.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.961	25	0.000	1.961
Total	0.000	3.922			

Support Reactions Serviceability (011 : 2.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.361	25	0.000	3.361
Total	0.000	6.722			

Support Reactions Serviceability (012 : 2.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.711	25	0.000	2.711
Total	0.000	5.422			

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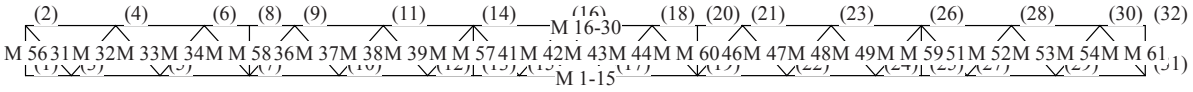

Frame Geometry - (Full Frame) - Front View

Not to Scale

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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group A1	Dead Load
Load Group A2	Dead Load
Load Group A3	Dead Load
Load Group A4	Dead Load
Load Group B1	Dead Load
Load Group B2	Dead Load
Load Group B3	Dead Load
Load Group B4	Dead Load

Load Case 001 : 1.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

Load Case 002 : 1.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L2

Load Case 003 : 1.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L3

Load Case 004 : 1.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L4

Load Case 005 : 1.5 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A1

Load Case 006 : 1.5 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A2

Load Case 007 : 1.5 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A3

Load Case 008 : 1.5 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A4

Load Case 009 : 2.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B1

Load Case 010 : 2.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B2

Load Case 011 : 2.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B3

Load Case 012 : 2.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B4

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The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.000	0.400	0.000
3	0.394	0.000	0.000	4	0.775	0.400	0.000
5	1.156	0.000	0.000	6	1.537	0.400	0.000
7	1.926	0.000	0.000	8	1.926	0.400	0.000
9	2.315	0.400	0.000	10	2.696	0.000	0.000
11	3.077	0.400	0.000	12	3.458	0.000	0.000
13	3.852	0.000	0.000	14	3.852	0.400	0.000
15	4.246	0.000	0.000	16	4.627	0.400	0.000
17	5.008	0.000	0.000	18	5.389	0.400	0.000
19	5.778	0.000	0.000	20	5.778	0.400	0.000
21	6.167	0.400	0.000	22	6.548	0.000	0.000
23	6.929	0.400	0.000	24	7.310	0.000	0.000
25	7.704	0.000	0.000	26	7.704	0.400	0.000
27	8.098	0.000	0.000	28	8.479	0.400	0.000
29	8.860	0.000	0.000	30	9.241	0.400	0.000
31	9.630	0.000	0.000	32	9.630	0.400	0.000

Member Properties

Members 1-30 and 56-61

```
M  ...  ...          48.3 CHS 4.0 []    E 70E6    G 40E6
 A 5.56E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

Members 31-55

```
M  ...  ...          32.8 22 2.6 []    E 70E6    G 40E6
 A 2.02E-4           Ix 2.077E-8         Iy 1.013E-8         J 4.154E-8
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm^2	Density kN/m^3
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 16-30

```
   L1 UDLY -001.300             ( kN/m )
   L2 PY   -007.100 4.627       ( kN,m )
   L3 PY   -004.800 3.077       ( kN,m )
   L3 PY   -004.800 6.167       ( kN,m )
   L4 PY   -003.300 2.315       ( kN,m )
   L4 PY   -003.300 4.627       ( kN,m )
   L4 PY   -003.300 6.929       ( kN,m )
   A1 UDLY -000.800             ( kN/m )
   A2 PY   -004.400 4.627       ( kN,m )
   A3 PY   -003.000 3.077       ( kN,m )
   A3 PY   -003.000 6.167       ( kN,m )
   A4 PY   -002.100 2.315       ( kN,m )
   A4 PY   -002.100 4.627       ( kN,m )
   A4 PY   -002.100 6.929       ( kN,m )
   B1 UDLY -000.500             ( kN/m )
   B2 PY   -002.700 4.627       ( kN,m )
   B3 PY   -001.800 3.077       ( kN,m )
   B3 PY   -001.800 6.167       ( kN,m )
   B4 PY   -001.200 2.315       ( kN,m )
   B4 PY   -001.200 4.627       ( kN,m )
   B4 PY   -001.200 6.929       ( kN,m )
```

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Nodal Loading and Support Conditions

NODES 11, 20 and 28

```
L4 Ls +0000.000 -0000.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 31

```
UT Rs 0 1 0 0 0 0
```

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Nodal Deflections Serviceability (001 : 1.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	6.37	-0.07	6.37
3	0.00	-6.81	6.81	4	6.26	-13.21	14.62
5	0.23	-19.32	19.32	6	5.94	-25.13	25.82
7	0.64	-30.60	30.61	8	5.69	-30.61	31.13
9	5.44	-35.55	35.96	10	1.20	-39.80	39.82
11	4.83	-43.48	43.74	12	1.86	-46.44	46.48
13	2.24	-48.82	48.87	14	4.13	-48.82	48.99
15	2.62	-50.36	50.43	16	3.37	-51.14	51.25
17	3.38	-51.11	51.22	18	2.61	-50.36	50.43
19	4.13	-48.81	48.98	20	2.24	-48.81	48.86
21	1.87	-46.48	46.52	22	4.84	-43.48	43.75
23	1.21	-39.84	39.86	24	5.46	-35.55	35.97
25	5.71	-30.55	31.08	26	0.65	-30.55	30.56
27	5.96	-24.98	25.68	28	0.24	-19.20	19.20
29	6.28	-13.05	14.48	30	0.02	-6.68	6.68
31	6.40	0.00	6.40	32	0.02	0.00	0.02

Nodal Deflections Serviceability (002 : 1.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	5.54	-0.04	5.54
3	0.00	-5.80	5.80	4	5.46	-11.29	12.54
5	0.15	-16.64	16.64	6	5.25	-21.79	22.41
7	0.44	-26.75	26.76	8	5.06	-26.75	27.23
9	4.88	-31.36	31.74	10	0.88	-35.45	35.46
11	4.37	-39.05	39.30	12	1.45	-42.11	42.14
13	1.83	-44.63	44.67	14	3.71	-44.63	44.78
15	2.20	-46.41	46.46	16	2.91	-47.37	47.46
17	3.06	-46.98	47.07	18	2.12	-45.83	45.87
19	3.79	-43.93	44.09	20	1.78	-43.93	43.97
21	1.44	-41.37	41.40	22	4.40	-38.29	38.54
23	0.90	-34.70	34.71	24	4.87	-30.66	31.04
25	5.04	-26.07	26.55	26	0.49	-26.07	26.07
27	5.22	-21.13	21.77	28	0.22	-16.11	16.11
29	5.42	-10.88	12.16	30	0.08	-5.53	5.53
31	5.49	0.00	5.49	32	0.08	0.00	0.08

Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	6.66	-0.05	6.66
3	0.00	-7.02	7.02	4	6.56	-13.65	15.14
5	0.20	-20.09	20.09	6	6.27	-26.25	26.99
7	0.59	-32.17	32.17	8	6.02	-32.17	32.73
9	5.77	-37.60	38.04	10	1.18	-42.35	42.37
11	5.09	-46.46	46.74	12	1.95	-49.47	49.51
13	2.35	-51.81	51.86	14	4.30	-51.81	51.99
15	2.76	-53.35	53.42	16	3.50	-54.08	54.19

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Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
17	3.55	-54.05	54.16	18	2.71	-53.26	53.33
19	4.35	-51.68	51.86	20	2.30	-51.68	51.73
21	1.89	-49.30	49.34	22	5.16	-45.84	46.13
23	1.18	-41.69	41.71	24	5.79	-36.95	37.40
25	6.02	-31.50	32.07	26	0.63	-31.50	31.50
27	6.25	-25.59	26.34	28	0.26	-19.53	19.53
29	6.52	-13.21	14.73	30	0.08	-6.72	6.72
31	6.62	0.00	6.62	32	0.08	0.00	0.08

Nodal Deflections Serviceability (004 : 1.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	6.48	-0.05	6.48
3	0.00	-6.85	6.85	4	6.37	-13.32	14.76
5	0.20	-19.59	19.59	6	6.07	-25.57	26.28
7	0.61	-31.29	31.30	8	5.82	-31.29	31.83
9	5.56	-36.51	36.94	10	1.21	-40.80	40.82
11	4.92	-44.48	44.75	12	1.88	-47.52	47.55
13	2.27	-49.95	50.00	14	4.20	-49.95	50.13
15	2.65	-51.62	51.69	16	3.41	-52.48	52.59
17	3.47	-52.32	52.43	18	2.62	-51.40	51.47
19	4.24	-49.72	49.90	20	2.25	-49.72	49.77
21	1.87	-47.30	47.34	22	4.95	-44.26	44.54
23	1.20	-40.57	40.59	24	5.60	-36.02	36.45
25	5.84	-30.75	31.30	26	0.63	-30.75	30.76
27	6.08	-25.01	25.74	28	0.26	-19.10	19.10
29	6.35	-12.93	14.41	30	0.07	-6.58	6.58
31	6.45	0.00	6.45	32	0.07	0.00	0.07

Nodal Deflections Serviceability (005 : 1.5 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.00	-0.04	4.00
3	0.00	-4.27	4.27	4	3.92	-8.28	9.17
5	0.14	-12.12	12.12	6	3.72	-15.76	16.19
7	0.40	-19.19	19.19	8	3.57	-19.19	19.52
9	3.41	-22.29	22.55	10	0.75	-24.96	24.97
11	3.03	-27.27	27.43	12	1.17	-29.13	29.15
13	1.40	-30.61	30.65	14	2.59	-30.61	30.72
15	1.64	-31.59	31.63	16	2.11	-32.07	32.14
17	2.12	-32.05	32.12	18	1.64	-31.59	31.63
19	2.59	-30.61	30.72	20	1.40	-30.61	30.64
21	1.17	-29.15	29.17	22	3.04	-27.27	27.43
23	0.76	-24.99	25.00	24	3.42	-22.30	22.56
25	3.58	-19.16	19.49	26	0.41	-19.16	19.17
27	3.74	-15.66	16.10	28	0.15	-12.04	12.04
29	3.94	-8.18	9.08	30	0.01	-4.19	4.19
31	4.01	0.00	4.01	32	0.01	0.00	0.01

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Nodal Deflections Serviceability (006 : 1.5 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.51	-0.03	3.51
3	0.00	-3.67	3.67	4	3.46	-7.15	7.94
5	0.09	-10.54	10.54	6	3.32	-13.79	14.19
7	0.28	-16.93	16.94	8	3.20	-16.94	17.24
9	3.08	-19.85	20.08	10	0.56	-22.43	22.44
11	2.76	-24.71	24.86	12	0.92	-26.64	26.65
13	1.16	-28.22	28.25	14	2.35	-28.22	28.32
15	1.39	-29.35	29.38	16	1.84	-29.95	30.00
17	1.93	-29.71	29.77	18	1.34	-28.98	29.01
19	2.40	-27.79	27.89	20	1.13	-27.79	27.81
21	0.91	-26.18	26.19	22	2.78	-24.23	24.39
23	0.57	-21.96	21.97	24	3.08	-19.41	19.65
25	3.19	-16.51	16.81	26	0.31	-16.51	16.51
27	3.30	-13.39	13.79	28	0.14	-10.20	10.20
29	3.43	-6.90	7.70	30	0.05	-3.51	3.51
31	3.48	0.00	3.48	32	0.05	0.00	0.05

Nodal Deflections Serviceability (007 : 1.5 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.23	-0.03	4.23
3	0.00	-4.46	4.46	4	4.17	-8.68	9.63
5	0.13	-12.78	12.78	6	3.98	-16.70	17.17
7	0.37	-20.46	20.46	8	3.83	-20.46	20.81
9	3.67	-23.91	24.19	10	0.75	-26.93	26.94
11	3.24	-29.54	29.71	12	1.24	-31.45	31.48
13	1.50	-32.94	32.97	14	2.74	-32.94	33.05
15	1.75	-33.92	33.97	16	2.23	-34.38	34.45
17	2.26	-34.37	34.44	18	1.72	-33.87	33.91
19	2.77	-32.86	32.98	20	1.46	-32.86	32.89
21	1.20	-31.34	31.37	22	3.28	-29.15	29.33
23	0.75	-26.52	26.53	24	3.68	-23.50	23.79
25	3.83	-20.04	20.40	26	0.40	-20.04	20.04
27	3.98	-16.28	16.76	28	0.17	-12.42	12.43
29	4.15	-8.41	9.37	30	0.05	-4.28	4.28
31	4.21	0.00	4.21	32	0.05	0.00	0.05

Nodal Deflections Serviceability (008 : 1.5 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.19	-0.04	4.19
3	0.00	-4.44	4.44	4	4.12	-8.62	9.56
5	0.13	-12.68	12.68	6	3.93	-16.55	17.01
7	0.39	-20.25	20.26	8	3.76	-20.25	20.60
9	3.60	-23.63	23.90	10	0.78	-26.41	26.42
11	3.19	-28.79	28.96	12	1.22	-30.75	30.78
13	1.47	-32.33	32.36	14	2.72	-32.33	32.44
15	1.72	-33.41	33.46	16	2.21	-33.97	34.04

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Nodal Deflections Serviceability (008 : 1.5 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
17	2.25	-33.86	33.94	18	1.70	-33.27	33.31
19	2.74	-32.18	32.30	20	1.46	-32.18	32.21
21	1.21	-30.62	30.64	22	3.20	-28.65	28.83
23	0.78	-26.26	26.27	24	3.62	-23.32	23.60
25	3.78	-19.91	20.26	26	0.41	-19.91	19.91
27	3.93	-16.19	16.66	28	0.17	-12.37	12.37
29	4.11	-8.37	9.33	30	0.05	-4.26	4.26
31	4.17	0.00	4.17	32	0.05	0.00	0.05

Nodal Deflections Serviceability (009 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.57	-0.03	2.57
3	0.00	-2.75	2.75	4	2.52	-5.33	5.90
5	0.09	-7.79	7.79	6	2.40	-10.14	10.42
7	0.26	-12.34	12.35	8	2.30	-12.35	12.56
9	2.20	-14.34	14.51	10	0.48	-16.06	16.06
11	1.95	-17.54	17.65	12	0.75	-18.74	18.75
13	0.90	-19.69	19.71	14	1.66	-19.69	19.76
15	1.06	-20.32	20.34	16	1.36	-20.63	20.67
17	1.36	-20.62	20.66	18	1.05	-20.32	20.34
19	1.67	-19.69	19.76	20	0.90	-19.69	19.71
21	0.75	-18.75	18.77	22	1.95	-17.54	17.65
23	0.49	-16.07	16.08	24	2.20	-14.34	14.51
25	2.30	-12.33	12.54	26	0.26	-12.33	12.33
27	2.40	-10.08	10.36	28	0.10	-7.75	7.75
29	2.53	-5.26	5.84	30	0.01	-2.69	2.69
31	2.58	0.00	2.58	32	0.01	0.00	0.01

Nodal Deflections Serviceability (010 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.23	-0.02	2.23
3	0.00	-2.33	2.33	4	2.20	-4.54	5.05
5	0.06	-6.69	6.70	6	2.11	-8.76	9.01
7	0.18	-10.75	10.75	8	2.03	-10.75	10.94
9	1.96	-12.60	12.75	10	0.36	-14.23	14.24
11	1.75	-15.67	15.77	12	0.59	-16.89	16.90
13	0.74	-17.90	17.91	14	1.49	-17.89	17.96
15	0.88	-18.60	18.62	16	1.17	-18.98	19.02
17	1.23	-18.83	18.87	18	0.85	-18.38	18.40
19	1.52	-17.63	17.69	20	0.72	-17.63	17.64
21	0.58	-16.61	16.62	22	1.76	-15.38	15.48
23	0.37	-13.95	13.95	24	1.95	-12.33	12.48
25	2.03	-10.49	10.68	26	0.20	-10.49	10.49
27	2.10	-8.51	8.76	28	0.09	-6.49	6.49
29	2.18	-4.39	4.90	30	0.03	-2.23	2.23
31	2.21	0.00	2.21	32	0.03	0.00	0.03

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Nodal Deflections Serviceability (011 : 2.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.62	-0.02	2.62
3	0.00	-2.76	2.76	4	2.58	-5.37	5.96
5	0.08	-7.90	7.90	6	2.46	-10.32	10.61
7	0.23	-12.65	12.65	8	2.37	-12.65	12.87
9	2.27	-14.78	14.95	10	0.46	-16.64	16.65
11	2.00	-18.25	18.36	12	0.77	-19.44	19.45
13	0.92	-20.36	20.38	14	1.69	-20.36	20.43
15	1.08	-20.97	21.00	16	1.38	-21.25	21.30
17	1.39	-21.24	21.29	18	1.07	-20.93	20.96
19	1.71	-20.31	20.38	20	0.91	-20.31	20.33
21	0.75	-19.37	19.39	22	2.03	-18.02	18.13
23	0.46	-16.40	16.40	24	2.28	-14.54	14.71
25	2.37	-12.40	12.62	26	0.25	-12.40	12.40
27	2.46	-10.07	10.37	28	0.10	-7.69	7.69
29	2.57	-5.20	5.80	30	0.03	-2.65	2.65
31	2.60	0.00	2.60	32	0.03	0.00	0.03

Nodal Deflections Serviceability (012 : 2.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.48	-0.02	2.48
3	0.00	-2.62	2.62	4	2.44	-5.10	5.65
5	0.08	-7.50	7.50	6	2.32	-9.79	10.06
7	0.23	-11.97	11.98	8	2.23	-11.97	12.18
9	2.13	-13.97	14.13	10	0.46	-15.61	15.62
11	1.88	-17.02	17.12	12	0.72	-18.18	18.20
13	0.87	-19.11	19.13	14	1.61	-19.11	19.18
15	1.02	-19.75	19.78	16	1.31	-20.08	20.12
17	1.33	-20.02	20.06	18	1.00	-19.67	19.70
19	1.62	-19.03	19.10	20	0.86	-19.03	19.05
21	0.72	-18.10	18.12	22	1.89	-16.94	17.04
23	0.46	-15.53	15.53	24	2.14	-13.79	13.96
25	2.23	-11.78	11.99	26	0.24	-11.78	11.78
27	2.32	-9.58	9.86	28	0.10	-7.32	7.32
29	2.43	-4.96	5.52	30	0.03	-2.52	2.52
31	2.47	0.00	2.47	32	0.03	0.00	0.03

Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-11.497	20.7	0.762	T
3	5	7	-20.846	37.5	0.770	T	4	7	10	-28.381	51.0	0.770	T
5	10	12	-33.793	60.8	0.762	T	6	12	13	-37.308	67.1	0.394	T
7	13	15	-37.308	67.1	0.394	T	8	15	17	-38.797	69.8	0.762	T
9	17	19	-38.305	68.9	0.770	T	10	19	22	-35.794	64.4	0.770	T
11	22	24	-31.365	56.4	0.762	T	12	24	25	-24.872	44.7	0.394	T
13	25	27	-24.872	44.7	0.394	T	14	27	29	-16.353	29.4	0.762	T
15	29	31	-6.021	10.8	0.770	T	16	2	4	5.851	10.5	0.775	C

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Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
17	4	6	16.178	29.1	0.762	C	18	6	8	24.872	44.7	0.389	C
19	8	9	24.872	44.7	0.389	C	20	9	11	31.094	55.9	0.762	C
21	11	14	35.527	63.9	0.775	C	22	14	16	38.071	68.5	0.775	C
23	16	18	38.558	69.3	0.762	C	24	18	20	37.308	67.1	0.389	C
25	20	21	37.308	67.1	0.389	C	26	21	23	33.586	60.4	0.762	C
27	23	26	28.179	50.7	0.775	C	28	26	28	20.547	37.0	0.775	C
29	28	30	11.194	20.1	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-8.337	41.3	0.561	T	32	3	4	8.187	40.5	0.552	C
33	4	5	-6.787	33.6	0.552	T	34	5	6	6.767	33.5	0.552	C
35	6	7	-5.775	28.6	0.558	T	36	7	9	5.033	24.9	0.558	C
37	9	10	-3.934	19.5	0.552	T	38	10	11	3.914	19.4	0.552	C
39	11	12	-2.514	12.4	0.552	T	40	12	14	2.538	12.6	0.561	C
41	14	15	-1.087	5.4	0.561	T	42	15	16	1.053	5.2	0.552	C
43	16	17	0.347	1.7	0.552	C	44	17	18	-0.367	1.8	0.552	T
45	18	19	1.430	7.1	0.558	C	46	19	21	-2.173	10.8	0.558	T
47	21	22	3.200	15.8	0.552	C	48	22	23	-3.220	15.9	0.552	T
49	23	24	4.620	22.9	0.552	C	50	24	26	-4.712	23.3	0.561	T
51	26	27	6.164	30.5	0.561	C	52	27	28	-6.081	30.1	0.552	T
53	28	29	7.480	37.0	0.552	C	54	29	30	-7.500	37.1	0.552	T
55	30	31	8.636	42.8	0.558	C	56	1	2	6.454	11.6	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.515	0.9	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.515	0.9	0.400	C
61	31	32	0.259	0.5	0.400	C							

Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-7.492	13.5	0.762	T
3	5	7	-14.806	26.6	0.770	T	4	7	10	-22.211	39.9	0.770	T
5	10	12	-29.402	52.9	0.762	T	6	12	13	-36.662	65.9	0.394	T
7	13	15	-36.662	65.9	0.394	T	8	15	17	-43.848	78.9	0.762	T
9	17	19	-37.336	67.2	0.770	T	10	19	22	-30.624	55.1	0.770	T
11	22	24	-23.989	43.1	0.762	T	12	24	25	-17.186	30.9	0.394	T
13	25	27	-17.186	30.9	0.394	T	14	27	29	-10.310	18.5	0.762	T
15	29	31	-3.497	6.3	0.770	T	16	2	4	3.815	6.9	0.775	C
17	4	6	11.156	20.1	0.762	C	18	6	8	18.521	33.3	0.389	C
19	8	9	18.521	33.3	0.389	C	20	9	11	25.813	46.4	0.762	C
21	11	14	32.977	59.3	0.775	C	22	14	16	40.321	72.5	0.775	C
23	16	18	40.599	73.0	0.762	C	24	18	20	33.993	61.1	0.389	C
25	20	21	33.993	61.1	0.389	C	26	21	23	27.313	49.1	0.762	C
27	23	26	20.650	37.1	0.775	C	28	26	28	13.696	24.6	0.775	C
29	28	30	6.910	12.4	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-5.436	26.9	0.561	T	32	3	4	5.332	26.4	0.552	C
33	4	5	-5.312	26.3	0.552	T	34	5	6	5.292	26.2	0.552	C
35	6	7	-5.329	26.4	0.558	T	36	7	9	5.292	26.2	0.558	C
37	9	10	-5.223	25.9	0.552	T	38	10	11	5.203	25.8	0.552	C
39	11	12	-5.183	25.7	0.552	T	40	12	14	5.252	26.0	0.561	C
41	14	15	-5.214	25.8	0.561	T	42	15	16	5.114	25.3	0.552	C
43	16	17	4.711	23.3	0.552	C	44	17	18	-4.731	23.4	0.552	T
45	18	19	4.795	23.7	0.558	C	46	19	21	-4.832	23.9	0.558	T
47	21	22	4.800	23.8	0.552	C	48	22	23	-4.820	23.9	0.552	T

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Job Ref : 1440
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Made by : IH
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Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
49	23	24	4.840	24.0	0.552	C	50	24	26	-4.936	24.4	0.561	T
51	26	27	4.973	24.6	0.561	C	52	27	28	-4.909	24.3	0.552	T
53	28	29	4.930	24.4	0.552	C	54	29	30	-4.950	24.5	0.552	T
55	30	31	5.016	24.8	0.558	C	56	1	2	3.883	7.0	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.018	18.0	0.762	T
3	5	7	-19.816	35.6	0.770	T	4	7	10	-29.756	53.5	0.770	T
5	10	12	-39.431	70.9	0.762	T	6	12	13	-39.918	71.8	0.394	T
7	13	15	-39.918	71.8	0.394	T	8	15	17	-40.330	72.5	0.762	T
9	17	19	-40.682	73.2	0.770	T	10	19	22	-40.980	73.7	0.770	T
11	22	24	-32.066	57.7	0.762	T	12	24	25	-22.946	41.3	0.394	T
13	25	27	-22.946	41.3	0.394	T	14	27	29	-13.752	24.7	0.762	T
15	29	31	-4.660	8.4	0.770	T	16	2	4	5.099	9.2	0.775	C
17	4	6	14.924	26.8	0.762	C	18	6	8	24.799	44.6	0.389	C
19	8	9	24.799	44.6	0.389	C	20	9	11	34.601	62.2	0.762	C
21	11	14	39.676	71.4	0.775	C	22	14	16	40.133	72.2	0.775	C
23	16	18	40.513	72.9	0.762	C	24	18	20	40.844	73.5	0.389	C
25	20	21	40.844	73.5	0.389	C	26	21	23	36.530	65.7	0.762	C
27	23	26	27.588	49.6	0.775	C	28	26	28	18.278	32.9	0.775	C
29	28	30	9.213	16.6	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-7.266	36.0	0.561	T	32	3	4	7.133	35.3	0.552	C
33	4	5	-7.113	35.2	0.552	T	34	5	6	7.093	35.1	0.552	C
35	6	7	-7.148	35.4	0.558	T	36	7	9	7.111	35.2	0.558	C
37	9	10	-7.024	34.8	0.552	T	38	10	11	7.004	34.7	0.552	C
39	11	12	-0.355	1.8	0.552	T	40	12	14	0.344	1.7	0.561	C
41	14	15	-0.307	1.5	0.561	T	42	15	16	0.286	1.4	0.552	C
43	16	17	-0.266	1.3	0.552	T	44	17	18	0.246	1.2	0.552	C
45	18	19	-0.232	1.1	0.558	T	46	19	21	0.195	1.0	0.558	C
47	21	22	6.452	31.9	0.552	C	48	22	23	-6.472	32.0	0.552	T
49	23	24	6.492	32.1	0.552	C	50	24	26	-6.615	32.7	0.561	T
51	26	27	6.652	32.9	0.561	C	52	27	28	-6.561	32.5	0.552	T
53	28	29	6.582	32.6	0.552	C	54	29	30	-6.602	32.7	0.552	T
55	30	31	6.684	33.1	0.558	C	56	1	2	5.187	9.3	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-10.317	18.6	0.762	T
3	5	7	-20.409	36.7	0.770	T	4	7	10	-30.649	55.1	0.770	T

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Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
5	10	12	-34.332	61.7	0.762	T	6	12	13	-38.023	68.4	0.394	T
7	13	15	-38.023	68.4	0.394	T	8	15	17	-41.641	74.9	0.762	T
9	17	19	-38.858	69.9	0.770	T	10	19	22	-35.955	64.7	0.770	T
11	22	24	-33.050	59.4	0.762	T	12	24	25	-23.648	42.5	0.394	T
13	25	27	-23.648	42.5	0.394	T	14	27	29	-14.172	25.5	0.762	T
15	29	31	-4.802	8.6	0.770	T	16	2	4	5.251	9.4	0.775	C
17	4	6	15.370	27.6	0.762	C	18	6	8	25.542	45.9	0.389	C
19	8	9	25.542	45.9	0.389	C	20	9	11	32.498	58.4	0.762	C
21	11	14	36.152	65.0	0.775	C	22	14	16	39.868	71.7	0.775	C
23	16	18	40.256	72.4	0.762	C	24	18	20	37.419	67.3	0.389	C
25	20	21	37.419	67.3	0.389	C	26	21	23	34.509	62.1	0.762	C
27	23	26	28.433	51.1	0.775	C	28	26	28	18.836	33.9	0.775	C
29	28	30	9.494	17.1	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-7.483	37.0	0.561	T	32	3	4	7.346	36.4	0.552	C
33	4	5	-7.326	36.3	0.552	T	34	5	6	7.306	36.2	0.552	C
35	6	7	-7.363	36.4	0.558	T	36	7	9	7.326	36.3	0.558	C
37	9	10	-2.680	13.3	0.552	T	38	10	11	2.660	13.2	0.552	C
39	11	12	-2.639	13.1	0.552	T	40	12	14	2.666	13.2	0.561	C
41	14	15	-2.629	13.0	0.561	T	42	15	16	2.570	12.7	0.552	C
43	16	17	2.007	9.9	0.552	C	44	17	18	-2.027	10.0	0.552	T
45	18	19	2.064	10.2	0.558	C	46	19	21	-2.101	10.4	0.558	T
47	21	22	2.096	10.4	0.552	C	48	22	23	-2.116	10.5	0.552	T
49	23	24	6.694	33.1	0.552	C	50	24	26	-6.820	33.8	0.561	T
51	26	27	6.857	33.9	0.561	C	52	27	28	-6.763	33.5	0.552	T
53	28	29	6.783	33.6	0.552	C	54	29	30	-6.803	33.7	0.552	T
55	30	31	6.887	34.1	0.558	C	56	1	2	5.341	9.6	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-7.208	13.0	0.762	T
3	5	7	-13.071	23.5	0.770	T	4	7	10	-17.797	32.0	0.770	T
5	10	12	-21.191	38.1	0.762	T	6	12	13	-23.398	42.1	0.394	T
7	13	15	-23.398	42.1	0.394	T	8	15	17	-24.329	43.8	0.762	T
9	17	19	-24.021	43.2	0.770	T	10	19	22	-22.446	40.4	0.770	T
11	22	24	-19.668	35.4	0.762	T	12	24	25	-15.598	28.1	0.394	T
13	25	27	-15.598	28.1	0.394	T	14	27	29	-10.253	18.4	0.762	T
15	29	31	-3.774	6.8	0.770	T	16	2	4	3.670	6.6	0.775	C
17	4	6	10.147	18.2	0.762	C	18	6	8	15.598	28.1	0.389	C
19	8	9	15.598	28.1	0.389	C	20	9	11	19.501	35.1	0.762	C
21	11	14	22.281	40.1	0.775	C	22	14	16	23.877	42.9	0.775	C
23	16	18	24.182	43.5	0.762	C	24	18	20	23.398	42.1	0.389	C
25	20	21	23.398	42.1	0.389	C	26	21	23	21.064	37.9	0.762	C
27	23	26	17.673	31.8	0.775	C	28	26	28	12.887	23.2	0.775	C
29	28	30	7.021	12.6	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-5.230	25.9	0.561	T	32	3	4	5.130	25.4	0.552	C
33	4	5	-4.261	21.1	0.552	T	34	5	6	4.241	21.0	0.552	C
35	6	7	-3.625	17.9	0.558	T	36	7	9	3.154	15.6	0.558	C

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Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
37	9	10	-2.470	12.2	0.552	T	38	10	11	2.450	12.1	0.552	C
39	11	12	-1.581	7.8	0.552	T	40	12	14	1.591	7.9	0.561	C
41	14	15	-0.683	3.4	0.561	T	42	15	16	0.656	3.2	0.552	C
43	16	17	0.213	1.1	0.552	C	44	17	18	-0.233	1.2	0.552	T
45	18	19	0.894	4.4	0.558	C	46	19	21	-1.365	6.8	0.558	T
47	21	22	2.004	9.9	0.552	C	48	22	23	-2.024	10.0	0.552	T
49	23	24	2.893	14.3	0.552	C	50	24	26	-2.957	14.6	0.561	T
51	26	27	3.864	19.1	0.561	C	52	27	28	-3.818	18.9	0.552	T
53	28	29	4.687	23.2	0.552	C	54	29	30	-4.707	23.3	0.552	T
55	30	31	5.413	26.8	0.558	C	56	1	2	4.046	7.3	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.320	0.6	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.320	0.6	0.400	C
61	31	32	0.162	0.3	0.400	C							

Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-4.775	8.6	0.762	T
3	5	7	-9.416	16.9	0.770	T	4	7	10	-14.093	25.3	0.770	T
5	10	12	-18.612	33.5	0.762	T	6	12	13	-23.154	41.6	0.394	T
7	13	15	-23.154	41.6	0.394	T	8	15	17	-27.622	49.7	0.762	T
9	17	19	-23.581	42.4	0.770	T	10	19	22	-19.392	34.9	0.770	T
11	22	24	-15.229	27.4	0.762	T	12	24	25	-10.940	19.7	0.394	T
13	25	27	-10.940	19.7	0.394	T	14	27	29	-6.577	11.8	0.762	T
15	29	31	-2.235	4.0	0.770	T	16	2	4	2.433	4.4	0.775	C
17	4	6	7.102	12.8	0.762	C	18	6	8	11.767	21.2	0.389	C
19	8	9	11.767	21.2	0.389	C	20	9	11	16.359	29.4	0.762	C
21	11	14	20.850	37.5	0.775	C	22	14	16	25.431	45.7	0.775	C
23	16	18	25.609	46.1	0.762	C	24	18	20	21.500	38.7	0.389	C
25	20	21	21.500	38.7	0.389	C	26	21	23	17.317	31.1	0.762	C
27	23	26	13.126	23.6	0.775	C	28	26	28	8.728	15.7	0.775	C
29	28	30	4.413	7.9	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-3.467	17.2	0.561	T	32	3	4	3.395	16.8	0.552	C
33	4	5	-3.375	16.7	0.552	T	34	5	6	3.355	16.6	0.552	C
35	6	7	-3.372	16.7	0.558	T	36	7	9	3.335	16.5	0.558	C
37	9	10	-3.286	16.3	0.552	T	38	10	11	3.266	16.2	0.552	C
39	11	12	-3.246	16.1	0.552	T	40	12	14	3.283	16.3	0.561	C
41	14	15	-3.245	16.1	0.561	T	42	15	16	3.177	15.7	0.552	C
43	16	17	2.920	14.5	0.552	C	44	17	18	-2.940	14.6	0.552	T
45	18	19	2.986	14.8	0.558	C	46	19	21	-3.022	15.0	0.558	T
47	21	22	3.009	14.9	0.552	C	48	22	23	-3.029	15.0	0.552	T
49	23	24	3.049	15.1	0.552	C	50	24	26	-3.115	15.4	0.561	T
51	26	27	3.152	15.6	0.561	C	52	27	28	-3.118	15.4	0.552	T
53	28	29	3.138	15.5	0.552	C	54	29	30	-3.158	15.6	0.552	T
55	30	31	3.206	15.9	0.558	C	56	1	2	2.480	4.5	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

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Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-6.391	11.5	0.762	T
3	5	7	-12.622	22.7	0.770	T	4	7	10	-18.921	34.0	0.770	T
5	10	12	-25.030	45.0	0.762	T	6	12	13	-25.376	45.6	0.394	T
7	13	15	-25.376	45.6	0.394	T	8	15	17	-25.649	46.1	0.762	T
9	17	19	-25.864	46.5	0.770	T	10	19	22	-26.021	46.8	0.770	T
11	22	24	-20.399	36.7	0.762	T	12	24	25	-14.627	26.3	0.394	T
13	25	27	-14.627	26.3	0.394	T	14	27	29	-8.781	15.8	0.762	T
15	29	31	-2.980	5.4	0.770	T	16	2	4	3.255	5.9	0.775	C
17	4	6	9.513	17.1	0.762	C	18	6	8	15.785	28.4	0.389	C
19	8	9	15.785	28.4	0.389	C	20	9	11	21.983	39.5	0.762	C
21	11	14	25.206	45.3	0.775	C	22	14	16	25.521	45.9	0.775	C
23	16	18	25.763	46.3	0.762	C	24	18	20	25.955	46.7	0.389	C
25	20	21	25.955	46.7	0.389	C	26	21	23	23.217	41.8	0.762	C
27	23	26	17.567	31.6	0.775	C	28	26	28	11.660	21.0	0.775	C
29	28	30	5.887	10.6	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-4.638	23.0	0.561	T	32	3	4	4.547	22.5	0.552	C
33	4	5	-4.527	22.4	0.552	T	34	5	6	4.507	22.3	0.552	C
35	6	7	-4.536	22.5	0.558	T	36	7	9	4.499	22.3	0.558	C
37	9	10	-4.438	22.0	0.552	T	38	10	11	4.418	21.9	0.552	C
39	11	12	-0.255	1.3	0.552	T	40	12	14	0.243	1.2	0.561	C
41	14	15	-0.206	1.0	0.561	T	42	15	16	0.186	0.9	0.552	C
43	16	17	-0.166	0.8	0.552	T	44	17	18	0.146	0.7	0.552	C
45	18	19	-0.131	0.6	0.558	T	46	19	21	0.094	0.5	0.558	C
47	21	22	4.066	20.1	0.552	C	48	22	23	-4.086	20.2	0.552	T
49	23	24	4.106	20.3	0.552	C	50	24	26	-4.190	20.7	0.561	T
51	26	27	4.227	20.9	0.561	C	52	27	28	-4.175	20.7	0.552	T
53	28	29	4.195	20.8	0.552	C	54	29	30	-4.215	20.9	0.552	T
55	30	31	4.274	21.2	0.558	C	56	1	2	3.315	6.0	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-6.691	12.0	0.762	T
3	5	7	-13.217	23.8	0.770	T	4	7	10	-19.818	35.6	0.770	T
5	10	12	-22.221	40.0	0.762	T	6	12	13	-24.611	44.3	0.394	T
7	13	15	-24.611	44.3	0.394	T	8	15	17	-26.928	48.4	0.762	T
9	17	19	-25.152	45.2	0.770	T	10	19	22	-23.277	41.9	0.770	T
11	22	24	-21.378	38.5	0.762	T	12	24	25	-15.325	27.6	0.394	T
13	25	27	-15.325	27.6	0.394	T	14	27	29	-9.198	16.5	0.762	T
15	29	31	-3.121	5.6	0.770	T	16	2	4	3.407	6.1	0.775	C
17	4	6	9.961	17.9	0.762	C	18	6	8	16.531	29.7	0.389	C
19	8	9	16.531	29.7	0.389	C	20	9	11	21.026	37.8	0.762	C
21	11	14	23.402	42.1	0.775	C	22	14	16	25.795	46.4	0.775	C
23	16	18	26.047	46.8	0.762	C	24	18	20	24.227	43.6	0.389	C
25	20	21	24.227	43.6	0.389	C	26	21	23	22.334	40.2	0.762	C
27	23	26	18.408	33.1	0.775	C	28	26	28	12.216	22.0	0.775	C
29	28	30	6.166	11.1	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-4.856	24.0	0.561	T	32	3	4	4.761	23.6	0.552	C

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Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
33	4	5	-4.741	23.5	0.552	T	34	5	6	4.721	23.4	0.552	C
35	6	7	-4.752	23.5	0.558	T	36	7	9	4.715	23.3	0.558	C
37	9	10	-1.752	8.7	0.552	T	38	10	11	1.732	8.6	0.552	C
39	11	12	-1.712	8.5	0.552	T	40	12	14	1.724	8.5	0.561	C
41	14	15	-1.686	8.3	0.561	T	42	15	16	1.643	8.1	0.552	C
43	16	17	1.277	6.3	0.552	C	44	17	18	-1.297	6.4	0.552	T
45	18	19	1.327	6.6	0.558	C	46	19	21	-1.364	6.8	0.558	T
47	21	22	1.366	6.8	0.552	C	48	22	23	-1.386	6.9	0.552	T
49	23	24	4.306	21.3	0.552	C	50	24	26	-4.393	21.7	0.561	T
51	26	27	4.431	21.9	0.561	C	52	27	28	-4.376	21.7	0.552	T
53	28	29	4.396	21.8	0.552	C	54	29	30	-4.416	21.9	0.552	T
55	30	31	4.476	22.2	0.558	C	56	1	2	3.470	6.2	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (009 : 2.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-4.635	8.3	0.762	T
3	5	7	-8.407	15.1	0.770	T	4	7	10	-11.447	20.6	0.770	T
5	10	12	-13.630	24.5	0.762	T	6	12	13	-15.051	27.1	0.394	T
7	13	15	-15.051	27.1	0.394	T	8	15	17	-15.648	28.1	0.762	T
9	17	19	-15.451	27.8	0.770	T	10	19	22	-14.437	26.0	0.770	T
11	22	24	-12.650	22.8	0.762	T	12	24	25	-10.034	18.0	0.394	T
13	25	27	-10.034	18.0	0.394	T	14	27	29	-6.594	11.9	0.762	T
15	29	31	-2.426	4.4	0.770	T	16	2	4	2.362	4.2	0.775	C
17	4	6	6.528	11.7	0.762	C	18	6	8	10.034	18.0	0.389	C
19	8	9	10.034	18.0	0.389	C	20	9	11	12.545	22.6	0.762	C
21	11	14	14.334	25.8	0.775	C	22	14	16	15.361	27.6	0.775	C
23	16	18	15.556	28.0	0.762	C	24	18	20	15.051	27.1	0.389	C
25	20	21	15.051	27.1	0.389	C	26	21	23	13.551	24.4	0.762	C
27	23	26	11.370	20.4	0.775	C	28	26	28	8.291	14.9	0.775	C
29	28	30	4.517	8.1	0.762	C	30	30	32	0.000	0.0	0.389	C
31	2	3	-3.366	16.7	0.561	T	32	3	4	3.295	16.3	0.552	C
33	4	5	-2.745	13.6	0.552	T	34	5	6	2.725	13.5	0.552	C
35	6	7	-2.334	11.6	0.558	T	36	7	9	2.026	10.0	0.558	C
37	9	10	-1.592	7.9	0.552	T	38	10	11	1.572	7.8	0.552	C
39	11	12	-1.022	5.1	0.552	T	40	12	14	1.022	5.1	0.561	C
41	14	15	-0.441	2.2	0.561	T	42	15	16	0.417	2.1	0.552	C
43	16	17	0.133	0.7	0.552	C	44	17	18	-0.153	0.8	0.552	T
45	18	19	0.573	2.8	0.558	C	46	19	21	-0.881	4.4	0.558	T
47	21	22	1.286	6.4	0.552	C	48	22	23	-1.306	6.5	0.552	T
49	23	24	1.856	9.2	0.552	C	50	24	26	-1.903	9.4	0.561	T
51	26	27	2.484	12.3	0.561	C	52	27	28	-2.461	12.2	0.552	T
53	28	29	3.011	14.9	0.552	C	54	29	30	-3.031	15.0	0.552	T
55	30	31	3.480	17.2	0.558	C	56	1	2	2.602	4.7	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.203	0.4	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.203	0.4	0.400	C
61	31	32	0.103	0.2	0.400	C							

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Member Forces (010 : 2.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.063	5.5	0.762	T
3	5	7	-6.022	10.8	0.770	T	4	7	10	-8.981	16.2	0.770	T
5	10	12	-11.818	21.3	0.762	T	6	12	13	-14.649	26.3	0.394	T
7	13	15	-14.649	26.3	0.394	T	8	15	17	-17.406	31.3	0.762	T
9	17	19	-14.921	26.8	0.770	T	10	19	22	-12.321	22.2	0.770	T
11	22	24	-9.713	17.5	0.762	T	12	24	25	-7.007	12.6	0.394	T
13	25	27	-7.007	12.6	0.394	T	14	27	29	-4.227	7.6	0.762	T
15	29	31	-1.441	2.6	0.770	T	16	2	4	1.563	2.8	0.775	C
17	4	6	4.550	8.2	0.762	C	18	6	8	7.515	13.5	0.389	C
19	8	9	7.515	13.5	0.389	C	20	9	11	10.406	18.7	0.762	C
21	11	14	13.215	23.8	0.775	C	22	14	16	16.056	28.9	0.775	C
23	16	18	16.170	29.1	0.762	C	24	18	20	13.634	24.5	0.389	C
25	20	21	13.634	24.5	0.389	C	26	21	23	11.024	19.8	0.762	C
27	23	26	8.388	15.1	0.775	C	28	26	28	5.599	10.1	0.775	C
29	28	30	2.841	5.1	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-2.227	11.0	0.561	T	32	3	4	2.175	10.8	0.552	C
33	4	5	-2.155	10.7	0.552	T	34	5	6	2.135	10.6	0.552	C
35	6	7	-2.140	10.6	0.558	T	36	7	9	2.103	10.4	0.558	C
37	9	10	-2.066	10.2	0.552	T	38	10	11	2.046	10.1	0.552	C
39	11	12	-2.026	10.0	0.552	T	40	12	14	2.043	10.1	0.561	C
41	14	15	-2.006	9.9	0.561	T	42	15	16	1.957	9.7	0.552	C
43	16	17	1.792	8.9	0.552	C	44	17	18	-1.812	9.0	0.552	T
45	18	19	1.846	9.1	0.558	C	46	19	21	-1.883	9.3	0.558	T
47	21	22	1.881	9.3	0.552	C	48	22	23	-1.901	9.4	0.552	T
49	23	24	1.921	9.5	0.552	C	50	24	26	-1.969	9.7	0.561	T
51	26	27	2.006	9.9	0.561	C	52	27	28	-1.990	9.9	0.552	T
53	28	29	2.010	9.9	0.552	C	54	29	30	-2.030	10.0	0.552	T
55	30	31	2.067	10.2	0.558	C	56	1	2	1.597	2.9	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.973	7.1	0.762	T
3	5	7	-7.826	14.1	0.770	T	4	7	10	-11.698	21.0	0.770	T
5	10	12	-15.429	27.7	0.762	T	6	12	13	-15.682	28.2	0.394	T
7	13	15	-15.682	28.2	0.394	T	8	15	17	-15.861	28.5	0.762	T
9	17	19	-15.985	28.7	0.770	T	10	19	22	-16.048	28.9	0.770	T
11	22	24	-12.620	22.7	0.762	T	12	24	25	-9.080	16.3	0.394	T
13	25	27	-9.080	16.3	0.394	T	14	27	29	-5.466	9.8	0.762	T
15	29	31	-1.859	3.3	0.770	T	16	2	4	2.025	3.6	0.775	C
17	4	6	5.906	10.6	0.762	C	18	6	8	9.775	17.6	0.389	C
19	8	9	9.775	17.6	0.389	C	20	9	11	13.570	24.4	0.762	C
21	11	14	15.559	28.0	0.775	C	22	14	16	15.779	28.4	0.775	C
23	16	18	15.930	28.7	0.762	C	24	18	20	16.030	28.8	0.389	C
25	20	21	16.030	28.8	0.389	C	26	21	23	14.341	25.8	0.762	C
27	23	26	10.886	19.6	0.775	C	28	26	28	7.248	13.0	0.775	C
29	28	30	3.670	6.6	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-2.886	14.3	0.561	T	32	3	4	2.824	14.0	0.552	C

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Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
33	4	5	-2.804	13.9	0.552	T	34	5	6	2.783	13.8	0.552	C
35	6	7	-2.795	13.8	0.558	T	36	7	9	2.758	13.7	0.558	C
37	9	10	-2.715	13.4	0.552	T	38	10	11	2.695	13.3	0.552	C
39	11	12	-0.189	0.9	0.552	T	40	12	14	0.175	0.9	0.561	C
41	14	15	-0.138	0.7	0.561	T	42	15	16	0.120	0.6	0.552	C
43	16	17	-0.100	0.5	0.552	T	44	17	18	0.079	0.4	0.552	C
45	18	19	-0.064	0.3	0.558	T	46	19	21	0.027	0.1	0.558	C
47	21	22	2.475	12.3	0.552	C	48	22	23	-2.495	12.4	0.552	T
49	23	24	2.515	12.5	0.552	C	50	24	26	-2.573	12.7	0.561	T
51	26	27	2.610	12.9	0.561	C	52	27	28	-2.584	12.8	0.552	T
53	28	29	2.604	12.9	0.552	C	54	29	30	-2.625	13.0	0.552	T
55	30	31	2.667	13.2	0.558	C	56	1	2	2.067	3.7	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.972	7.1	0.762	T
3	5	7	-7.824	14.1	0.770	T	4	7	10	-11.694	21.0	0.770	T
5	10	12	-13.138	23.6	0.762	T	6	12	13	-14.553	26.2	0.394	T
7	13	15	-14.553	26.2	0.394	T	8	15	17	-15.893	28.6	0.762	T
9	17	19	-14.872	26.7	0.770	T	10	19	22	-13.768	24.8	0.770	T
11	22	24	-12.625	22.7	0.762	T	12	24	25	-9.083	16.3	0.394	T
13	25	27	-9.083	16.3	0.394	T	14	27	29	-5.468	9.8	0.762	T
15	29	31	-1.860	3.3	0.770	T	16	2	4	2.025	3.6	0.775	C
17	4	6	5.905	10.6	0.762	C	18	6	8	9.772	17.6	0.389	C
19	8	9	9.772	17.6	0.389	C	20	9	11	12.423	22.3	0.762	C
21	11	14	13.839	24.9	0.775	C	22	14	16	15.240	27.4	0.775	C
23	16	18	15.390	27.7	0.762	C	24	18	20	14.333	25.8	0.389	C
25	20	21	14.333	25.8	0.389	C	26	21	23	13.203	23.7	0.762	C
27	23	26	10.889	19.6	0.775	C	28	26	28	7.251	13.0	0.775	C
29	28	30	3.671	6.6	0.762	C	30	30	32	0.000	0.0	0.389	T
31	2	3	-2.885	14.3	0.561	T	32	3	4	2.823	14.0	0.552	C
33	4	5	-2.803	13.9	0.552	T	34	5	6	2.783	13.8	0.552	C
35	6	7	-2.794	13.8	0.558	T	36	7	9	2.757	13.7	0.558	C
37	9	10	-1.057	5.2	0.552	T	38	10	11	1.037	5.1	0.552	C
39	11	12	-1.016	5.0	0.552	T	40	12	14	1.017	5.0	0.561	C
41	14	15	-0.979	4.8	0.561	T	42	15	16	0.947	4.7	0.552	C
43	16	17	0.730	3.6	0.552	C	44	17	18	-0.750	3.7	0.552	T
45	18	19	0.774	3.8	0.558	C	46	19	21	-0.811	4.0	0.558	T
47	21	22	0.819	4.1	0.552	C	48	22	23	-0.839	4.2	0.552	T
49	23	24	2.516	12.5	0.552	C	50	24	26	-2.574	12.7	0.561	T
51	26	27	2.611	12.9	0.561	C	52	27	28	-2.585	12.8	0.552	T
53	28	29	2.605	12.9	0.552	C	54	29	30	-2.625	13.0	0.552	T
55	30	31	2.668	13.2	0.558	C	56	1	2	2.066	3.7	0.400	C
57	13	14	-0.009	0.0	0.400	T	58	7	8	0.009	0.0	0.400	C
59	25	26	-0.009	0.0	0.400	T	60	19	20	0.009	0.0	0.400	C
61	31	32	0.006	0.0	0.400	C							

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Support Reactions Serviceability (001 : 1.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	6.460	31	0.000	6.460
Total	0.000	12.920			

Support Reactions Serviceability (002 : 1.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.889	31	0.000	3.612
Total	0.000	7.501			

Support Reactions Serviceability (003 : 1.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.193	31	0.000	4.808
Total	0.000	10.001			

Support Reactions Serviceability (004 : 1.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.347	31	0.000	4.954
Total	0.000	10.301			

Support Reactions Serviceability (005 : 1.5 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.052	31	0.000	4.052
Total	0.000	8.105			

Support Reactions Serviceability (006 : 1.5 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.486	31	0.000	2.315
Total	0.000	4.801			

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Support Reactions Serviceability (007 : 1.5 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.321	31	0.000	3.080
Total	0.000	6.401			

Support Reactions Serviceability (008 : 1.5 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.476	31	0.000	3.225
Total	0.000	6.701			

Support Reactions Serviceability (009 : 2.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.608	31	0.000	2.608
Total	0.000	5.216			

Support Reactions Serviceability (010 : 2.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.603	31	0.000	1.498
Total	0.000	3.101			

Support Reactions Serviceability (011 : 2.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.073	31	0.000	1.928
Total	0.000	4.001			

Support Reactions Serviceability (012 : 2.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.072	31	0.000	1.929
Total	0.000	4.001			

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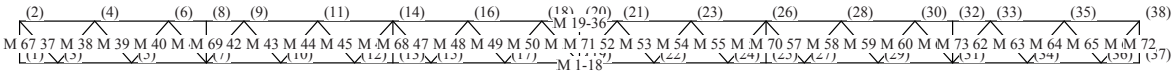

Frame Geometry - (Full Frame) - Front View

Not to Scale

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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group A1	Dead Load
Load Group A2	Dead Load
Load Group A3	Dead Load
Load Group A4	Dead Load
Load Group B1	Dead Load
Load Group B2	Dead Load
Load Group B3	Dead Load
Load Group B4	Dead Load

Load Case 001 : 1.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

Load Case 002 : 1.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L2

Load Case 003 : 1.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L3

Load Case 004 : 1.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L4

Load Case 005 : 1.5 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A1

Load Case 006 : 1.5 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A2

Load Case 007 : 1.5 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A3

Load Case 008 : 1.5 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 A4

Load Case 009 : 2.0 UDL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B1

Load Case 010 : 2.0 CPL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B2

Load Case 011 : 2.0 2PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B3

Load Case 012 : 2.0 3PL
Load Combination + 1.00 UT + 1.00 D1 + 1.00 B4

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The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.000	0.400	0.000
3	0.394	0.000	0.000	4	0.775	0.400	0.000
5	1.156	0.000	0.000	6	1.537	0.400	0.000
7	1.926	0.000	0.000	8	1.926	0.400	0.000
9	2.315	0.400	0.000	10	2.696	0.000	0.000
11	3.077	0.400	0.000	12	3.458	0.000	0.000
13	3.852	0.000	0.000	14	3.852	0.400	0.000
15	4.246	0.000	0.000	16	4.627	0.400	0.000
17	5.008	0.000	0.000	18	5.389	0.400	0.000
19	5.778	0.000	0.000	20	5.778	0.400	0.000
21	6.167	0.400	0.000	22	6.548	0.000	0.000
23	6.929	0.400	0.000	24	7.310	0.000	0.000
25	7.704	0.000	0.000	26	7.704	0.400	0.000
27	8.098	0.000	0.000	28	8.479	0.400	0.000
29	8.860	0.000	0.000	30	9.241	0.400	0.000
31	9.630	0.000	0.000	32	9.630	0.400	0.000
33	10.019	0.400	0.000	34	10.400	0.000	0.000
35	10.781	0.400	0.000	36	11.162	0.000	0.000
37	11.556	0.000	0.000	38	11.556	0.400	0.000

Member Properties

Members 1-36 and 67-73

```
M  ...  ...          48.3 CHS 4.0 []    E 70E6    G 40E6
 A 5.56E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

Members 37-66

```
M  ...  ...          32.8 22 2.6 []    E 70E6    G 40E6
 A 2.02E-4           Ix 2.077E-8         Iy 1.013E-8         J 4.154E-8
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm^2	Density kN/m^3
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 19-36

```
   L1 UDLY -000.900             ( kN/m )
   L2 PY   -005.400 5.778       ( kN,m )
   L3 PY   -004.100 3.852       ( kN,m )
   L3 PY   -004.100 7.704       ( kN,m )
   L4 PY   -002.600 3.077       ( kN,m )
   L4 PY   -002.600 5.778       ( kN,m )
   L4 PY   -002.600 8.479       ( kN,m )
   A1 UDLY -000.500             ( kN/m )
   A2 PY   -003.400 5.778       ( kN,m )
   A3 PY   -002.500 3.852       ( kN,m )
   A3 PY   -002.500 7.704       ( kN,m )
   A4 PY   -001.600 3.077       ( kN,m )
   A4 PY   -001.600 5.778       ( kN,m )
   A4 PY   -001.600 8.479       ( kN,m )
   B1 UDLY -000.300             ( kN/m )
   B2 PY   -002.000 5.778       ( kN,m )
   B3 PY   -001.500 3.852       ( kN,m )
   B3 PY   -001.500 7.704       ( kN,m )
   B4 PY   -000.900 3.077       ( kN,m )
   B4 PY   -000.900 5.778       ( kN,m )
```

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```
      B4 PY   -000.900 8.479       ( kN,m )
```

Nodal Loading and Support Conditions

NODES 11, 20 and 28

```
       L4 Ls +0000.000 -0000.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
       UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 37

```
       UT Rs 0 1 0 0 0 0
```

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Nodal Deflections Serviceability (001 : 1.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	7.74	-0.06	7.74
3	0.00	-8.08	8.08	4	7.64	-15.74	17.50
5	0.19	-23.16	23.16	6	7.37	-30.32	31.20
7	0.55	-37.25	37.25	8	7.15	-37.25	37.93
9	6.93	-43.72	44.27	10	1.05	-49.54	49.55
11	6.39	-54.84	55.21	12	1.65	-59.52	59.54
13	2.00	-63.71	63.75	14	5.74	-63.71	63.97
15	2.36	-67.16	67.20	16	5.01	-69.79	69.97
17	3.09	-71.67	71.74	18	4.26	-72.84	72.96
19	3.87	-73.23	73.34	20	3.87	-73.24	73.34
21	3.47	-72.84	72.92	22	4.64	-71.67	71.82
23	2.72	-69.79	69.85	24	5.38	-67.16	67.37
25	5.73	-63.71	63.97	26	2.00	-63.71	63.75
27	6.09	-59.52	59.83	28	1.35	-54.84	54.86
29	6.69	-49.54	49.99	30	0.80	-43.72	43.73
31	7.18	-37.25	37.93	32	0.58	-37.25	37.26
33	0.36	-30.32	30.32	34	7.54	-23.16	24.36
35	0.09	-15.74	15.74	36	7.73	-8.08	11.19
37	7.73	0.00	7.73	38	-0.01	-0.06	0.06

Nodal Deflections Serviceability (002 : 1.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	6.13	-0.03	6.13
3	0.00	-6.29	6.29	4	6.07	-12.29	13.71
5	0.11	-18.18	18.18	6	5.91	-23.92	24.64
7	0.33	-29.56	29.56	8	5.77	-29.56	30.12
9	5.63	-34.93	35.38	10	0.66	-39.87	39.87
11	5.25	-44.44	44.75	12	1.09	-48.60	48.62
13	1.37	-52.43	52.44	14	4.75	-52.43	52.64
15	1.65	-55.70	55.72	16	4.15	-58.28	58.43
17	2.30	-60.25	60.30	18	3.46	-61.56	61.66
19	3.05	-62.16	62.24	20	3.05	-62.22	62.29
21	2.64	-61.56	61.62	22	3.80	-60.25	60.37
23	1.95	-58.28	58.31	24	4.45	-55.70	55.87
25	4.72	-52.43	52.64	26	1.35	-52.43	52.44
27	5.00	-48.60	48.86	28	0.85	-44.44	44.45
29	5.44	-39.87	40.23	30	0.47	-34.93	34.93
31	5.77	-29.56	30.12	32	0.33	-29.56	29.56
33	0.19	-23.92	23.92	34	5.99	-18.18	19.14
35	0.03	-12.29	12.29	36	6.10	-6.29	8.76
37	6.10	0.00	6.10	38	-0.03	-0.03	0.04

Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	8.15	-0.04	8.15
3	0.00	-8.41	8.41	4	8.07	-16.42	18.29

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Nodal Deflections Serviceability (003 : 1.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
5	0.16	-24.27	24.27	6	7.82	-31.88	32.83
7	0.49	-39.34	39.34	8	7.62	-39.34	40.07
9	7.41	-46.40	46.98	10	0.98	-52.83	52.84
11	6.85	-58.73	59.13	12	1.63	-64.02	64.04
13	2.04	-68.76	68.79	14	6.11	-68.76	69.04
15	2.46	-72.37	72.41	16	5.29	-75.08	75.26
17	3.26	-77.02	77.08	18	4.49	-78.19	78.31
19	4.08	-78.59	78.69	20	4.08	-78.59	78.69
21	3.66	-78.19	78.27	22	4.89	-77.02	77.17
23	2.86	-75.08	75.13	24	5.70	-72.37	72.59
25	6.11	-68.76	69.04	26	2.04	-68.76	68.79
27	6.53	-64.02	64.35	28	1.31	-58.73	58.75
29	7.17	-52.83	53.32	30	0.74	-46.40	46.40
31	7.66	-39.34	40.08	32	0.53	-39.34	39.35
33	0.33	-31.88	31.88	34	7.99	-24.27	25.55
35	0.08	-16.42	16.42	36	8.15	-8.41	11.71
37	8.15	0.00	8.15	38	0.00	-0.04	0.04

Nodal Deflections Serviceability (004 : 1.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	7.48	-0.04	7.48
3	0.00	-7.73	7.73	4	7.40	-15.09	16.81
5	0.16	-22.30	22.30	6	7.17	-29.28	30.15
7	0.47	-36.11	36.11	8	6.97	-36.11	36.78
9	6.77	-42.55	43.09	10	0.94	-48.41	48.42
11	6.24	-53.76	54.12	12	1.55	-58.33	58.35
13	1.89	-62.41	62.44	14	5.59	-62.41	62.66
15	2.24	-65.82	65.85	16	4.88	-68.43	68.61
17	2.96	-70.36	70.43	18	4.14	-71.59	71.71
19	3.73	-72.08	72.18	20	3.73	-72.11	72.21
21	3.33	-71.59	71.66	22	4.51	-70.36	70.51
23	2.59	-68.43	68.48	24	5.23	-65.82	66.02
25	5.57	-62.41	62.66	26	1.88	-62.41	62.44
27	5.92	-58.33	58.63	28	1.23	-53.76	53.77
29	6.53	-48.41	48.85	30	0.69	-42.55	42.56
31	7.00	-36.11	36.78	32	0.49	-36.11	36.11
33	0.30	-29.28	29.28	34	7.31	-22.30	23.46
35	0.06	-15.09	15.09	36	7.47	-7.73	10.75
37	7.47	0.00	7.47	38	-0.02	-0.04	0.05

Nodal Deflections Serviceability (005 : 1.5 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.45	-0.03	4.45
3	0.00	-4.65	4.65	4	4.39	-9.05	10.06
5	0.11	-13.32	13.32	6	4.24	-17.43	17.94
7	0.32	-21.41	21.42	8	4.11	-21.42	21.81

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Nodal Deflections Serviceability (005 : 1.5 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
9	3.99	-25.13	25.45	10	0.60	-28.48	28.49
11	3.67	-31.53	31.74	12	0.95	-34.22	34.23
13	1.15	-36.63	36.65	14	3.30	-36.63	36.78
15	1.35	-38.61	38.63	16	2.88	-40.12	40.23
17	1.78	-41.21	41.24	18	2.45	-41.88	41.95
19	2.22	-42.10	42.16	20	2.22	-42.11	42.16
21	2.00	-41.88	41.92	22	2.67	-41.21	41.29
23	1.57	-40.12	40.15	24	3.09	-38.61	38.73
25	3.30	-36.63	36.78	26	1.15	-36.63	36.65
27	3.50	-34.22	34.40	28	0.77	-31.53	31.54
29	3.84	-28.48	28.74	30	0.46	-25.13	25.14
31	4.13	-21.41	21.81	32	0.33	-21.42	21.42
33	0.21	-17.43	17.43	34	4.34	-13.32	14.00
35	0.05	-9.05	9.05	36	4.45	-4.65	6.43
37	4.45	0.00	4.45	38	-0.01	-0.03	0.03

Nodal Deflections Serviceability (006 : 1.5 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.98	-0.02	3.98
3	0.00	-4.09	4.09	4	3.94	-7.99	8.91
5	0.07	-11.82	11.82	6	3.84	-15.55	16.01
7	0.22	-19.21	19.21	8	3.75	-19.21	19.57
9	3.65	-22.70	22.99	10	0.43	-25.90	25.90
11	3.41	-28.87	29.07	12	0.72	-31.56	31.57
13	0.90	-34.04	34.05	14	3.08	-34.04	34.18
15	1.08	-36.15	36.17	16	2.69	-37.82	37.92
17	1.50	-39.09	39.12	18	2.24	-39.93	40.00
19	1.98	-40.32	40.37	20	1.98	-40.36	40.41
21	1.72	-39.93	39.97	22	2.47	-39.09	39.17
23	1.27	-37.82	37.84	24	2.89	-36.15	36.27
25	3.07	-34.04	34.17	26	0.88	-34.04	34.05
27	3.25	-31.56	31.73	28	0.56	-28.87	28.87
29	3.53	-25.90	26.14	30	0.31	-22.70	22.70
31	3.75	-19.21	19.57	32	0.22	-19.21	19.21
33	0.13	-15.55	15.55	34	3.89	-11.82	12.45
35	0.02	-7.99	7.99	36	3.96	-4.09	5.70
37	3.96	0.00	3.96	38	-0.02	-0.02	0.03

Nodal Deflections Serviceability (007 : 1.5 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	5.10	-0.03	5.10
3	0.00	-5.27	5.27	4	5.05	-10.28	11.45
5	0.10	-15.19	15.19	6	4.90	-19.96	20.55
7	0.31	-24.62	24.62	8	4.77	-24.62	25.08
9	4.64	-29.03	29.40	10	0.62	-33.06	33.06
11	4.28	-36.74	36.99	12	1.02	-40.05	40.06

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Nodal Deflections Serviceability (007 : 1.5 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
13	1.28	-43.01	43.03	14	3.82	-43.01	43.18
15	1.54	-45.27	45.30	16	3.31	-46.96	47.08
17	2.04	-48.18	48.22	18	2.81	-48.91	48.99
19	2.55	-49.16	49.23	20	2.55	-49.16	49.23
21	2.29	-48.91	48.96	22	3.06	-48.18	48.28
23	1.79	-46.96	47.00	24	3.56	-45.27	45.41
25	3.82	-43.01	43.18	26	1.28	-43.01	43.03
27	4.08	-40.05	40.25	28	0.82	-36.74	36.75
29	4.48	-33.06	33.36	30	0.47	-29.03	29.04
31	4.79	-24.62	25.08	32	0.34	-24.62	24.62
33	0.21	-19.96	19.96	34	5.00	-15.19	15.99
35	0.05	-10.28	10.28	36	5.10	-5.27	7.33
37	5.10	0.00	5.10	38	0.00	-0.03	0.03

Nodal Deflections Serviceability (008 : 1.5 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	4.73	-0.03	4.73
3	0.00	-4.90	4.90	4	4.68	-9.55	10.64
5	0.10	-14.11	14.11	6	4.53	-18.53	19.07
7	0.30	-22.84	22.85	8	4.41	-22.84	23.27
9	4.28	-26.92	27.26	10	0.59	-30.62	30.63
11	3.94	-34.00	34.23	12	0.98	-36.89	36.90
13	1.20	-39.47	39.49	14	3.53	-39.47	39.63
15	1.42	-41.63	41.65	16	3.09	-43.28	43.39
17	1.87	-44.50	44.54	18	2.62	-45.27	45.35
19	2.36	-45.58	45.65	20	2.36	-45.60	45.66
21	2.11	-45.27	45.32	22	2.85	-44.50	44.59
23	1.64	-43.28	43.31	24	3.31	-41.63	41.76
25	3.52	-39.47	39.63	26	1.19	-39.47	39.49
27	3.74	-36.89	37.08	28	0.78	-34.00	34.01
29	4.13	-30.62	30.90	30	0.44	-26.92	26.92
31	4.43	-22.84	23.27	32	0.31	-22.84	22.85
33	0.19	-18.53	18.53	34	4.62	-14.11	14.85
35	0.04	-9.55	9.55	36	4.72	-4.90	6.80
37	4.72	0.00	4.72	38	-0.01	-0.03	0.03

Nodal Deflections Serviceability (009 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.81	-0.02	2.81
3	0.00	-2.93	2.93	4	2.77	-5.70	6.34
5	0.07	-8.39	8.39	6	2.67	-10.99	11.31
7	0.20	-13.50	13.50	8	2.59	-13.50	13.74
9	2.51	-15.84	16.04	10	0.38	-17.95	17.96
11	2.31	-19.87	20.01	12	0.60	-21.57	21.58
13	0.73	-23.09	23.10	14	2.08	-23.09	23.18
15	0.85	-24.33	24.35	16	1.82	-25.29	25.35

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Nodal Deflections Serviceability (009 : 2.0 UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
17	1.12	-25.97	26.00	18	1.54	-26.39	26.44
19	1.40	-26.54	26.57	20	1.40	-26.54	26.58
21	1.26	-26.39	26.42	22	1.68	-25.97	26.03
23	0.99	-25.29	25.31	24	1.95	-24.33	24.41
25	2.08	-23.09	23.18	26	0.72	-23.09	23.10
27	2.20	-21.57	21.68	28	0.49	-19.87	19.88
29	2.42	-17.95	18.11	30	0.29	-15.84	15.84
31	2.60	-13.50	13.75	32	0.21	-13.50	13.50
33	0.13	-10.99	10.99	34	2.73	-8.39	8.83
35	0.03	-5.70	5.70	36	2.80	-2.93	4.05
37	2.80	0.00	2.80	38	0.00	-0.02	0.02

Nodal Deflections Serviceability (010 : 2.0 CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.48	-0.01	2.48
3	0.00	-2.55	2.55	4	2.46	-4.98	5.56
5	0.05	-7.37	7.37	6	2.39	-9.69	9.98
7	0.14	-11.97	11.97	8	2.33	-11.97	12.19
9	2.27	-14.13	14.32	10	0.27	-16.12	16.13
11	2.12	-17.96	18.09	12	0.45	-19.63	19.64
13	0.56	-21.16	21.17	14	1.92	-21.16	21.25
15	0.68	-22.47	22.48	16	1.67	-23.50	23.56
17	0.93	-24.28	24.30	18	1.40	-24.80	24.84
19	1.23	-25.03	25.06	20	1.23	-25.05	25.08
21	1.07	-24.80	24.82	22	1.54	-24.28	24.33
23	0.80	-23.50	23.51	24	1.79	-22.47	22.54
25	1.91	-21.16	21.25	26	0.55	-21.16	21.17
27	2.02	-19.63	19.74	28	0.35	-17.96	17.97
29	2.20	-16.12	16.27	30	0.20	-14.13	14.14
31	2.33	-11.97	12.19	32	0.14	-11.97	11.97
33	0.08	-9.69	9.69	34	2.42	-7.37	7.76
35	0.01	-4.98	4.98	36	2.47	-2.55	3.55
37	2.47	0.00	2.47	38	-0.01	-0.01	0.02

Nodal Deflections Serviceability (011 : 2.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	3.20	-0.02	3.20
3	0.00	-3.30	3.30	4	3.16	-6.44	7.18
5	0.07	-9.52	9.52	6	3.07	-12.50	12.87
7	0.19	-15.42	15.42	8	2.98	-15.42	15.71
9	2.90	-18.18	18.41	10	0.39	-20.70	20.70
11	2.68	-23.00	23.16	12	0.64	-25.06	25.07
13	0.80	-26.92	26.93	14	2.39	-26.92	27.02
15	0.96	-28.33	28.35	16	2.07	-29.39	29.47
17	1.28	-30.15	30.18	18	1.76	-30.61	30.67
19	1.60	-30.77	30.81	20	1.60	-30.77	30.81

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Nodal Deflections Serviceability (011 : 2.0 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
21	1.44	-30.61	30.65	22	1.92	-30.15	30.22
23	1.12	-29.39	29.41	24	2.23	-28.33	28.42
25	2.39	-26.92	27.02	26	0.80	-26.92	26.93
27	2.56	-25.06	25.19	28	0.51	-23.00	23.01
29	2.81	-20.70	20.89	30	0.29	-18.18	18.18
31	3.00	-15.42	15.71	32	0.21	-15.42	15.42
33	0.13	-12.50	12.50	34	3.13	-9.52	10.02
35	0.03	-6.44	6.44	36	3.20	-3.30	4.59
37	3.20	0.00	3.20	38	0.00	-0.02	0.02

Nodal Deflections Serviceability (012 : 2.0 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δ X →	δ Y ↑	δ ZXY		δ X →	δ Y ↑	δ ZXY
1	0.00	0.00	0.00	2	2.81	-0.02	2.81
3	0.00	-2.91	2.91	4	2.78	-5.67	6.32
5	0.06	-8.38	8.38	6	2.69	-11.00	11.32
7	0.18	-13.56	13.56	8	2.62	-13.56	13.81
9	2.54	-15.97	16.17	10	0.35	-18.17	18.17
11	2.34	-20.17	20.31	12	0.58	-21.88	21.89
13	0.71	-23.42	23.43	14	2.10	-23.42	23.51
15	0.84	-24.69	24.71	16	1.83	-25.67	25.74
17	1.11	-26.40	26.42	18	1.55	-26.85	26.90
19	1.40	-27.04	27.07	20	1.40	-27.05	27.08
21	1.25	-26.85	26.88	22	1.69	-26.40	26.45
23	0.97	-25.67	25.69	24	1.96	-24.69	24.77
25	2.09	-23.42	23.51	26	0.71	-23.42	23.43
27	2.22	-21.88	22.00	28	0.46	-20.17	20.18
29	2.45	-18.17	18.33	30	0.26	-15.97	15.98
31	2.63	-13.56	13.81	32	0.19	-13.56	13.56
33	0.11	-11.00	11.00	34	2.74	-8.38	8.82
35	0.02	-5.67	5.67	36	2.80	-2.91	4.04
37	2.80	0.00	2.80	38	-0.01	-0.02	0.02

Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-9.822	17.7	0.762	T
3	5	7	-18.108	32.6	0.770	T	4	7	10	-25.158	45.2	0.770	T
5	10	12	-30.682	55.2	0.762	T	6	12	13	-34.906	62.8	0.394	T
7	13	15	-34.906	62.8	0.394	T	8	15	17	-37.705	67.8	0.762	T
9	17	19	-39.087	70.3	0.770	T	10	19	22	-39.087	70.3	0.770	T
11	22	24	-37.705	67.8	0.762	T	12	24	25	-34.906	62.8	0.394	T
13	25	27	-34.906	62.8	0.394	T	14	27	29	-30.682	55.2	0.762	T
15	29	31	-25.158	45.2	0.770	T	16	31	34	-18.108	32.6	0.770	T
17	34	36	-9.822	17.7	0.762	T	18	36	37	0.000	0.0	0.394	
19	2	4	4.999	9.0	0.775	C	20	4	6	13.972	25.1	0.762	C
21	6	8	21.817	39.2	0.389	C	22	8	9	21.817	39.2	0.389	C
23	9	11	27.927	50.2	0.762	C	24	11	14	32.765	58.9	0.775	C

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Member Forces (001 : 1.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
25	14	16	36.335	65.4	0.775	C	26	16	18	38.403	69.1	0.762	C
27	18	20	39.270	70.6	0.389	C	28	20	21	39.270	70.6	0.389	C
29	21	23	38.403	69.1	0.762	C	30	23	26	36.335	65.4	0.775	C
31	26	28	32.765	58.9	0.775	C	32	28	30	27.927	50.2	0.762	C
33	30	32	21.817	39.2	0.389	C	34	32	33	21.817	39.2	0.389	C
35	33	35	13.972	25.1	0.762	C	36	35	38	4.999	9.0	0.775	C
37	2	3	-7.124	35.3	0.561	T	38	3	4	6.993	34.6	0.552	C
39	4	5	-6.017	29.8	0.552	T	40	5	6	5.997	29.7	0.552	C
41	6	7	-5.319	26.3	0.558	T	42	7	9	4.794	23.7	0.558	C
43	9	10	-4.014	19.9	0.552	T	44	10	11	3.994	19.8	0.552	C
45	11	12	-3.019	14.9	0.552	T	46	12	14	3.052	15.1	0.561	C
47	14	15	-2.036	10.1	0.561	T	48	15	16	1.987	9.8	0.552	C
49	16	17	-1.011	5.0	0.552	T	50	17	18	0.991	4.9	0.552	C
51	18	19	-0.263	1.3	0.558	T	52	19	21	-0.263	1.3	0.558	T
53	21	22	0.991	4.9	0.552	C	54	22	23	-1.011	5.0	0.552	T
55	23	24	1.987	9.8	0.552	C	56	24	26	-2.036	10.1	0.561	T
57	26	27	3.052	15.1	0.561	C	58	27	28	-3.019	14.9	0.552	T
59	28	29	3.994	19.8	0.552	C	60	29	30	-4.014	19.9	0.552	T
61	30	31	4.794	23.7	0.558	C	62	31	33	-5.319	26.3	0.558	T
63	33	34	5.997	29.7	0.552	C	64	34	35	-6.017	29.8	0.552	T
65	35	36	6.993	34.6	0.552	C	66	36	38	-7.124	35.3	0.561	T
67	1	2	5.434	9.8	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.359	0.6	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.359	0.6	0.400	C	72	37	38	5.434	9.8	0.400	C
73	31	32	0.359	0.6	0.400	C							

Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.653	10.2	0.762	T
3	5	7	-11.159	20.1	0.770	T	4	7	10	-16.718	30.1	0.770	T
5	10	12	-22.101	39.7	0.762	T	6	12	13	-27.522	49.5	0.394	T
7	13	15	-27.522	49.5	0.394	T	8	15	17	-32.869	59.1	0.762	T
9	17	19	-38.074	68.5	0.770	T	10	19	22	-38.074	68.5	0.770	T
11	22	24	-32.869	59.1	0.762	T	12	24	25	-27.522	49.5	0.394	T
13	25	27	-27.522	49.5	0.394	T	14	27	29	-22.101	39.7	0.762	T
15	29	31	-16.718	30.1	0.770	T	16	31	34	-11.159	20.1	0.770	T
17	34	36	-5.653	10.2	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	2.880	5.2	0.775	C	20	4	6	8.413	15.1	0.762	C
21	6	8	13.951	25.1	0.389	C	22	8	9	13.951	25.1	0.389	C
23	9	11	19.416	34.9	0.762	C	24	11	14	24.772	44.6	0.775	C
25	14	16	30.246	54.4	0.775	C	26	16	18	35.479	63.8	0.762	C
27	18	20	40.713	73.2	0.389	C	28	20	21	40.713	73.2	0.389	C
29	21	23	35.479	63.8	0.762	C	30	23	26	30.246	54.4	0.775	C
31	26	28	24.772	44.6	0.775	C	32	28	30	19.416	34.9	0.762	C
33	30	32	13.951	25.1	0.389	C	34	32	33	13.951	25.1	0.389	C
35	33	35	8.413	15.1	0.762	C	36	35	38	2.880	5.2	0.775	C
37	2	3	-4.104	20.3	0.561	T	38	3	4	4.021	19.9	0.552	C
39	4	5	-4.001	19.8	0.552	T	40	5	6	3.981	19.7	0.552	C
41	6	7	-4.005	19.8	0.558	T	42	7	9	3.968	19.6	0.558	C
43	9	10	-3.913	19.4	0.552	T	44	10	11	3.893	19.3	0.552	C

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Member Forces (002 : 1.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
45	11	12	-3.872	19.2	0.552	T	46	12	14	3.919	19.4	0.561	C
47	14	15	-3.882	19.2	0.561	T	48	15	16	3.803	18.8	0.552	C
49	16	17	-3.783	18.7	0.552	T	50	17	18	3.763	18.6	0.552	C
51	18	19	-3.785	18.7	0.558	T	52	19	21	-3.785	18.7	0.558	T
53	21	22	3.763	18.6	0.552	C	54	22	23	-3.783	18.7	0.552	T
55	23	24	3.803	18.8	0.552	C	56	24	26	-3.882	19.2	0.561	T
57	26	27	3.919	19.4	0.561	C	58	27	28	-3.872	19.2	0.552	T
59	28	29	3.893	19.3	0.552	C	60	29	30	-3.913	19.4	0.552	T
61	30	31	3.968	19.6	0.558	C	62	31	33	-4.005	19.8	0.558	T
63	33	34	3.981	19.7	0.552	C	64	34	35	-4.001	19.8	0.552	T
65	35	36	4.021	19.9	0.552	C	66	36	38	-4.104	20.3	0.561	T
67	1	2	2.934	5.3	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	5.409	9.7	0.400	C	72	37	38	2.934	5.3	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-8.366	15.0	0.762	T
3	5	7	-16.538	29.7	0.770	T	4	7	10	-24.820	44.6	0.770	T
5	10	12	-32.870	59.1	0.762	T	6	12	13	-41.004	73.7	0.394	T
7	13	15	-41.004	73.7	0.394	T	8	15	17	-41.120	74.0	0.762	T
9	17	19	-41.181	74.1	0.770	T	10	19	22	-41.181	74.1	0.770	T
11	22	24	-41.120	74.0	0.762	T	12	24	25	-41.004	73.7	0.394	T
13	25	27	-41.004	73.7	0.394	T	14	27	29	-32.870	59.1	0.762	T
15	29	31	-24.820	44.6	0.770	T	16	31	34	-16.539	29.7	0.770	T
17	34	36	-8.366	15.0	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	4.259	7.7	0.775	C	20	4	6	12.459	22.4	0.762	C
21	6	8	20.692	37.2	0.389	C	22	8	9	20.692	37.2	0.389	C
23	9	11	28.852	51.9	0.762	C	24	11	14	36.875	66.3	0.775	C
25	14	16	41.069	73.9	0.775	C	26	16	18	41.158	74.0	0.762	C
27	18	20	41.194	74.1	0.389	C	28	20	21	41.194	74.1	0.389	C
29	21	23	41.158	74.0	0.762	C	30	23	26	41.069	73.9	0.775	C
31	26	28	36.875	66.3	0.775	C	32	28	30	28.852	51.9	0.762	C
33	30	32	20.692	37.2	0.389	C	34	32	33	20.692	37.2	0.389	C
35	33	35	12.459	22.4	0.762	C	36	35	38	4.259	7.7	0.775	C
37	2	3	-6.069	30.0	0.561	T	38	3	4	5.955	29.5	0.552	C
39	4	5	-5.935	29.4	0.552	T	40	5	6	5.915	29.3	0.552	C
41	6	7	-5.958	29.5	0.558	T	42	7	9	5.921	29.3	0.558	C
43	9	10	-5.846	28.9	0.552	T	44	10	11	5.826	28.8	0.552	C
45	11	12	-5.806	28.7	0.552	T	46	12	14	5.884	29.1	0.561	C
47	14	15	-0.092	0.5	0.561	T	48	15	16	0.075	0.4	0.552	C
49	16	17	-0.054	0.3	0.552	T	50	17	18	0.034	0.2	0.552	C
51	18	19	-0.018	0.1	0.558	T	52	19	21	-0.018	0.1	0.558	T
53	21	22	0.034	0.2	0.552	C	54	22	23	-0.054	0.3	0.552	T
55	23	24	0.075	0.4	0.552	C	56	24	26	-0.092	0.5	0.561	T
57	26	27	5.884	29.1	0.561	C	58	27	28	-5.806	28.7	0.552	T
59	28	29	5.826	28.8	0.552	C	60	29	30	-5.846	28.9	0.552	T
61	30	31	5.921	29.3	0.558	C	62	31	33	-5.958	29.5	0.558	T
63	33	34	5.915	29.3	0.552	C	64	34	35	-5.935	29.4	0.552	T

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Member Forces (003 : 1.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
65	35	36	5.955	29.5	0.552	C	66	36	38	-6.069	30.0	0.561	T
67	1	2	4.334	7.8	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.009	0.0	0.400	C	72	37	38	4.334	7.8	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (004 : 1.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-7.978	14.3	0.762	T
3	5	7	-15.770	28.4	0.770	T	4	7	10	-23.663	42.6	0.770	T
5	10	12	-31.332	56.4	0.762	T	6	12	13	-34.041	61.2	0.394	T
7	13	15	-34.041	61.2	0.394	T	8	15	17	-36.675	66.0	0.762	T
9	17	19	-39.213	70.5	0.770	T	10	19	22	-39.213	70.5	0.770	T
11	22	24	-36.675	66.0	0.762	T	12	24	25	-34.041	61.2	0.394	T
13	25	27	-34.041	61.2	0.394	T	14	27	29	-31.332	56.4	0.762	T
15	29	31	-23.663	42.6	0.770	T	16	31	34	-15.770	28.4	0.770	T
17	34	36	-7.978	14.3	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	4.062	7.3	0.775	C	20	4	6	11.881	21.4	0.762	C
21	6	8	19.729	35.5	0.389	C	22	8	9	19.729	35.5	0.389	C
23	9	11	27.504	49.5	0.762	C	24	11	14	32.669	58.8	0.775	C
25	14	16	35.386	63.6	0.775	C	26	16	18	37.951	68.3	0.762	C
27	18	20	40.490	72.8	0.389	C	28	20	21	40.490	72.8	0.389	C
29	21	23	37.951	68.3	0.762	C	30	23	26	35.386	63.6	0.775	C
31	26	28	32.669	58.8	0.775	C	32	28	30	27.504	49.5	0.762	C
33	30	32	19.729	35.5	0.389	C	34	32	33	19.729	35.5	0.389	C
35	33	35	11.881	21.4	0.762	C	36	35	38	4.062	7.3	0.775	C
37	2	3	-5.788	28.7	0.561	T	38	3	4	5.679	28.1	0.552	C
39	4	5	-5.659	28.0	0.552	T	40	5	6	5.639	27.9	0.552	C
41	6	7	-5.679	28.1	0.558	T	42	7	9	5.642	27.9	0.558	C
43	9	10	-5.570	27.6	0.552	T	44	10	11	5.550	27.5	0.552	C
45	11	12	-1.939	9.6	0.552	T	46	12	14	1.954	9.7	0.561	C
47	14	15	-1.917	9.5	0.561	T	48	15	16	1.870	9.3	0.552	C
49	16	17	-1.850	9.2	0.552	T	50	17	18	1.830	9.1	0.552	C
51	18	19	-1.832	9.1	0.558	T	52	19	21	-1.832	9.1	0.558	T
53	21	22	1.830	9.1	0.552	C	54	22	23	-1.850	9.2	0.552	T
55	23	24	1.870	9.3	0.552	C	56	24	26	-1.917	9.5	0.561	T
57	26	27	1.954	9.7	0.561	C	58	27	28	-1.939	9.6	0.552	T
59	28	29	5.550	27.5	0.552	C	60	29	30	-5.570	27.6	0.552	T
61	30	31	5.642	27.9	0.558	C	62	31	33	-5.679	28.1	0.558	T
63	33	34	5.639	27.9	0.552	C	64	34	35	-5.659	28.0	0.552	T
65	35	36	5.679	28.1	0.552	C	66	36	38	-5.788	28.7	0.561	T
67	1	2	4.134	7.4	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	2.609	4.7	0.400	C	72	37	38	4.134	7.4	0.400	C
73	31	32	0.009	0.0	0.400	C							

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Member Forces (005 : 1.5 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.644	10.2	0.762	T
3	5	7	-10.409	18.7	0.770	T	4	7	10	-14.462	26.0	0.770	T
5	10	12	-17.637	31.7	0.762	T	6	12	13	-20.068	36.1	0.394	T
7	13	15	-20.068	36.1	0.394	T	8	15	17	-21.675	39.0	0.762	T
9	17	19	-22.470	40.4	0.770	T	10	19	22	-22.470	40.4	0.770	T
11	22	24	-21.675	39.0	0.762	T	12	24	25	-20.068	36.1	0.394	T
13	25	27	-20.068	36.1	0.394	T	14	27	29	-17.637	31.7	0.762	T
15	29	31	-14.462	26.0	0.770	T	16	31	34	-10.409	18.7	0.770	T
17	34	36	-5.644	10.2	0.762	T	18	36	37	0.000	0.0	0.394	
19	2	4	2.875	5.2	0.775	C	20	4	6	8.033	14.4	0.762	C
21	6	8	12.543	22.6	0.389	C	22	8	9	12.543	22.6	0.389	C
23	9	11	16.057	28.9	0.762	C	24	11	14	18.838	33.9	0.775	C
25	14	16	20.891	37.6	0.775	C	26	16	18	22.079	39.7	0.762	C
27	18	20	22.577	40.6	0.389	C	28	20	21	22.577	40.6	0.389	C
29	21	23	22.079	39.7	0.762	C	30	23	26	20.891	37.6	0.775	C
31	26	28	18.838	33.9	0.775	C	32	28	30	16.057	28.9	0.762	C
33	30	32	12.543	22.6	0.389	C	34	32	33	12.543	22.6	0.389	C
35	33	35	8.033	14.4	0.762	C	36	35	38	2.875	5.2	0.775	C
37	2	3	-4.097	20.3	0.561	T	38	3	4	4.015	19.9	0.552	C
39	4	5	-3.464	17.1	0.552	T	40	5	6	3.444	17.0	0.552	C
41	6	7	-3.061	15.2	0.558	T	42	7	9	2.753	13.6	0.558	C
43	9	10	-2.312	11.4	0.552	T	44	10	11	2.292	11.3	0.552	C
45	11	12	-1.741	8.6	0.552	T	46	12	14	1.753	8.7	0.561	C
47	14	15	-1.172	5.8	0.561	T	48	15	16	1.137	5.6	0.552	C
49	16	17	-0.586	2.9	0.552	T	50	17	18	0.566	2.8	0.552	C
51	18	19	-0.154	0.8	0.558	T	52	19	21	-0.154	0.8	0.558	T
53	21	22	0.566	2.8	0.552	C	54	22	23	-0.586	2.9	0.552	T
55	23	24	1.137	5.6	0.552	C	56	24	26	-1.172	5.8	0.561	T
57	26	27	1.753	8.7	0.561	C	58	27	28	-1.741	8.6	0.552	T
59	28	29	2.292	11.3	0.552	C	60	29	30	-2.312	11.4	0.552	T
61	30	31	2.753	13.6	0.558	C	62	31	33	-3.061	15.2	0.558	T
63	33	34	3.444	17.0	0.552	C	64	34	35	-3.464	17.1	0.552	T
65	35	36	4.015	19.9	0.552	C	66	36	38	-4.097	20.3	0.561	T
67	1	2	3.123	5.6	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.203	0.4	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.203	0.4	0.400	C	72	37	38	3.123	5.6	0.400	C
73	31	32	0.203	0.4	0.400	C							

Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.716	6.7	0.762	T
3	5	7	-7.316	13.2	0.770	T	4	7	10	-10.930	19.7	0.770	T
5	10	12	-14.408	25.9	0.762	T	6	12	13	-17.892	32.2	0.394	T
7	13	15	-17.892	32.2	0.394	T	8	15	17	-21.302	38.3	0.762	T
9	17	19	-24.602	44.2	0.770	T	10	19	22	-24.602	44.2	0.770	T
11	22	24	-21.302	38.3	0.762	T	12	24	25	-17.892	32.2	0.394	T
13	25	27	-17.892	32.2	0.394	T	14	27	29	-14.408	25.9	0.762	T
15	29	31	-10.930	19.7	0.770	T	16	31	34	-7.316	13.2	0.770	T
17	34	36	-3.716	6.7	0.762	T	18	36	37	0.000	0.0	0.394	
19	2	4	1.895	3.4	0.775	C	20	4	6	5.523	9.9	0.762	C

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Member Forces (006 : 1.5 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
21	6	8	9.136	16.4	0.389	C	22	8	9	9.136	16.4	0.389	C
23	9	11	12.676	22.8	0.762	C	24	11	14	16.127	29.0	0.775	C
25	14	16	19.631	35.3	0.775	C	26	16	18	22.959	41.3	0.762	C
27	18	20	26.268	47.2	0.389	C	28	20	21	26.268	47.2	0.389	C
29	21	23	22.959	41.3	0.762	C	30	23	26	19.631	35.3	0.775	C
31	26	28	16.127	29.0	0.775	C	32	28	30	12.676	22.8	0.762	C
33	30	32	9.136	16.4	0.389	C	34	32	33	9.136	16.4	0.389	C
35	33	35	5.523	9.9	0.762	C	36	35	38	1.895	3.4	0.775	C
37	2	3	-2.700	13.4	0.561	T	38	3	4	2.640	13.1	0.552	C
39	4	5	-2.620	13.0	0.552	T	40	5	6	2.600	12.9	0.552	C
41	6	7	-2.610	12.9	0.558	T	42	7	9	2.573	12.7	0.558	C
43	9	10	-2.532	12.5	0.552	T	44	10	11	2.511	12.4	0.552	C
45	11	12	-2.491	12.3	0.552	T	46	12	14	2.516	12.5	0.561	C
47	14	15	-2.478	12.3	0.561	T	48	15	16	2.422	12.0	0.552	C
49	16	17	-2.402	11.9	0.552	T	50	17	18	2.382	11.8	0.552	C
51	18	19	-2.390	11.8	0.558	T	52	19	21	-2.390	11.8	0.558	T
53	21	22	2.382	11.8	0.552	C	54	22	23	-2.402	11.9	0.552	T
55	23	24	2.422	12.0	0.552	C	56	24	26	-2.478	12.3	0.561	T
57	26	27	2.516	12.5	0.561	C	58	27	28	-2.491	12.3	0.552	T
59	28	29	2.511	12.4	0.552	C	60	29	30	-2.532	12.5	0.552	T
61	30	31	2.573	12.7	0.558	C	62	31	33	-2.610	12.9	0.558	T
63	33	34	2.600	12.9	0.552	C	64	34	35	-2.620	13.0	0.552	T
65	35	36	2.640	13.1	0.552	C	66	36	38	-2.700	13.4	0.561	T
67	1	2	1.934	3.5	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	3.409	6.1	0.400	C	72	37	38	1.934	3.5	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.266	9.5	0.762	T
3	5	7	-10.390	18.7	0.770	T	4	7	10	-15.560	28.0	0.770	T
5	10	12	-20.562	37.0	0.762	T	6	12	13	-25.596	46.0	0.394	T
7	13	15	-25.596	46.0	0.394	T	8	15	17	-25.712	46.2	0.762	T
9	17	19	-25.773	46.4	0.770	T	10	19	22	-25.773	46.4	0.770	T
11	22	24	-25.712	46.2	0.762	T	12	24	25	-25.596	46.0	0.394	T
13	25	27	-25.596	46.0	0.394	T	14	27	29	-20.562	37.0	0.762	T
15	29	31	-15.560	28.0	0.770	T	16	31	34	-10.390	18.7	0.770	T
17	34	36	-5.266	9.5	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	2.683	4.8	0.775	C	20	4	6	7.835	14.1	0.762	C
21	6	8	12.988	23.4	0.389	C	22	8	9	12.988	23.4	0.389	C
23	9	11	18.068	32.5	0.762	C	24	11	14	23.043	41.4	0.775	C
25	14	16	25.661	46.2	0.775	C	26	16	18	25.750	46.3	0.762	C
27	18	20	25.786	46.4	0.389	C	28	20	21	25.786	46.4	0.389	C
29	21	23	25.750	46.3	0.762	C	30	23	26	25.661	46.2	0.775	C
31	26	28	23.043	41.4	0.775	C	32	28	30	18.068	32.5	0.762	C
33	30	32	12.988	23.4	0.389	C	34	32	33	12.988	23.4	0.389	C
35	33	35	7.835	14.1	0.762	C	36	35	38	2.683	4.8	0.775	C
37	2	3	-3.823	18.9	0.561	T	38	3	4	3.745	18.5	0.552	C
39	4	5	-3.725	18.4	0.552	T	40	5	6	3.705	18.3	0.552	C

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Member Forces (007 : 1.5 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
41	6	7	-3.726	18.4	0.558	T	42	7	9	3.689	18.3	0.558	C
43	9	10	-3.636	18.0	0.552	T	44	10	11	3.616	17.9	0.552	C
45	11	12	-3.596	17.8	0.552	T	46	12	14	3.639	18.0	0.561	C
47	14	15	-0.092	0.5	0.561	T	48	15	16	0.075	0.4	0.552	C
49	16	17	-0.054	0.3	0.552	T	50	17	18	0.034	0.2	0.552	C
51	18	19	-0.018	0.1	0.558	T	52	19	21	-0.018	0.1	0.558	T
53	21	22	0.034	0.2	0.552	C	54	22	23	-0.054	0.3	0.552	T
55	23	24	0.075	0.4	0.552	C	56	24	26	-0.092	0.5	0.561	T
57	26	27	3.639	18.0	0.561	C	58	27	28	-3.596	17.8	0.552	T
59	28	29	3.616	17.9	0.552	C	60	29	30	-3.636	18.0	0.552	T
61	30	31	3.689	18.3	0.558	C	62	31	33	-3.726	18.4	0.558	T
63	33	34	3.705	18.3	0.552	C	64	34	35	-3.725	18.4	0.552	T
65	35	36	3.745	18.5	0.552	C	66	36	38	-3.823	18.9	0.561	T
67	1	2	2.734	4.9	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.009	0.0	0.400	C	72	37	38	2.734	4.9	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-5.072	9.1	0.762	T
3	5	7	-10.006	18.0	0.770	T	4	7	10	-14.981	26.9	0.770	T
5	10	12	-19.793	35.6	0.762	T	6	12	13	-21.533	38.7	0.394	T
7	13	15	-21.533	38.7	0.394	T	8	15	17	-23.199	41.7	0.762	T
9	17	19	-24.784	44.6	0.770	T	10	19	22	-24.784	44.6	0.770	T
11	22	24	-23.199	41.7	0.762	T	12	24	25	-21.533	38.7	0.394	T
13	25	27	-21.533	38.7	0.394	T	14	27	29	-19.793	35.6	0.762	T
15	29	31	-14.981	26.9	0.770	T	16	31	34	-10.006	18.0	0.770	T
17	34	36	-5.072	9.1	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	2.584	4.6	0.775	C	20	4	6	7.546	13.6	0.762	C
21	6	8	12.507	22.5	0.389	C	22	8	9	12.507	22.5	0.389	C
23	9	11	17.394	31.3	0.762	C	24	11	14	20.654	37.1	0.775	C
25	14	16	22.386	40.3	0.775	C	26	16	18	23.999	43.2	0.762	C
27	18	20	25.575	46.0	0.389	C	28	20	21	25.575	46.0	0.389	C
29	21	23	23.999	43.2	0.762	C	30	23	26	22.386	40.3	0.775	C
31	26	28	20.654	37.1	0.775	C	32	28	30	17.394	31.3	0.762	C
33	30	32	12.507	22.5	0.389	C	34	32	33	12.507	22.5	0.389	C
35	33	35	7.546	13.6	0.762	C	36	35	38	2.584	4.6	0.775	C
37	2	3	-3.683	18.2	0.561	T	38	3	4	3.607	17.9	0.552	C
39	4	5	-3.587	17.8	0.552	T	40	5	6	3.567	17.7	0.552	C
41	6	7	-3.587	17.8	0.558	T	42	7	9	3.550	17.6	0.558	C
43	9	10	-3.498	17.3	0.552	T	44	10	11	3.478	17.2	0.552	C
45	11	12	-1.248	6.2	0.552	T	46	12	14	1.252	6.2	0.561	C
47	14	15	-1.215	6.0	0.561	T	48	15	16	1.179	5.8	0.552	C
49	16	17	-1.159	5.7	0.552	T	50	17	18	1.139	5.6	0.552	C
51	18	19	-1.134	5.6	0.558	T	52	19	21	-1.134	5.6	0.558	T
53	21	22	1.139	5.6	0.552	C	54	22	23	-1.159	5.7	0.552	T
55	23	24	1.179	5.8	0.552	C	56	24	26	-1.215	6.0	0.561	T
57	26	27	1.252	6.2	0.561	C	58	27	28	-1.248	6.2	0.552	T
59	28	29	3.478	17.2	0.552	C	60	29	30	-3.498	17.3	0.552	T

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Member Forces (008 : 1.5 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
61	30	31	3.550	17.6	0.558	C	62	31	33	-3.587	17.8	0.558	T
63	33	34	3.567	17.7	0.552	C	64	34	35	-3.587	17.8	0.552	T
65	35	36	3.607	17.9	0.552	C	66	36	38	-3.683	18.2	0.561	T
67	1	2	2.634	4.7	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	1.609	2.9	0.400	C	72	37	38	2.634	4.7	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (009 : 2.0 UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.555	6.4	0.762	T
3	5	7	-6.559	11.8	0.770	T	4	7	10	-9.114	16.4	0.770	T
5	10	12	-11.115	20.0	0.762	T	6	12	13	-12.649	22.8	0.394	T
7	13	15	-12.649	22.8	0.394	T	8	15	17	-13.660	24.6	0.762	T
9	17	19	-14.161	25.5	0.770	T	10	19	22	-14.161	25.5	0.770	T
11	22	24	-13.660	24.6	0.762	T	12	24	25	-12.649	22.8	0.394	T
13	25	27	-12.649	22.8	0.394	T	14	27	29	-11.115	20.0	0.762	T
15	29	31	-9.114	16.4	0.770	T	16	31	34	-6.559	11.8	0.770	T
17	34	36	-3.555	6.4	0.762	T	18	36	37	0.000	0.0	0.394	
19	2	4	1.813	3.3	0.775	C	20	4	6	5.064	9.1	0.762	C
21	6	8	7.906	14.2	0.389	C	22	8	9	7.906	14.2	0.389	C
23	9	11	10.121	18.2	0.762	C	24	11	14	11.875	21.4	0.775	C
25	14	16	13.169	23.7	0.775	C	26	16	18	13.917	25.0	0.762	C
27	18	20	14.231	25.6	0.389	C	28	20	21	14.231	25.6	0.389	C
29	21	23	13.917	25.0	0.762	C	30	23	26	13.169	23.7	0.775	C
31	26	28	11.875	21.4	0.775	C	32	28	30	10.121	18.2	0.762	C
33	30	32	7.906	14.2	0.389	C	34	32	33	7.906	14.2	0.389	C
35	33	35	5.064	9.1	0.762	C	36	35	38	1.813	3.3	0.775	C
37	2	3	-2.584	12.8	0.561	T	38	3	4	2.526	12.5	0.552	C
39	4	5	-2.187	10.8	0.552	T	40	5	6	2.167	10.7	0.552	C
41	6	7	-1.932	9.6	0.558	T	42	7	9	1.732	8.6	0.558	C
43	9	10	-1.461	7.2	0.552	T	44	10	11	1.441	7.1	0.552	C
45	11	12	-1.102	5.5	0.552	T	46	12	14	1.104	5.5	0.561	C
47	14	15	-0.740	3.7	0.561	T	48	15	16	0.712	3.5	0.552	C
49	16	17	-0.373	1.8	0.552	T	50	17	18	0.353	1.7	0.552	C
51	18	19	-0.100	0.5	0.558	T	52	19	21	-0.100	0.5	0.558	T
53	21	22	0.353	1.7	0.552	C	54	22	23	-0.373	1.8	0.552	T
55	23	24	0.712	3.5	0.552	C	56	24	26	-0.740	3.7	0.561	T
57	26	27	1.104	5.5	0.561	C	58	27	28	-1.102	5.5	0.552	T
59	28	29	1.441	7.1	0.552	C	60	29	30	-1.461	7.2	0.552	T
61	30	31	1.732	8.6	0.558	C	62	31	33	-1.932	9.6	0.558	T
63	33	34	2.167	10.7	0.552	C	64	34	35	-2.187	10.8	0.552	T
65	35	36	2.526	12.5	0.552	C	66	36	38	-2.584	12.8	0.561	T
67	1	2	1.967	3.5	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.126	0.2	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.126	0.2	0.400	C	72	37	38	1.967	3.5	0.400	C
73	31	32	0.126	0.2	0.400	C							

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Member Forces (010 : 2.0 CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-2.360	4.2	0.762	T
3	5	7	-4.627	8.3	0.770	T	4	7	10	-6.879	12.4	0.770	T
5	10	12	-9.024	16.2	0.762	T	6	12	13	-11.151	20.1	0.394	T
7	13	15	-11.151	20.1	0.394	T	8	15	17	-13.205	23.7	0.762	T
9	17	19	-15.171	27.3	0.770	T	10	19	22	-15.171	27.3	0.770	T
11	22	24	-13.205	23.7	0.762	T	12	24	25	-11.151	20.1	0.394	T
13	25	27	-11.151	20.1	0.394	T	14	27	29	-9.024	16.2	0.762	T
15	29	31	-6.879	12.4	0.770	T	16	31	34	-4.627	8.3	0.770	T
17	34	36	-2.360	4.2	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	1.205	2.2	0.775	C	20	4	6	3.500	6.3	0.762	C
21	6	8	5.766	10.4	0.389	C	22	8	9	5.766	10.4	0.389	C
23	9	11	7.958	14.3	0.762	C	24	11	14	10.075	18.1	0.775	C
25	14	16	12.201	21.9	0.775	C	26	16	18	14.195	25.5	0.762	C
27	18	20	16.156	29.1	0.389	C	28	20	21	16.156	29.1	0.389	C
29	21	23	14.195	25.5	0.762	C	30	23	26	12.201	21.9	0.775	C
31	26	28	10.075	18.1	0.775	C	32	28	30	7.958	14.3	0.762	C
33	30	32	5.766	10.4	0.389	C	34	32	33	5.766	10.4	0.389	C
35	33	35	3.500	6.3	0.762	C	36	35	38	1.205	2.2	0.775	C
37	2	3	-1.718	8.5	0.561	T	38	3	4	1.674	8.3	0.552	C
39	4	5	-1.654	8.2	0.552	T	40	5	6	1.634	8.1	0.552	C
41	6	7	-1.634	8.1	0.558	T	42	7	9	1.597	7.9	0.558	C
43	9	10	-1.565	7.7	0.552	T	44	10	11	1.545	7.6	0.552	C
45	11	12	-1.525	7.5	0.552	T	46	12	14	1.533	7.6	0.561	C
47	14	15	-1.496	7.4	0.561	T	48	15	16	1.456	7.2	0.552	C
49	16	17	-1.435	7.1	0.552	T	50	17	18	1.415	7.0	0.552	C
51	18	19	-1.413	7.0	0.558	T	52	19	21	-1.413	7.0	0.558	T
53	21	22	1.415	7.0	0.552	C	54	22	23	-1.435	7.1	0.552	T
55	23	24	1.456	7.2	0.552	C	56	24	26	-1.496	7.4	0.561	T
57	26	27	1.533	7.6	0.561	C	58	27	28	-1.525	7.5	0.552	T
59	28	29	1.545	7.6	0.552	C	60	29	30	-1.565	7.7	0.552	T
61	30	31	1.597	7.9	0.558	C	62	31	33	-1.634	8.1	0.558	T
63	33	34	1.634	8.1	0.552	C	64	34	35	-1.654	8.2	0.552	T
65	35	36	1.674	8.3	0.552	C	66	36	38	-1.718	8.5	0.561	T
67	1	2	1.234	2.2	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	2.009	3.6	0.400	C	72	37	38	1.234	2.2	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.328	6.0	0.762	T
3	5	7	-6.548	11.8	0.770	T	4	7	10	-9.773	17.6	0.770	T
5	10	12	-12.870	23.1	0.762	T	6	12	13	-15.966	28.7	0.394	T
7	13	15	-15.966	28.7	0.394	T	8	15	17	-16.082	28.9	0.762	T
9	17	19	-16.143	29.0	0.770	T	10	19	22	-16.143	29.0	0.770	T
11	22	24	-16.082	28.9	0.762	T	12	24	25	-15.966	28.7	0.394	T
13	25	27	-15.966	28.7	0.394	T	14	27	29	-12.870	23.1	0.762	T
15	29	31	-9.773	17.6	0.770	T	16	31	34	-6.548	11.8	0.770	T
17	34	36	-3.328	6.0	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	1.698	3.1	0.775	C	20	4	6	4.945	8.9	0.762	C

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Member Forces (011 : 2.0 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
21	6	8	8.173	14.7	0.389	C	22	8	9	8.173	14.7	0.389	C
23	9	11	11.328	20.4	0.762	C	24	11	14	14.398	25.9	0.775	C
25	14	16	16.031	28.8	0.775	C	26	16	18	16.120	29.0	0.762	C
27	18	20	16.156	29.1	0.389	C	28	20	21	16.156	29.1	0.389	C
29	21	23	16.120	29.0	0.762	C	30	23	26	16.031	28.8	0.775	C
31	26	28	14.398	25.9	0.775	C	32	28	30	11.328	20.4	0.762	C
33	30	32	8.173	14.7	0.389	C	34	32	33	8.173	14.7	0.389	C
35	33	35	4.945	8.9	0.762	C	36	35	38	1.698	3.1	0.775	C
37	2	3	-2.419	12.0	0.561	T	38	3	4	2.364	11.7	0.552	C
39	4	5	-2.344	11.6	0.552	T	40	5	6	2.324	11.5	0.552	C
41	6	7	-2.331	11.5	0.558	T	42	7	9	2.294	11.4	0.558	C
43	9	10	-2.255	11.2	0.552	T	44	10	11	2.235	11.1	0.552	C
45	11	12	-2.215	11.0	0.552	T	46	12	14	2.235	11.1	0.561	C
47	14	15	-0.092	0.5	0.561	T	48	15	16	0.075	0.4	0.552	C
49	16	17	-0.054	0.3	0.552	T	50	17	18	0.034	0.2	0.552	C
51	18	19	-0.018	0.1	0.558	T	52	19	21	-0.018	0.1	0.558	T
53	21	22	0.034	0.2	0.552	C	54	22	23	-0.054	0.3	0.552	T
55	23	24	0.075	0.4	0.552	C	56	24	26	-0.092	0.5	0.561	T
57	26	27	2.235	11.1	0.561	C	58	27	28	-2.215	11.0	0.552	T
59	28	29	2.235	11.1	0.552	C	60	29	30	-2.255	11.2	0.552	T
61	30	31	2.294	11.4	0.558	C	62	31	33	-2.331	11.5	0.558	T
63	33	34	2.324	11.5	0.552	C	64	34	35	-2.344	11.6	0.552	T
65	35	36	2.364	11.7	0.552	C	66	36	38	-2.419	12.0	0.561	T
67	1	2	1.734	3.1	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.009	0.0	0.400	C	72	37	38	1.734	3.1	0.400	C
73	31	32	0.009	0.0	0.400	C							

Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
1	1	3	0.000	0.0	0.394	T	2	3	5	-3.038	5.5	0.762	T
3	5	7	-5.972	10.7	0.770	T	4	7	10	-8.905	16.0	0.770	T
5	10	12	-11.716	21.1	0.762	T	6	12	13	-12.778	23.0	0.394	T
7	13	15	-12.778	23.0	0.394	T	8	15	17	-13.766	24.8	0.762	T
9	17	19	-14.684	26.4	0.770	T	10	19	22	-14.684	26.4	0.770	T
11	22	24	-13.766	24.8	0.762	T	12	24	25	-12.778	23.0	0.394	T
13	25	27	-12.778	23.0	0.394	T	14	27	29	-11.716	21.1	0.762	T
15	29	31	-8.905	16.0	0.770	T	16	31	34	-5.972	10.7	0.770	T
17	34	36	-3.038	5.5	0.762	T	18	36	37	0.000	0.0	0.394	T
19	2	4	1.550	2.8	0.775	C	20	4	6	4.512	8.1	0.762	C
21	6	8	7.451	13.4	0.389	C	22	8	9	7.451	13.4	0.389	C
23	9	11	10.317	18.6	0.762	C	24	11	14	12.244	22.0	0.775	C
25	14	16	13.286	23.9	0.775	C	26	16	18	14.232	25.6	0.762	C
27	18	20	15.135	27.2	0.389	C	28	20	21	15.135	27.2	0.389	C
29	21	23	14.232	25.6	0.762	C	30	23	26	13.286	23.9	0.775	C
31	26	28	12.244	22.0	0.775	C	32	28	30	10.317	18.6	0.762	C
33	30	32	7.451	13.4	0.389	C	34	32	33	7.451	13.4	0.389	C
35	33	35	4.512	8.1	0.762	C	36	35	38	1.550	2.8	0.775	C
37	2	3	-2.209	10.9	0.561	T	38	3	4	2.157	10.7	0.552	C
39	4	5	-2.137	10.6	0.552	T	40	5	6	2.117	10.5	0.552	C

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Member Forces (012 : 2.0 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm)	Length (m)	CT
41	6	7	-2.122	10.5	0.558	T	42	7	9	2.085	10.3	0.558	C
43	9	10	-2.048	10.1	0.552	T	44	10	11	2.028	10.0	0.552	C
45	11	12	-0.765	3.8	0.552	T	46	12	14	0.761	3.8	0.561	C
47	14	15	-0.724	3.6	0.561	T	48	15	16	0.696	3.4	0.552	C
49	16	17	-0.676	3.3	0.552	T	50	17	18	0.656	3.2	0.552	C
51	18	19	-0.646	3.2	0.558	T	52	19	21	-0.646	3.2	0.558	T
53	21	22	0.656	3.2	0.552	C	54	22	23	-0.676	3.3	0.552	T
55	23	24	0.696	3.4	0.552	C	56	24	26	-0.724	3.6	0.561	T
57	26	27	0.761	3.8	0.561	C	58	27	28	-0.765	3.8	0.552	T
59	28	29	2.028	10.0	0.552	C	60	29	30	-2.048	10.1	0.552	T
61	30	31	2.085	10.3	0.558	C	62	31	33	-2.122	10.5	0.558	T
63	33	34	2.117	10.5	0.552	C	64	34	35	-2.137	10.6	0.552	T
65	35	36	2.157	10.7	0.552	C	66	36	38	-2.209	10.9	0.561	T
67	1	2	1.584	2.8	0.400	C	68	13	14	-0.009	0.0	0.400	T
69	7	8	0.009	0.0	0.400	C	70	25	26	-0.009	0.0	0.400	T
71	19	20	0.909	1.6	0.400	C	72	37	38	1.584	2.8	0.400	C
73	31	32	0.009	0.0	0.400	C							

Support Reactions Serviceability (001 : 1.0 UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	5.440	37	0.000	5.440
Total	0.000	10.880			

Support Reactions Serviceability (002 : 1.0 CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.940	37	0.000	2.940
Total	0.000	5.880			

Support Reactions Serviceability (003 : 1.0 2PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.340	37	0.000	4.340
Total	0.000	8.680			

Support Reactions Serviceability (004 : 1.0 3PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	4.140	37	0.000	4.140
Total	0.000	8.280			

S-Mech Ltd
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Tel: 01257 367580 Email: info@s-mech.co.uk

Job Ref : 1440
Sheet : 12000 /
Made by : IH
Date : 21 May 2015 / Ver. 2014.14
Checked : IH
Approved :

Support Reactions Serviceability (005 : 1.5 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	3.129	37	0.000	3.129
Total	0.000	6.258			

Support Reactions Serviceability (006 : 1.5 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.940	37	0.000	1.940
Total	0.000	3.880			

Support Reactions Serviceability (007 : 1.5 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.740	37	0.000	2.740
Total	0.000	5.480			

Support Reactions Serviceability (008 : 1.5 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	2.640	37	0.000	2.640
Total	0.000	5.280			

Support Reactions Serviceability (009 : 2.0 UDL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.973	37	0.000	1.973
Total	0.000	3.947			

Support Reactions Serviceability (010 : 2.0 CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.240	37	0.000	1.240
Total	0.000	2.480			

S-Mech Ltd
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Tel: 01257 367580 Email: info@s-mech.co.uk

Job Ref : 1440
Sheet : 12000 /
Made by : IH
Date : 21 May 2015 / Ver. 2014.14
Checked : IH
Approved :

Support Reactions Serviceability (011 : 2.0 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.740	37	0.000	1.740
Total	0.000	3.480			

Support Reactions Serviceability (012 : 2.0 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→ (kN)	Ry↑ (kN)		Rx→ (kN)	Ry↑ (kN)
1	0.000	1.590	37	0.000	1.590
Total	0.000	3.180			

SECTION 3

VR Access Solutions Ltd

Structural Calculations:

750 Deep Aluminium Lattice Beams

Client: VR Access Solutions

Reference: #1440-C2a

Date: November 2015

S-MECH LTD
Suite 9 – Railway House – Railway Road - Chorley – PR6 0LY • 01257 367 580 • info@s-mech.co.uk • www.s-mech.co.uk•

Contents

Tables

Appendices

Revision	Date	Details
a	Feb 2016	Details of testing added.

1. Introduction

This calculation package has been produced to derive the maximum safe working loads that can be applied to the aluminium lattice beams for certain prescribed loading patterns.

Calculations are in accordance with the requirements of BS EN 12811-1:2003 with material design in accordance with the requirements of BS EN 1999-1-1:2007+A2:2013.

For the purposes of analysis deflection is limited to span/100. This is not found to be critical in any analysis case.

Load conditions considered are UDL, central point load, two point loads at third points, three point loads at quarter points and a point load at each node. In order to ensure the load is applied at node points the exact locations of the loads (eg centre point or third point etc.) are adjusted to suit the geometry of the beams. The exact location of the load as designed is shown on the safe working load summary sheets.

2. Section Capacities

Calculations relating to the derivation of the member capacities with regard to axial force, bending and shear are given in Appendix A. The information is summarized as follows:

Section	Material	Location	Axial (kN)	M_c (kN.m)	V_c (kN)
48.3 4.0 ACHS	6082 T6	All members	L = 0.702m: 42.17 L = 1.0m: 41.3 L = 1.201m: 35.2 L = 1.5m: 26.3 L = 2.0m: 16.29	0.56	14.6

Table 2-1 Section Capacities (permissible)

3. Beam Resistance – Moment and Shear

Moment Resistance

Tabulated moment resistance is based on the axial compression resistance of the chord taking into account the relevant restraint conditions. The lever arm between centres of chords is 0.702m thus:

$$M = N \times 0.702$$

Restraint	Moment Capacity
1.0m c/c	29.0 kN.m
1.5m c/c	18.4 kN.m
2.0m c/c	11.4 kN.m

Table 3-1 Beam Moment Capacity (permissible)

Shear Resistance

Shear resistance is based on the shear capacity of a single chord. This accommodates the case where the beam is supported using a clamp directly adjacent to the node point on the bottom chord, and the top chord is restrained laterally only.

Therefore14.6 kN is the shear limit of the beam (permissible)

4. Analysis Method

General Procedure

The analysis and design uses a 'unit load' approach, which takes advantage of the linear elastic nature of the system, where force and elastic displacement is proportional to the applied load. A beam of each length is analysed under the required load patterns with fixed loading, and the results for member forces, girder deflections and support shear are recorded:

6	**2.0 2000 Beam**				
8	**Span:**	2000	mm		
10	**Unit Load Analysis:**				
11	**Load**	**UDL (kN/m)**	**UDL N (kN)**	**CPL (kN)**	**2PL (kN)**
12	**Value**	30	0	30	0
14	**Unit Analysis Forces (kN):**				
15		**UDL (kN/m)**	**UDL N (kN)**	**CPL (kN)**	**2PL (kN)**
16	Maximum Chord Compression:	20.4	0	20.9	0
17	Maximum Chord Tension:	20.4	0	20.9	0
18	Maximum Vt Strut Compression:	29.3	0	15.1	0
19	Maximum Diag Strut Compression:	25.1	0	25.7	0
20	Support Shear Force	29.3	0	15.1	0
21	Girder Deflection (mm):	2.4	0	2.4	0

Figure 4-1 Unit Load Results

Interaction checks are then carried out at the required top chord restraint length, and the maximum interaction figure is noted for that condition:

3		**Restraint**	**Nd**		
4		1000	41.3		
6	Force Ratios:	UDL	UDL N	CPL	2PL
7	Chord Compression:	0.49	0.00	0.51	0.00
8	Chord Axial & Moment:	6.86			
9	Chord Tension:	0.48	0.00	0.50	0.00
10	Vt Strut Compression:	0.69	0.00	0.36	0.00
11	Diag Strut Compression:	0.71	0.00	0.73	0.00
12	Support Shear Force	1.43	0.00	0.73	0.00
13	Deflection:	0.12	0.00	0.12	0.00
14	**Maximum:**	**6.86**	**0.00**	**0.73**	**0.00**
15	Adjusted Force:	4.37		40.85	
16		kN/m		kN, each	

Figure 4-2 Interaction Checks

Finally, the applied force is adjusted by the critical interaction to find the allowable force. In the example shown, at 30 kN/m the axial with moments check on the top chord is critical at 6.86. The allowable force is therefore 30/6.86 = 4.37 kN/m.

Validation

Beams of length 4m and 7m have additional load cases added which are validation checks. The results from the load adjustment are input back into the analysis and the critical check is assessed. This allows the method to be validated, and the results are as shown in Table 4-1.

Length (m)	Restraint (m, c/c)	Load Case	Load	Critical Element	Unity
4.0	1.0	UDL	kN/m	Chord A&M	1.02
	1.5	CPL	29.61 kN	Chord +	0.99
	2.0	2PL	18.79 kN	Chord +	1.00
7.0	1.0	PL each node	4.9 kN each	Chord +	1.00
	1.5	CPL	10.9 kN	Chord +	1.01
	2.0	2PL	5.76 kN each	Chord +	1.01

Table 4-1 Verification Checks

By inspection of the above validation checks the method is considered fit for purpose.

5. Safe Working Loads

The following summary sheets show the safe working and ultimate loads for the conditions discussed previously.

S-Mech Ltd.		
Consulting Engineering	Project#:	1440-750
Suite 9, Railway House,	Element:	750 Lattice Beams
Railway Road, Chorley, PR6 0HW	Material:	As noted below
	Codes:	As noted below

1.0 Beam Data

Length	2000 mm
Material:	6082 T6
Codes:	BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

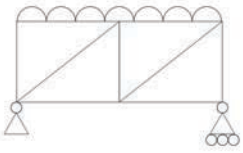
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	29.0	18.4	11.4
Ultimate Moment Capacity (kN.m)	43.5	24.9	17.1
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working and (Ultimate) Loads

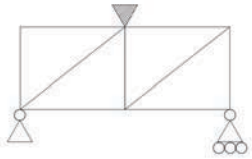
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	4.4 (6.6)	4.2 (6.3)	3.9 (5.9)
Central Point Load (kN)	40.9 (61.4)	37.8 (56.6)	23.4 (35.1)

4.0 Load Position Diagrams

UDL



Centre PL



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads

2) Ultimate load capacities are shown in brackets

3) Loads should be applied at node points only, with the exception of the UDL

4) Capacities are calculated based on simple supports at each end

5) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd. **Consulting Engineering** Suite 9, Railway House, Railway Road, Chorley, PR6 0HW	Project#: 1440-750 Element: 750 Lattice Beams Material: As noted below Codes: As noted below

1.0 Beam Data

Length 3000 mm
Material: 6082 T6
Codes: BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

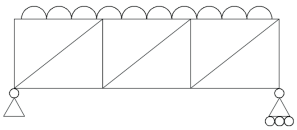
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	29.0	18.4	11.4
Ultimate Moment Capacity (kN.m)	43.5	24.9	17.1
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working and (Ultimate) Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	4.1 (6.2)	3.8 (5.7)	3.4 (5.1)
Central Point Load (kN)	30.7 (46.1)	28.3 (42.4)	17.5 (26.3)
Two Point Loads at Third Points (each)	20.5 (30.7)	18.9 (28.3)	11.7 (17.5)

4.0 Load Position Diagrams

UDL



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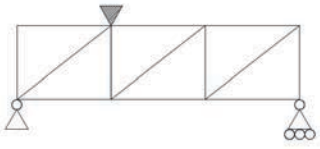

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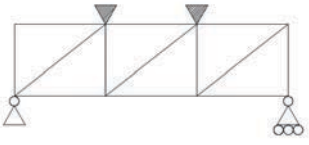


5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads
2) Ultimate load capacities are shown in brackets
3) Loads should be applied at node points only, with the exception of the UDL
4) Capacities are calculated based on simple supports at each end
5) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440-750
Consulting Engineering	Element:	750 Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length	4000 mm
Material:	6082 T6
Codes:	BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

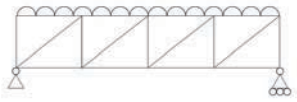
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	29.0	18.4	11.4
Ultimate Moment Capacity (kN.m)	43.5	24.9	17.1
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working and (Ultimate) Loads

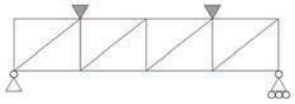
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	3.6 (5.4)	3.2 (4.8)	2.6 (4.0)
Central Point Load (kN)	29.6 (44.4)	18.9 (28.3)	11.7 (17.5)
Two Point Loads at Third Points (each)	20.4 (30.6)	18.8 (28.2)	11.6 (17.5)
PL on each node (kN, each)	13.6 (20.4)	9.4 (14.2)	5.9 (8.8)

4.0 Load Position Diagrams

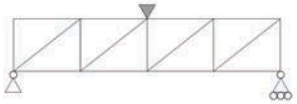
UDL



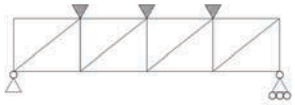
Two PL



Centre PL



PL each node



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads

2) Ultimate load capacities are shown in brackets

3) Loads should be applied at node points only, with the exception of the UDL

4) Capacities are calculated based on simple supports at each end

5) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440-750
Consulting Engineering	Element:	750 Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length	5000 mm
Material:	6082 T6
Codes:	BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

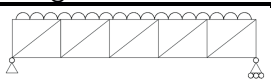
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	29.0	18.4	11.4
Ultimate Moment Capacity (kN.m)	43.5	24.9	17.1
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working and (Ultimate) Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	3.2 (4.8)	2.7 (4.1)	2.2 (3.2)
Central Point Load (kN)	24.6 (36.9)	15.7 (23.5)	9.7 (14.6)
Two Point Loads at Third Points (each)	17.0 (25.5)	11.7 (17.6)	7.3 (10.9)
Three PL at Quarter Points (kN, each)	12.8 (19.2)	8.6 (12.8)	5.3 (8.0)
PL on each node (kN, each)	9.9 (14.8)	6.3 (9.4)	3.9 (5.9)

4.0 Load Position Diagrams

UDL



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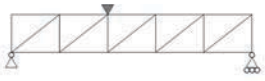
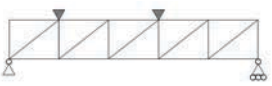


Two PL



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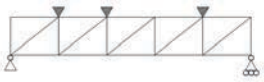
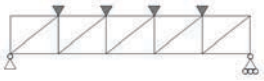


PL each node



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads

2) Ultimate load capacities are shown in brackets

3) Loads should be applied at node points only, with the exception of the UDL

4) Capacities are calculated based on simple supports at each end

5) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.	Project#:	1440-750
Consulting Engineering	Element:	750 Lattice Beams
Suite 9, Railway House,	Material:	As noted below
Railway Road, Chorley, PR6 0HW	Codes:	As noted below

1.0 Beam Data

Length	6000 mm
Material:	6082 T6
Codes:	BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

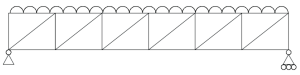
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	29.0	18.4	11.4
Ultimate Moment Capacity (kN.m)	43.5	24.9	17.1
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

3.0 Safe Working and (Ultimate) Loads

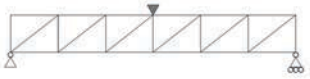
Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	2.8 (4.2)	2.2 (3.4)	1.7 (2.5)
Central Point Load (kN)	19.6 (29.4)	12.5 (18.7)	7.7 (11.6)
Two Point Loads at Third Points (each)	14.7 (22.1)	9.4 (14.0)	5.8 (8.7)
Three PL at Quarter Points (kN, each)	11.8 (17.7)	7.5 (11.2)	4.6 (7.0)
PL on each node (kN, each)	6.5 (9.8)	4.2 (6.2)	2.6 (3.9)

4.0 Load Position Diagrams

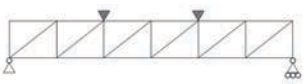
UDL



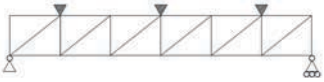
Centre PL



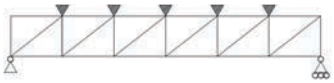
Two PL



Three PL



PL each node



5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads

2) Ultimate load capacities are shown in brackets

3) Loads should be applied at node points only, with the exception of the UDL

4) Capacities are calculated based on simple supports at each end

5) Beams should be supported at node points and not at ends of cantilever tube sections

S-Mech Ltd.		
Consulting Engineering	Project#:	1440-750
Suite 9, Railway House,	Element:	750 Lattice Beams
Railway Road, Chorley, PR6 0HW	Material:	As noted below
	Codes:	As noted below

1.0 Beam Data

Length	7000 mm
Material:	6082 T6
Codes:	BS EN 12811, BS EN 1999

2.0 Moment and Shear Capacity

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
Permissible Moment Capacity (kN.m)	29.0	18.4	11.4
Ultimate Moment Capacity (kN.m)	43.5	24.9	17.1
Permissible Shear Capacity (kN)	14.6	14.6	14.6
Ultimate Shear Capacity (kN)	21.9	21.9	21.9

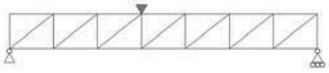
3.0 Safe Working and (Ultimate) Loads

Restraints to Top Chord (m, c/c)	**1.00**	**1.50**	**2.00**
UDL (kN/m)	2.4 (3.6)	1.9 (2.9)	1.4 (2.1)
Central Point Load (kN)	17.1 (25.7)	10.9 (16.4)	6.8 (10.1)
Two Point Loads at Third Points (each)	14.6 (21.9)	9.3(13.9)	5.8 (8.6)
Three PL at Quarter Points (kN, each)	7.9 (11.9)	5.1 (7.6)	3.1 (4.7)
PL on each node (kN, each)	4.9 (7.4)	3.1 (4.7)	1.9 (2.9)

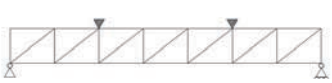
4.0 Load Position Diagrams

UDL

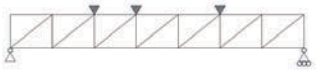
Centre PL



Two PL



Three PL



PL each node

5.0 Notes

1) Safe Working Loads are to be used in conjunction with unfactored applied loads

2) Ultimate load capacities are shown in brackets

3) Loads should be applied at node points only, with the exception of the UDL

4) Capacities are calculated based on simple supports at each end

5) Beams should be supported at node points and not at ends of cantilever tube sections

6. Validation by Testing

A test program specified by S-Mech was completed in the 4m and 6m span beams to allow a comparison to be made against the capacities derived by calculation. UDL and central point load cases were tested when the top chord was restrained at 2m centres. In the central point load case the beams were loaded through to failure to give an indication of the residual capacity when the material moves from the elastic range.

The results are detailed in Tesmec Report TES000109 and are summarised below.

Beam Length	Centre Point Load (two parallel beams loaded equally)				UDL (two parallel beams at 1m c/c loaded equally)			
	Load by Calculation and Test Load		Deflections		Load by Calculation and Test Load		Deflections	
	SLS	ULS	SLS Calc	SLS Test	SLS	ULS	SLS Calc	SLS Test
4m	23.4 kN	38.6 kN	2.98 mm	**3.15 mm**	5.3 kN/m²	8.7 kN/m²	1.45 mm	**1.8 mm**
6m	15.5 kN	25.5 kN	4.85 mm	**4.03 mm**	3.4 kN/m²	5.6 kN/m²	3.59 mm	**4.03 mm**

Table 6-1 Summary of Testing

When the central point load was increased to failure the 4m beam test was abandoned at the maximum load that could be applied of 98.8 kN. The 6m beam failed at 78.2 kN. These represent safety factors of 4.2 and 5.0 respectively from permissible to collapse loading.

Deflections recorded under test loads are considered sufficiently close to the theoretical displacements to validate the calculations as accurate.

It is therefore considered that the analysis is validated to BS EN 1999-1-1:2007+A2:2013.

Appendix A Section Capacities

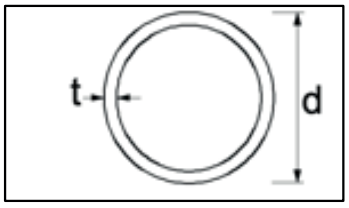
S-Mech Ltd. **Consulting Engineering** Suite 9, Railway House, Railway Road, Chorley, PR6 0HW		Project#: 1440 Section: ACHS Material: 6082 T6 Aluminium Code: BS EN 1999-1

1.0 Global Partial Factors

Cross Section Partial Factor (γ_{M0})	1	
Material Partial Factor (γ_{m1}) =	1.1	
Material Partial Factor (γ_{m2}) =	1.25	
Load Partial Factor (γ_f) =	1.5	
$\rho_{o,haz}$ =	0.5	From Table 3.2b
$\rho_{u,haz}$ =	0.64	From Table 3.2b

2.0 Section Properties

Section : 48.3 4.0 CHS



Outside Dia.	48.3	mm
Inside Dia.	40.3	mm
Thickness	4	mm
f_o	250	N/mm^2
f_u	290	N/mm^2
Area	557	mm^2
Tube I_{yy}	137676	mm^4
R_{yy}	15.73	mm
R_{zz}	15.73	mm
Z_{yy}	5701	mm^3
S_{xx}	7871	mm^3
Weight	0.043	kN/m

3.0 Section Classification

Modification Factor ε = $\sqrt{(250/f_o)}$

ε = 1

Buckling Parameter β = $\sqrt[3]{(D/t)}$

β = 2.23

β_1/ε =	9	For 6082 T6 Class A Material, Internal parts
β_2/ε =	13	
β_3/ε =	18	

Therefore:

β_1 =	9
β_2 =	13
β_3 =	18

Section Classification =	Class 1	As a beam

S-Mech Ltd. **Consulting Engineering** Suite 9, Railway House, Railway Road, Chorley, PR6 0HW		Project#: 1440 Section: ACHS Material: 6082 T6 Aluminium Code: BS EN 1999-1

4.0 Axial Capacity

Axial Capacity Ignoring Buckling

Max Capacity $N_{u,Rd}$ = $\dfrac{A_{net}\, f_u}{\gamma_{M2}}$

Max Capacity $N_{o,Rd}$ = $\dfrac{A_{eff}\, f_o}{\gamma_{M2}}$

$N_{u,Rd}$ = 82.66 kN

$N_{c,Rd}$ = 63.26 kN

Min Capacity $N_{,Rd}$ = 63.26 kN

Permissible Axial Force =	42.17	kN	(Ignoring Buckling)

Buckling Capacity

Buckling Capacity ($N_{b,Rd)}$ = $\dfrac{\kappa\chi\, A_{eff}\, f_o}{\gamma_{M1}}$

Flexural Buckling Reduction Factor (χ) = $\dfrac{1}{\varphi + \sqrt{(\varphi^2 - \underline{\lambda}^2)}}$ To be verified in table as <1

(NB. $\chi \leq 1$)

φ = $0.5\,[1 + \alpha\,(\underline{\lambda}-\underline{\lambda}_0) + \underline{\lambda}^2]$

$\underline{\lambda}$ = $(1\, L_{cr} / \pi\, i) * (A_{eff}\, f_o / A\, E)^{0.5}$

Relevant Radius of Gyration i = 15.73 mm

$\kappa = \omega_x$ = 0.653 To be Verified as <1

α = 0.2

$\underline{\lambda}_0$ = 0.1

Modulus of Elasticity E= 70000 Mpa (For 6082 T6)

Axial Buckling Capacities							
Effective Length (mm)	**702**	**1000**	**1201**	**1500**	**2000**	**1000**	**1000**
$\underline{\lambda}$	0.600	0.855	1.027	1.283	1.711	0.855	0.855
φ	0.730	0.941	1.120	1.441	2.124	0.941	0.941
χ	0.873	0.749	0.638	0.477	0.296	0.749	0.749
$N_{b,Rd}$ (kN)	72.13	61.94	52.73	39.40	24.43	61.94	61.94
Permissible Force (KN) (1)	48.08	41.30	35.15	26.26	16.29	41.30	41.30
Permissible Force (kN) (2)	**42.17**	**41.30**	**35.15**	**26.26**	**16.29**	**41.30**	**41.30**

If (2)<(1) Local Squashing Controls

5.0 Tensile Capacity

Tensile Design Plastic Resistance $N_{o,Rd}$ = $\frac{A_g f_o}{\gamma_{M1}}$

Tensile Design Plastic Resistance $N_{u,Rd}$ = $\frac{A_{eff} f_u}{\gamma_{M2}}$

$N_{o,Rd}$ = 63.26 kN

$N_{u,Rd}$ = 82.66 kN

Tensile Design Plastic Resistance $N_{pl,Rd}$ = 63.26 kN

Permissible Tensile Force =	42.17	kN

6.0 Section Bending Capacity

Section is not susceptible to lateral torsional buckling therefore:

Section Bending Resistance ($M_{u,Rd}$) = $\frac{W_{net} f_u}{\gamma_{M2}}$

Section Bending Resistance ($M_{c,Rd}$) = $\frac{\alpha W_{el} f_o}{\gamma_{M1}}$

α = W_{pl}/W_{el}

α = 1.38072

$M_{u,Rd}$ = 0.85 kN.m

$M_{c,Rd}$ = 0.89 kN.m

Section Bending Resistance ($M_{c,Rd}$) = 0.85 kN.m

Permissible Moment =	0.564	kN.m	Class 1

7.0 Section Shear Capacity

Section Shear Resistance ($V_{pl,Rd}$) = $\dfrac{A_v f_o}{\sqrt{3}\,\gamma_{M1}}$

For CHS Section Shear Area (A_v) = $\eta\, A_e$

η = 0.6

Section Shear Resistance ($V_{pl,Rd}$) = 21.91 kN

Permissible Shear Resistance =	14.61	kN

Appendix B Analysis Outputs

S-Mech Ltd
Consulting Structural Engineering
Suite 9, Railway House, Railway Road, Chorley, PR6 0HW
info@s-mech.co.uk www.s-mech.co.uk

Job ref	: 1440
Sheet	: 750 Beams
Made By	: IH
Date	: November 2015
Checked	: IH
Approved	:

2000mm 750 Beam

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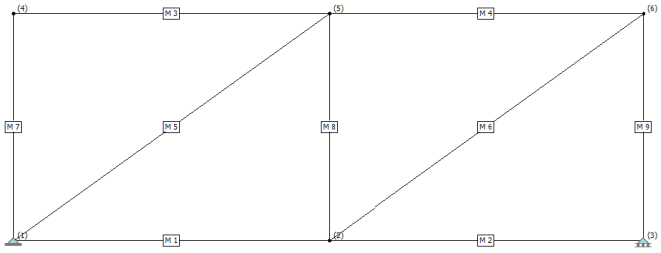

Frame Geometry - (Full Frame) - Front View

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MASTERFRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load

Load Case 001 : L1 - UDL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L1

Load Case 002 : L2 - CPL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L2

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.975	0.000	0.000
3	1.950	0.000	0.000	4	0.000	0.702	0.000
5	0.975	0.702	0.000	6	1.950	0.702	0.000

S-Mech Ltd
Consulting Structural Engineering
Suite 9, Railway House, Railway Road, Chorley, PR6 0HW
info@s-mech.co.uk www.s-mech.co.uk

Job ref	: 1440
Sheet	: 750 Beams
Made By	: IH
Date	: November 2015
Checked	: IH
Approved	:

MEMBER PROPERTIES

Members 1-9

```
M  ...  ...          48 ACHS 4 []     E 70E6     G 27E6
 A 5.57E-4            Ix 13.77E-8          Iy 13.77E-8          J 27.53E-8
```

MEMBER LOADING

Member Self Weight Density Load Included in Load Group D0, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 3-4

```
L1 UDLY -030.000              ( kN/m )
```

NODAL LOADING AND SUPPORT CONDITIONS

NODE 5

```
L2 Ls +0000.000 -0030.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 3

```
UT Rs 0 1 0 0 0 0 (Vertical Restraint)
```

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	0.21	0.00	2	0.60	-2.35	-0.11	2.42
3	0.65	0.00	-0.23	0.65	4	0.96	-0.24	-1.66	0.99
5	0.90	-2.64	-0.01	2.79	6	0.29	-0.52	1.25	0.59

Nodal Deflections Serviceability (002 : L2 - CPL)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.11	0.00	2	0.51	-2.04	0.02	2.10
3	0.52	0.00	0.07	0.52	4	0.71	0.00	-0.10	0.71
5	0.71	-2.31	-0.04	2.41	6	0.19	-0.27	0.09	0.33

Member Forces (001 : L1 - UDL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	23.926T	0.413	-0.254		0.843
	2	23.926T	0.398	0.141		@ 0.312
2	2	1.973T	-0.641	0.294		0.679
	3	1.973T	-0.656	-0.338		@ 0.741
3	4	2.642C	13.162	-1.376	1.510	10.954
	5	2.642C	-16.103	-2.810	@ 0.439	@ 0.449
4	5	24.063C	15.685	-2.674	1.424	10.062
	6	24.063C	-13.580	-1.648	@ 0.517	@ 0.517
5	1	26.463C	0.328	-0.225		0.888
	5	26.453C	0.313	0.160		@ 0.336
6	2	26.720T	0.695	-0.225		3.947
	6	26.731T	0.680	0.601		@ 0.769

S-Mech Ltd
Consulting Structural Engineering
Suite 9, Railway House, Railway Road, Chorley, PR6 0HW
info@s-mech.co.uk www.s-mech.co.uk

Job ref	: 1440
Sheet	: 750 Beams
Made By	: IH
Date	: November 2015
Checked	: IH
Approved	:

Member Forces (001 : L1 - UDL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
7	1	13.172C	-2.642	0.479		3.152
	4	13.162C	-2.642	-1.376		@ 0.442
8	2	16.088C	-0.137	0.072		0.166
	5	16.078C	-0.137	-0.024		@ 0.260
9	3	28.657C	1.973	-0.338		2.467
	6	28.647C	1.973	1.046		@ 0.442

Member Forces (002 : L2 - CPL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	20.568T	0.158	-0.052		0.339
	2	20.568T	0.144	0.095		@ 0.653
2	2	0.221T	-0.156	0.088		0.209
	3	0.221T	-0.171	-0.072		@ 0.254
3	4	0.191C	0.155	-0.063		0.210
	5	0.191C	0.140	0.081		@ 0.702
4	5	20.544C	-0.186	0.115		0.363
	6	20.544C	-0.201	-0.074		@ 0.302
5	1	25.149C	0.055	-0.019		0.241
	5	25.138C	0.040	0.038		@ 0.781
6	2	25.060T	-0.025	0.028		0.222
	6	25.070T	-0.039	-0.010		@ 0.457
7	1	0.166C	-0.191	0.072		0.074
	4	0.155C	-0.191	-0.063		@ 0.168
8	2	14.962C	0.025	-0.021		0.081
	5	14.952C	0.025	-0.004		@ 0.309
9	3	14.892C	0.221	-0.072		0.090
	6	14.882C	0.221	0.083		@ 0.527

Support Reactions Serviceability (001 : L1 - UDL)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	29.313	0.000	3	0.000	29.313	0.000
Total	0.000	58.626	0.000				

Support Reactions Serviceability (002 : L2 - CPL)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	15.063	0.000	3	0.000	15.063	0.000
Total	0.000	30.126	0.000				

S-Mech Ltd
Consulting Structural Engineering
Suite 9, Railway House, Railway Road, Chorley, PR6 0HW
info@s-mech.co.uk www.s-mech.co.uk

Job ref	: 1440
Sheet	: 750 Beams
Made By	: IH
Date	: November 2015
Checked	: IH
Approved	:

3000mm 750 Beam

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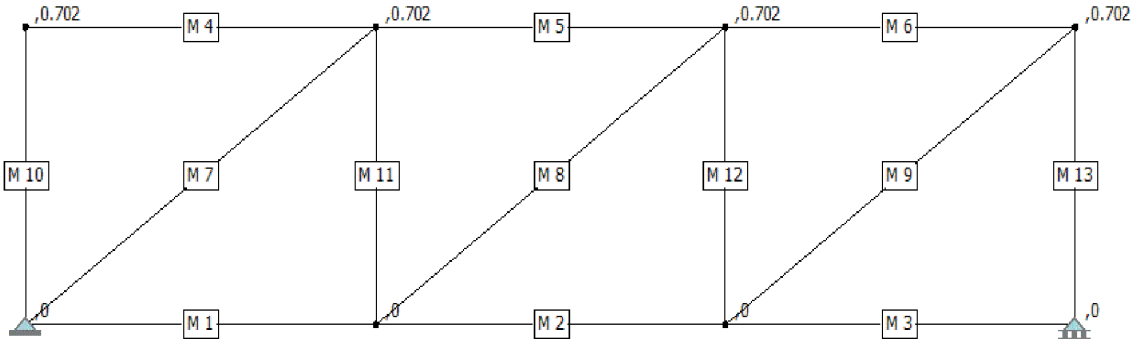

Frame Geometry - (Full Frame) - Front View

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MASTERFRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load

Load Case 001 : L1 - UDL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L1

Load Case 002 : L2 - CPL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L2

Load Case 003 : L3 - 2PL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L3

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.975	0.000	0.000
3	1.950	0.000	0.000	4	2.925	0.000	0.000
5	0.000	0.702	0.000	6	0.975	0.702	0.000

```
     7      1.950      0.702      0.000          8      2.925      0.702      0.000
```

MEMBER PROPERTIES

Members 1-13

```
M  ...  ...          48 ACHS 4 []    E 70E6    G 27E6
 A 5.57E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

MEMBER LOADING

Member Self Weight Density Load Included in Load Group D0, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 4-6

```
L1 UDLY -015.000              ( kN/m )
```

NODAL LOADING AND SUPPORT CONDITIONS

NODE 6

```
L2 Ls +0000.000 -0030.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 6-7

```
L3 Ls +0000.000 -0020.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 4

```
UT Rs 0 1 0 0 0 0 (Vertical Restraint)
```

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.51	-2.96	3.01
3	1.02	-2.92	3.09	4	1.02	0.00	1.02
5	1.18	-0.13	1.19	6	1.18	-2.96	3.19
7	0.67	-3.18	3.25	8	0.16	-0.40	0.43

Nodal Deflections Serviceability (002 : L2 - CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.70	-3.42	3.49
3	1.05	-2.20	2.44	4	1.05	0.00	1.05
5	1.29	0.00	1.29	6	1.29	-3.60	3.83
7	0.60	-2.38	2.45	8	0.25	-0.18	0.31

Nodal Deflections Serviceability (003 : L3 - 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.70	-3.99	4.05
3	1.39	-3.87	4.11	4	1.39	0.00	1.39
5	1.57	0.00	1.57	6	1.57	-3.99	4.28
7	0.87	-4.23	4.32	8	0.17	-0.36	0.40

Member Forces (001 : L1 - UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-20.393	36.6	0.975	T	2	2	3	-20.393	36.6	0.975	T
3	3	4	0.000	0.0	0.975	C	4	5	6	0.000	0.0	0.975	C

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Member Forces (001 : L1 - UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
5	6	7	20.393	36.6	0.975	C	6	7	8	20.393	36.6	0.975	C
7	1	6	25.129	45.1	1.201	C	8	2	7	0.000	0.0	1.201	T
9	3	8	-25.129	45.1	1.201	T	10	1	5	7.325	13.2	0.702	C
11	2	6	-0.029	0.1	0.702	T	12	3	7	14.654	26.3	0.702	C
13	4	8	22.017	39.5	0.702	C							

Member Forces (002 : L2 - CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-27.858	50.0	0.975	T	2	2	3	-13.969	25.1	0.975	T
3	3	4	0.000	0.0	0.975		4	5	6	0.000	0.0	0.975	C
5	6	7	27.858	50.0	0.975	C	6	7	8	13.969	25.1	0.975	C
7	1	6	34.328	61.6	1.201	C	8	2	7	-17.114	30.7	1.201	T
9	3	8	-17.214	30.9	1.201	T	10	1	5	0.013	0.0	0.702	C
11	2	6	9.971	17.9	0.702	C	12	3	7	10.029	18.0	0.702	C
13	4	8	10.080	18.1	0.702	C							

Member Forces (003 : L3 - 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-27.858	50.0	0.975	T	2	2	3	-27.858	50.0	0.975	T
3	3	4	0.000	0.0	0.975		4	5	6	0.000	0.0	0.975	C
5	6	7	27.858	50.0	0.975	C	6	7	8	27.858	50.0	0.975	C
7	1	6	34.328	61.6	1.201	C	8	2	7	0.000	0.0	1.201	T
9	3	8	-34.328	61.6	1.201	T	10	1	5	0.013	0.0	0.702	C
11	2	6	-0.029	0.1	0.702	T	12	3	7	20.029	36.0	0.702	C
13	4	8	20.080	36.0	0.702	C							

Support Reactions Serviceability (001 : L1 - UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	22.030	4	0.000	22.030
Total	0.000	44.059			

Support Reactions Serviceability (002 : L2 - CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	20.092	4	0.000	10.092
Total	0.000	30.184			

Support Reactions Serviceability (003 : L3 - 2PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	20.092	4	0.000	20.092
Total	0.000	40.184			

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4000mm 750 Beam

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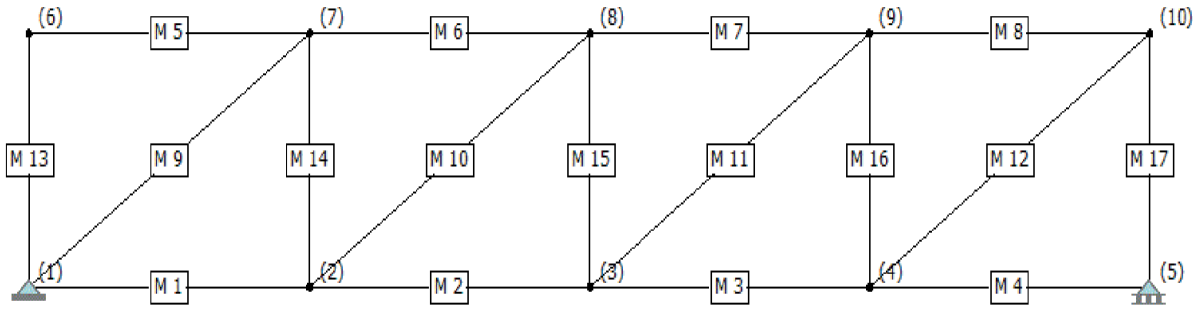
MasterFrame : Graphics



Frame Geometry - (Full Frame) - Front View

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MASTERFRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group L5	Live Load
Load Group L6	Live Load
Load Group L7	Live Load

Load Case 001 : L1 - UDL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L1

Load Case 002 : L2 - CPL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L2

Load Case 003 : L3 - 2PL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L3

Load Case 004 : L4 - 3PL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L4

Load Case 005 : Validation L6 - CPL at 1.0m
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L6

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Load Case 006 : Validation L7 - 2PL at 1.5m

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L7

Load Case 007 : Validation L5 - UDL at 2m

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L5

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.975	0.000	0.000
3	1.950	0.000	0.000	4	2.925	0.000	0.000
5	3.900	0.000	0.000	6	0.000	0.702	0.000
7	0.975	0.702	0.000	8	1.950	0.702	0.000
9	2.925	0.702	0.000	10	3.900	0.702	0.000

MEMBER PROPERTIES

Members 1-17

```
M  ...  ...        48 ACHS 4 []    E 70E6    G 27E6
 A 5.57E-4          Ix 13.77E-8        Iy 13.77E-8        J 27.53E-8
```

MEMBER LOADING

Member Self Weight Density Load Included in Load Group D0, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 5-8

```
L1 UDLY -010.000            ( kN/m )
L5 UDLY -002.640            ( kN/m )
```

NODAL LOADING AND SUPPORT CONDITIONS

NODE 8

```
L2 Ls +0000.000 -0020.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 7 and 9

```
L3 Ls +0000.000 -0015.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 7-9

```
L4 Ls +0000.000 -0015.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 8

```
L6 Ls +0000.000 -0029.610 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 7 and 9

```
L7 Ls +0000.000 -0018.790 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 5

```
UT Rs 0 1 0 0 0 0 (Vertical Restraint)
```

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.10	0.00	2	0.54	-4.04	-0.17	4.08
3	1.24	-5.53	0.01	5.67	4	1.78	-4.01	0.14	4.39
5	1.80	0.00	0.07	1.80	6	1.92	-0.08	-0.71	1.92
7	1.89	-3.96	-0.11	4.39	8	1.35	-5.62	-0.02	5.78
9	0.65	-4.28	0.08	4.33	10	0.11	-0.35	0.58	0.37

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Nodal Deflections Serviceability (002 : L2 - CPL)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.15	0.00	2	0.35	-3.10	-0.13	3.12
3	1.04	-4.86	0.02	4.97	4	1.39	-2.92	0.13	3.23
5	1.40	0.00	0.14	1.40	6	1.46	0.00	-0.14	1.46
7	1.46	-2.92	-0.14	3.26	8	1.10	-5.03	-0.02	5.15
9	0.41	-3.10	0.13	3.13	10	0.06	-0.18	0.14	0.19

Nodal Deflections Serviceability (003 : L3 - 2PL)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.19	0.00	2	0.52	-3.64	-0.11	3.68
3	1.04	-4.51	0.00	4.63	4	1.56	-3.64	0.13	3.96
5	1.57	0.00	0.16	1.57	6	1.66	0.00	-0.17	1.66
7	1.66	-3.64	-0.14	4.00	8	1.14	-4.51	-0.01	4.65
9	0.61	-3.91	0.10	3.96	10	0.10	-0.27	0.18	0.29

Nodal Deflections Serviceability (004 : L4 - 3PL)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.30	0.00	2	0.78	-5.94	-0.21	5.99
3	1.82	-8.13	0.01	8.33	4	2.60	-5.81	0.23	6.37
5	2.61	0.00	0.26	2.61	6	2.75	0.00	-0.27	2.75
7	2.74	-5.81	-0.24	6.43	8	1.96	-8.26	-0.02	8.49
9	0.92	-6.21	0.19	6.28	10	0.14	-0.40	0.28	0.43

Nodal Deflections Serviceability (005 : Validation L6 - CPL at 1.0m)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.23	0.00	2	0.51	-4.57	-0.20	4.60
3	1.54	-7.17	0.03	7.34	4	2.06	-4.31	0.19	4.78
5	2.06	0.00	0.20	2.06	6	2.16	0.00	-0.20	2.16
7	2.15	-4.31	-0.20	4.82	8	1.63	-7.44	-0.03	7.62
9	0.61	-4.57	0.19	4.61	10	0.10	-0.27	0.21	0.28

Nodal Deflections Serviceability (006 : Validation L7 - 2PL at 1.5m)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.24	0.00	2	0.65	-4.55	-0.14	4.60
3	1.30	-5.64	-0.01	5.79	4	1.96	-4.55	0.16	4.95
5	1.96	0.00	0.20	1.96	6	2.08	0.00	-0.21	2.08
7	2.08	-4.55	-0.17	5.00	8	1.42	-5.64	-0.01	5.82
9	0.77	-4.89	0.12	4.95	10	0.12	-0.34	0.22	0.36

Nodal Deflections Serviceability (007 : Validation L5 - UDL at 2m)

Node	Nodal Def. (mm and degrees)				Node	Nodal Def. (mm and degrees)			
	δX→	δY↑	θZ↗	δXY		δX→	δY↑	θZ↗	δXY
1	0.00	0.00	-0.03	0.00	2	0.14	-1.09	-0.04	1.09
3	0.33	-1.48	0.00	1.52	4	0.48	-1.08	0.04	1.18
5	0.48	0.00	0.02	0.48	6	0.51	-0.02	-0.19	0.51
7	0.51	-1.06	-0.03	1.18	8	0.36	-1.51	0.00	1.55
9	0.17	-1.15	0.02	1.16	10	0.03	-0.09	0.16	0.10

Member Forces (001 : L1 - UDL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	21.424T	0.230	-0.121		0.272
	2	21.424T	0.215	0.096		@ 0.254

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Member Forces (001 : L1 - UDL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
2	2	28.226T	0.030	0.019		0.386
	3	28.226T	0.016	0.041		@ 0.517
3	3	21.606T	-0.025	0.036		0.268
	4	21.606T	-0.039	0.004		@ 0.429
4	4	0.776T	-0.274	0.125		0.312
	5	0.776T	-0.288	-0.149		@ 0.731
5	6	1.016C	4.500	-0.503	0.508	3.750
	7	1.016C	-5.265	-0.876	@ 0.449	@ 0.458
6	7	21.529C	4.956	-0.814	0.412	2.632
	8	21.529C	-4.809	-0.742	@ 0.488	@ 0.497
7	8	28.200C	4.786	-0.728	0.414	2.665
	9	28.200C	-4.979	-0.823	@ 0.468	@ 0.478
8	9	21.533C	5.102	-0.814	0.485	3.513
	10	21.533C	-4.663	-0.600	@ 0.507	@ 0.507
9	1	25.257C	0.151	-0.089		0.217
	7	25.247C	0.137	0.084		@ 0.252
10	2	8.249C	-0.005	0.026		0.395
	8	8.239C	-0.019	0.012		@ 0.565
11	3	8.136T	-0.015	0.022		0.203
	9	8.147T	-0.030	-0.005		@ 0.493
12	4	25.401T	0.247	-0.083		1.320
	10	25.411T	0.232	0.205		@ 0.769
13	1	4.510C	-1.016	0.210		1.058
	6	4.500C	-1.016	-0.503		@ 0.456
14	2	4.631T	-0.105	0.051		0.104
	7	4.642T	-0.105	-0.022		@ 0.246
15	3	4.807C	0.026	-0.017		0.050
	8	4.796C	0.026	0.002		@ 0.288
16	4	14.876C	0.073	-0.038		0.086
	9	14.865C	0.073	0.013		@ 0.253
17	5	19.333C	0.776	-0.149		0.873
	10	19.322C	0.776	0.395		@ 0.449

Member Forces (002 : L2 - CPL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	13.893T	0.088	-0.037		0.095
	2	13.893T	0.074	0.042		@ 0.722
2	2	27.704T	0.103	-0.022		0.349
	3	27.704T	0.088	0.071		@ 0.605
3	3	14.091T	-0.079	0.060		0.268
	4	14.091T	-0.093	-0.024		@ 0.351
4	4	0.120T	-0.076	0.040		0.075
	5	0.120T	-0.091	-0.041		@ 0.224
5	6	0.111C	0.077	-0.035		0.056
	7	0.111C	0.063	0.033		@ 0.761
6	7	14.080C	0.100	-0.027		0.278

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Member Forces (002 : L2 - CPL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
	8	14.080C	0.086	0.064		@ 0.624
7	8	27.694C	-0.121	0.087		0.368
	9	27.694C	-0.135	-0.037		@ 0.351
8	9	13.888C	-0.070	0.038		0.077
	10	13.888C	-0.084	-0.037		@ 0.234
9	1	16.996C	0.018	-0.006		0.054
	7	16.985C	0.003	0.007		@ 0.769
10	2	16.812C	0.032	-0.001		0.305
	8	16.801C	0.018	0.029		@ 0.685
11	3	16.769T	-0.010	0.024		0.305
	9	16.780T	-0.024	0.004		@ 0.541
12	4	16.968T	-0.004	0.007		0.044
	10	16.978T	-0.019	-0.007		@ 0.396
13	1	0.088C	-0.111	0.043		0.049
	6	0.077C	-0.111	-0.035		@ 0.176
14	2	9.879T	-0.187	0.064		0.058
	7	9.889T	-0.187	-0.067		@ 0.548
15	3	9.973C	0.010	-0.013		0.061
	8	9.962C	0.010	-0.006		@ 0.330
16	4	9.900C	0.203	-0.071		0.059
	9	9.890C	0.203	0.071		@ 0.555
17	5	10.030C	0.120	-0.041		0.040
	10	10.020C	0.120	0.043		@ 0.541

Member Forces (003 : L3 - 2PL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	20.709T	0.144	-0.054		0.238
	2	20.709T	0.129	0.079		@ 0.683
2	2	20.971T	-0.005	0.023		0.227
	3	20.971T	-0.020	0.011		@ 0.458
3	3	20.837T	0.032	0.010		0.293
	4	20.837T	0.017	0.034		@ 0.527
4	4	0.202T	-0.138	0.075		0.159
	5	0.202T	-0.152	-0.067		@ 0.244
5	6	0.180C	0.136	-0.058		0.151
	7	0.180C	0.121	0.067		@ 0.722
6	7	20.832C	-0.038	0.043		0.286
	8	20.832C	-0.052	-0.001		@ 0.419
7	8	20.964C	0.027	0.007		0.227
	9	20.964C	0.012	0.026		@ 0.527
8	9	20.689C	-0.155	0.092		0.258
	10	20.689C	-0.169	-0.066		@ 0.283
9	1	25.326C	0.041	-0.014		0.166
	7	25.316C	0.026	0.026		@ 0.781
10	2	0.169C	-0.003	0.019		0.276

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Job ref	: 1440
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Date	: November 2015
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Approved	:

Member Forces (003 : L3 - 2PL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
	8	0.158C	-0.018	0.006		@ 0.553
11	3	0.141T	0.022	0.004		0.276
	9	0.151T	0.008	0.022		@ 0.661
12	4	25.257T	-0.016	0.019		0.144
	10	25.267T	-0.031	-0.009		@ 0.445
13	1	0.146C	-0.180	0.068		0.074
	6	0.136C	-0.180	-0.058		@ 0.176
14	2	0.039C	-0.123	0.037		0.067
	7	0.028C	-0.123	-0.050		@ 0.505
15	3	0.012C	0.007	-0.003	0.002	0.000
	8	0.001C	0.007	0.002	@ 0.000	@ 0.000
16	4	14.926C	0.148	-0.060		0.081
	9	14.915C	0.148	0.044		@ 0.197
17	5	14.969C	0.202	-0.067		0.077
	10	14.958C	0.202	0.075		@ 0.534

Member Forces (004 : L4 - 3PL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	31.035T	0.205	-0.081		0.305
	2	31.035T	0.190	0.111		@ 0.692
2	2	41.625T	0.067	0.007		0.473
	3	41.625T	0.052	0.065		@ 0.546
3	3	31.310T	-0.031	0.055		0.472
	4	31.310T	-0.046	0.018		@ 0.449
4	4	0.289T	-0.200	0.105		0.211
	5	0.289T	-0.214	-0.096		@ 0.234
5	6	0.260C	0.188	-0.084		0.188
	7	0.260C	0.173	0.092		@ 0.741
6	7	31.298C	0.031	0.024		0.464
	8	31.298C	0.017	0.048		@ 0.517
7	8	41.611C	-0.070	0.074		0.479
	9	41.611C	-0.084	-0.001		@ 0.410
8	9	31.011C	-0.213	0.122		0.312
	10	31.011C	-0.228	-0.093		@ 0.273
9	1	37.957C	0.048	-0.017		0.198
	7	37.947C	0.034	0.032		@ 0.781
10	2	12.737C	0.015	0.019		0.490
	8	12.726C	0.001	0.029		@ 0.625
11	3	12.685T	0.010	0.023	0.027	0.491
	9	12.696T	-0.005	0.026	@ 0.000	@ 0.601
12	4	37.875T	-0.025	0.026		0.169
	10	37.886T	-0.040	-0.013		@ 0.433
13	1	0.198C	-0.260	0.099		0.109
	6	0.188C	-0.260	-0.084		@ 0.176
14	2	7.331T	-0.263	0.085		0.110

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Member Forces (004 : L4 - 3PL)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
	7	7.342T	-0.263	-0.100		@ 0.527
15	3	7.488C	0.015	-0.013		0.052
	8	7.477C	0.015	-0.003		@ 0.316
16	4	22.304C	0.299	-0.113		0.123
	9	22.294C	0.299	0.097		@ 0.176
17	5	22.407C	0.289	-0.096		0.106
	10	22.396C	0.289	0.106		@ 0.534

Member Forces (005 : Validation L6 - CPL at 1.0m)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	20.509T	0.128	-0.055		0.139
	2	20.509T	0.113	0.062		@ 0.731
2	2	40.936T	0.149	-0.032		0.515
	3	40.936T	0.134	0.106		@ 0.605
3	3	20.801T	-0.119	0.089		0.394
	4	20.801T	-0.134	-0.034		@ 0.351
4	4	0.176T	-0.116	0.060		0.108
	5	0.176T	-0.130	-0.060		@ 0.224
5	6	0.162C	0.111	-0.052		0.081
	7	0.162C	0.096	0.049		@ 0.770
6	7	20.785C	0.145	-0.039		0.409
	8	20.785C	0.130	0.095		@ 0.624
7	8	40.921C	-0.182	0.130		0.543
	9	40.921C	-0.197	-0.055		@ 0.341
8	9	20.501C	-0.107	0.057		0.113
	10	20.501C	-0.122	-0.054		@ 0.234
9	1	25.088C	0.023	-0.008		0.074
	7	25.077C	0.008	0.011		@ 0.781
10	2	24.864C	0.044	-0.001		0.447
	8	24.853C	0.030	0.044		@ 0.685
11	3	24.806T	-0.018	0.037		0.447
	9	24.817T	-0.032	0.007		@ 0.541
12	4	25.052T	-0.009	0.011		0.061
	10	25.062T	-0.024	-0.009		@ 0.384
13	1	0.121C	-0.162	0.062		0.071
	6	0.111C	-0.162	-0.052		@ 0.176
14	2	14.600T	-0.276	0.095		0.087
	7	14.611T	-0.276	-0.099		@ 0.548
15	3	14.762C	0.015	-0.020		0.091
	8	14.752C	0.015	-0.009		@ 0.330
16	4	14.627C	0.300	-0.105		0.086
	9	14.617C	0.300	0.105		@ 0.555
17	5	14.796C	0.176	-0.060		0.059
	10	14.785C	0.176	0.064		@ 0.541

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Member Forces (006 : Validation L7 - 2PL at 1.5m)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	25.910T	0.178	-0.067		0.297
	2	25.910T	0.164	0.099		@ 0.683
2	2	26.228T	-0.008	0.029		0.283
	3	26.228T	-0.023	0.014		@ 0.458
3	3	26.070T	0.039	0.013		0.366
	4	26.070T	0.024	0.043		@ 0.527
4	4	0.252T	-0.174	0.094		0.198
	5	0.252T	-0.189	-0.083		@ 0.244
5	6	0.224C	0.168	-0.073		0.187
	7	0.224C	0.153	0.084		@ 0.731
6	7	26.064C	-0.049	0.054		0.357
	8	26.064C	-0.064	-0.001		@ 0.410
7	8	26.219C	0.031	0.010		0.283
	9	26.219C	0.017	0.033		@ 0.527
8	9	25.885C	-0.196	0.115		0.322
	10	25.885C	-0.210	-0.083		@ 0.283
9	1	31.686C	0.049	-0.017		0.205
	7	31.676C	0.034	0.033		@ 0.781
10	2	0.197C	-0.006	0.024		0.342
	8	0.187C	-0.021	0.008		@ 0.553
11	3	0.165T	0.026	0.005		0.342
	9	0.176T	0.012	0.028		@ 0.661
12	4	31.602T	-0.022	0.025		0.178
	10	31.613T	-0.037	-0.011		@ 0.445
13	1	0.179C	-0.224	0.085		0.092
	6	0.168C	-0.224	-0.073		@ 0.176
14	2	0.062C	-0.154	0.046		0.084
	7	0.051C	-0.154	-0.062		@ 0.505
15	3	0.014C	0.009	-0.004	0.002	0.000
	8	0.003C	0.009	0.002	@ 0.000	@ 0.000
16	4	18.681C	0.185	-0.075		0.102
	9	18.671C	0.185	0.055		@ 0.197
17	5	18.722C	0.252	-0.083		0.096
	10	18.712C	0.252	0.094		@ 0.534

Member Forces (007 : Validation L5 - UDL at 2m)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	5.748T	0.066	-0.032		0.069
	2	5.748T	0.051	0.024		@ 0.244
2	2	7.573T	0.013	0.004		0.106
	3	7.573T	-0.002	0.010		@ 0.507
3	3	5.797T	-0.002	0.009		0.075
	4	5.797T	-0.017	0.000		@ 0.429
4	4	0.208T	-0.068	0.033		0.080
	5	0.208T	-0.082	-0.040		@ 0.741
5	6	0.271C	1.194	-0.134	0.135	0.995

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Member Forces (007 : Validation L5 - UDL at 2m)

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
	7	0.271C	-1.395	-0.232	@ 0.449	@ 0.458
6	7	5.776C	1.315	-0.216	0.109	0.699
	8	5.776C	-1.274	-0.196	@ 0.478	@ 0.497
7	8	7.566C	1.269	-0.193	0.110	0.708
	9	7.566C	-1.319	-0.218	@ 0.478	@ 0.478
8	9	5.777C	1.353	-0.216	0.129	0.932
	10	5.777C	-1.236	-0.159	@ 0.507	@ 0.507
9	1	6.781C	0.045	-0.024		0.057
	7	6.771C	0.031	0.021		@ 0.937
10	2	2.217C	0.004	0.006	0.007	0.113
	8	2.207C	-0.010	0.002	@ 0.000	@ 0.577
11	3	2.180T	0.001	0.005	0.005	0.062
	9	2.190T	-0.013	-0.002	@ 0.000	@ 0.505
12	4	6.811T	0.071	-0.023		0.356
	10	6.822T	0.056	0.053		@ 0.769
13	1	1.205C	-0.271	0.057		0.279
	6	1.194C	-0.271	-0.134		@ 0.456
14	2	1.261T	-0.028	0.014		0.029
	7	1.272T	-0.028	-0.006		@ 0.246
15	3	1.273C	0.007	-0.004	0.001	0.012
	8	1.262C	0.007	0.001	@ 0.000	@ 0.281
16	4	3.973C	0.020	-0.010		0.022
	9	3.963C	0.020	0.004		@ 0.253
17	5	5.187C	0.208	-0.040		0.232
	10	5.176C	0.208	0.106		@ 0.449

Support Reactions Serviceability (001 : L1 - UDL)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	19.621	0.000	5	0.000	19.621	0.000
Total	0.000	39.242	0.000				

Support Reactions Serviceability (002 : L2 - CPL)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	10.121	0.000	5	0.000	10.121	0.000
Total	0.000	20.242	0.000				

Support Reactions Serviceability (003 : L3 - 2PL)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	15.121	0.000	5	0.000	15.121	0.000
Total	0.000	30.242	0.000				

Support Reactions Serviceability (004 : L4 - 3PL)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	22.621	0.000	5	0.000	22.621	0.000
Total	0.000	45.242	0.000				

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Support Reactions Serviceability (005 : Validation L6 - CPL at 1.0m)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	14.926	0.000	5	0.000	14.926	0.000
Total	0.000	29.852	0.000				

Support Reactions Serviceability (006 : Validation L7 - 2PL at 1.5m)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	18.911	0.000	5	0.000	18.911	0.000
Total	0.000	37.822	0.000				

Support Reactions Serviceability (007 : Validation L5 - UDL at 2m)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)		Rx→(kN)	Ry↑(kN)	Mz↗(kN.m)
1	0.000	5.269	0.000	5	0.000	5.269	0.000
Total	0.000	10.538	0.000				

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5000mm 750 Beam

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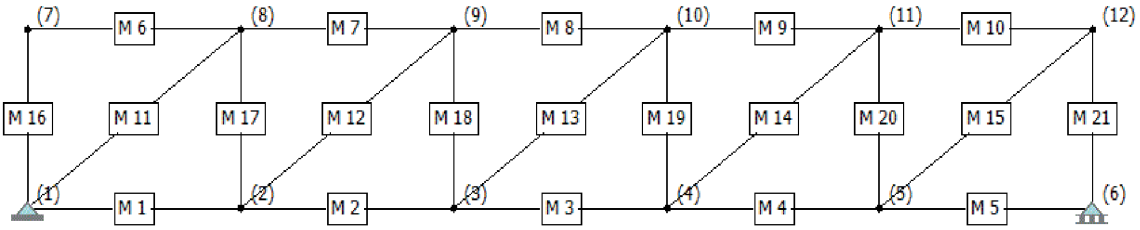
MasterFrame : Graphics



Frame Geometry - (Full Frame) - Front View

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MASTERFRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group L5	Live Load

Load Case 001 : L1 - UDL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L1

Load Case 002 : L5 - UDL N

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L5

Load Case 003 : L2 - CPL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L2

Load Case 004 : L3 - 2PL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L3

Load Case 005 : L4 - 3PL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L4

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)

```
    1     0.000     0.000     0.000       2     0.975     0.000     0.000
    3     1.950     0.000     0.000       4     2.925     0.000     0.000
    5     3.900     0.000     0.000       6     4.875     0.000     0.000
    7     0.000     0.702     0.000       8     0.975     0.702     0.000
    9     1.950     0.702     0.000      10     2.925     0.702     0.000
   11     3.900     0.702     0.000      12     4.875     0.702     0.000
```

MEMBER PROPERTIES

Members 1-21

```
M  ...  ...          48 ACHS 4 []    E 70E6    G 27E6
 A 5.57E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

MEMBER LOADING

Member Self Weight Density Load Included in Load Group D0, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 6-10

```
L1 UDLY -010.000              ( kN/m )
```

NODAL LOADING AND SUPPORT CONDITIONS

NODE 9

```
L2 Ls +0000.000 -0020.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 8 and 10

```
L3 Ls +0000.000 -0015.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 8-9 and 11

```
L4 Ls +0000.000 -0015.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 8-11

```
L5 Ls +0000.000 -0010.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 6

```
UT Rs 0 1 0 0 0 0 (Vertical Restraint)
```

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.68	-6.84	6.87
3	1.70	-10.72	10.85	4	2.73	-10.70	11.04
5	3.41	-6.78	7.59	6	3.41	0.00	3.41
7	3.52	-0.09	3.52	8	3.52	-6.66	7.53
9	2.84	-10.72	11.09	10	1.82	-10.88	11.03
11	0.80	-7.14	7.18	12	0.11	-0.44	0.46

Nodal Deflections Serviceability (002 : L5 - UDL N)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.70	-6.99	7.03
3	1.75	-10.96	11.10	4	2.79	-10.92	11.27
5	3.49	-6.89	7.72	6	3.49	0.00	3.49
7	3.60	0.00	3.60	8	3.60	-6.81	7.70
9	2.90	-10.96	11.33	10	1.85	-11.10	11.25
11	0.80	-7.25	7.29	12	0.10	-0.36	0.38

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Nodal Deflections Serviceability (003 : L2 - CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.42	-4.50	4.52
3	1.26	-7.46	7.57	4	1.82	-6.28	6.54
5	2.10	-3.54	4.11	6	2.10	0.00	2.10
7	2.30	0.00	2.30	8	2.30	-4.28	4.86
9	1.87	-7.61	7.83	10	1.03	-6.43	6.51
11	0.47	-3.68	3.71	12	0.19	-0.15	0.24

Nodal Deflections Serviceability (004 : L3 - 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.63	-5.59	5.62
3	1.36	-8.07	8.19	4	2.20	-8.23	8.52
5	2.62	-4.70	5.39	6	2.62	0.00	2.62
7	2.81	0.00	2.81	8	2.81	-5.53	6.21
9	2.18	-8.02	8.31	10	1.44	-8.45	8.57
11	0.60	-4.92	4.96	12	0.18	-0.22	0.28

Nodal Deflections Serviceability (005 : L4 - 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.84	-7.74	7.79
3	1.99	-11.52	11.69	4	2.93	-10.75	11.14
5	3.67	-7.07	7.97	6	3.67	0.00	3.67
7	3.89	0.00	3.89	8	3.89	-7.58	8.52
9	3.05	-11.63	12.02	10	1.90	-10.86	11.02
11	0.95	-7.45	7.51	12	0.22	-0.38	0.44

Member Forces (001 : L1 - UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-27.244	48.9	0.975	T	2	2	3	-40.866	73.4	0.975	T
3	3	4	-40.866	73.4	0.975	T	4	4	5	-27.244	48.9	0.975	T
5	5	6	0.000	0.0	0.975		6	7	8	0.000	0.0	0.975	C
7	8	9	27.244	48.9	0.975	C	8	9	10	40.866	73.4	0.975	C
9	10	11	40.866	73.4	0.975	C	10	11	12	27.244	48.9	0.975	C
11	1	8	33.571	60.3	1.201	C	12	2	9	16.786	30.1	1.201	C
13	3	10	0.000	0.0	1.201	T	14	4	11	-16.786	30.1	1.201	T
15	5	12	-33.571	60.3	1.201	T	16	1	7	4.888	8.8	0.702	C
17	2	8	-9.837	17.7	0.702	T	18	3	9	-0.029	0.1	0.702	T
19	4	10	9.779	17.6	0.702	C	20	5	11	19.587	35.2	0.702	C
21	6	12	24.513	44.0	0.702	C							

Member Forces (002 : L5 - UDL N)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-27.939	50.2	0.975	T	2	2	3	-41.908	75.2	0.975	T
3	3	4	-41.908	75.2	0.975	T	4	4	5	-27.939	50.2	0.975	T
5	5	6	0.000	0.0	0.975	T	6	7	8	0.000	0.0	0.975	C
7	8	9	27.939	50.2	0.975	C	8	9	10	41.908	75.2	0.975	C
9	10	11	41.908	75.2	0.975	C	10	11	12	27.939	50.2	0.975	C
11	1	8	34.427	61.8	1.201	C	12	2	9	17.214	30.9	1.201	C
13	3	10	0.000	0.0	1.201	T	14	4	11	-17.214	30.9	1.201	T
15	5	12	-34.427	61.8	1.201	T	16	1	7	0.013	0.0	0.702	C
17	2	8	-10.087	18.1	0.702	T	18	3	9	-0.029	0.1	0.702	T
19	4	10	10.029	18.0	0.702	C	20	5	11	20.087	36.1	0.702	C
21	6	12	20.138	36.2	0.702	C							

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Member Forces (003 : L2 - CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-16.828	30.2	0.975	T	2	2	3	-33.575	60.3	0.975	T
3	3	4	-22.464	40.3	0.975	T	4	4	5	-11.272	20.2	0.975	T
5	5	6	0.000	0.0	0.975		6	7	8	0.000	0.0	0.975	C
7	8	9	16.828	30.2	0.975	C	8	9	10	33.575	60.3	0.975	C
9	10	11	22.464	40.3	0.975	C	10	11	12	11.272	20.2	0.975	C
11	1	8	20.736	37.2	1.201	C	12	2	9	20.636	37.0	1.201	C
13	3	10	-13.691	24.6	1.201	T	14	4	11	-13.791	24.8	1.201	T
15	5	12	-13.890	24.9	1.201	T	16	1	7	0.013	0.0	0.702	C
17	2	8	-12.087	21.7	0.702	T	18	3	9	7.971	14.3	0.702	C
19	4	10	8.029	14.4	0.702	C	20	5	11	8.087	14.5	0.702	C
21	6	12	8.138	14.6	0.702	C							

Member Forces (004 : L3 - 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-25.161	45.2	0.975	T	2	2	3	-29.408	52.8	0.975	T
3	3	4	-33.575	60.3	0.975	T	4	4	5	-16.828	30.2	0.975	T
5	5	6	0.000	0.0	0.975		6	7	8	0.000	0.0	0.975	
7	8	9	25.161	45.2	0.975	C	8	9	10	29.408	52.8	0.975	C
9	10	11	33.575	60.3	0.975	C	10	11	12	16.828	30.2	0.975	C
11	1	8	31.004	55.7	1.201	C	12	2	9	5.233	9.4	1.201	C
13	3	10	5.134	9.2	1.201	C	14	4	11	-20.636	37.0	1.201	T
15	5	12	-20.736	37.2	1.201	T	16	1	7	0.013	0.0	0.702	C
17	2	8	-3.087	5.5	0.702	T	18	3	9	-3.029	5.4	0.702	T
19	4	10	12.029	21.6	0.702	C	20	5	11	12.087	21.7	0.702	C
21	6	12	12.138	21.8	0.702	C							

Member Forces (005 : L4 - 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-33.494	60.1	0.975	T	2	2	3	-46.075	82.7	0.975	T
3	3	4	-37.741	67.8	0.975	T	4	4	5	-29.328	52.7	0.975	T
5	5	6	0.000	0.0	0.975		6	7	8	0.000	0.0	0.975	C
7	8	9	33.494	60.1	0.975	C	8	9	10	46.075	82.7	0.975	C
9	10	11	37.741	67.8	0.975	C	10	11	12	29.328	52.7	0.975	C
11	1	8	41.273	74.1	1.201	C	12	2	9	15.502	27.8	1.201	C
13	3	10	-10.269	18.4	1.201	T	14	4	11	-10.368	18.6	1.201	T
15	5	12	-36.139	64.9	1.201	T	16	1	7	0.013	0.0	0.702	C
17	2	8	-9.087	16.3	0.702	T	18	3	9	5.971	10.7	0.702	C
19	4	10	6.029	10.8	0.702	C	20	5	11	21.087	37.9	0.702	C
21	6	12	21.138	37.9	0.702	C							

Support Reactions Serviceability (001 : L1 - UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	24.525	6	0.000	24.525
Total	0.000	49.050			

Support Reactions Serviceability (002 : L5 - UDL N)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	20.150	6	0.000	20.150
Total	0.000	40.300			

Support Reactions Serviceability (003 : L2 - CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	12.150	6	0.000	8.150

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Support Reactions Serviceability (003 : L2 - CPL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
Total	0.000	20.300			

Support Reactions Serviceability (004 : L3 - 2PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	18.150	6	0.000	12.150
Total	0.000	30.300			

Support Reactions Serviceability (005 : L4 - 3PL)					
Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	24.150	6	0.000	21.150
Total	0.000	45.300			

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6000mm 750 Beam

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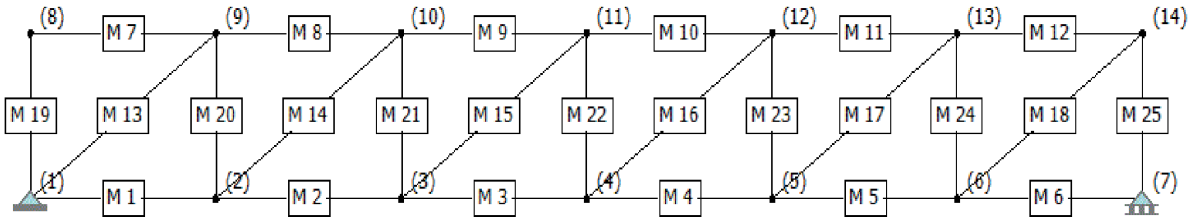
MasterFrame : Graphics



Frame Geometry - (Full Frame) - Front View

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MASTERFRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group L5	Live Load

Load Case 001 : L1 - UDL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L1

Load Case 002 : L5 - UDL N

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L5

Load Case 003 : L2 - CPL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L2

Load Case 004 : L3 - 2PL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L3

Load Case 005 : L4 - 3PL

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L4

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.975	0.000	0.000
3	1.950	0.000	0.000	4	2.925	0.000	0.000

```
    5     3.900     0.000     0.000       6     4.875     0.000     0.000
    7     5.850     0.000     0.000       8     0.000     0.702     0.000
    9     0.975     0.702     0.000      10     1.950     0.702     0.000
   11     2.925     0.702     0.000      12     3.900     0.702     0.000
   13     4.875     0.702     0.000      14     5.850     0.702     0.000
```

MEMBER PROPERTIES

Members 1-25

```
M  ...  ...          48 ACHS 4 []    E 70E6    G 27E6
 A 5.57E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

MEMBER LOADING

Member Self Weight Density Load Included in Load Group D0, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 7-12

```
L1 UDLY -005.000              ( kN/m )
```

NODAL LOADING AND SUPPORT CONDITIONS

NODE 11

```
L2 Ls +0000.000 -0015.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 10 and 12

```
L3 Ls +0000.000 -0010.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 9, 11 and 13

```
L4 Ls +0000.000 -0010.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 9-13

```
L5 Ls +0000.000 -0005.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 7

```
UT Rs 0 1 0 0 0 0 (Vertical Restraint)
```

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.43	-5.49	5.51
3	1.11	-9.26	9.33	4	1.88	-10.59	10.76
5	2.57	-9.25	9.60	6	3.00	-5.46	6.23
7	3.00	0.00	3.00	8	3.06	-0.04	3.06
9	3.06	-5.36	6.17	10	2.63	-9.22	9.58
11	1.94	-10.63	10.81	12	1.17	-9.38	9.45
13	0.49	-5.68	5.70	14	0.06	-0.27	0.27

Nodal Deflections Serviceability (002 : L5 - UDL N)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.44	-5.62	5.64
3	1.14	-9.48	9.55	4	1.93	-10.84	11.01
5	2.64	-9.45	9.81	6	3.07	-5.56	6.36
7	3.07	0.00	3.07	8	3.13	0.00	3.13
9	3.13	-5.49	6.32	10	2.69	-9.43	9.81
11	1.99	-10.88	11.06	12	1.20	-9.59	9.66
13	0.49	-5.79	5.81	14	0.05	-0.23	0.23

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Nodal Deflections Serviceability (003 : L2 - CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.27	-4.18	4.19
3	0.79	-7.61	7.65	4	1.59	-9.30	9.43
5	2.11	-7.43	7.73	6	2.38	-4.09	4.73
7	2.38	0.00	2.38	8	2.41	0.00	2.41
9	2.41	-4.04	4.71	10	2.15	-7.48	7.78
11	1.62	-9.43	9.57	12	0.83	-7.57	7.61
13	0.30	-4.22	4.24	14	0.03	-0.14	0.14

Nodal Deflections Serviceability (004 : L3 - 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.35	-5.07	5.08
3	1.06	-8.97	9.03	4	1.76	-10.01	10.16
5	2.46	-8.91	9.24	6	2.81	-4.95	5.69
7	2.81	0.00	2.81	8	2.86	0.00	2.86
9	2.86	-4.88	5.66	10	2.50	-8.97	9.31
11	1.80	-10.01	10.17	12	1.10	-9.09	9.15
13	0.40	-5.13	5.14	14	0.04	-0.18	0.19

Nodal Deflections Serviceability (005 : L4 - 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.53	-6.18	6.20
3	1.23	-9.99	10.07	4	2.11	-11.67	11.85
5	2.81	-9.99	10.38	6	3.33	-6.18	7.02
7	3.33	0.00	3.33	8	3.40	0.00	3.40
9	3.40	-6.09	6.97	10	2.87	-9.90	10.31
11	2.17	-11.76	11.95	12	1.29	-10.08	10.17
13	0.59	-6.45	6.48	14	0.07	-0.27	0.28

Member Forces (001 : L1 - UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-17.128	30.8	0.975	T	2	2	3	-27.405	49.2	0.975	T
3	3	4	-30.831	55.4	0.975	T	4	4	5	-27.405	49.2	0.975	T
5	5	6	-17.128	30.8	0.975	T	6	6	7	0.000	0.0	0.975	
7	8	9	0.000	0.0	0.975	C	8	9	10	17.128	30.8	0.975	C
9	10	11	27.405	49.2	0.975	C	10	11	12	30.831	55.4	0.975	C
11	12	13	27.405	49.2	0.975	C	12	13	14	17.128	30.8	0.975	C
13	1	9	21.106	37.9	1.201	C	14	2	10	12.664	22.7	1.201	C
15	3	11	4.221	7.6	1.201	C	16	4	12	-4.221	7.6	1.201	T
17	5	13	-12.664	22.7	1.201	T	18	6	14	-21.106	37.9	1.201	T
19	1	8	2.450	4.4	0.702	C	20	2	9	-7.428	13.3	0.702	T
21	3	10	-2.495	4.5	0.702	T	22	4	11	2.438	4.4	0.702	C
23	5	12	7.370	13.2	0.702	C	24	6	13	12.303	22.1	0.702	C
25	7	14	14.792	26.6	0.702	C							

Member Forces (002 : L5 - UDL N)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-17.562	31.5	0.975	T	2	2	3	-28.100	50.4	0.975	T
3	3	4	-31.612	56.8	0.975	T	4	4	5	-28.100	50.4	0.975	T
5	5	6	-17.562	31.5	0.975	T	6	6	7	0.000	0.0	0.975	C
7	8	9	0.000	0.0	0.975	C	8	9	10	17.562	31.5	0.975	C
9	10	11	28.100	50.4	0.975	C	10	11	12	31.612	56.8	0.975	C
11	12	13	28.100	50.4	0.975	C	12	13	14	17.562	31.5	0.975	C
13	1	9	21.641	38.9	1.201	C	14	2	10	12.985	23.3	1.201	C
15	3	11	4.328	7.8	1.201	C	16	4	12	-4.328	7.8	1.201	T

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Member Forces (002 : L5 - UDL N)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
17	5	13	-12.985	23.3	1.201	T	18	6	14	-21.641	38.9	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-7.616	13.7	0.702	T
21	3	10	-2.558	4.6	0.702	T	22	4	11	2.500	4.5	0.702	C
23	5	12	7.558	13.6	0.702	C	24	6	13	12.616	22.6	0.702	C
25	7	14	12.667	22.7	0.702	C							

Member Forces (003 : L2 - CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-10.618	19.1	0.975	T	2	2	3	-21.155	38.0	0.975	T
3	3	4	-31.612	56.8	0.975	T	4	4	5	-21.155	38.0	0.975	T
5	5	6	-10.618	19.1	0.975	T	6	6	7	0.000	0.0	0.975	
7	8	9	0.000	0.0	0.975	C	8	9	10	10.618	19.1	0.975	C
9	10	11	21.155	38.0	0.975	C	10	11	12	31.612	56.8	0.975	C
11	12	13	21.155	38.0	0.975	C	12	13	14	10.618	19.1	0.975	C
13	1	9	13.084	23.5	1.201	C	14	2	10	12.985	23.3	1.201	C
15	3	11	12.885	23.1	1.201	C	16	4	12	-12.885	23.1	1.201	T
17	5	13	-12.985	23.3	1.201	T	18	6	14	-13.084	23.5	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-7.616	13.7	0.702	T
21	3	10	-7.558	13.6	0.702	T	22	4	11	7.500	13.5	0.702	C
23	5	12	7.558	13.6	0.702	C	24	6	13	7.616	13.7	0.702	C
25	7	14	7.667	13.8	0.702	C							

Member Forces (004 : L3 - 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-14.090	25.3	0.975	T	2	2	3	-28.100	50.4	0.975	T
3	3	4	-28.140	50.5	0.975	T	4	4	5	-28.100	50.4	0.975	T
5	5	6	-14.090	25.3	0.975	T	6	6	7	0.000	0.0	0.975	
7	8	9	0.000	0.0	0.975	C	8	9	10	14.090	25.3	0.975	C
9	10	11	28.100	50.4	0.975	C	10	11	12	28.140	50.5	0.975	C
11	12	13	28.100	50.4	0.975	C	12	13	14	14.090	25.3	0.975	C
13	1	9	17.362	31.2	1.201	C	14	2	10	17.263	31.0	1.201	C
15	3	11	0.050	0.1	1.201	C	16	4	12	-0.050	0.1	1.201	T
17	5	13	-17.263	31.0	1.201	T	18	6	14	-17.362	31.2	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-10.116	18.2	0.702	T
21	3	10	-0.058	0.1	0.702	T	22	4	11	0.000	0.0	0.702	C
23	5	12	10.058	18.1	0.702	C	24	6	13	10.116	18.2	0.702	C
25	7	14	10.167	18.3	0.702	C							

Member Forces (005 : L4 - 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-21.035	37.8	0.975	T	2	2	3	-28.100	50.4	0.975	T
3	3	4	-35.084	63.0	0.975	T	4	4	5	-28.100	50.4	0.975	T
5	5	6	-21.035	37.8	0.975	T	6	6	7	0.000	0.0	0.975	
7	8	9	0.000	0.0	0.975	C	8	9	10	21.035	37.8	0.975	C
9	10	11	28.100	50.4	0.975	C	10	11	12	35.084	63.0	0.975	C
11	12	13	28.100	50.4	0.975	C	12	13	14	21.035	37.8	0.975	C
13	1	9	25.919	46.5	1.201	C	14	2	10	8.706	15.6	1.201	C
15	3	11	8.607	15.5	1.201	C	16	4	12	-8.607	15.5	1.201	T
17	5	13	-8.706	15.6	1.201	T	18	6	14	-25.920	46.5	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-5.116	9.2	0.702	T
21	3	10	-5.058	9.1	0.702	T	22	4	11	5.000	9.0	0.702	C
23	5	12	5.058	9.1	0.702	C	24	6	13	15.116	27.1	0.702	C
25	7	14	15.167	27.2	0.702	C							

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Approved	:

Support Reactions Serviceability (001 : L1 - UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	14.804	7	0.000	14.804
Total	0.000	29.608			

Support Reactions Serviceability (002 : L5 - UDL N)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	12.679	7	0.000	12.679
Total	0.000	25.358			

Support Reactions Serviceability (003 : L2 - CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	7.679	7	0.000	7.679
Total	0.000	15.358			

Support Reactions Serviceability (004 : L3 - 2PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	10.179	7	0.000	10.179
Total	0.000	20.358			

Support Reactions Serviceability (005 : L4 - 3PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	15.179	7	0.000	15.179
Total	0.000	30.358			

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7000mm 750 Beam

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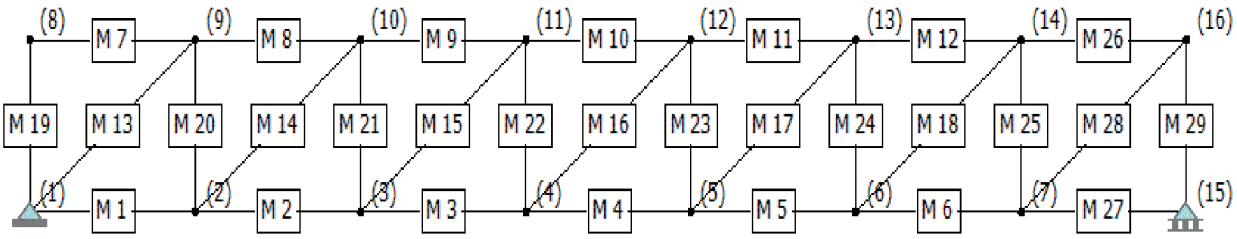
MasterFrame : Graphics



Frame Geometry - (Full Frame) - Front View

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MASTERFRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load
Load Group L1	Live Load
Load Group L2	Live Load
Load Group L3	Live Load
Load Group L4	Live Load
Load Group L5	Live Load
Load Group L6	Live Load
Load Group L7	Live Load
Load Group L8	Live Load

Load Case 001 : L1 - UDL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L1

Load Case 002 : L5 - UDL N
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L5

Load Case 003 : L2 - CPL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L2

Load Case 004 : L3 - 2PL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L3

Load Case 005 : L4 - 3PL
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L4

Load Case 006 : L6 Validation UDL N at 1m restraint
Load Combination + 1.00 UT + 1.00 D0 + 1.00 L6

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Load Case 007 : L6 Validation CPL at 1.5m restraint

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L7

Load Case 008 : L8 Validation 2PL at 2.0m restraint

Load Combination + 1.00 UT + 1.00 D0 + 1.00 L8

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.975	0.000	0.000
3	1.950	0.000	0.000	4	2.925	0.000	0.000
5	3.900	0.000	0.000	6	4.875	0.000	0.000
7	5.850	0.000	0.000	8	0.000	0.702	0.000
9	0.975	0.702	0.000	10	1.950	0.702	0.000
11	2.925	0.702	0.000	12	3.900	0.702	0.000
13	4.875	0.702	0.000	14	5.850	0.702	0.000
15	6.825	0.000	0.000	16	6.825	0.702	0.000

MEMBER PROPERTIES

Members 1-29

```
M  ...  ...          48 ACHS 4 []    E 70E6    G 27E6
 A 5.57E-4           Ix 13.77E-8         Iy 13.77E-8         J 27.53E-8
```

MEMBER LOADING

Member Self Weight Density Load Included in Load Group D0, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	78.50
>= 20.00	27.00
>= 2.00	10.00

Members 7-12 and 26

```
L1 UDLY -005.000              ( kN/m )
```

NODAL LOADING AND SUPPORT CONDITIONS

NODE 11

```
L2 Ls +0000.000 -0015.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 10 and 13

```
L3 Ls +0000.000 -0010.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 10-11 and 13

```
L4 Ls +0000.000 -0010.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 9-14

```
L5 Ls +0000.000 -0005.000 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 9-14

```
L6 Ls +0000.000 -0004.900 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 11

```
L7 Ls +0000.000 -0010.900 +0000.000 +0000.000 +0000.000 +0000.000
```

NODES 10 and 13

```
L8 Ls +0000.000 -0005.760 +0000.000 +0000.000 +0000.000 +0000.000
```

NODE 1

```
UT Rs 1 1 1 0 0 0 (Pinned)
```

NODE 15

```
UT Rs 0 1 0 0 0 0 (Vertical Restraint)
```

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.51	-8.26	8.27
3	1.37	-14.56	14.62	4	2.40	-17.94	18.10

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Nodal Deflections Serviceability (001 : L1 - UDL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
5	3.43	-17.93	18.26	6	4.28	-14.54	15.15
7	4.80	-8.23	9.52	8	4.86	-0.04	4.86
9	4.86	-8.08	9.43	10	4.34	-14.47	15.10
11	3.49	-17.94	18.27	12	2.46	-18.02	18.19
13	1.43	-14.71	14.78	14	0.57	-8.49	8.51
15	4.80	0.00	4.80	16	0.06	-0.31	0.32

Nodal Deflections Serviceability (002 : L5 - UDL N)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.53	-8.46	8.48
3	1.41	-14.91	14.98	4	2.46	-18.37	18.54
5	3.51	-18.36	18.69	6	4.39	-14.87	15.51
7	4.92	-8.40	9.73	8	4.97	0.00	4.97
9	4.97	-8.28	9.66	10	4.45	-14.82	15.47
11	3.57	-18.37	18.72	12	2.52	-18.45	18.62
13	1.46	-15.05	15.12	14	0.58	-8.67	8.69
15	4.92	0.00	4.92	16	0.06	-0.27	0.28

Nodal Deflections Serviceability (003 : L2 - CPL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.30	-5.61	5.62
3	0.91	-10.37	10.41	4	1.81	-13.18	13.30
5	2.50	-12.11	12.36	6	2.95	-9.13	9.60
7	3.18	-4.89	5.83	8	3.36	0.00	3.36
9	3.36	-5.45	6.41	10	3.06	-10.22	10.66
11	2.45	-13.29	13.52	12	1.54	-12.22	12.32
13	0.86	-9.25	9.29	14	0.41	-5.01	5.02
15	3.18	0.00	3.18	16	0.18	-0.12	0.21

Nodal Deflections Serviceability (004 : L3 - 2PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.35	-6.05	6.07
3	1.06	-10.94	10.99	4	1.76	-12.96	13.08
5	2.47	-13.01	13.25	6	3.18	-10.92	11.37
7	3.53	-5.95	6.92	8	3.57	0.00	3.57
9	3.57	-5.87	6.87	10	3.21	-10.94	11.40
11	2.51	-12.96	13.20	12	1.80	-13.01	13.14
13	1.10	-11.10	11.15	14	0.39	-6.13	6.15
15	3.53	0.00	3.53	16	0.04	-0.18	0.19

Nodal Deflections Serviceability (005 : L4 - 3PL)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.55	-9.73	9.75
3	1.65	-17.74	17.82	4	2.96	-21.61	21.81
5	4.11	-20.94	21.34	6	5.11	-16.89	17.65
7	5.61	-9.15	10.73	8	5.77	0.00	5.77
9	5.77	-9.45	11.07	10	5.22	-17.64	18.39
11	4.12	-21.68	22.07	12	2.81	-21.02	21.21
13	1.66	-17.15	17.23	14	0.66	-9.41	9.43
15	5.61	0.00	5.61	16	0.16	-0.26	0.30

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Nodal Deflections Serviceability (006 : L6 Validation UDL N at 1m restraint)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.52	-8.29	8.31
3	1.38	-14.62	14.68	4	2.41	-18.01	18.17
5	3.44	-18.00	18.32	6	4.30	-14.58	15.20
7	4.82	-8.23	9.54	8	4.88	0.00	4.88
9	4.88	-8.12	9.47	10	4.36	-14.53	15.17
11	3.50	-18.01	18.35	12	2.47	-18.09	18.25
13	1.43	-14.76	14.83	14	0.57	-8.50	8.52
15	4.82	0.00	4.82	16	0.05	-0.27	0.27

Nodal Deflections Serviceability (007 : L6 Validation CPL at 1.5m restraint)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.22	-4.10	4.11
3	0.67	-7.58	7.61	4	1.33	-9.63	9.72
5	1.82	-8.85	9.04	6	2.16	-6.68	7.02
7	2.33	-3.58	4.27	8	2.46	0.00	2.46
9	2.46	-3.99	4.69	10	2.23	-7.47	7.80
11	1.79	-9.72	9.88	12	1.13	-8.94	9.01
13	0.63	-6.77	6.80	14	0.30	-3.67	3.68
15	2.33	0.00	2.33	16	0.13	-0.09	0.16

Nodal Deflections Serviceability (008 : L8 Validation 2PL at 2.0m restraint)

Node	Nodal Displacements (mm)			Node	Nodal Displacements (mm)		
	δX→	δY↑	δXY		δX→	δY↑	δXY
1	0.00	0.00	0.00	2	0.21	-3.53	3.53
3	0.62	-6.38	6.40	4	1.03	-7.56	7.63
5	1.44	-7.59	7.72	6	1.85	-6.36	6.62
7	2.06	-3.47	4.03	8	2.08	0.00	2.08
9	2.08	-3.42	4.00	10	1.87	-6.37	6.64
11	1.46	-7.56	7.70	12	1.05	-7.59	7.66
13	0.64	-6.47	6.50	14	0.23	-3.58	3.58
15	2.06	0.00	2.06	16	0.02	-0.11	0.11

Member Forces (001 : L1 - UDL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-20.554	36.9	0.975	T	2	2	3	-34.257	61.5	0.975	T
3	3	4	-41.108	73.8	0.975	T	4	4	5	-41.108	73.8	0.975	T
5	5	6	-34.257	61.5	0.975	T	6	6	7	-20.554	36.9	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	20.554	36.9	0.975	C
9	10	11	34.257	61.5	0.975	C	10	11	12	41.108	73.8	0.975	C
11	12	13	41.108	73.8	0.975	C	12	13	14	34.257	61.5	0.975	C
13	1	9	25.327	45.5	1.201	C	14	2	10	16.885	30.3	1.201	C
15	3	11	8.442	15.2	1.201	C	16	4	12	0.000	0.0	1.201	T
17	5	13	-8.442	15.2	1.201	T	18	6	14	-16.885	30.3	1.201	T
19	1	8	2.450	4.4	0.702	C	20	2	9	-9.895	17.8	0.702	T
21	3	10	-4.962	8.9	0.702	T	22	4	11	-0.029	0.1	0.702	T
23	5	12	4.904	8.8	0.702	C	24	6	13	9.837	17.7	0.702	C
25	7	14	14.770	26.5	0.702	C	26	14	16	20.554	36.9	0.975	C
27	7	15	0.000	0.0	0.975		28	7	16	-25.327	45.5	1.201	T
29	15	16	17.258	31.0	0.702	C							

Member Forces (002 : L5 - UDL N)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-21.075	37.8	0.975	T	2	2	3	-35.125	63.1	0.975	T
3	3	4	-42.150	75.7	0.975	T	4	4	5	-42.150	75.7	0.975	T
5	5	6	-35.125	63.1	0.975	T	6	6	7	-21.075	37.8	0.975	T

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Member Forces (002 : L5 - UDL N)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
7	8	9	0.000	0.0	0.975	C	8	9	10	21.075	37.8	0.975	C
9	10	11	35.125	63.1	0.975	C	10	11	12	42.150	75.7	0.975	C
11	12	13	42.150	75.7	0.975	C	12	13	14	35.125	63.1	0.975	C
13	1	9	25.969	46.6	1.201	C	14	2	10	17.313	31.1	1.201	C
15	3	11	8.656	15.5	1.201	C	16	4	12	0.000	0.0	1.201	T
17	5	13	-8.656	15.5	1.201	T	18	6	14	-17.313	31.1	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-10.145	18.2	0.702	T
21	3	10	-5.087	9.1	0.702	T	22	4	11	-0.029	0.1	0.702	T
23	5	12	5.029	9.0	0.702	C	24	6	13	10.087	18.1	0.702	C
25	7	14	15.145	27.2	0.702	C	26	14	16	21.075	37.8	0.975	C
27	7	15	0.000	0.0	0.975	T	28	7	16	-25.969	46.6	1.201	T
29	15	16	15.196	27.3	0.702	C							

Member Forces (003 : L2 - CPL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-12.146	21.8	0.975	T	2	2	3	-24.212	43.5	0.975	T
3	3	4	-36.197	65.0	0.975	T	4	4	5	-27.269	49.0	0.975	T
5	5	6	-18.260	32.8	0.975	T	6	6	7	-9.170	16.5	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	12.146	21.8	0.975	C
9	10	11	24.212	43.5	0.975	C	10	11	12	36.197	65.0	0.975	C
11	12	13	27.269	49.0	0.975	C	12	13	14	18.260	32.8	0.975	C
13	1	9	14.967	26.9	1.201	C	14	2	10	14.868	26.7	1.201	C
15	3	11	14.769	26.5	1.201	C	16	4	12	-11.002	19.8	1.201	T
17	5	13	-11.101	19.9	1.201	T	18	6	14	-11.200	20.1	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-8.716	15.6	0.702	T
21	3	10	-8.658	15.5	0.702	T	22	4	11	6.400	11.5	0.702	C
23	5	12	6.458	11.6	0.702	C	24	6	13	6.516	11.7	0.702	C
25	7	14	6.573	11.8	0.702	C	26	14	16	9.170	16.5	0.975	C
27	7	15	0.000	0.0	0.975	C	28	7	16	-11.300	20.3	1.201	T
29	15	16	6.624	11.9	0.702	C							

Member Forces (004 : L3 - 2PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-14.130	25.4	0.975	T	2	2	3	-28.180	50.6	0.975	T
3	3	4	-28.261	50.7	0.975	T	4	4	5	-28.261	50.7	0.975	T
5	5	6	-28.180	50.6	0.975	T	6	6	7	-14.130	25.4	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	14.130	25.4	0.975	C
9	10	11	28.180	50.6	0.975	C	10	11	12	28.261	50.7	0.975	C
11	12	13	28.261	50.7	0.975	C	12	13	14	28.180	50.6	0.975	C
13	1	9	17.412	31.3	1.201	C	14	2	10	17.313	31.1	1.201	C
15	3	11	0.099	0.2	1.201	C	16	4	12	0.000	0.0	1.201	T
17	5	13	-0.099	0.2	1.201	T	18	6	14	-17.313	31.1	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-10.145	18.2	0.702	T
21	3	10	-0.087	0.2	0.702	T	22	4	11	-0.029	0.1	0.702	T
23	5	12	0.029	0.1	0.702	C	24	6	13	10.087	18.1	0.702	C
25	7	14	10.145	18.2	0.702	C	26	14	16	14.130	25.4	0.975	C
27	7	15	0.000	0.0	0.975	C	28	7	16	-17.412	31.3	1.201	T
29	15	16	10.196	18.3	0.702	C							

Member Forces (005 : L4 - 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-22.067	39.6	0.975	T	2	2	3	-44.053	79.1	0.975	T
3	3	4	-52.070	93.5	0.975	T	4	4	5	-46.118	82.8	0.975	T
5	5	6	-40.085	72.0	0.975	T	6	6	7	-20.083	36.1	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	22.067	39.6	0.975	C

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Job ref	: 1440
Sheet	: 750 Beams
Made By	: IH
Date	: November 2015
Checked	: IH
Approved	:

Member Forces (005 : L4 - 3PL)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
9	10	11	44.053	79.1	0.975	C	10	11	12	52.070	93.5	0.975	C
11	12	13	46.118	82.8	0.975	C	12	13	14	40.085	72.0	0.975	C
13	1	9	27.192	48.8	1.201	C	14	2	10	27.092	48.6	1.201	C
15	3	11	9.879	17.7	1.201	C	16	4	12	-7.335	13.2	1.201	T
17	5	13	-7.434	13.3	1.201	T	18	6	14	-24.647	44.3	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-15.859	28.5	0.702	T
21	3	10	-5.801	10.4	0.702	T	22	4	11	4.257	7.6	0.702	C
23	5	12	4.315	7.7	0.702	C	24	6	13	14.373	25.8	0.702	C
25	7	14	14.431	25.9	0.702	C	26	14	16	20.083	36.1	0.975	C
27	7	15	0.000	0.0	0.975	T	28	7	16	-24.747	44.4	1.201	T
29	15	16	14.481	26.0	0.702	C							

Member Forces (006 : L6 Validation UDL N at 1m restraint)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-20.658	37.1	0.975	T	2	2	3	-34.430	61.8	0.975	T
3	3	4	-41.316	74.2	0.975	T	4	4	5	-41.316	74.2	0.975	T
5	5	6	-34.430	61.8	0.975	T	6	6	7	-20.658	37.1	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	20.658	37.1	0.975	C
9	10	11	34.430	61.8	0.975	C	10	11	12	41.316	74.2	0.975	C
11	12	13	41.316	74.2	0.975	C	12	13	14	34.430	61.8	0.975	C
13	1	9	25.456	45.7	1.201	C	14	2	10	16.970	30.5	1.201	C
15	3	11	8.485	15.2	1.201	C	16	4	12	0.000	0.0	1.201	T
17	5	13	-8.485	15.2	1.201	T	18	6	14	-16.970	30.5	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-9.945	17.9	0.702	T
21	3	10	-4.987	9.0	0.702	T	22	4	11	-0.029	0.1	0.702	T
23	5	12	4.929	8.8	0.702	C	24	6	13	9.887	17.8	0.702	C
25	7	14	14.845	26.7	0.702	C	26	14	16	20.658	37.1	0.975	C
27	7	15	0.000	0.0	0.975	C	28	7	16	-25.456	45.7	1.201	T
29	15	16	14.896	26.7	0.702	C							

Member Forces (007 : L6 Validation CPL at 1.5m restraint)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-8.892	16.0	0.975	T	2	2	3	-17.704	31.8	0.975	T
3	3	4	-26.435	47.5	0.975	T	4	4	5	-19.947	35.8	0.975	T
5	5	6	-13.379	24.0	0.975	T	6	6	7	-6.730	12.1	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	8.892	16.0	0.975	C
9	10	11	17.704	31.8	0.975	C	10	11	12	26.435	47.5	0.975	C
11	12	13	19.947	35.8	0.975	C	12	13	14	13.379	24.0	0.975	C
13	1	9	10.957	19.7	1.201	C	14	2	10	10.858	19.5	1.201	C
15	3	11	10.759	19.3	1.201	C	16	4	12	-7.995	14.4	1.201	T
17	5	13	-8.094	14.5	1.201	T	18	6	14	-8.193	14.7	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-6.373	11.4	0.702	T
21	3	10	-6.315	11.3	0.702	T	22	4	11	4.642	8.3	0.702	C
23	5	12	4.700	8.4	0.702	C	24	6	13	4.758	8.5	0.702	C
25	7	14	4.816	8.6	0.702	C	26	14	16	6.730	12.1	0.975	C
27	7	15	0.000	0.0	0.975	C	28	7	16	-8.292	14.9	1.201	T
29	15	16	4.867	8.7	0.702	C							

Member Forces (008 : L8 Validation 2PL at 2.0m restraint)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
1	1	2	-8.241	14.8	0.975	T	2	2	3	-16.402	29.4	0.975	T
3	3	4	-16.483	29.6	0.975	T	4	4	5	-16.483	29.6	0.975	T
5	5	6	-16.402	29.4	0.975	T	6	6	7	-8.241	14.8	0.975	T
7	8	9	0.000	0.0	0.975	C	8	9	10	8.241	14.8	0.975	C
9	10	11	16.402	29.4	0.975	C	10	11	12	16.483	29.6	0.975	C

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Job ref	: 1440
Sheet	: 750 Beams
Made By	: IH
Date	: November 2015
Checked	: IH
Approved	:

Member Forces (008 : L8 Validation 2PL at 2.0m restraint)

Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT	Member	Nodes End 1-2		Force (kN)	Stress (N/mm²)	Length (m)	CT
11	12	13	16.483	29.6	0.975	C	12	13	14	16.402	29.4	0.975	C
13	1	9	10.155	18.2	1.201	C	14	2	10	10.056	18.1	1.201	C
15	3	11	0.099	0.2	1.201	C	16	4	12	0.000	0.0	1.201	T
17	5	13	-0.099	0.2	1.201	T	18	6	14	-10.056	18.1	1.201	T
19	1	8	0.013	0.0	0.702	C	20	2	9	-5.905	10.6	0.702	T
21	3	10	-0.087	0.2	0.702	T	22	4	11	-0.029	0.1	0.702	T
23	5	12	0.029	0.1	0.702	C	24	6	13	5.847	10.5	0.702	C
25	7	14	5.905	10.6	0.702	C	26	14	16	8.241	14.8	0.975	C
27	7	15	0.000	0.0	0.975	C	28	7	16	-10.155	18.2	1.201	T
29	15	16	5.956	10.7	0.702	C							

Support Reactions Serviceability (001 : L1 - UDL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	17.271	15	0.000	17.271
Total	0.000	34.541			

Support Reactions Serviceability (002 : L5 - UDL N)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	15.208	15	0.000	15.208
Total	0.000	30.416			

Support Reactions Serviceability (003 : L2 - CPL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	8.780	15	0.000	6.637
Total	0.000	15.416			

Support Reactions Serviceability (004 : L3 - 2PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	10.208	15	0.000	10.208
Total	0.000	20.416			

Support Reactions Serviceability (005 : L4 - 3PL)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	15.922	15	0.000	14.494
Total	0.000	30.416			

Support Reactions Serviceability (006 : L6 Validation UDL N at 1m restraint)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	14.908	15	0.000	14.908
Total	0.000	29.816			

Support Reactions Serviceability (007 : L6 Validation CPL at 1.5m restraint)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	6.437	15	0.000	4.880
Total	0.000	11.316			

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Date	: November 2015
Checked	: IH
Approved	:

Support Reactions Serviceability (008 : L8 Validation 2PL at 2.0m restraint)

Node	Support Reactions (kN)		Node	Support Reactions (kN)	
	Rx→(kN)	Ry↑(kN)		Rx→(kN)	Ry↑(kN)
1	0.000	5.968	15	0.000	5.968
Total	0.000	11.936			

SECTION 4

VR Access Solutions Ltd

TESMEC Limited: Test house, Unit 19 Newey Business Park
Sedgley Road West, Tipton, West midlands
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Telephone: 07947 103 644

TESMEC
Independent Testing & Engineering Services

Report/Survey of Examination & Test:
Document number: *TES000109*
Client: *VR Scaffold Solutions Ltd*

Address: *1A Swan Court Yard*
Charles Edwards Road
Birmingham
B26 1BU

Date of applied testing/survey: *Start date 5th February 2016 to 14th February 2016*

Item description: *Free issue aluminium lattice scaffold beams, depth of sections submitted 450mm & 750mm, testing lengths from 4000mm nominal, 6000mm nominal and 8000mm spliced tube, nominal outside diameter 48.3mm, 450mm deep section include angular lattice bracing oval section 33.5mmx22mm,fully butt welded connections, N2 750mm deep section include angular lattice bracing tubular section 48.3mm tube nominal, fully butt welded connection . Overall section lengths at 4100mm & 6100mm. (See digital images for fabricated arrangement). Lateral upper and lower tube spigot dimensions 430mm long, 38.3mm O/D,26.5mm I/D. securing pin dimensions 11.6mm nominal diameter 59mm long under head.*
Aluminium grade not specified, technical or fabrication drawings not submitted.

Identification mark affixed to item: *None affixed.*

Client submitted drawing numbers: *Not submitted at time of survey*

Client design review Ref: *S-Mech to review all findings*

Quantity submitted for test: *Minimum assemblies required for test and failure analysis; 12off.*

Client submitted British standard or procedure number*: Test procedure submitted 1440-S1, testing conducted as per submitted procedure.*

Address of where testing /surveys were conducted: *TESMEC Limited; independent Testing and Engineering services.*
Unit 19, Newey Business Park
Sedgley Road West
Tipton, West Midlands
DY4 8AH

Number of pages contained in this report: 59

The data collated and compiled in this document is solely for client review and if/ where required, is to be used in conjunction with the additional requirements of the stated standard as a whole or accompanying standards where applicable for further calculation, statistical analysis and review prior to compliance.

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CONTENTS

TESMEC
Independent Testing & Engineering Services

TESMEC Limited: Test house, Unit 19 Newey Business Park
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1.1 TESMEC mission statement

It is the intention of TESMEC Limited; Independent Testing and Engineering services to continuously provide independent advice in addition to a professional and confidential Engineering service to all of its trusted clients and where applicable, engage in incessant professional development through review, investment and training to further *our existing service and to support the increasing requirements our customers.*

1.2 Test/survey requirements

The client requested a load test survey to be conducted to free issue aluminium scaffold lattice beam components, all submitted items where requested to be chosen at random from stock. All intermediate components e.g. transom, ledger and diagonal bracing systems where of standard EN39 scaffold tube and EN74 drop forged fittings. All bracing arrangements where connected and situated as close as reasonably practicable in accordance with the submitted requirements of procedure S-Mech 1440-S1. CPL and UDL applications required. Digital images where logged to show typical bracing arrangements.

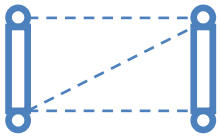
1.3 Equipment arrangement

Two number horizontal aluminium lattice beams running at 1000mm centres apart , requested configurations in accordance with S-Mech 1440-S1 procedure. Typical arrangement as detailed in figure 1.3.1.

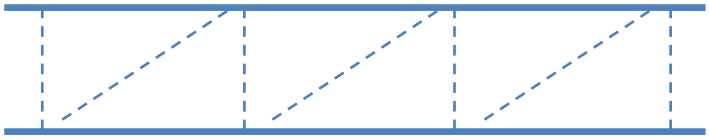
1.3.1. Basic test bracing arrangement

.

4000mm plan view bracing configuration top chord restraint only

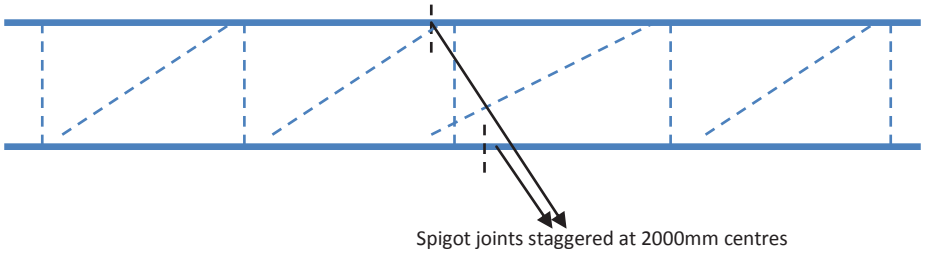


all assemblies end view restraint



NOTE: bracing connections assembled as reasonably practicable near to vertical lattice beam node points

6000mm plan view bracing configuration top chord restraint only



Spigot joints staggered at 2000mm centres

8000mm plan view bracing configuration top chord restraint only

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1.4. Test equipment & Instrument calibration

Calibrated 100kN compressive load cell complete with digital read out, incremental values read at 0.01kN.
10000kgs hydraulic actuator complete with 10000psi glycerine filled gauge and single stage hydraulic pump.
100kN test frame complete with 280mm compressive stools.
5000kgs of 25kg hand mass.
Compressive central bridge 205x205 universal column loading beam.
Digital secured vertical displacement gauges x 2.
1100mm steel scaffold boards.

2.0. Load application study 4000mmx450mm assembly

The requirements submitted in the procedure S-Mech 1440-S1 require the following load surveys.
A series of load displacement tests to a 450mm deep assembly at 4000mm nominal length.
Compressive stools to be placed directly beneath the end vertical node points, a CPL application to a stated SLS load and ULS load with displacement values recorded at each increment, complete with an ultimate load application where modes and loads of failure are observed and documented.
A UDL application to a stated SLS load and ULS load with displacement values recorded at each increment.

2.1. Collated test data UDL load applications

2.1.1. *Digital image showing typical bracing arrangement for UDL application, bracing connections situated bellow upper chord for installation of steel battens.*

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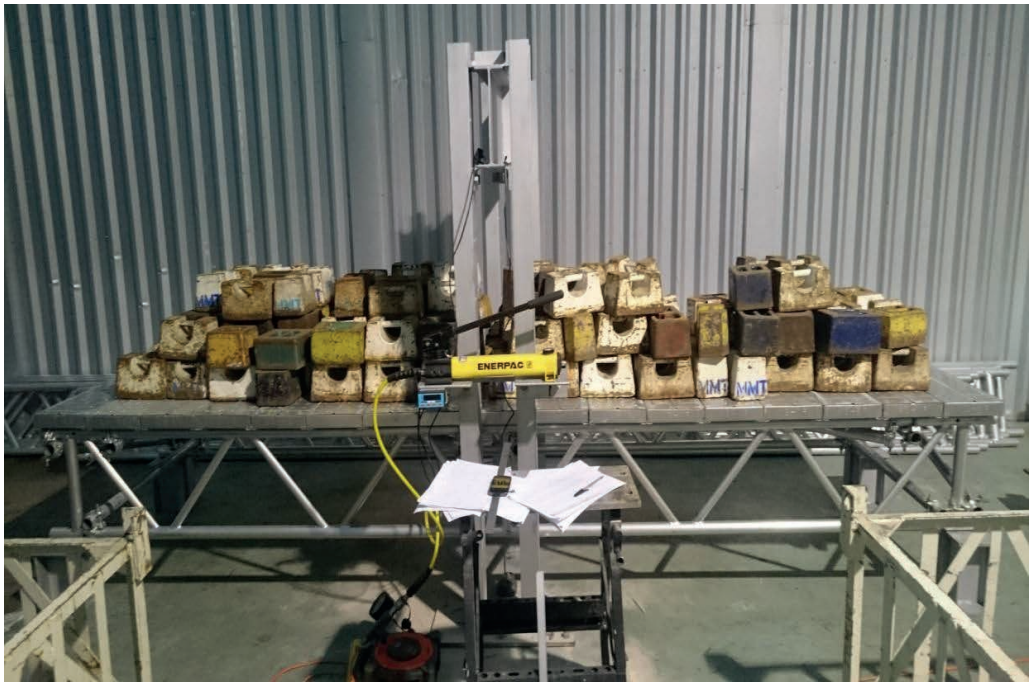
2.1.2. Digital image showing installed 1100mx 230mm steel battens with 1000mm^2 areas marked for loading.

2.1.3. *View of applied physical UDL mass at the ULS state requested.*



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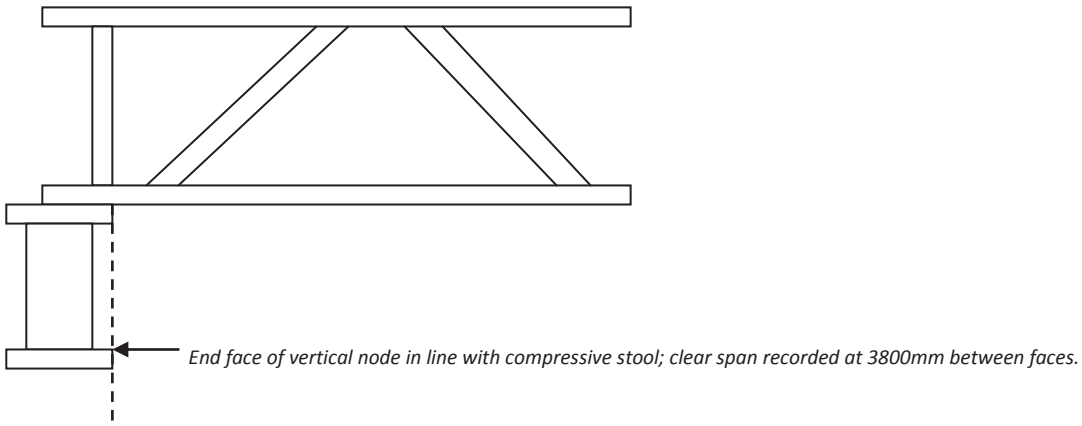
2.2. Requirements for displacement and load values UDL SLS.

Requested UDL SLS loads where 6.8kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.
Actual clear unsupported span 3800mm. ***See figure 2.2.1.***
*For test load applications the calculations and load increments for the mass applied where as stated****.2.2.2***

Figure 2.2.1.



2.2.2. Load calculation and incremental values applied UDL SLS
For the purposes of the load study a UDL was calculated as follows:
4mx6.8kN/m^2 = 27.2kN total applied load.
5% of 27.2kN = 1.36kN therefore 1.36kN/4 = 0.34kN/m^2 per increment.
Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.
6.8kN = 693kg: this figure was rounded to suit the favour of the mass to 700kg/m^2
Total required force 27.2kN=2773.6kg
Actual total applied 2800kg
Increments applied at a total of 28.

Data logging recorded manually as requested. Mass applied as evenly as practicable throughout UDL load applications.

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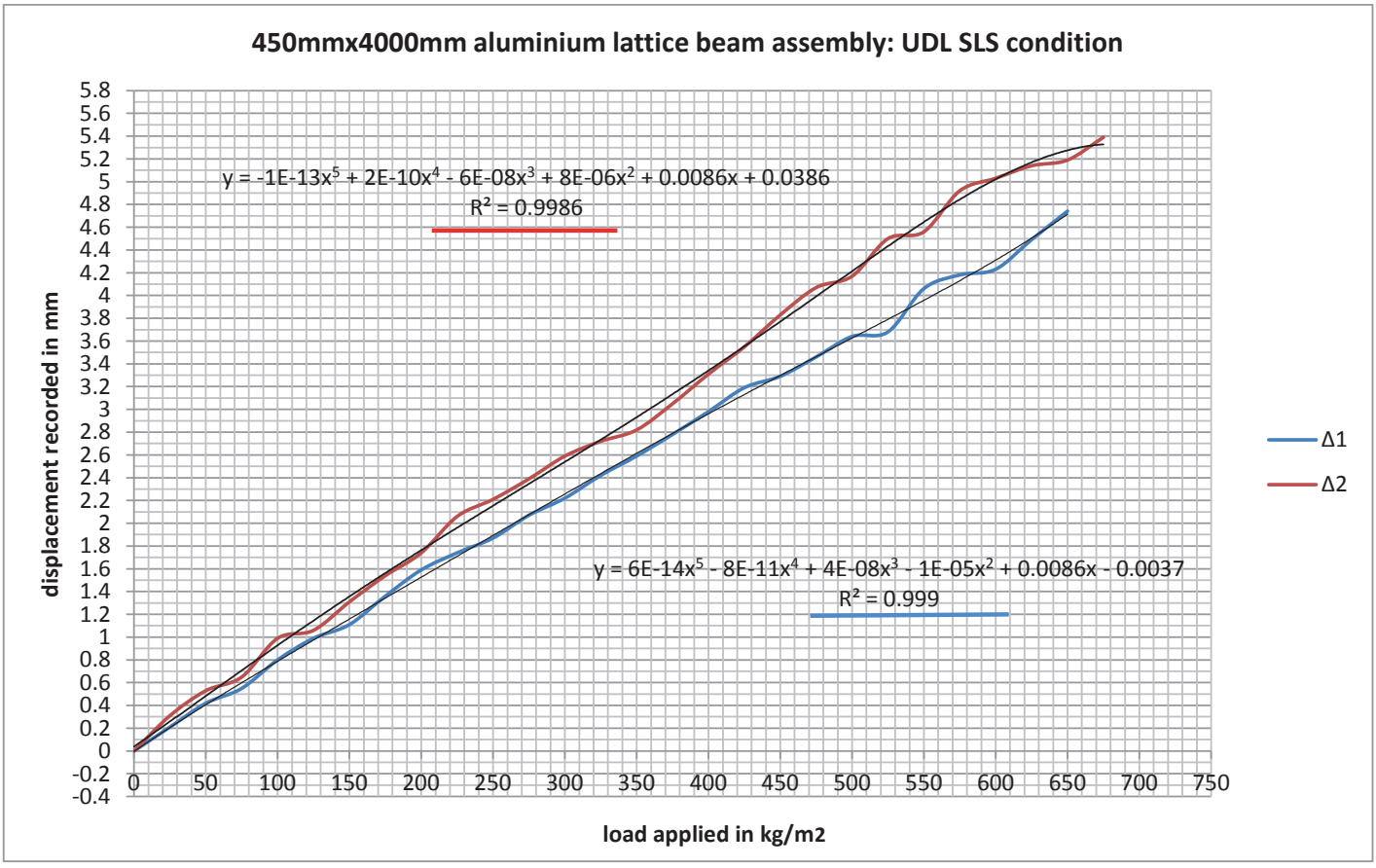
2.3. Load displacement graph showing Δ^1 and Δ^2 throughout incremental UDL SLS loading



2.3.1. Logged load displacement values per kg/m^2: all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
25	0.21	0.31	375	2.78	3.05
50	0.42	0.53	400	2.98	3.31
75	0.55	0.65	425	3.19	3.55
100	0.8	0.99	450	3.29	3.83
125	0.99	1.06	475	3.46	4.07
150	1.11	1.31	500	3.64	4.17
175	1.36	1.54	525	3.68	4.5
200	1.59	1.74	550	4.06	4.56
225	1.74	2.06	575	4.18	4.92
250	1.87	2.21	600	4.23	5.03
275	2.07	2.39	625	4.49	5.14
300	2.22	2.59	650	4.74	5.19
325	2.42	2.72	675	4.94	5.39
350	2.59	2.82	700	5.11	5.61

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2.3.2. Observations at requested UDL SLS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 5.11mm showing no increase in displacement.
Δ^2 mm=5.61mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

2.3.3. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.08mm.
Position Δ^2 showed a permanent displacement value of 0.12mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.07mm and position Δ^2 showed a recovery to a recorded value 0.09mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations.*

2.3.4. UDL ULS load application

Requested UDL ULS loads where 11.2kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.

2.3.4.1. Load calculation and incremental values applied UDL ULS

For the purposes of the load study a UDL was calculated as follows:
4mx11.2kN/m^2 = 44.8kN total applied load.
5% of 44.8kN = 2.24kN therefore 2.24kN/4 = 0.56kN/m^2 per increment.
Smallest valued physical load that could be applied equals a minimum increment of 50kgs mass.
11.2kN = 1142kg: this figure was rounded to suit the favour of the mass to 1150kg/m^2
Total required force 44.8kN=4568kg
Actual total applied 4575kg
Increments applied at a total of 23 at 50kg/m^2

Data logging recorded manually as agreed. Mass applied as evenly as practicable through load applications.

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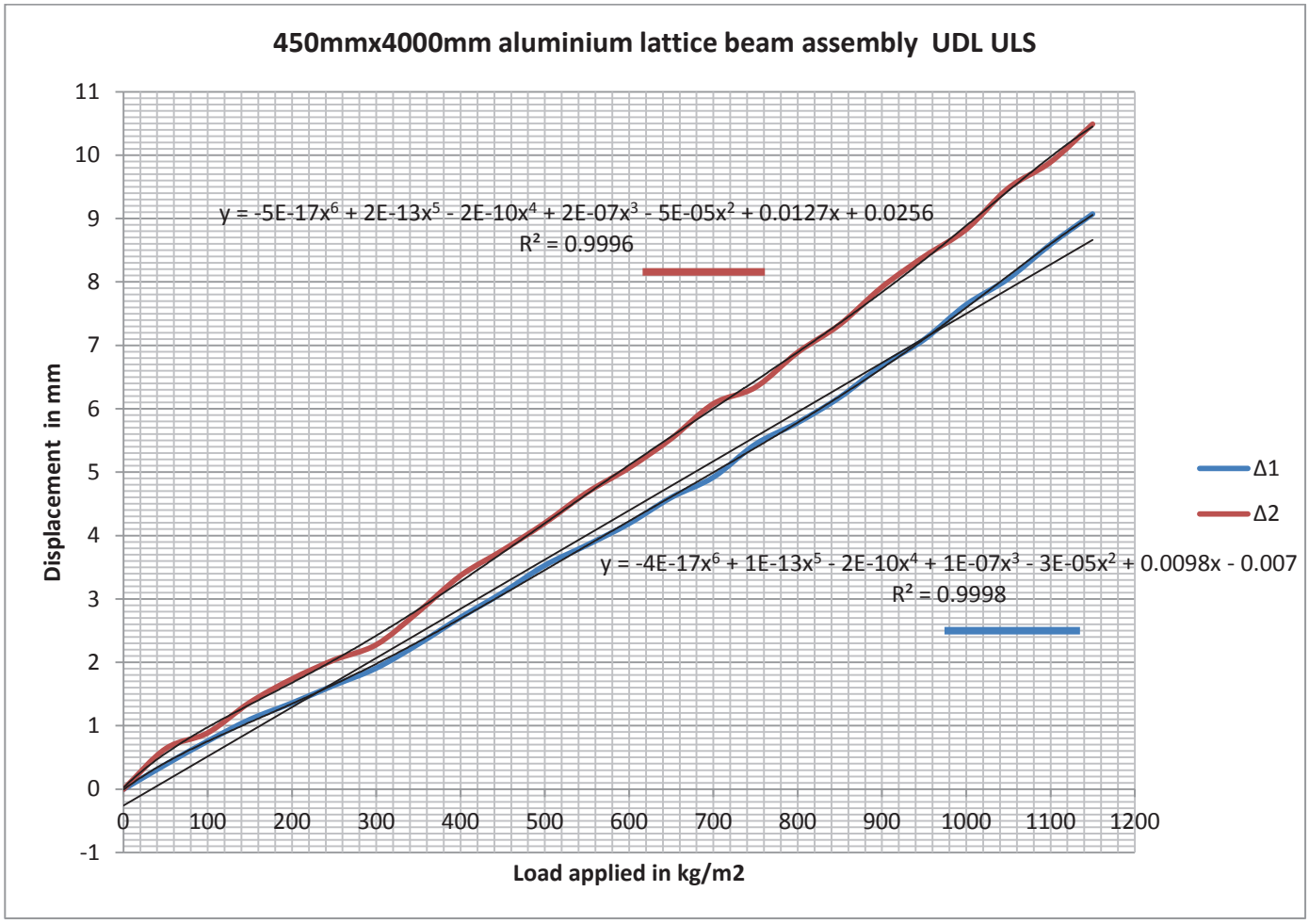
2.3.5. Load displacement graph showing Δ^1 and Δ^2 throughout incremental UDL ULS loading



2.3.6. Logged load displacement values per kg/m^2, all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	600	4.19	5.07
50	0.39	0.64	650	4.6	5.53
100	0.76	0.89	700	4.92	6.08
150	1.1	1.37	750	5.44	6.34
200	1.36	1.74	800	5.78	6.89
250	1.64	2.04	850	6.18	7.33
300	1.91	2.28	900	6.68	7.92
350	2.29	2.8	950	7.09	8.4
400	2.71	3.37	1000	7.64	8.83
450	3.1	3.77	1050	8.05	9.48
500	3.53	4.2	1100	8.59	9.89
550	3.85	4.68	1150	9.07	10.49

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2.3.7. Observations at requested UDL ULS

The displacement recorded at the 5 minute holding period was as follows:

Δ^1 mm= 9.07mm showing no increase in displacement.

Δ^2 mm=10.49mm showing no increase in displacement.

No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

2.3.8. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.2mm.

Position Δ^2 showed a permanent displacement value of 0.35mm.

Upon 5 minutes settlement time the recovery of each beam was as follows:

Position Δ^1 showed a recovery to a recorded value 0.19mm and position Δ^2 showed a recovery to a recorded value 0.33mm

Visual examination post load showed no apparent buckling, failures or weld failures.

***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations.*

2.4. Collated test data CPL load applications

Digital image showing typical end bracing arrangement for CPL applications.

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Plan view of typical bracing arrangement CPL load applications

2.4.1. Requirements for displacement and load values CPL SLS.

Requested CPL SLS load 13.2kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 3800mm.

2.4.1.1. Load calculation and incremental values applied
For the purposes of the load study a CPL SLS was conducted as follows:
13.2kN total applied load.
5% of 13.2= 0.66kN therefore each applied increment = +0.66kN through to the total requested load of 13.2kN.
Total of 20 increments.

Bridging reaction beam plus cylinder mass equal to 0.66kN, this recorded load was included in all CPL conditions.

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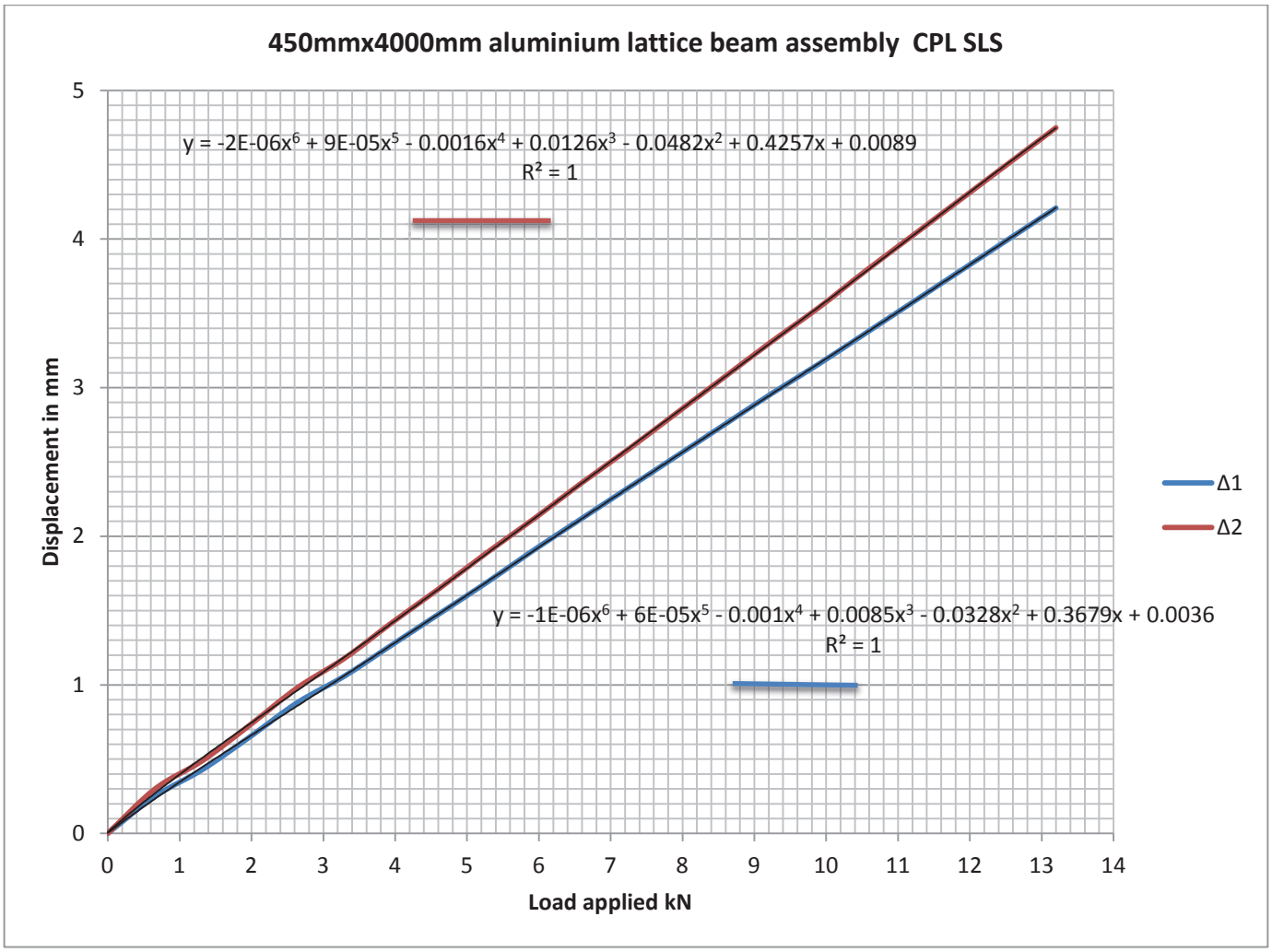
2.4.2. Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL SLS loading



2.4.3. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm.

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	7.26	2.33	2.59
0.66	0.25	0.30	7.92	2.54	2.83
1.32	0.43	0.49	8.58	2.75	3.07
1.98	0.65	0.73	9.24	2.96	3.31
2.64	0.88	0.98	9.9	3.16	3.54
3.3	1.06	1.18	10.56	3.37	3.79
3.96	1.27	1.42	11.22	3.58	4.03
4.62	1.48	1.65	11.88	3.79	4.27
5.28	1.69	1.89	12.54	4.0	4.51
5.94	1.91	2.12	13.2	4.21	4.75
6.6	2.12	2.36			

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2.4.4. Observations at requested CPL SLS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 4.21mm showing no increase in displacement.
Δ^2 mm=4.75mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL SLS application.

2.4.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.02mm.
Position Δ^2 showed a permanent displacement value of 0.09mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.02mm and position Δ^2 showed a recovery to a recorded value 0.07mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

2.4.6. Requirements for displacement and load values CPL ULS.

Requested CPL ULS load 21.8kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 3800mm.

2.4.6.1. Load calculation and incremental values applied CPL ULS

For the purposes of the load study a CPL ULS was conducted as follows:
21.8kN total applied load.
5% of 21.8= 1.09kN therefore each applied increment = +1.09kN through to the total requested load of 21.8kN.
Total of 20 increments.

Bridging reaction beam plus cylinder mass equal to 0.66kN, this recorded load was included in all CPL conditions.

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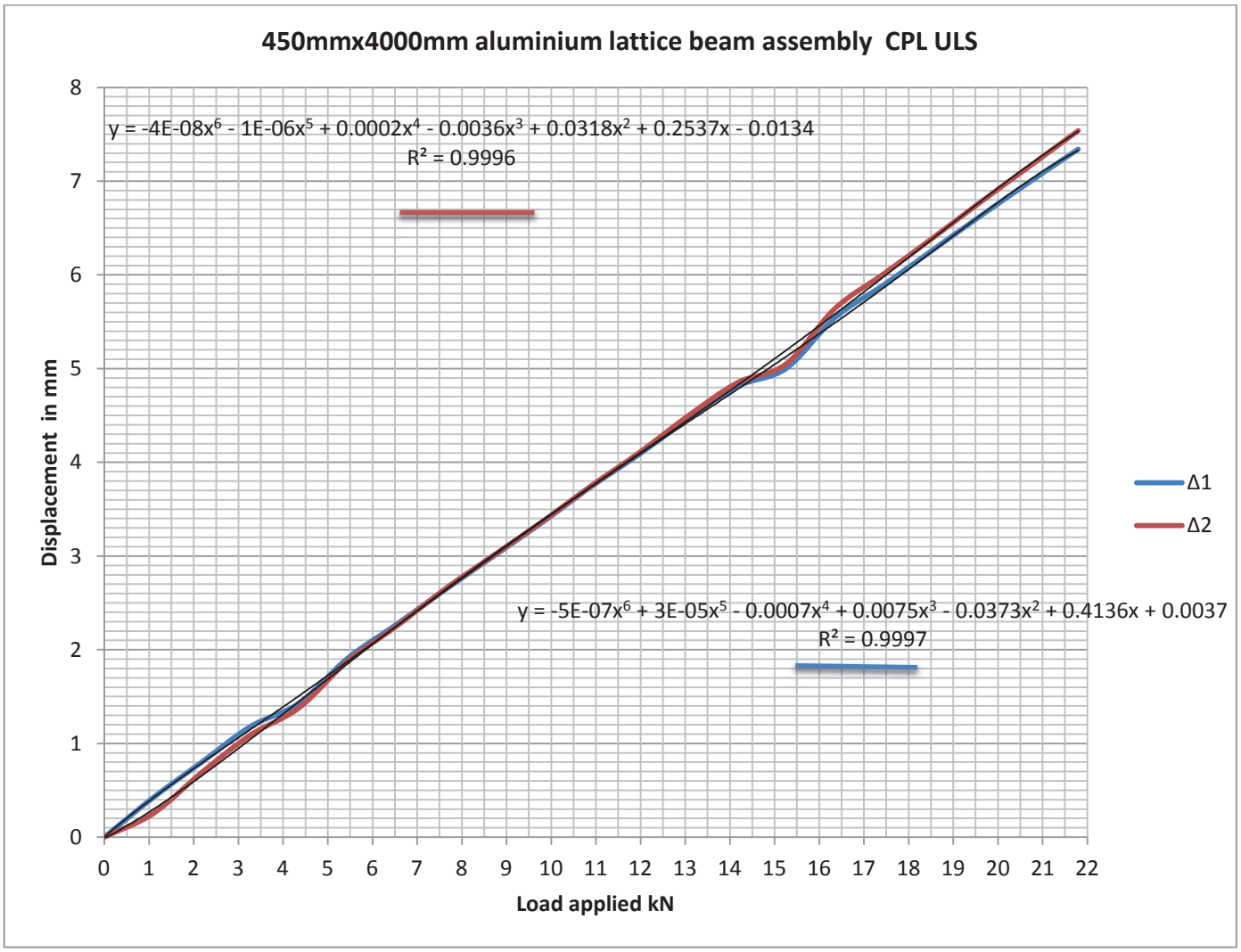
2.4.7. Load displacement graph showingΔ^1 and Δ^2 throughout incremental CPL ULS loading



2.4.8. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm.

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	11.99	4.09	4.11
1.09	0.42	0.25	13.08	4.47	4.5
2.18	0.8	0.69	14.17	4.81	4.85
3.27	1.18	1.09	15.26	5	5.05
4.36	1.43	1.38	16.35	5.54	5.64
5.45	1.91	1.88	17.44	5.89	6.01
6.54	2.27	2.25	18.53	6.26	6.39
7.63	2.64	2.65	19.62	6.63	6.78
8.72	3	3.01	20.71	6.99	7.16
9.81	3.36	3.37	21.8	7.34	7.54
10.9	3.74	3.75			

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2.4.9. Observations at requested CPL ULS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 7.35mm showing an increase in displacement of 0.01mm
Δ^2 mm=7.54mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL ULS application.

2.4.9.1. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.13mm.
Position Δ^2 showed a permanent displacement value of 0.16mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.11mm and position Δ^2 showed a recovery to a recorded value 0.12mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

2.5. CPL load application to ultimate failure

For the purpose of the failure load application, the failure would be recognised where yield, fracture or catastrophic failure was evident, where no more increase in load could be achieved or a load of 98.1kn (10000kgs)was reached in which the testing would cease.

Ultimate CPL load achieved at a recorded 61.32kN.
Load reduced at failure to a recorded 51.36kN and was sustained by the product assembly.
Failure occurred at diagonal lattice beam oval welded brace 4th section in from end vertical node, compressive buckling/yield evident.
Upon visual examination no weld failures were evident.
Failure digital images recorded: figures 2.5.1 to 2.5.4.

Figure 2.5.1. Digital image of diagonal node failure

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Figure 2.5.2. Side view of diaganol node compressive failure, note centre section buckling with no apparent visual weld defect evident.

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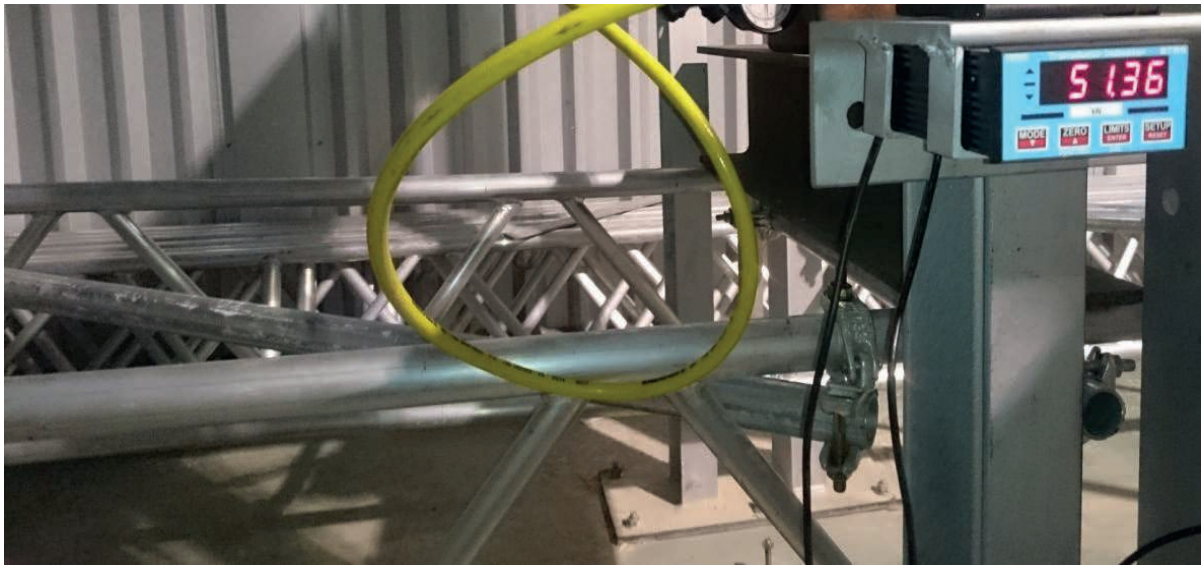
2.5.3. Digital view along length of lattice beam, load sustained at 51.36kN

2.5.4. Documented load sustained post failure



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3.0. Load application study 6000mmx450mm assembly

A series of load displacement tests to a 450mm deep assembly at 6000mm nominal length.
Compressive stools to be placed directly beneath the end vertical node points, a CPL application to a stated SLS load and ULS load with displacement values recorded at each increment, complete with an ultimate load application where modes and loads of failure are observed and documented.
A UDL application to a stated SLS load and ULS load with displacement values recorded at each increment.

3.1. Digital images of bracing 450mmx6000mm CPL

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3.2. 1. Requirements for displacement and load values CPL SLS.

Requested CPL SLS load 10kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 5800mm.

3.2.1.1. Load calculation and incremental values applied

For the purposes of the load study a CPL SLS was conducted as follows:
10kN total applied load.
5% of 10= 0.5kN therefore each applied increment = +0.5kN through to the total requested load of 10kN, total of 20 increments. NOTE; first load applied at 0.66kN (actual mass of bridging beam and cylinder).

Bridging reaction beam plus cylinder mass equal to 0.66kN, this recorded load was included in all CPL conditions.

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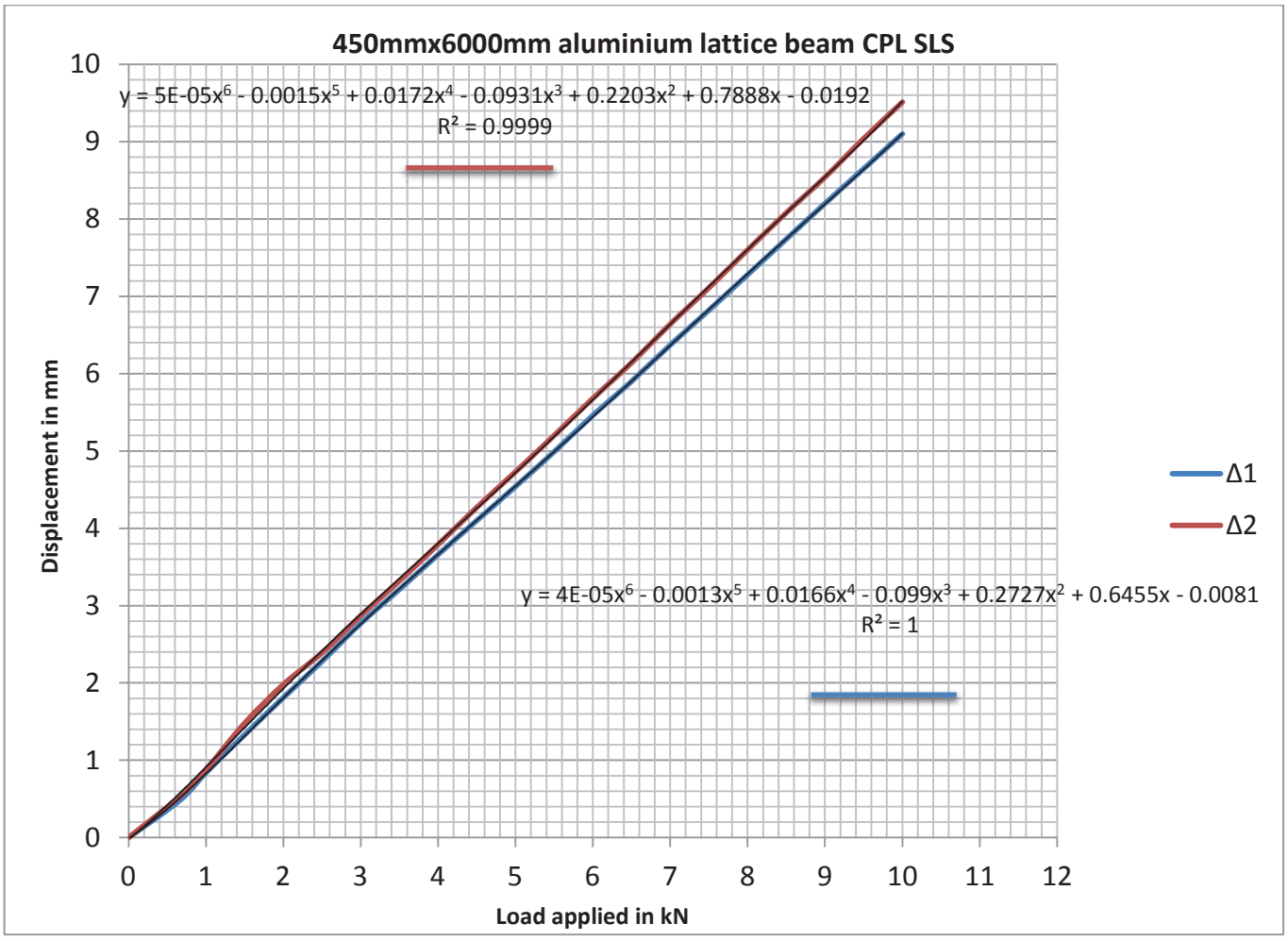
3.3. Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL SLS loading



3.3.1. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	5.5	4.99	5.2
0.66	0.48	0.53	6	5.46	5.68
1	0.84	0.88	6.5	5.9	6.14
1.5	1.33	1.48	7	6.37	6.64
2	1.81	1.98	7.5	6.82	7.11
2.5	2.28	2.39	8	7.28	7.6
3	2.77	2.87	8.5	7.74	8.08
3.5	3.21	3.32	9	8.2	8.54
4	3.66	3.79	9.5	8.65	9.04
4.5	4.1	4.27	10	9.1	9.51
5	4.54	4.73			

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3.3.2. Observations at requested CPL SLS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 9.13mm showing an increase in displacement of 0.03mm
Δ^2 mm=9.51mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL SLS application.

3.3.3. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.19mm.
Position Δ^2 showed a permanent displacement value of 0.15mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.16mm and position Δ^2 showed a recovery to a recorded value 0.12mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

3.4. Requirements for displacement and load values CPL ULS.

Requested CPL ULS load 16.5kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 5800mm.

3.4.1. Load calculation and incremental values applied

For the purposes of the load study a CPL ULS was conducted as follows:
16.5kN total applied load.
5% of 16.5= 0.825kN therefore each applied increment = +0.82kN to 0.83kN through to the total requested load of 16.5kN, total of 20 increments.

Bridging reaction beam plus cylinder mass equal to 0.66kN, this recorded load was included in all CPL conditions.

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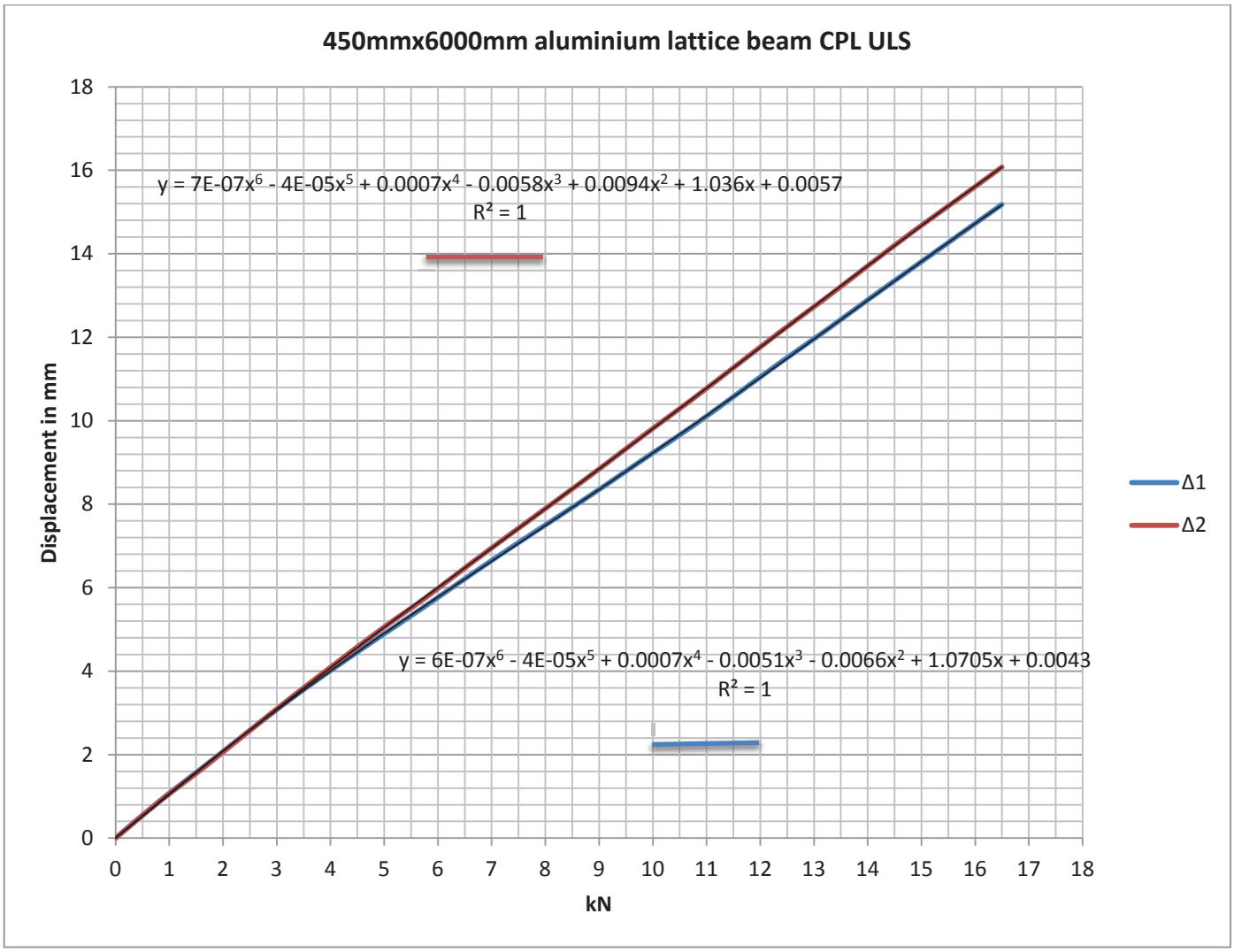
3.4.2. Load displacement graph showingΔ^1 and Δ^2 throughout incremental CPL ULS loading



3.4.3. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	9.07	8.41	8.91
0.82	0.89	0.88	9.9	9.14	9.72
1.65	1.72	1.7	10.72	9.85	10.5
2.47	2.55	2.55	11.55	10.62	11.32
3.3	3.37	3.4	12.37	11.39	12.13
4.12	4.12	4.21	13.2	12.14	12.92
4.95	4.85	5.01	14.02	12.91	13.73
5.77	5.56	5.76	14.85	13.67	14.54
6.6	6.3	6.57	15.67	14.42	15.3
7.42	7.01	7.35	16.5	15.18	16.08
8.25	7.71	8.13			

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3.5. Observations at requested CPL ULS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 15.21mm showing an increase in displacement of 0.03mm
Δ^2 mm=16.09mm showing an increase in displacement of 0.01mm

No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL ULS application.

3.5.1. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.12mm.
Position Δ^2 showed a permanent displacement value of 0.13mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.12mm and position Δ^2 showed a recovery to a recorded value 0.13mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

3.6. CPL load application to ultimate failure

For the purpose of the failure load application, the failure would be recognised where yield, fracture or catastrophic failure was evident, where no more increase in load could be achieved or a load of 98.1kN (10000kgs) was reached in which the testing would cease.

Ultimate CPL load achieved at a recorded 38.18kN.
No more loads could be achieved from the recorded value 38.18kN, top chord yield, deformation evident at bearing point of test bridging beam face. Due to diagonal brace geometry there was no node support at the central bearing point.
Upon visual examination no weld failures were evident.
Failure digital images recorded: figures 3.6.1 to 3.6.4

3.6.1 Showing top chord failure through crushing

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3.6.2 Showing unsupported node section at failure

3.6.3. View of top chord post load

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3.6.4. Digital image showing recovery and upper face bruising/indentation post load

All 450mmx6000mm CPL load applications SLS, ULS and failure testing witnessed by VR Scaffold representative and S-Mech representative.

3.7. Requirements for displacement and load values UDL SLS.

Requested UDL SLS loads where 6.8kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.
Actual clear unsupported span 5800mm.

3.7.1. Load calculation and incremental values applied UDL SLS
For the purposes of the load study a UDL was calculated as follows:
6mx3kN/m^2 = 18kN total applied load required..
Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.
3kN/m^2 was adjusted to 325kg/m^2
Total required force 18kN=1835kg
Actual total applied 1950kg
Increments applied at a total of 13 due to mass configuration.

Data logging recorded manually as requested. Mass applied as evenly as practicable throughout UDL load applications.

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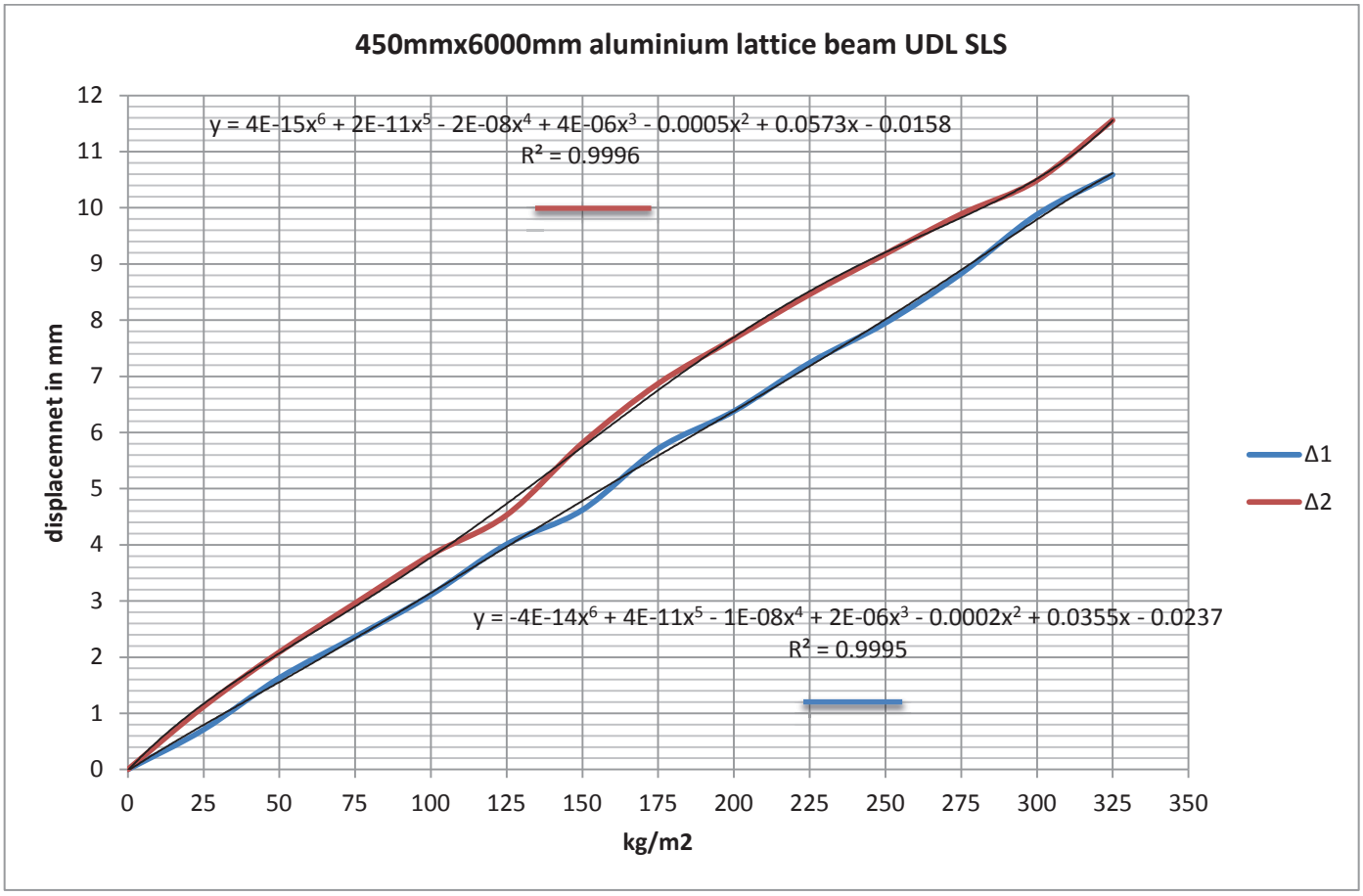
3.7.2. ***Load displacement graph showingΔ^1 and Δ^2 throughout incremental kg/m^2 loading UDL SLS***



3.7.3. Logged load displacement values per kg/m^2 increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	175	5.71	6.87
25	0.71	1.12	200	6.38	7.67
50	1.63	2.09	225	7.24	8.46
75	2.36	2.96	250	7.95	9.18
100	3.11	3.82	275	8.83	9.89
125	4.01	4.53	300	9.88	10.49
150	4.62	5.81	325	10.59	11.56

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3.7.4. Observations at requested UDL SLS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 10.62mm showing an increase in displacement of +0.03mm
Δ^2 mm=11.61mm showing an increase in displacement of +0.05mm
No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

3.7.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.28mm.
Position Δ^2 showed a permanent displacement value of 0.14mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.26mm and position Δ^2 showed a recovery to a recorded value 0.11mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations.*

3.8. UDL ULS load application

Requested UDL ULS loads where 5kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.

3.8.1. Load calculation and incremental values applied UDL ULS

For the purposes of the load study a UDL was calculated as follows:
6mx5kN/m^2 = 30kN total applied load.
5% of 30kN = 1.5kN therefore 1.5kN/6 = 0.25kN/m^2 per increment.
Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.
30kN = 3059kg: this figure was rounded to suit the favour of the mass to 3150kg
Actual total applied 3150kg: 525kg/m^2
Increments applied at a total of 19 at 25kg/m^2

Data logging recorded manually as agreed. Mass applied as evenly as practicable through load applications.

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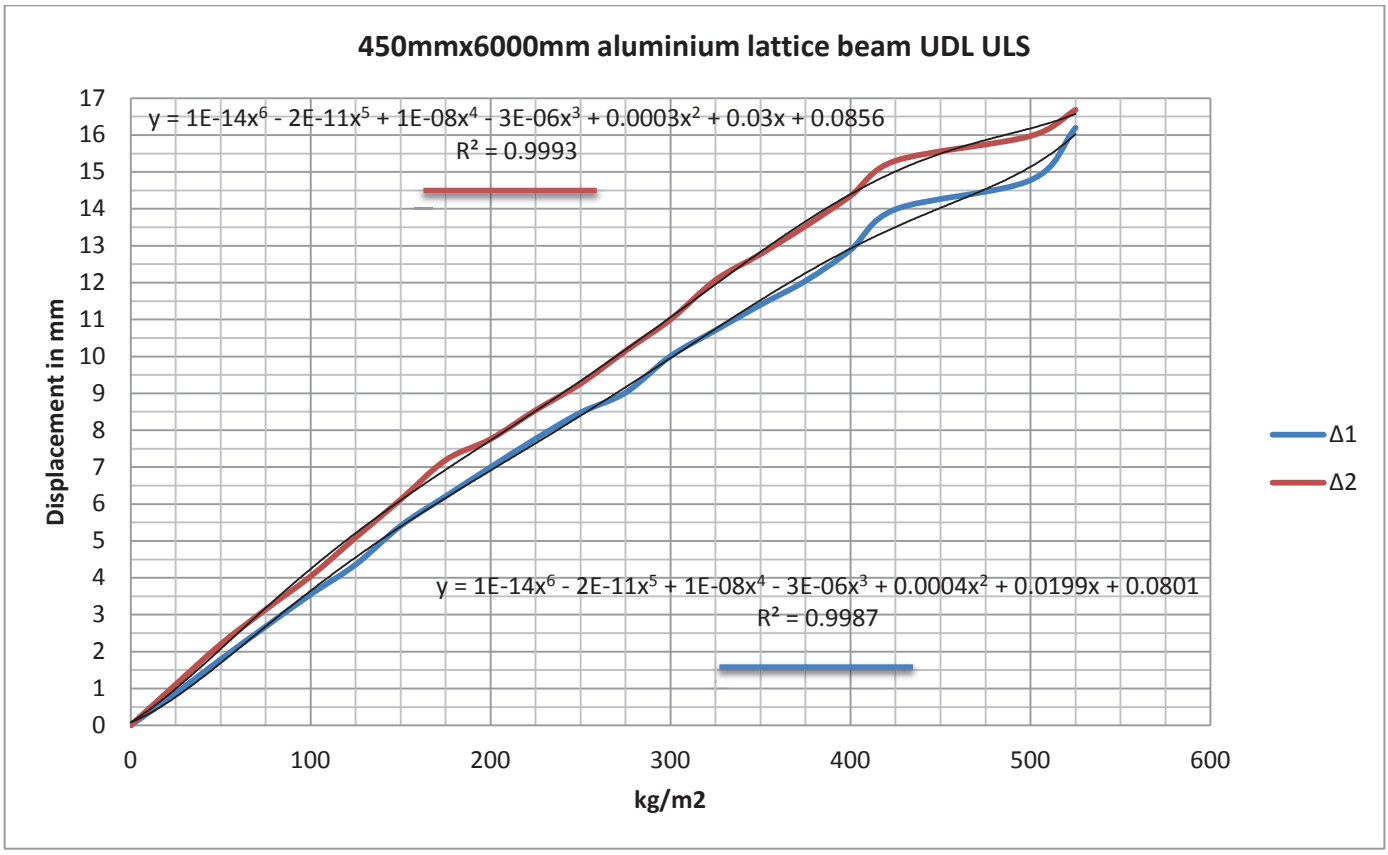
3.8.2. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental kg/m^2 loading UDL ULS***



3.8.3. Logged load displacement values per kg/m^2 increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	8.48	250	0	9.26
25	0.87	9.02	275	1.11	10.15
50	1.79	10.01	300	2.2	11
75	2.68	10.71	325	3.14	12.07
100	3.55	11.4	350	4.04	12.77
125	4.36	12.05	375	5.09	13.53
150	5.41	12.89	400	6.12	14.35
175	6.21	13.99	425	7.19	15.3
200	7	14.78	500	7.76	15.97
225	7.77	16.2	525	8.54	16.68

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3.8.4. Observations at requested UDL ULS

The displacement recorded at the 5 minute holding period was as follows:

Δ^1 mm= 16.2mm showing no increase in displacement.

Δ^2 mm=16.73mm showing an increase in displacement of +0.05mm

No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

3.8.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.1mm.

Position Δ^2 showed a permanent displacement value of 0.15mm.

Upon 5 minutes settlement time the recovery of each beam was as follows:

Position Δ^1 showed a recovery to a recorded value 0.9mm and position Δ^2 showed a recovery to a recorded value 0.05mm

Visual examination post load showed no apparent buckling, failures or weld failures.

***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations.*

3.8.5.1. UDL digital image 450mmx6000mm

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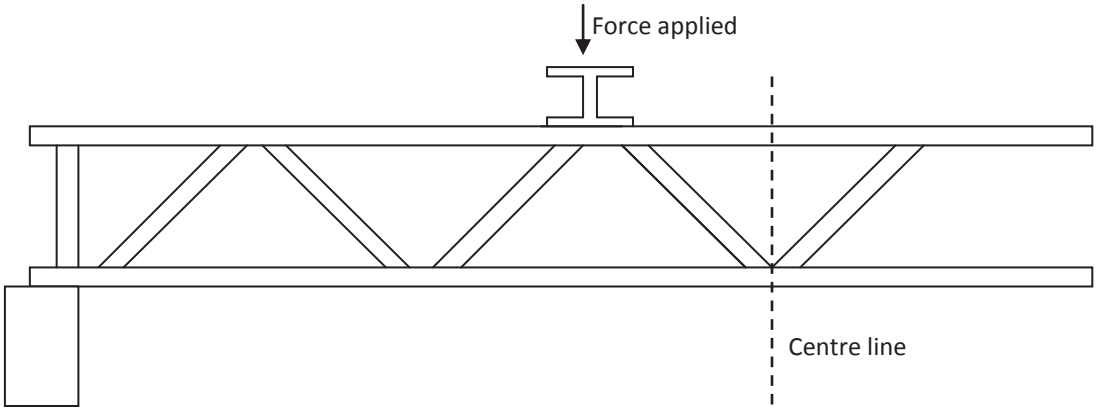
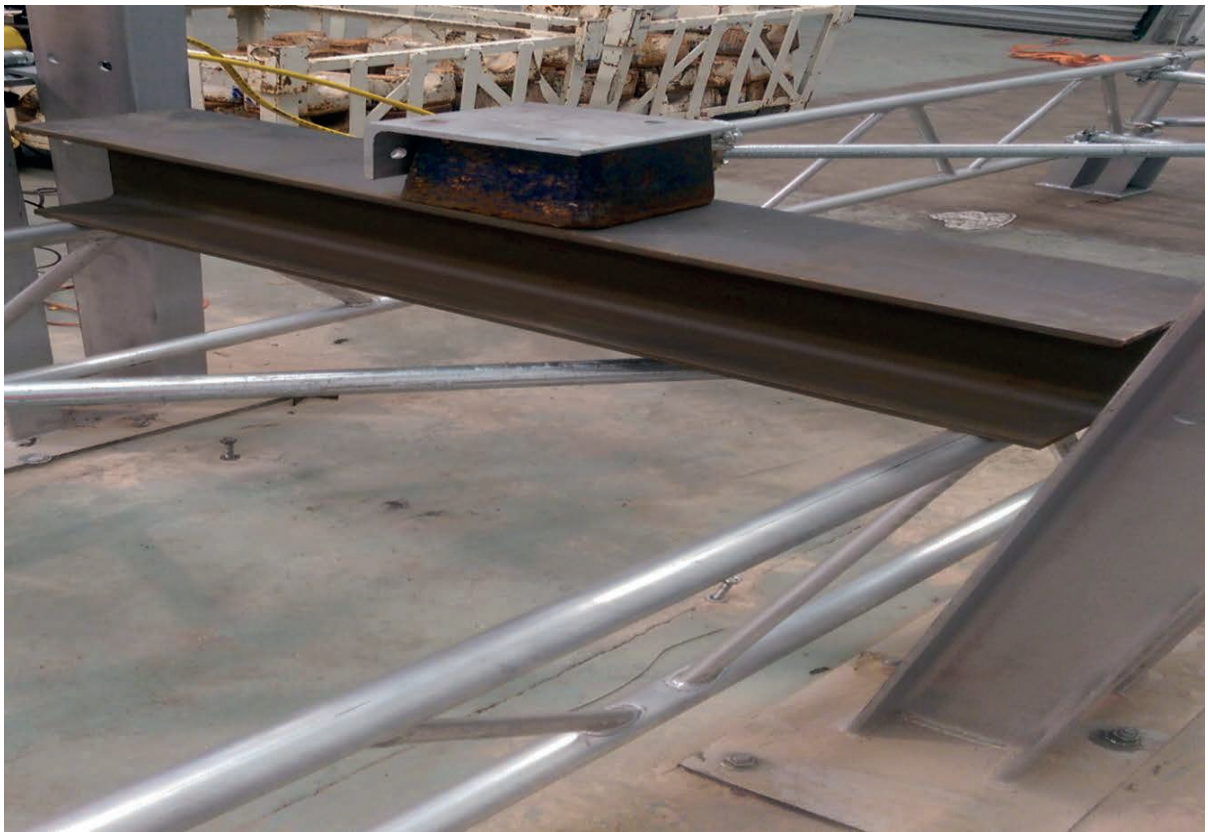
3.9. Additional CPL to failure applied offset from geometric centre above diagonal nodes.

The client requested an additional CPL load application to failure at a position off set to the centre.



The 450mmx6000mm assembly reached an ultimate load of 38.41kN, with lateral bending along the length of the top chord.

3.9.1. Digital image of load application position, off set to centre line above diagonal nodes



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3.9.2. Digital image showing set along top chord post load application.

Permanent deformation of approx 3-4mm top chord post load

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4.0. Load application study 4000mmx750mm assembly client reference N2 beams

A series of load displacement tests to a N2 750mm deep assembly at 4000mm nominal length.
Compressive stools to be placed directly beneath the end vertical node points, a CPL application to a stated SLS load and ULS load with displacement values recorded at each increment, complete with an ultimate load application where modes and loads of failure are observed and documented.
A UDL application to a stated SLS load and ULS load with displacement values recorded at each increment.

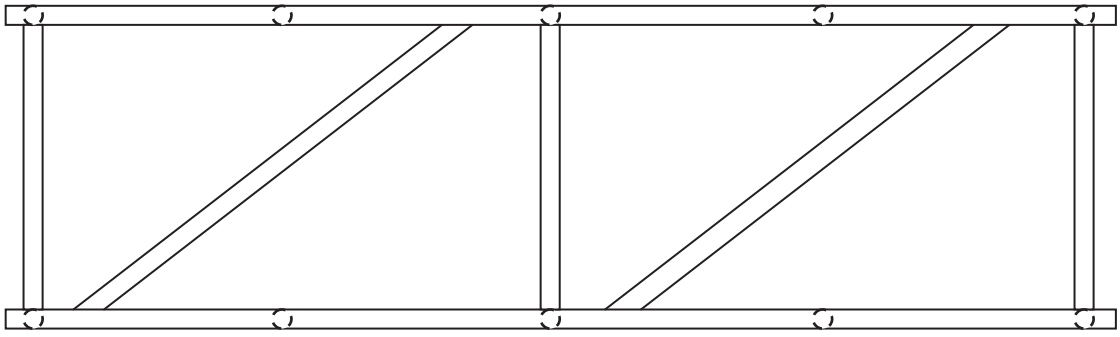
4.1. Requirements for displacement and load values CPL SLS.

Requested CPL SLS load 23.4kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 3800mm.

4.1.1. Load calculation and incremental values applied

For the purposes of the load study a CPL SLS was conducted as follows:
23.4kN total applied load.
5% of 23.41= 1.17kN therefore each applied increment = +1.17kN through to the total requested load of 23.41kN, total of 20 increments.
Bridging reaction beam plus cylinder mass and packing equal to 0.85kN, this recorded load was included in all CPL conditions.

4.1.2. Plan view of bracing configuration N2 Lattice beams 750mmx4000mm



End bracing configurations as all previous assemblies

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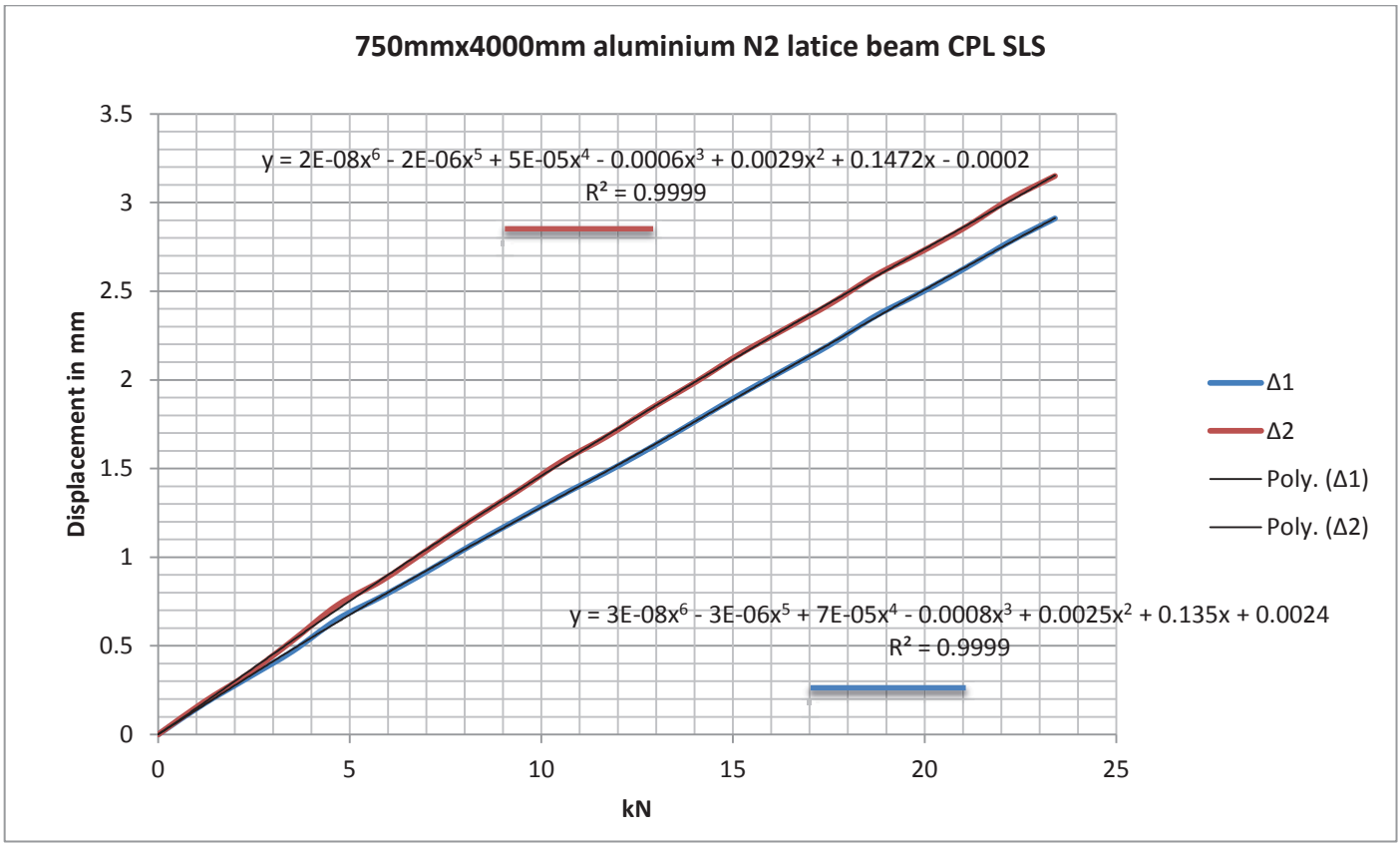
4.2. *Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL SLS loading*



4.2.1. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm.

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	11.7	1.48	1.68
1.17	0.17	0.18	12.87	1.62	1.84
2.34	0.32	0.34	14.04	1.77	1.99
3.51	0.47	0.53	15.21	1.92	2.15
4.68	0.65	0.73	16.38	2.06	2.29
5.85	0.78	0.87	17.55	2.2	2.43
7.02	0.92	1.04	18.72	2.36	2.59
8.19	1.07	1.21	19.89	2.49	2.72
9.36	1.21	1.37	21.06	2.63	2.86
10.53	1.35	1.54	22.23	2.78	3.02
			23.4	2.91	3.15

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4.2.2. Observations at requested CPL SLS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 2.91mm showing no increase in displacement.
Δ^2 mm=3.15mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL SLS application.

4.2.2.1. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.03mm.
Position Δ^2 showed a permanent displacement value of 0.0mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.03mm and position Δ^2 showed a recovery to a recorded value 0.00mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

4.3. Requirements for displacement and load values CPL ULS.

Requested CPL ULS load 38.6kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 3800mm.

4.3.1. Load calculation and incremental values applied

For the purposes of the load study a CPL ULS was conducted as follows:
38.6kN total applied load.
5% of 38.6= 1.93kN therefore each applied increment = +1.93kN through to the total requested load of 38.6kN, total of 20 increments.
Bridging reaction beam plus cylinder mass and packing equal to 0.85kN, this recorded load was included in all CPL conditions.

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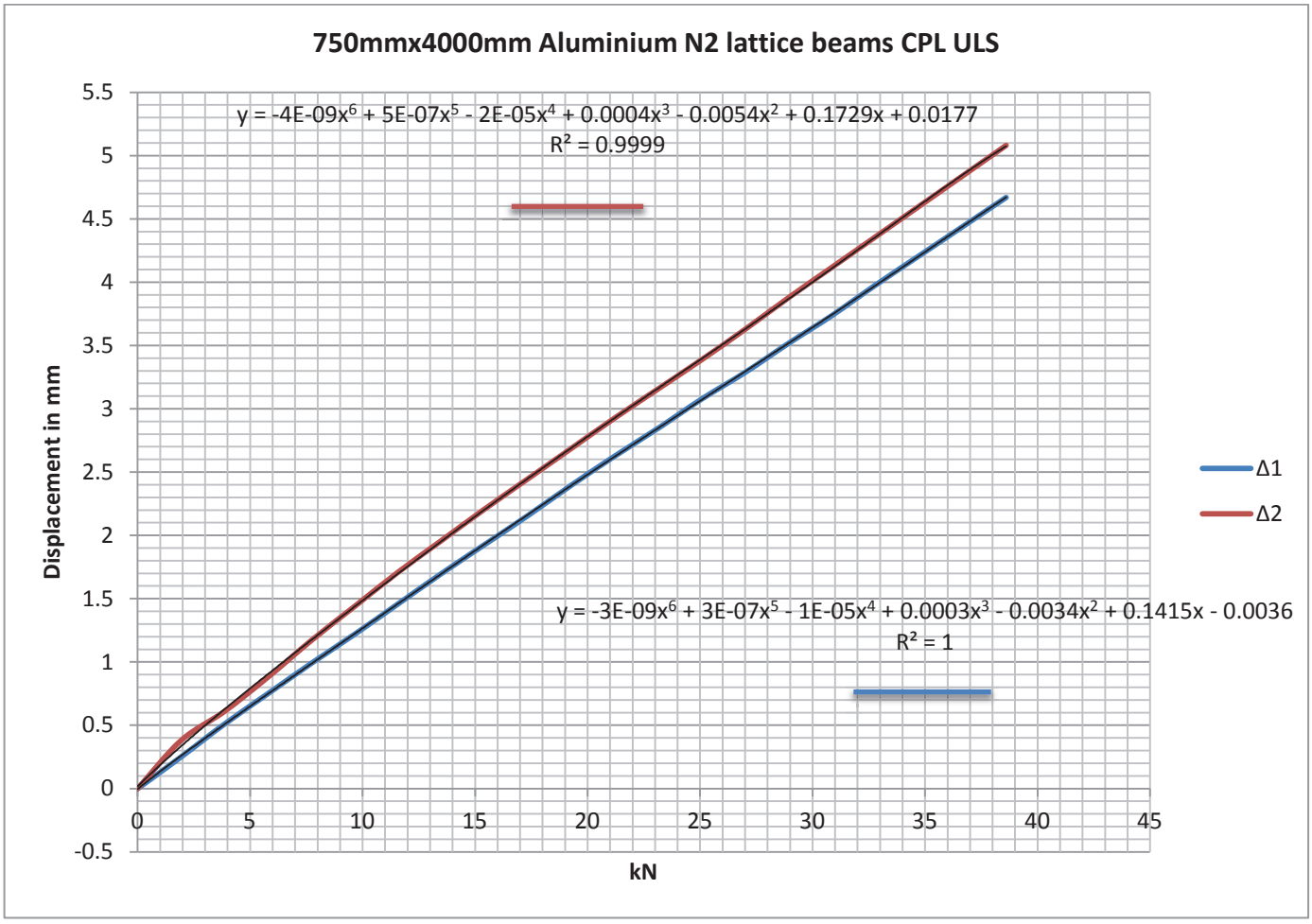
4.3.2. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL ULS loading***



4.3.3. Logged load displacement values per kN increments, all displacement values Δ^1 & Δ^2 recorded in mm.

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	19.3	2.4	2.69
1.93	0.25	0.38	21.23	2.63	2.93
3.86	0.51	0.61	23.16	2.85	3.16
5.79	0.75	0.88	25.09	3.08	3.39
7.72	0.99	1.17	27.02	3.29	3.63
9.65	1.22	1.44	28.95	3.52	3.88
11.58	1.46	1.71	30.88	3.74	4.12
13.51	1.7	1.96	32.81	3.98	4.36
15.44	1.93	2.21	34.74	4.21	4.6
17.37	2.16	2.45	36.67	4.44	4.84
			38.6	4.67	5.08

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4.3.4. Observations at requested CPL ULS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 4.68mm showing an increase in displacement of 0.01mm
Δ^2 mm=5.08mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL SLS application.

4.3.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.02mm.
Position Δ^2 showed a permanent displacement value of 0.03mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.01mm and position Δ^2 showed a recovery to a recorded value 0.02mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

4.4. UDL SLS load application

Requested UDL SLS loads where 5.3kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
4000mm clear span = 40mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.

4.4.1. Load calculation and incremental values applied UDL SLS

For the purposes of the load study a UDL was calculated as follows:
4mx5.3kN/m^2 = 21.2kN total applied load.
5% of 21.2kN = 1.06kN therefore 1.06kN/4 = 0.265kN/m^2 per increment.
Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.
21.2kN = 2162kg: this figure was rounded to suit the favour of the mass to 2200kg
Actual total applied 2200kg: 550kg/m^2
Increments applied at a total of 22 at 25kg/m^2

Data logging recorded manually as agreed. Mass applied as evenly as practicable through load applications.

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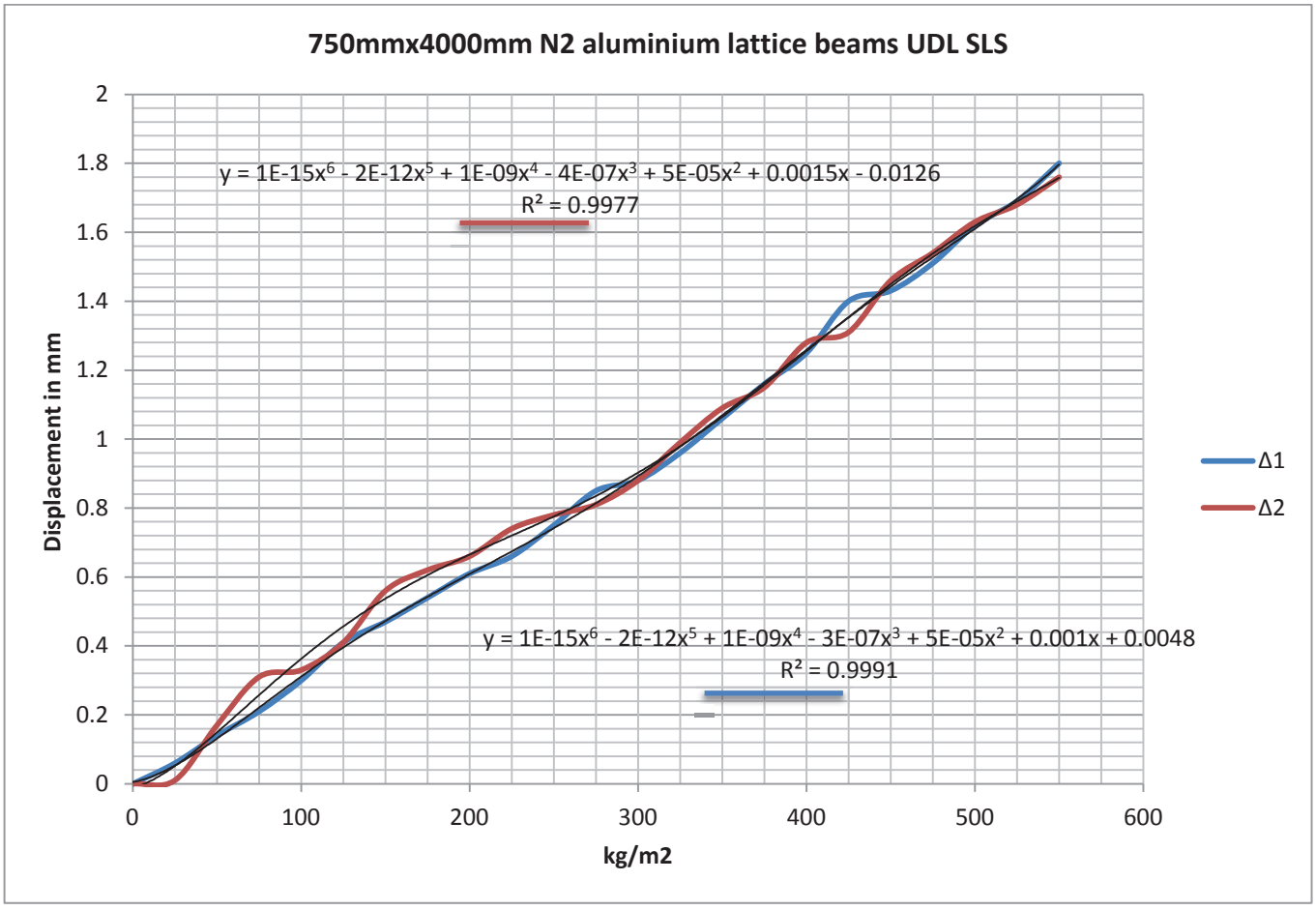
4.4.2. *Load displacement graph showing Δ^1 and Δ^2 throughout incremental UDL SLS loading*



4.4.3. Logged load displacement values per kg/m^2 increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	275	0.85	0.81
25	0.06	0.01	300	0.88	0.88
50	0.14	0.17	325	0.96	0.99
75	0.21	0.31	350	1.06	1.09
100	0.3	0.33	375	1.16	1.15
125	0.41	0.41	400	1.25	1.28
150	0.47	0.56	425	1.4	1.31
175	0.54	0.62	450	1.43	1.46
200	0.61	0.66	475	1.51	1.54
225	0.66	0.74	500	1.62	1.63
250	0.75	0.78	525	1.69	1.68
			0.85	1.8	1.76

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4.4.4. Observations at requested UDL SLS

The displacement recorded at the 5 minute holding period was as follows:

Δ^1 mm= 1.8mm showing no increase in displacement.

Δ^2 mm=1.76mm showing no increase in displacement

No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

4.4.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.03mm.

Position Δ^2 showed a permanent displacement value of 0.05mm.

Upon 5 minutes settlement time the recovery of each beam was as follows:

Position Δ^1 showed a recovery to a recorded value 0.02mm and position Δ^2 showed a recovery to a recorded value 0.03mm

Visual examination post load showed no apparent buckling, failures or weld failures.

***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations*

4.5. UDL ULS load application

Requested UDL ULS loads where 8.7kN/m^2.

Maximum permissible displacement values based upon 1/100 of the clear span.

4000mm clear span = 40mm allowable displacement.

Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.

An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.

Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.

4.5.1. Load calculation and incremental values applied UDL ULS

For the purposes of the load study a UDL was calculated as follows:

4mx8.7kN/m^2 = 34.8kN total applied load.

5% of 34.8kN = 1.74kN therefore 1.74kN/4 = 0.435kN/m^2 per increment.

Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.

34.8kN = 3549kg: this figure was rounded to suit the favour of the mass to 3600kg

Actual total applied 3600kg: 900kg/m^2

Increments applied at a total of 17 at 50kg/m^2

Data logging recorded manually as agreed. Mass applied as evenly as practicable through load applications.

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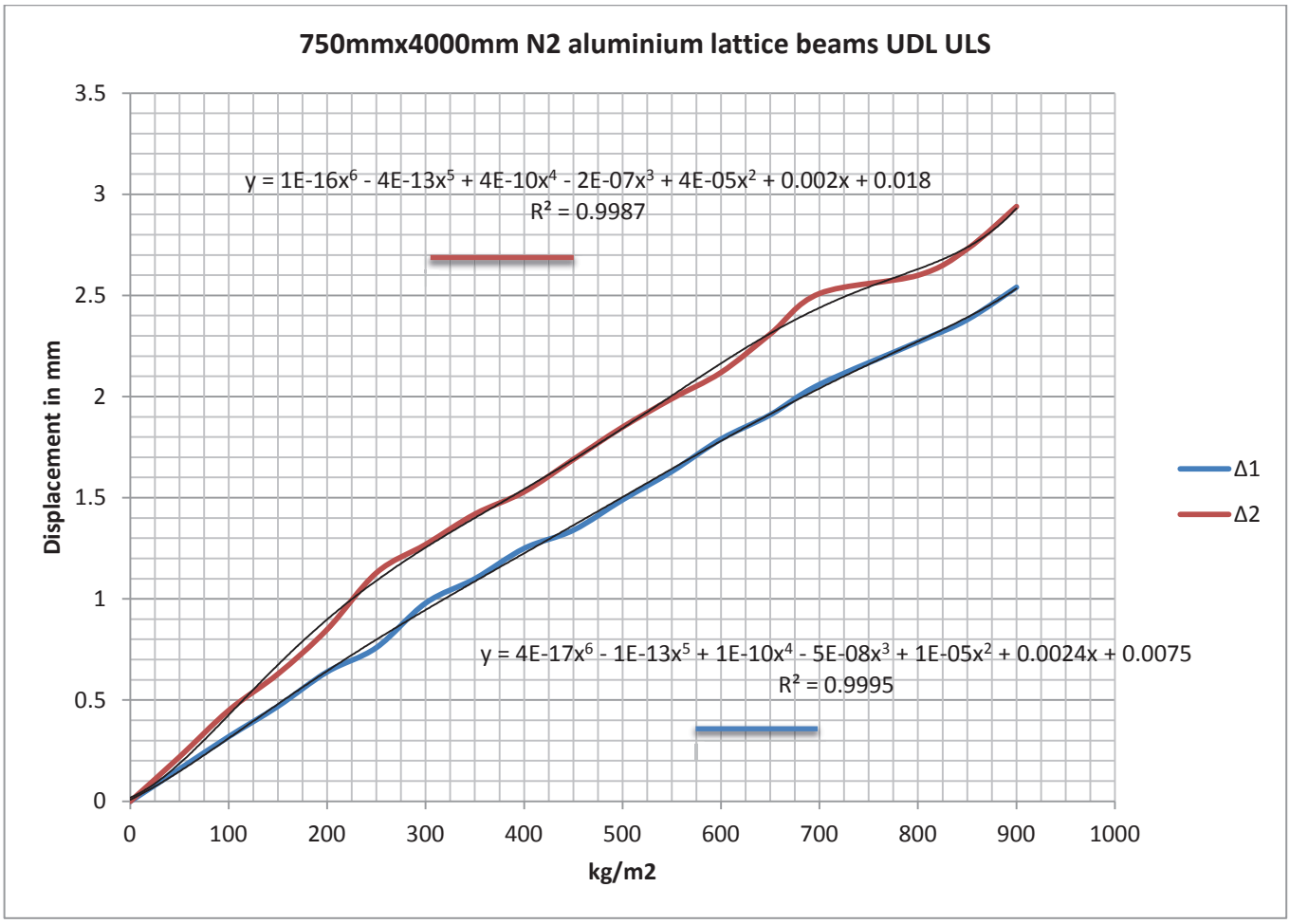
4.5.2. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental UDL ULS loading***



4.5.3. Logged load displacement values per kg/m^2 increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	450	1.34	1.69
50	0.16	0.22	500	1.49	1.85
100	0.32	0.45	550	1.63	1.99
150	0.47	0.63	600	1.79	2.12
200	0.64	0.85	650	1.91	2.31
250	0.76	1.13	700	2.06	2.51
300	0.98	1.27	800	2.27	2.6
350	1.1	1.42	850	2.38	2.73
400	1.25	1.53	900	2.54	2.94

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4.5.4. Observations at requested UDL ULS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 2.54mm showing no increase in displacement.
Δ^2 mm=2.94mm showing no increase in displacement
No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

4.5.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.01mm.
Position Δ^2 showed a permanent displacement value of 0.01mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.01mm and position Δ^2 showed a recovery to a recorded value 0.0mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations*

4.6. CPL load application to ultimate failure N2 750mmx4000mm configuration

For the purpose of the failure load application, the failure would be recognised where yield, fracture or catastrophic failure was evident, where no more increase in load could be achieved or a load of 98.1kn (10000kgs)was reached in which the testing would cease.

Ultimate CPL load achieved at a recorded 98.77kN.
No more loads could be physically applied from the recorded value 98.77kN,
Displacement values recorded at Δ^1 14.34mm & Δ^2 13.12mm overall.
Permanent set recorded at Δ^1 1.48mm & $\Delta^2$0.98mm
Upon visual examination no weld failures were evident. No apparent visual signs of buckling or yield.

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5.0. Load application study 6000mmx750mm assembly client reference N2 beams

A series of load displacement tests to a N2 750mm deep assembly at 6000mm nominal length.
Compressive stools to be placed directly beneath the end vertical node points, a CPL application to a stated SLS load and ULS load with displacement values recorded at each increment, complete with an ultimate load application where modes and loads of failure are observed and documented.
A UDL application to a stated SLS load and ULS load with displacement values recorded at each increment.

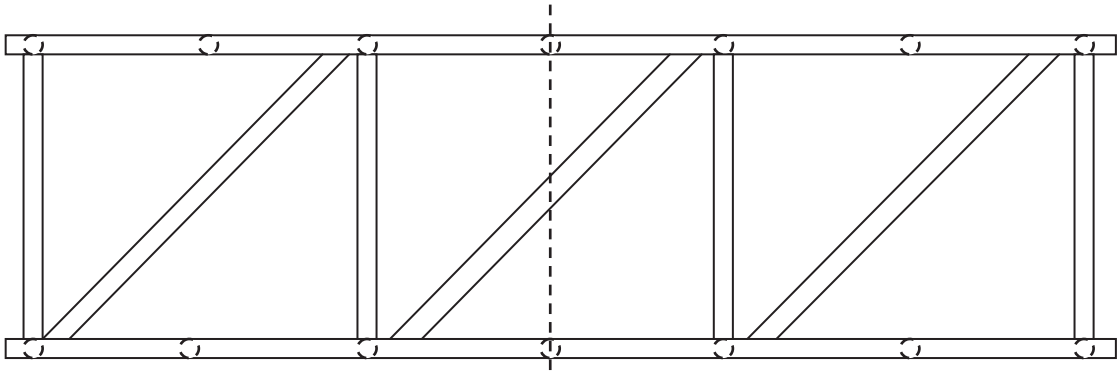
5.1. Requirements for displacement and load values CPL SLS.

Requested CPL SLS load 15.5kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 5800mm.

5.1.1. Load calculation and incremental values applied

For the purposes of the load study a CPL SLS was conducted as follows:
15.5kN total applied load.
5% of 15.5kN= 0.775kN therefore each applied increment = +0.77kN to 0.78kN through to the total requested load of 15.5kN, total of 20 increments.
Bridging reaction beam plus cylinder mass and packing equal to 0.85kN, this recorded load was included in all CPL conditions.
First load applied 0.85kN equal to self weight of bridge beam and packing

5.1.2. Plan view of bracing configuration N2 Lattice beams 750mmx4000mm



Load applied through bridge beam at centre node point

End bracing configurations as all previous assemblies

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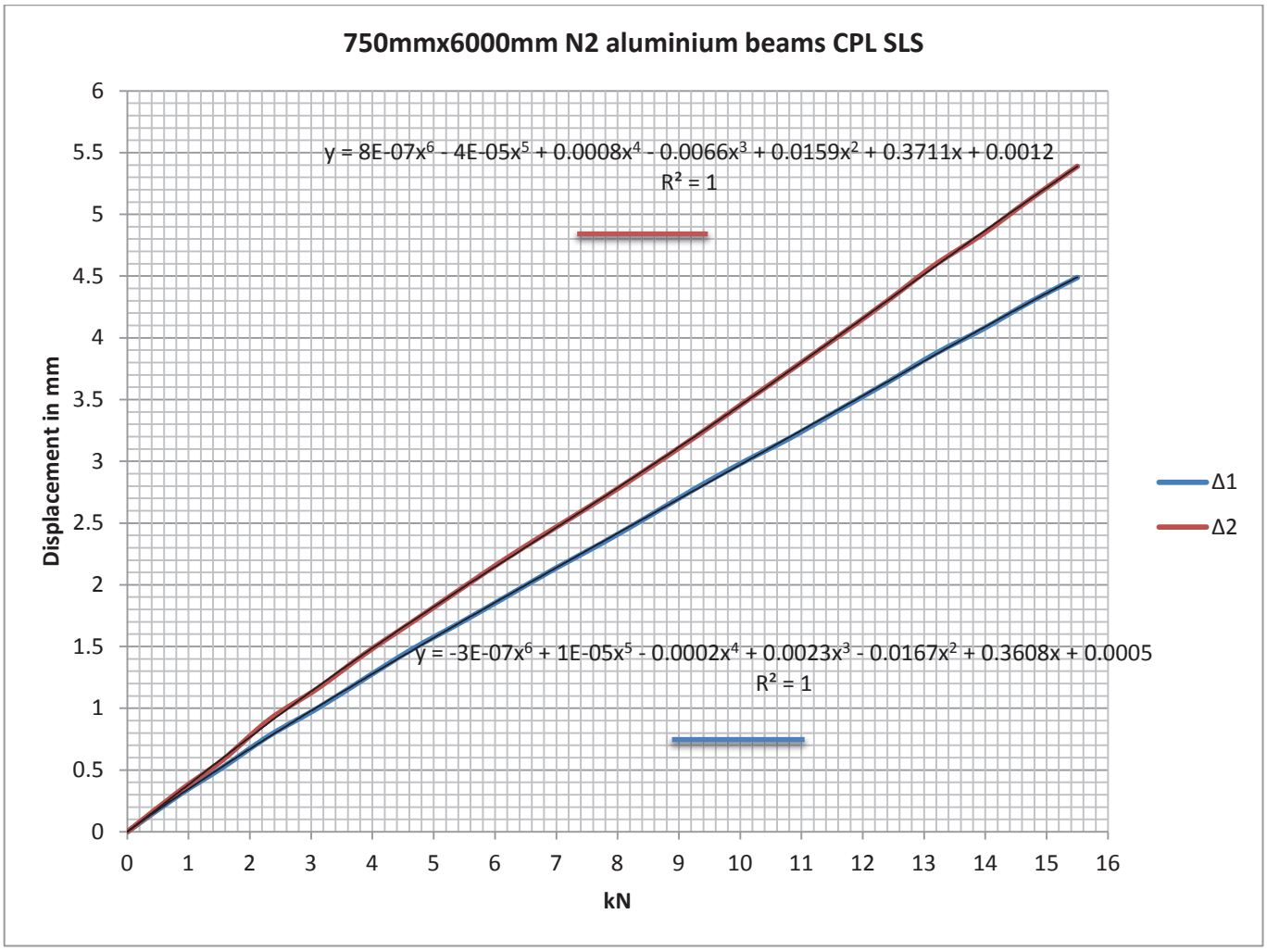
5.2. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL SLS loading***



5.2.1. Logged load displacement values per kN increments all displacement values Δ^1 & Δ^2 recorded in mm

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	8.52	2.56	2.95
0.85	0.3	0.33	9.3	2.79	3.21
1.55	0.52	0.58	10.07	3	3.48
2.32	0.78	0.91	10.85	3.2	3.75
3.1	1	1.16	11.62	3.42	4.02
3.87	1.24	1.44	12.4	3.64	4.3
4.65	1.48	1.7	13.17	3.87	4.59
5.42	1.69	1.96	13.95	4.07	4.84
6.2	1.91	2.22	14.72	4.29	5.12
6.97	2.13	2.46	15.5	4.49	5.39
7.75	2.34	2.7			

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5.2.2. Observations at requested CPL SLS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 4.5mm showing an increase in displacement of 0.01mm
Δ^2 mm=5.39mm showing no increase in displacement.
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL SLS application.

5.2.2.1. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.04mm.
Position Δ^2 showed a permanent displacement value of 0.01mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.03mm and position Δ^2 showed a recovery to a recorded value 0.01mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

5.3. Requirements for displacement and load values CPL ULS.

Requested CPL ULS load 25.5kN.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable.
Actual clear unsupported span 5800mm.

5.3.1. Load calculation and incremental values applied

For the purposes of the load study a CPL ULS was conducted as follows:
25.5kN total applied load.
5% of 25.5kN= 1.275kN therefore each applied increment = +1.27to 1.28kN through to the total requested load of 25.5kN, total of 20 increments.
Bridging reaction beam plus cylinder mass and packing equal to 0.85kN, this recorded load was included in all CPL conditions.

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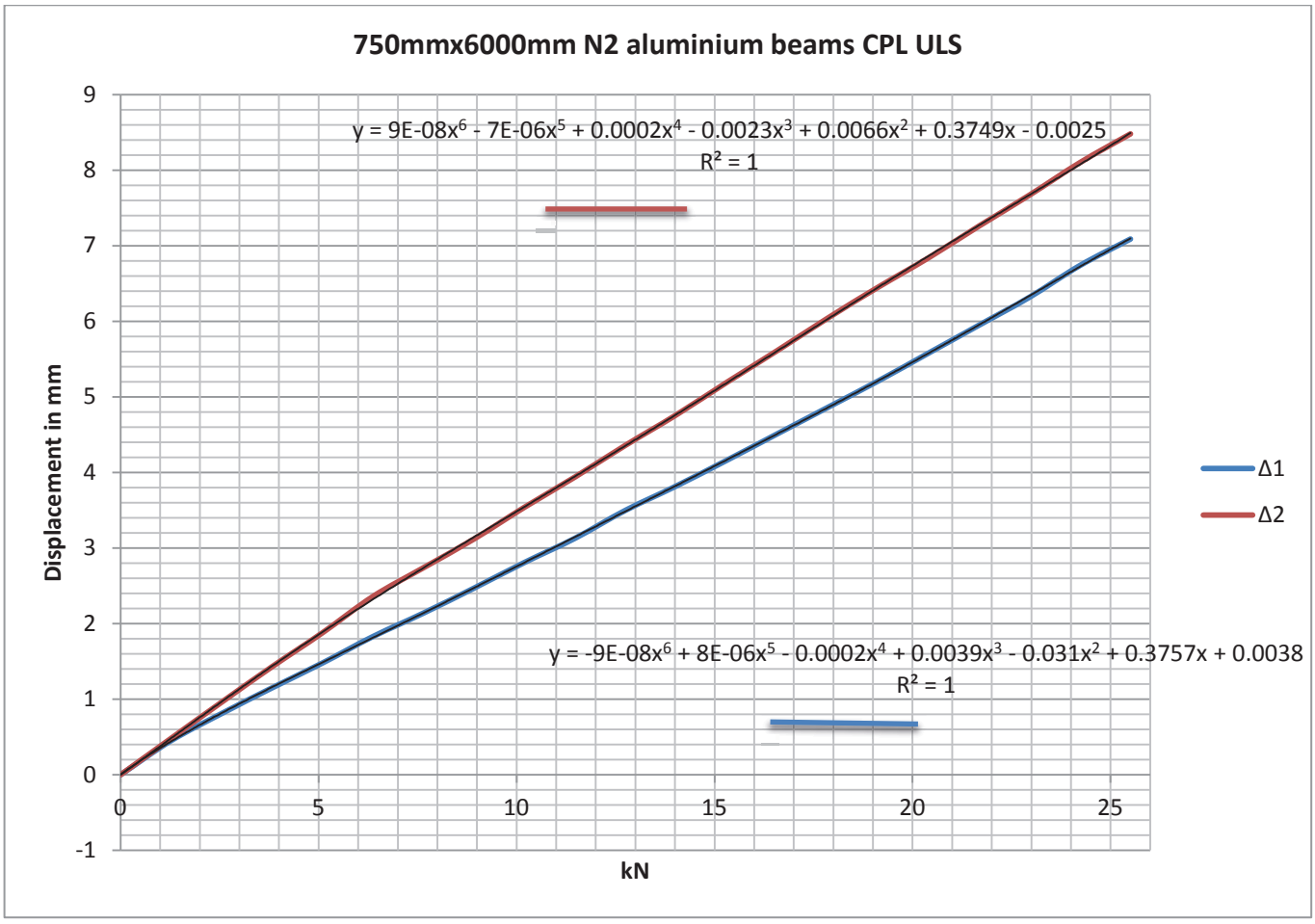
5.4. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL ULS loading***



5.4.1. Logged load displacement values per kN increments all displacement values Δ^1 & Δ^2 recorded in mm

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	14.025	3.82	4.76
1.27	0.45	0.48	15.3	4.16	5.19
2.55	0.81	0.96	16.575	4.51	5.61
3.825	1.15	1.43	17.85	4.86	6.04
5.1	1.48	1.88	19.125	5.21	6.45
6.375	1.83	2.36	20.4	5.58	6.84
7.65	2.14	2.74	21.675	5.95	7.26
8.925	2.47	3.12	22.95	6.32	7.67
10.2	2.81	3.54	24.225	6.74	8.1
11.475	3.13	3.94	25.5	7.09	8.48
12.75	3.5	4.36			

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5.4.2. Observations at requested CPL ULS

The displacement recorded at the 5 minute holding period was as follows:
Δ^1 mm= 7.11mm showing an increase in displacement of 0.02mm
Δ^2 mm=8.49mm showing an increase in displacement of 0.01mm
No visual or audible evidence of failure, fracture or weld failure was observed throughout CPL ULS application.

5.4.2.1. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.04mm.
Position Δ^2 showed a permanent displacement value of 0.03mm.
Upon 5 minutes settlement time the recovery of each beam was as follows:
Position Δ^1 showed a recovery to a recorded value 0.03mm and position Δ^2 showed a recovery to a recorded value 0.03mm
Visual examination post load showed no apparent buckling, failures or weld failures.
***NOTE:** All load displacement recordings and collated data included the initial mass of the bridging beam and cylinder.*

5.5. UDL SLS load application

Requested UDL SLS loads where 3.4kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.

5.5.1. Load calculation and incremental values applied UDL SLS

For the purposes of the load study a UDL was calculated as follows:
6mx3.4kN/m^2 = 20.4kN total applied load.
5% of 20.4kN = 1.02kN therefore 1.02kN/6 = 0.17kN/m^2 per increment.
Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.
20.4kN = 2080kg: this figure was rounded to suit the favour of the mass to 2100kg
Actual total applied 2100kg: 350kg/m^2
Increments applied at a total of 14 at 25kg/m^2

Data logging recorded manually as agreed. Mass applied as evenly as practicable through load applications.

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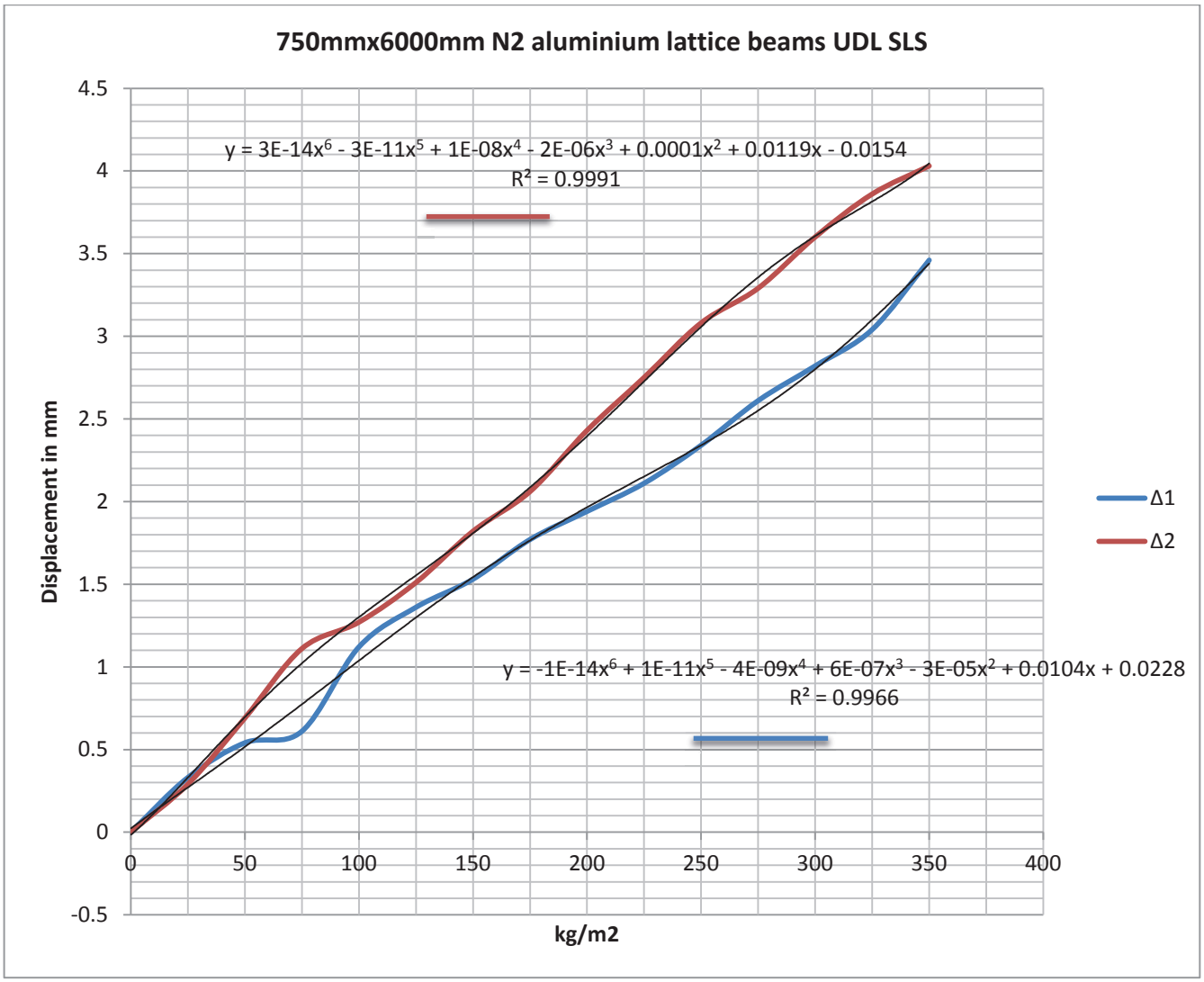
5.5.2. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental UDL SLS loading***



5.5.3. Logged load displacement values per kg/m^2 increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	200	1.94	2.43
25	0.33	0.29	225	2.11	2.75
50	0.54	0.69	250	2.34	3.08
75	0.61	1.11	275	2.61	3.29
100	1.12	1.27	300	2.82	3.6
125	1.36	1.51	325	3.04	3.86
150	1.53	1.82	350	3.46	4.03
175	1.77	2.06			

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5.5.4. Observations at requested UDL SLS

The displacement recorded at the 5 minute holding period was as follows:

Δ^1 mm= 3.47mm showing an increase in displacement of 0.01mm

Δ^2 mm=4.03mm showing no increase in displacement

No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

5.5.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.05mm.

Position Δ^2 showed a permanent displacement value of 0.01mm.

Upon 5 minutes settlement time the recovery of each beam was as follows:

Position Δ^1 showed a recovery to a recorded value 0.05mm and position Δ^2 showed a recovery to a recorded value 0.0mm

Visual examination post load showed no apparent buckling, failures or weld failures.

***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations*

Digital image showing UDL SLS load condition.

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5.6. UDL ULS load application

Requested UDL ULS loads where 5.6kN/m^2.
Maximum permissible displacement values based upon 1/100 of the clear span.
6000mm clear span = 60mm allowable displacement.
Initial load application of 1kN for 1 minute applied prior to datum zero recordings of the centralised vertical displacement gauges. Total load to be held for 5 minutes with displacement monitored and displacement extensions recorded, upon 5 minute dwell period load was to be removed and permanent displacement values recorded, and again after 5 minute settlement.
An average of 5% of the total load required every 30 seconds was applied as reasonably practicable due to mass transportation.
Where mass increments could only be applied at a minimum of 25kgs increments per square metre the following applications where followed.

5.6.1. Load calculation and incremental values applied UDL ULS

For the purposes of the load study a UDL was calculated as follows:
6mx5.6kN/m^2 = 33.6kN total applied load.
5% of 33.6kN = 1.68kN therefore 1.68kN/6 = 0.28kN/m^2 per increment.
Smallest valued physical load that could be applied equals a minimum increment of 25kgs mass.
33.6kN = 3426kg: this figure was rounded to suit the favour of the mass to 3450kg
Actual total applied 3450kg: 575kg/m^2
Increments applied at a total of 23 at 25kg/m^2

Data logging recorded manually as agreed. Mass applied as evenly as practicable through load applications.

Digital image showing UDL ULS condition

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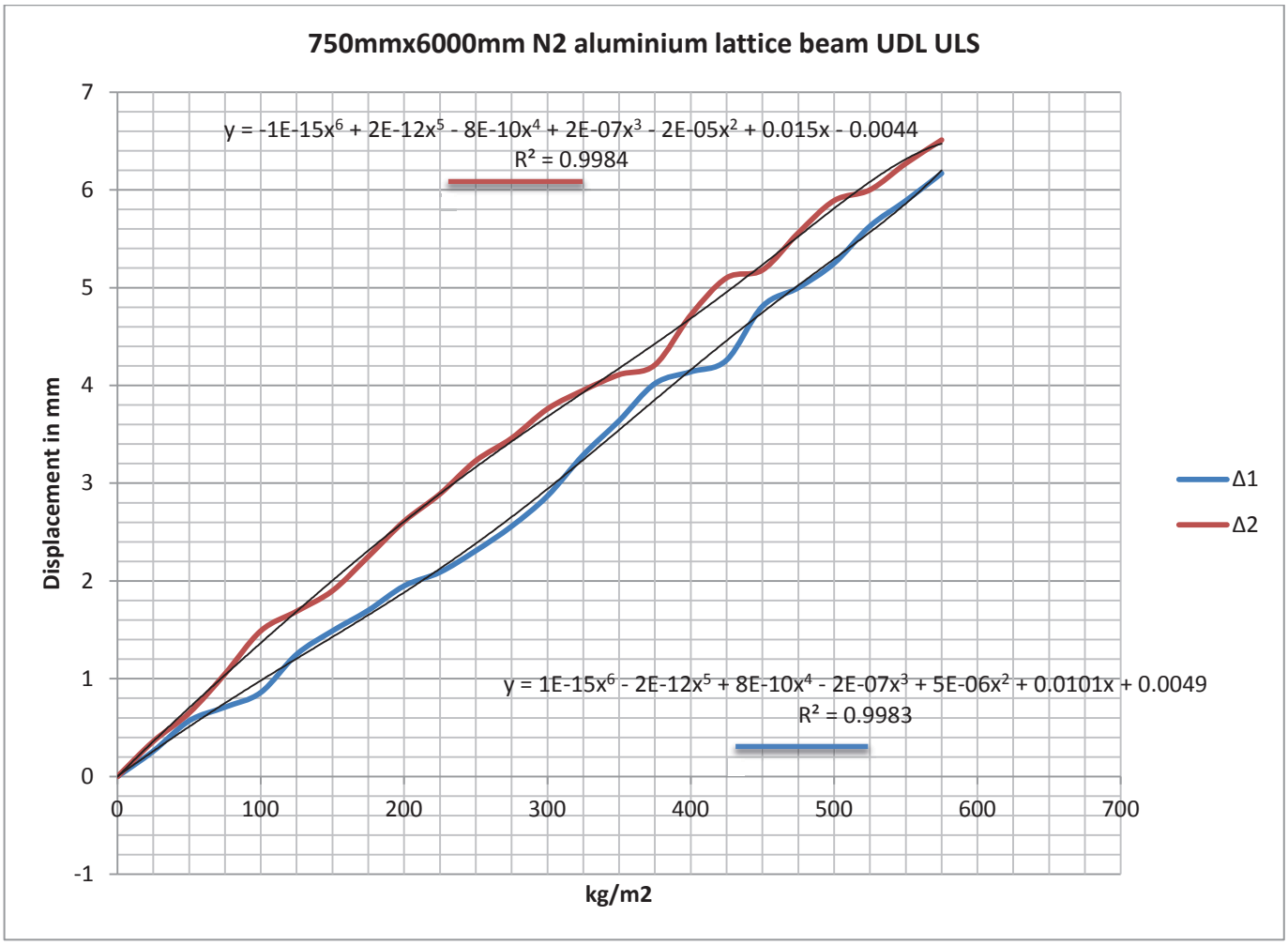
5.6.2. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental UDL ULS loading***



5.6.3. Logged load displacement values per kg/m^2 increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kg/m^2	*Δ^1 mm*	*Δ^2 mm*	*Load kg/m^2*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	300	2.87	3.76
25	0.26	0.36	325	3.29	3.95
50	0.57	0.65	350	3.64	4.11
75	0.71	1.05	375	4.02	4.21
100	0.86	1.49	400	4.14	4.72
125	1.25	1.69	425	4.26	5.1
150	1.49	1.9	450	4.81	5.18
175	1.7	2.25	475	5	5.56
200	1.95	2.61	500	5.25	5.89
225	2.09	2.89	525	5.63	6
250	2.31	3.23	550	5.89	6.27
275	2.56	3.46	575	6.17	6.51

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5.6.4. Observations at requested UDL ULS

The displacement recorded at the 5 minute holding period was as follows:

Δ^1 mm= 6.17mm showing no increase in displacement

Δ^2 mm=6.51mm showing no increase in displacement

No visual or audible evidence of failure, fracture or weld failure was observed throughout live mass application.

5.6.5. Permanent displacement values post load:

Upon initial load removal position Δ^1 showed a permanent displacement value of 0.04mm.

Position Δ^2 showed a permanent displacement value of 0.03mm.

Upon 5 minutes settlement time the recovery of each beam was as follows:

Position Δ^1 showed a recovery to a recorded value 0.03mm and position Δ^2 showed a recovery to a recorded value 0.01mm

Visual examination post load showed no apparent buckling, failures or weld failures.

***NOTE:** All load displacement recordings and collated data were in addition of the steel 1100mmx230mm battens which were not accounted for in the mass calculations.*

5.7. CPL load application to ultimate failure

For the purpose of the failure load application, the failure would be recognised where yield, fracture or catastrophic failure was evident, where no more increase in load could be achieved or a load of 98.1kN (10000kgs) was reached in which the testing would cease.

Ultimate CPL load achieved at a recorded 78.21kN.

No more load could be achieved from the recorded value 78.21kN, lower chord deformation, upper chord lateral deformation evident at bearing point of test bridging beam face lattice beam showed an S configuration throughout length. Upon visual examination no weld failures were evident.

Displacement was recorded up to a safe point prior to displacement gauges being removed.

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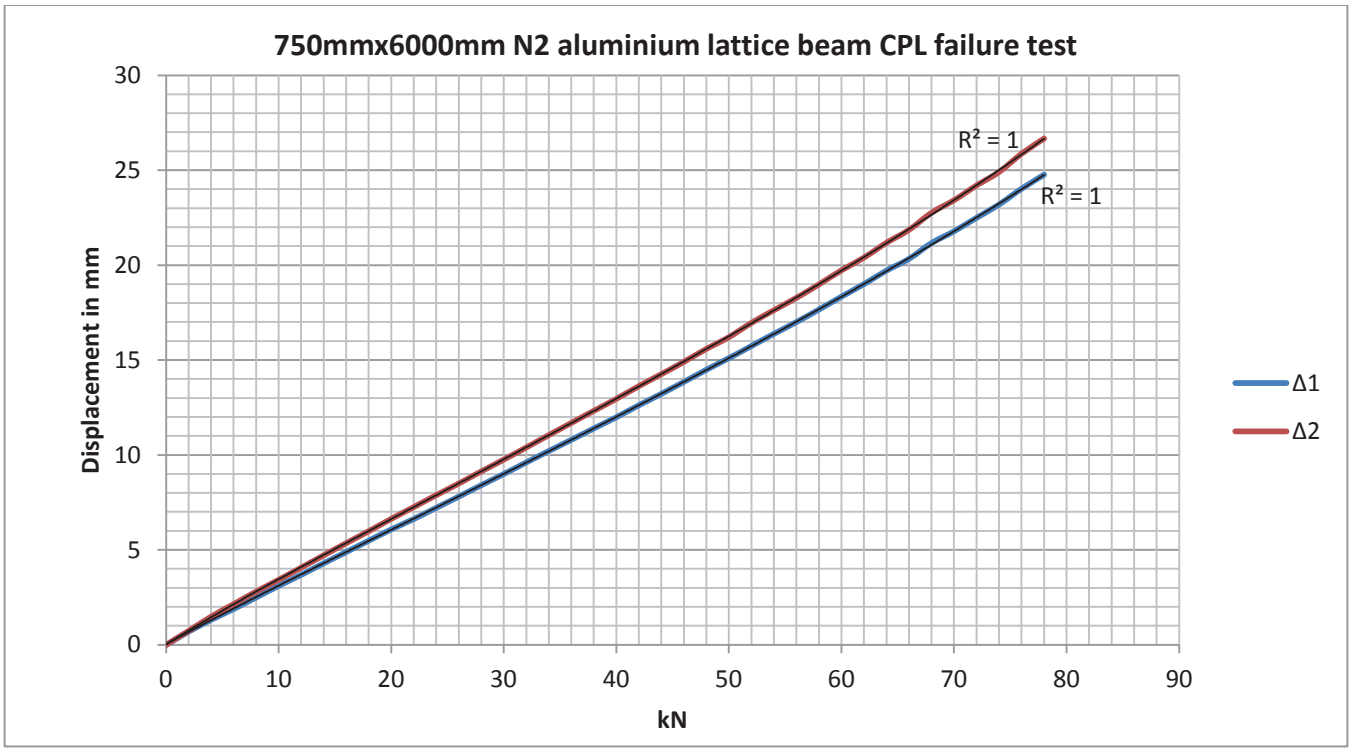
5.7.1. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL failure loading.***



5.7.2. Logged load displacement values per kN increment all displacement values Δ^1 & Δ^2 recorded in mm

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	40	11.99	12.96
2	0.7	0.74	42	12.62	13.63
4	1.32	1.49	44	13.22	14.26
6	1.89	2.15	46	13.85	14.91
8	2.5	2.81	48	14.49	15.59
10	3.11	3.43	50	15.1	16.21
12	3.69	4.07	52	15.74	16.96
14	4.3	4.72	54	16.38	17.63
16	4.89	5.36	56	17	18.28
18	5.49	5.99	58	17.66	18.99
20	6.08	6.64	60	18.34	19.73
22	6.63	7.26	62	19	20.4
24	7.22	7.89	64	19.71	21.18
26	7.81	8.5	66	20.33	21.86
28	8.41	9.14	68	21.16	22.76
30	9	9.76	70	21.78	23.42
32	9.61	10.4	72	22.49	24.2
34	10.21	11.05	74	23.19	24.91
36	10.8	11.69	76	24.02	25.87
38	11.4	12.33	78	24.76	26.67

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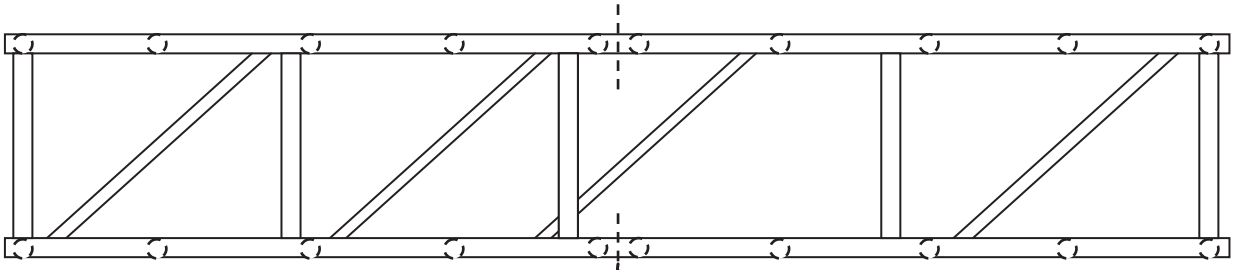
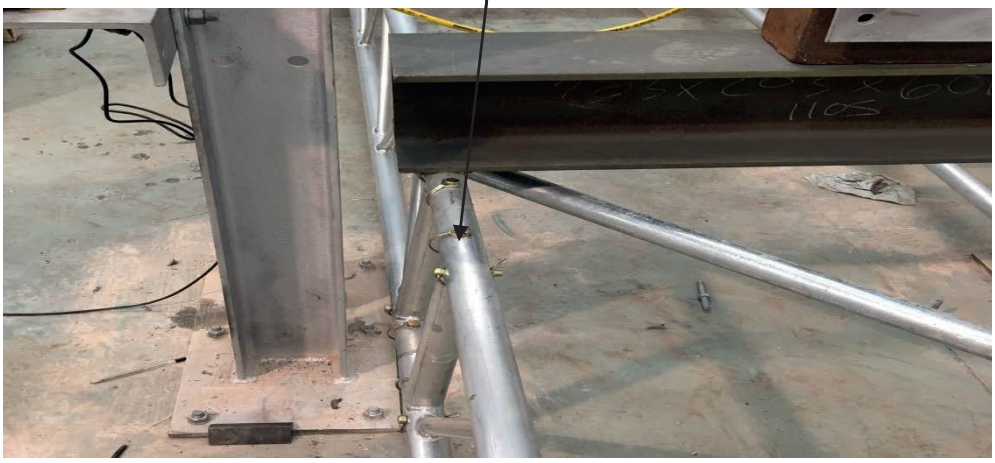
6.0. Load application study 8000mmx450mm assembly and 8000mmx750mm assembly.

A load displacement test to a 450mm deep assembly at 8000mm nominal length complete with spigot joints at geometric centre was requested.
Compressive stools to be placed directly beneath the end vertical node points, a CPL application applied with displacement values recorded at each increment through to an ultimate load application with modes and loads of failure observed and documented.
A load displacement test to a 750mm deep assembly N2 beam at 8000mm nominal length complete with spigot joints at geometric centre was requested.
Compressive stools to be placed directly beneath the end vertical node points, a CPL application applied with displacement values recorded at each increment through to an ultimate load application with modes and loads of failure observed and documented.

6.1. Load application to 450mmx8000mm lattice assembly

The system was assembled as the figure bellow with bracing applied to suit the requirements of the test.
The central spigot joints where positioned adjacent to each other as per request of technical Engineer.
A single diagonal brace tied the upper chords at either side of the joint; one ledger was positioned upon one side of the pair of lattice beams.
The spigots where secured using the pins provided, two per chord per lattice beam.
The bracings where spaced at approximately 2000mm centres.





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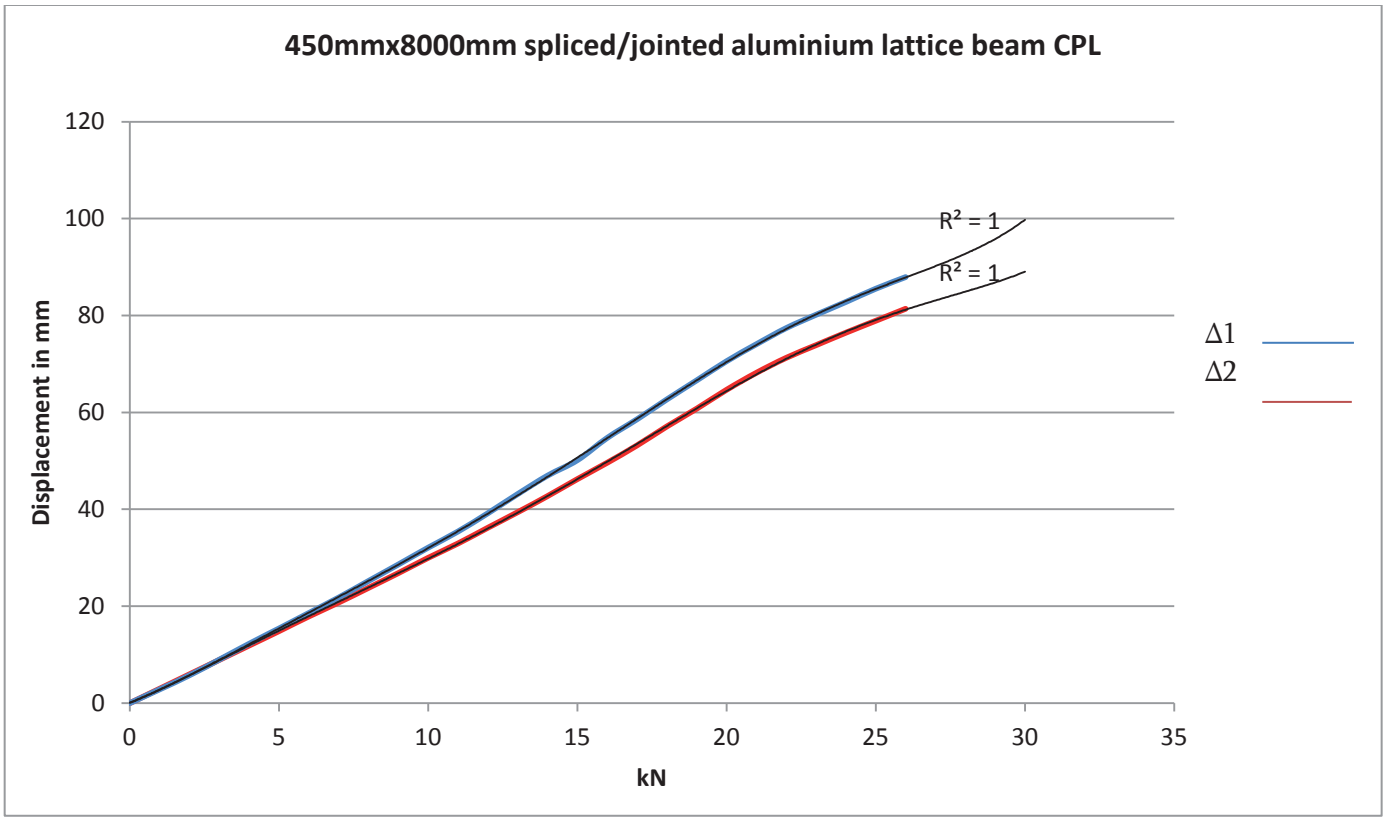
6.2. ***Load displacement graph showingΔ^1 and Δ^2 throughout incremental CPL failure loading.***



6.3. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm.

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	15	50.14	46.24
2	5.76	5.95	16	54.74	49.62
4	12.26	11.89	17	58.58	53.2
5	15.41	14.86	18	62.68	57.11
6	18.6	17.9	19	66.61	60.78
7	21.79	20.77	20	70.56	64.67
8	25.21	23.79	21	74.07	68.18
9	28.62	26.84	22	77.4	71.27
10	32.09	29.99	23	80.15	73.88
11	35.42	32.96	24	82.79	76.46
12	39.19	36.2	25	85.52	78.92
13	43.15	39.41	26	87.92	81.39
14	46.95	42.73			

6.3.1. Failure observations

Displacement monitors removed for safety at 26kN.Rotation through the vertical plain of the lattice beam noted at 38.25kN, ultimate load applied 39.02kN.

Elongation evident at the securing spigot pin holes through the aluminium sections, pin deformation evident lower chord upon disassembly.

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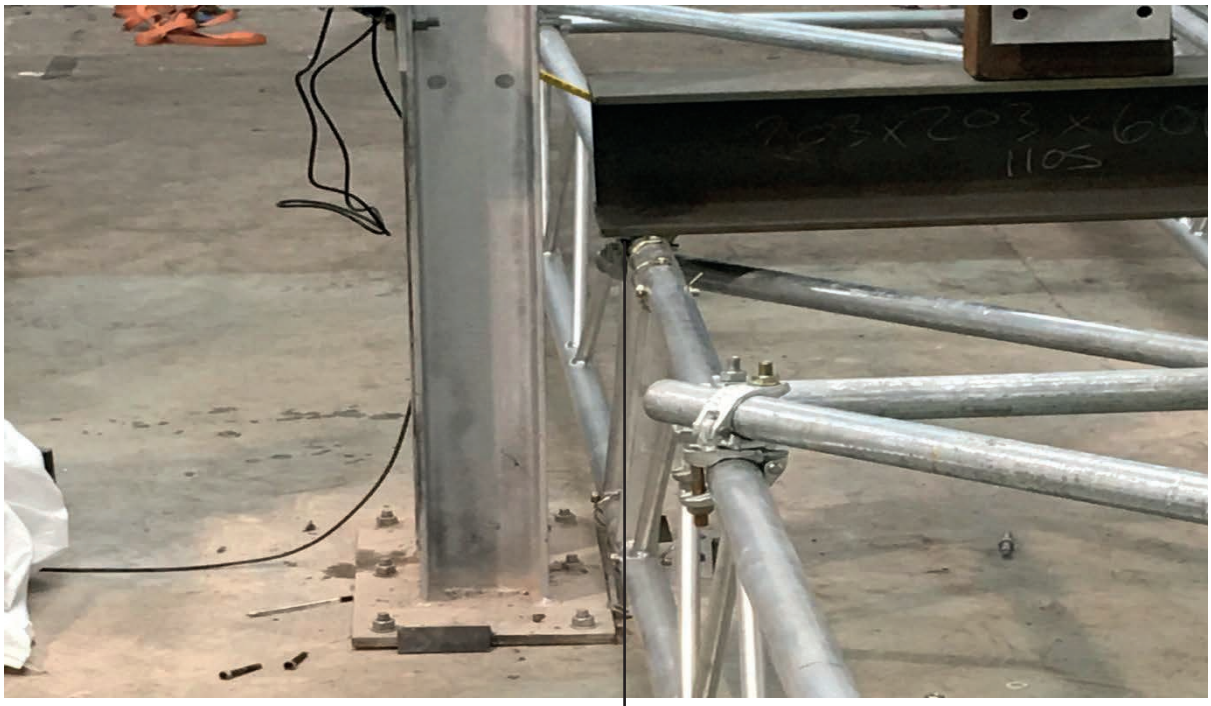
6.3.2. Digital images of 450mmx8000mm jointed beams.



Beam vertical rotation noted.

6.3.3. Lower chord image

Tension through lower chord under load condition

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6.3.4. Digital image lower chord

Lower chord aluminium tube elongation post load evident

6.3.5. Load pin

Digital image showing securing pin deformation, post load application.

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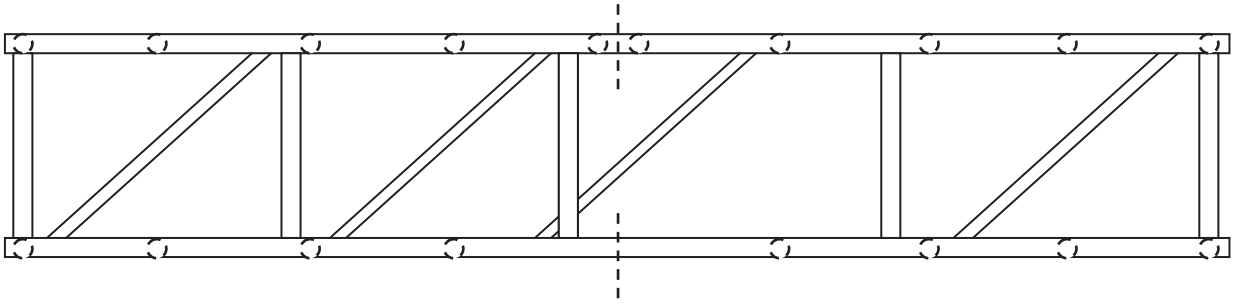
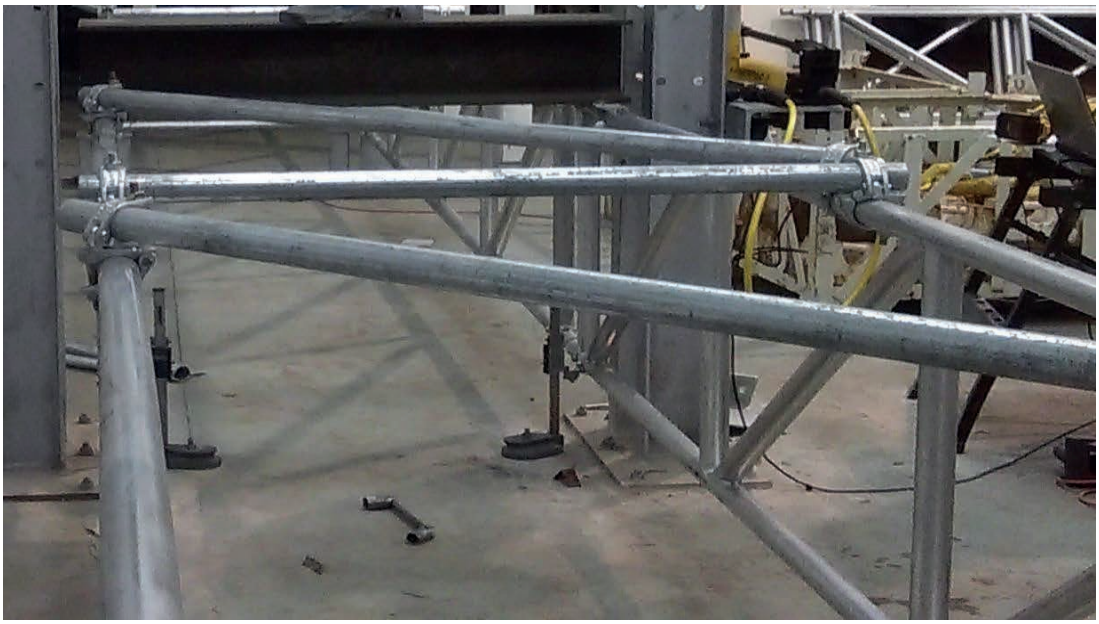
6.4. Load application to 750mmx8000mm lattice assembly

The system was assembled as the figure bellow with bracing applied to suit the requirements of the test.
The central spigot joints where positioned adjacent to each other as per request of technical Engineer.
A single diagonal brace tied the upper chords at either side of the joint; one ledger was positioned upon one side of the pair of lattice beams.
The spigots where secured using the pins provided, three pins per chord per lattice beam.
The bracings where spaced at approximately 2000mm centres.



6.4.1. Digital image of assembly 750mmx8000mm N2 beams



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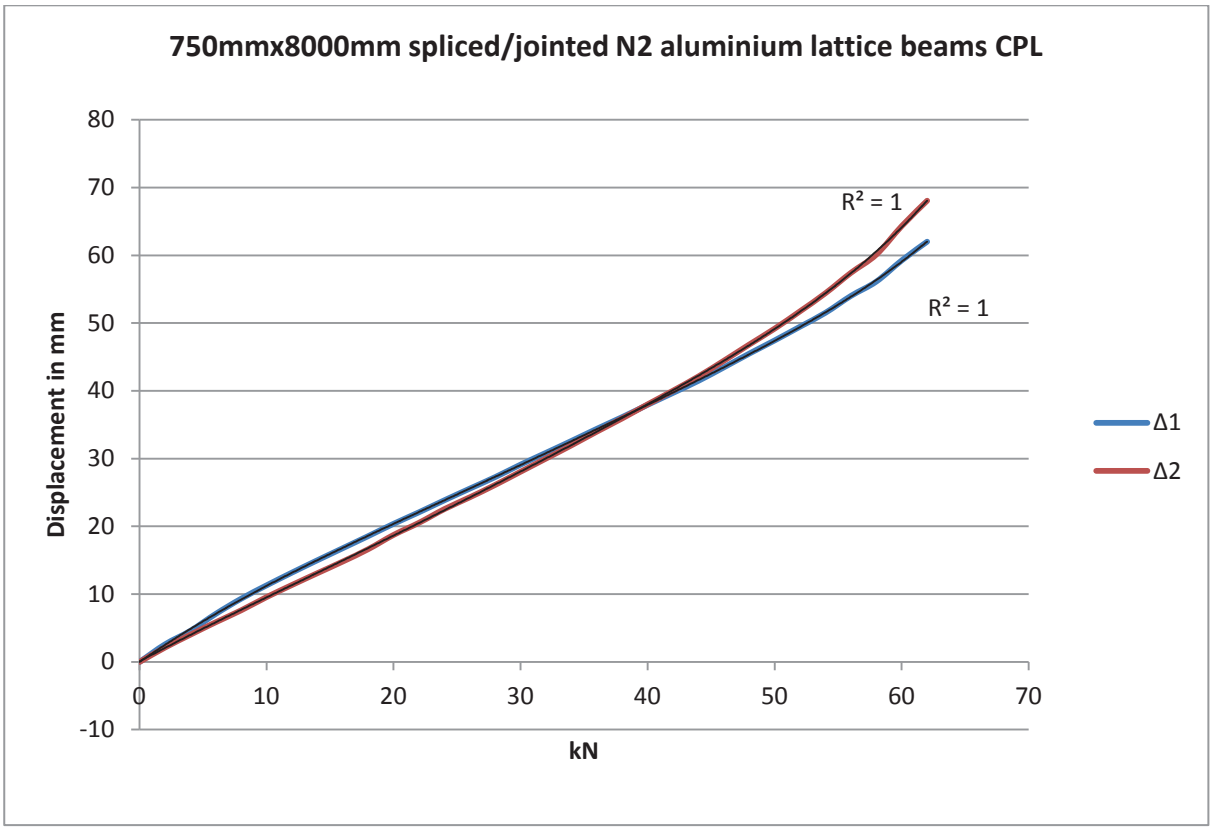
6.5. ***Load displacement graph showing Δ^1 and Δ^2 throughout incremental CPL failure loading.***



6.6. Logged load displacement values per kN increment, all displacement values Δ^1 & Δ^2 recorded in mm.

Load kN	*Δ^1 mm*	*Δ^2 mm*	*Load kN*	*Δ^1 mm*	*Δ^2 mm*
0	0	0	32	30.85	30.02
2	2.59	2.12	34	32.6	31.97
4	4.59	4.02	36	34.39	33.99
6	7.09	5.86	38	36.12	35.95
8	9.33	7.62	40	37.93	38.02
10	11.3	9.57	42	39.69	40.04
12	13.18	11.36	44	41.47	42.14
14	15	13.1	46	43.45	44.46
16	16.78	14.82	48	45.48	46.85
18	18.56	16.64	50	47.43	49.2
20	20.38	18.75	52	49.46	51.76
22	22.08	20.54	54	51.51	54.43
24	23.85	22.56	56	53.99	57.43
26	25.57	24.3	58	56.11	60.12
28	27.27	26.13	60	59.23	64.33
30	29.11	28.08	62	61.99	68.07

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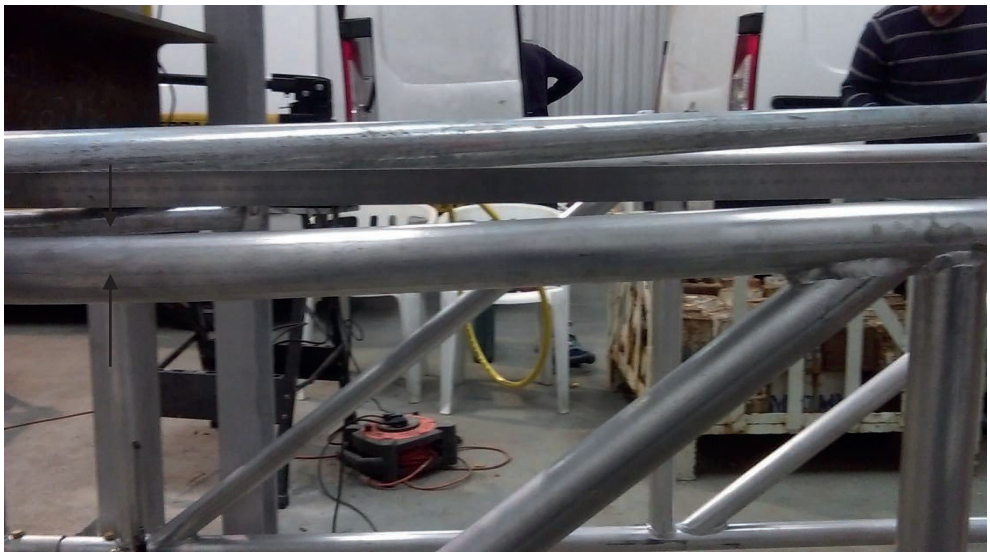
6.7. Failure observations

Ultimate load achieved 62.21kN, upper and lower chord lateral failure, upper chord failure evident between triangulation of bracing assembly. Rotation through vertical plain of N2 lattice beam Δ^2 evident at 36kN.
Permanent displacement recorded at Δ^1 of 18.44mm and Δ^2 of 32.39mm, load reduction upon failure recorded at 45.89kN sustained.

6.7.1. Mode of upper chord failure

6.7.2. Permanent deformation along top face of upper chord.



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All submitted aluminium lattice beams upon post load examination showed no visual weld failures.

No lower chord intermediate bracing was fitted as requested by S-Mech. Only lower chord restraint at ends of system assemblies as documented.

VR scaffolding solutions present for witnessing the following load conditions.

- *450mmx6000mm CPL SLS, ULS and failure testing*
- *750x4000mm and 750 x6000mm UDL SLS and UDL ULS testing*
- *450mmx8000mm spliced/jointed CPL testing.*

- *S-Mech representative present for 450mmx6000mm CPL SLS, ULS and failure testing*

The information and data recorded in this document is for the purposes of technical review and analysis by others.
The testing and results herein only apply to the items submitted at time of test.
Testing applied in accordance with submitted procedure S-Mech 1440-S1

Testing conducted by TESMEC Limited; Independent Testing and Engineering Services
Test House, unit 19 Newey Business Park
Sedgley Road West
Tipton
West Midlands
DY4 8AH
Date of report issue : 16th February 2016

Signed: Mr S.J.Rogers Senior Test Engineer

On behalf of TESMEC Limited.

Report and testing conducted for: VR Scaffold Solutions Ltd

NOTES

S-Mech Ltd.

Consulting Structural Engineering